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U.S. Bureau of Mines

MINERALS YEARBOOK AREA REPORTS

Volume III

1 9 5 3



Prepared by the field staff of the
BUREAU OF MINES
REGIONAL MINERAL INDUSTRY DIVISIONS

UNITED STATES DEPARTMENT OF THE INTERIOR

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FOREWORD

Minerals Yearbook 1953 is published in three volumes to provide a more comprehensive review of mineral-industry activities than was possible when all data were bound in a single volume. The results of the decision to change from a 1-volume to a 3-volume publication with Minerals Yearbook 1952 have been gratifying, because presentation of additional data has been possible with a format that permitted improvements in printing and binding. Minerals Yearbook will continue to record the year's progress and developments, with enough historical background to give full significance to current activities.

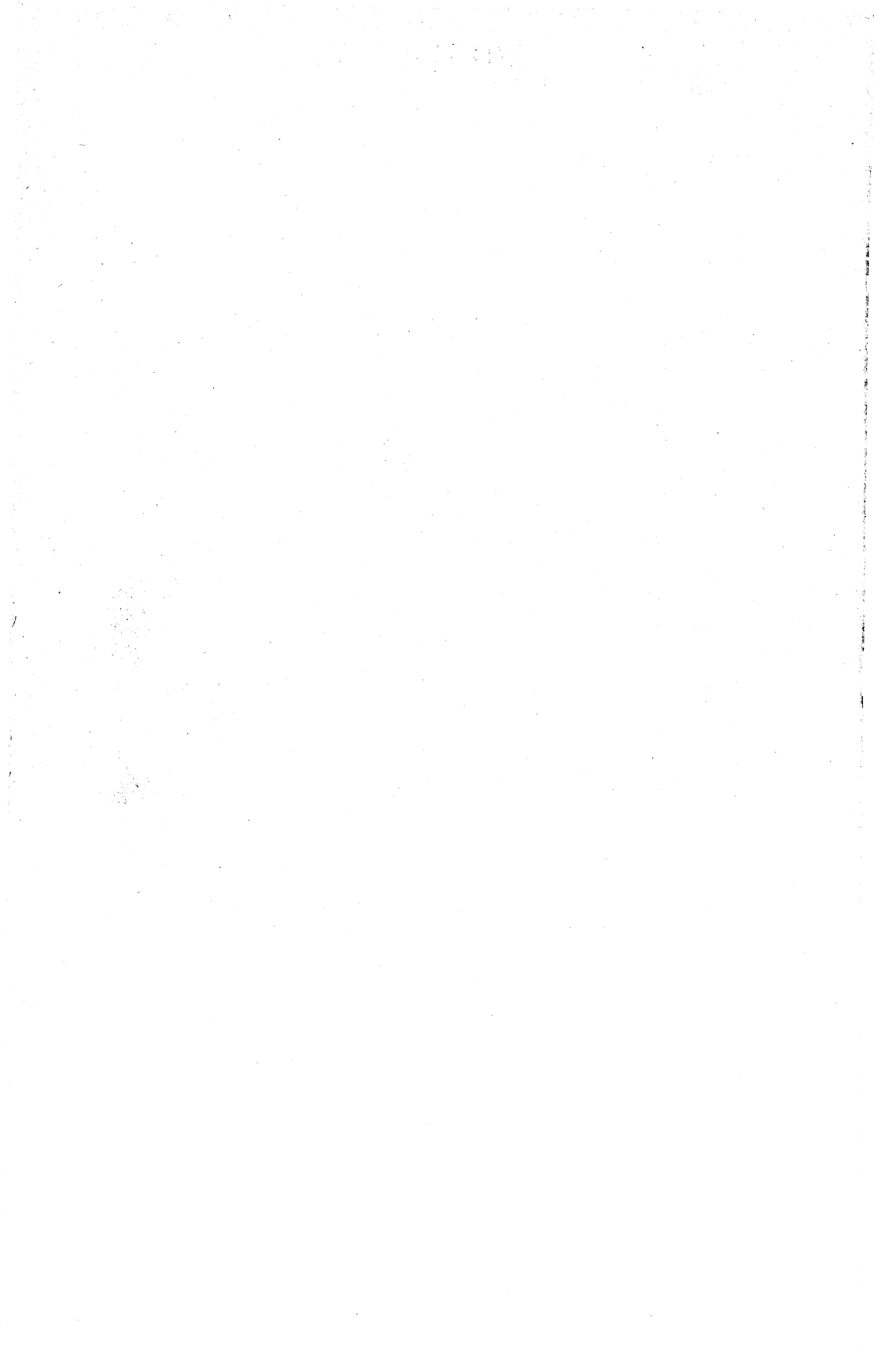
The three-volume yearbook permits fuller coverage in all phases of the reports, but major expansion has been undertaken in the regional presentation (volume III) and in the review of technologic developments and problems in the commodity presentation (volumes I and II).

In the current three-volume presentation, volume I is composed of chapters on mineral commodities, both metals and nonmetals, but exclusive of the mineral fuels. Included also are a chapter reviewing these mineral industries, a statistical summary, and chapters on mining technology, metallurgical technology, trends in technology and operations, and employment and injuries.

Volume II, which is devoted to the mineral fuels, consists of chapters on each mineral-fuel commodity, as well as chapters reviewing the industry as a whole, a statistical summary, and an employment and injury presentation.

Volume III is comprised of chapters covering each of the 48 States, plus chapters on the Territory of Alaska, the Territory of Hawaii and island possessions in the Pacific Ocean, and the Commonwealth of Puerto Rico and island possessions in the Caribbean Sea, including the Canal Zone. Volume III also has a chapter recapitulating its statistics in summary form on a regional basis and another presenting employment and injury data regionally.

MARLING J. ANKENY, *Director.*



ACKNOWLEDGMENTS

In the preparation of this volume of the Minerals yearbook, the Bureau of Mines was assisted in collecting statistical data and mineral-industry information by State and Territorial agencies, through cooperative agreements. Many State chapters were reviewed by staff members of these agencies, and in some instances the staff members collaborated in preparing the chapters and are shown as coauthors. For this assistance acknowledgment is made to the following cooperating State and Territorial organizations:

Alabama: Geological Survey of Alabama.
Alaska: Department of Mines.
Arkansas: Division of Geology.
California: Division of Mines.
Delaware: Delaware Geological Survey.
Florida: Florida Geological Survey.
Georgia: Department of Mines.
Illinois: Illinois State Geological Survey.
Indiana: Indiana Department of Conservation.
Iowa: Iowa Geological Survey.
Kansas: State Geological Survey of Kansas.
Kentucky: Kentucky Geological Survey.
Louisiana: Louisiana Geological Survey.
Maine: Maine Geological Survey.
Maryland: Department of Geology.
Michigan: Michigan Department of Conservation.
Mississippi: Mississippi Geological Survey.
Missouri: Division of Geological Survey.
Montana: Montana State Bureau of Mines & Geology.
Nevada: Conservation and Survey Division.
New Hampshire: Mineral Resources Committee.
New Jersey: Bureau of Geology & Topography.
New York: New York State Science Service.
North Carolina: Division of Mineral Resources.
North Dakota: North Dakota Geological Survey.
Oklahoma: Oklahoma Geological Survey.
Oregon: State Department of Geology and Mineral Industries.
Pennsylvania: Bureau of Topographic & Geologic Survey.
South Carolina: South Carolina Geological Survey.
South Dakota: State Geological Survey.
Tennessee: Tennessee Department of Conservation.
Texas: Bureau of Economic Geology.
Utah: Utah Geological and Mineralogical Survey.
Virginia: Department of Conservation and Development.
Washington: State of Washington Division of Mines and Geology.
West Virginia: West Virginia Geological and Economic Survey.
Wisconsin: Wisconsin Geological & Natural History Survey.
Wyoming: The Geological Survey of Wyoming.

Except for the two review chapters, this volume was prepared by the field staffs of the eight Mineral Industry Divisions in existence during the year of review. The following supervised preparation of the chapters: W. H. Kerns, acting chief, Mineral Industry Division, Region I; Albert J. Kauffman, Jr., chief, Mineral Industry Division,

Region II; R. B. Maurer, chief, Mineral Industry Division, Region III; Alfred L. Ransome, chief, Mineral Industry Division, Region IV; Samuel A. Gustavson, chief, Mineral Industry Division, Region V; F. F. Netzeband, chief, Statistics Branch, Mineral Industry Division, Region VI; J. R. Thoenen, chief, Mineral Industry Division, Region VII; and R. H. Mote, chief, Mineral Industry Division, Region VIII. Preparation of this volume was supervised and the chapters coordinated with those in volume I by Paul F. Yopes, assistant to the chief, Division of Minerals.

Statisticians and researchers in the Mineral Industry Divisions who gave substantial assistance to the authors of the chapters were: In Region I, Opal Y. Sharman; in Region II, Catherine M. Vroman; in Region III, Roy Y. Ashizawa; in Region IV, Stella K. Drake and Virginia C. Halverson; in Region V, Eunice M. Clark and Dorothy O. Stearns; in Region VI, Naomi R. Harrison and Jo D. Stallings; in Region VII, Mildred Rivers; and Region VIII, Roy H. Davis.

The manuscripts upon which this volume is based have been reviewed to insure statistical consistency between the tables, figures, and text, between this volume and volume I, and between this volume and volume III for 1953 by a staff under the direct supervision of Kathleen J. D'Amico, assisted by Julia Muscal, Hope R. Anderson, Helen L. Gealy, Ruby J. Phillips, Anita C. Going, Anne Rogers, and Ruth Kidwell.

The data presented in the Minerals Yearbook are largely based upon information obtained from mineral producers, processors, and users, and acknowledgement is made of this indispensable cooperation given by industry.

CHARLES W. MERRILL,
Chief, Minerals Division.

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Statistical Summary of Mineral Production

By Kathleen J. D'Amico¹



MINERAL production, by geographic areas in 1953, is given in greater detail in this chapter than in the Statistical Summary chapters in volumes 1 and 2. Volume 1 contains tables on imports and exports, in addition to those on production.

Statistics used in this chapter to derive total mineral production of the United States represent primary products only; that is, they do not include products from scrap. Geographically, the figures represent the 48 States, the District of Columbia, and the Territories and possessions of the United States. World production and the proportion of the total produced by the United States are also shown.

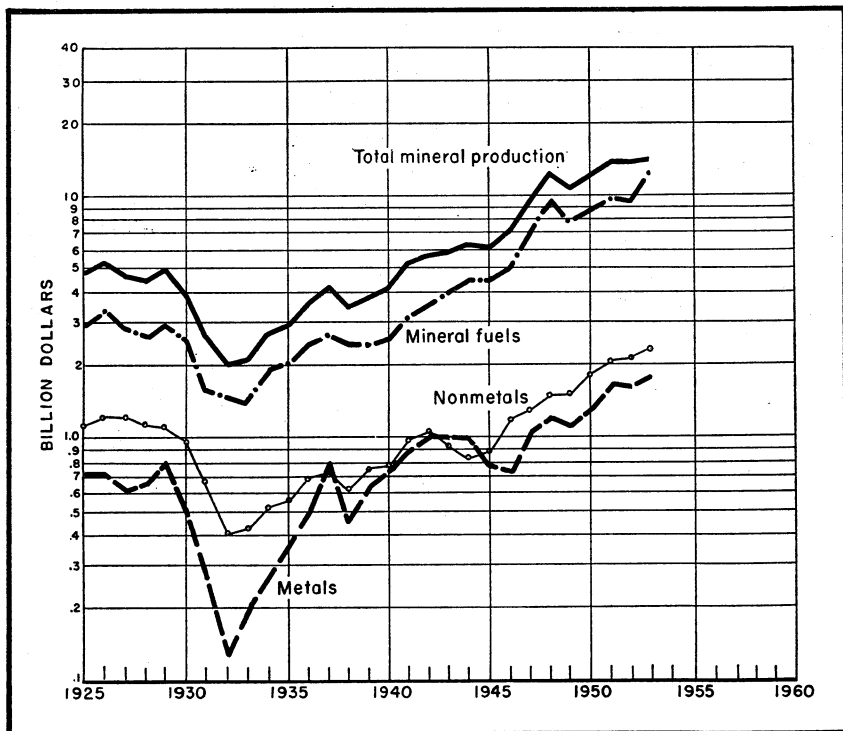


FIGURE 1.—Value of mineral production in continental United States, 1925-53.

¹ Publications editor.

Mineral production may be measured at any of several stages of extraction and processing. The term "mine production" usually refers to minerals in the form in which they are first extracted from the ground but customarily includes, for some minerals, the product of auxiliary processing operations at or near mines, such as sizing and cleaning (coal) and concentrating (metallic ores).

Because of inadequacies in the available statistics, some series deviate from the foregoing definition. In particular, the limestone, cement rock, and gypsum processed into cement are reflected in the series on cement rather than being included in their originally extracted form; similarly, limestone used for lime is reflected in the series on lime rather than in that on stone. The quantities of gold, silver, copper, lead, zinc, and tin are recorded on a mine basis—that is, as the recoverable content of ore sold or treated; the values assigned to these quantities, however, are based on the average selling price of refined metal, not the mine value. Mercury is measured in the form of recoverable metal and valued at the average New York price for metal.

The weight or volume units shown are those customary in the particular industries producing the respective products. No adjustment has been made in the dollar values for changes in the purchasing power of the dollar.

TABLE 1.—Value of mineral production in continental United States, 1925–53, by mineral groups ¹

(Million dollars)

Year	Mineral fuels	Nonmetallic minerals (except fuels)	Metals	Total
1925.....	2,910	1,187	715	4,812
1926.....	3,371	1,219	721	5,311
1927.....	2,875	1,201	622	4,698
1928.....	2,666	1,163	655	4,484
1929.....	2,940	1,166	802	4,908
1930.....	2,500	973	507	3,980
1931.....	1,620	671	287	2,578
1932.....	1,460	412	128	2,000
1933.....	1,413	432	205	2,050
1934.....	1,947	520	277	2,744
1935.....	2,013	564	365	2,942
1936.....	2,405	685	516	3,606
1937.....	2,798	711	756	4,265
1938.....	2,436	622	460	3,518
1939.....	2,423	754	631	3,808
1940.....	2,662	784	752	4,198
1941.....	3,228	989	890	5,107
1942.....	3,568	1,056	999	5,623
1943.....	4,028	916	987	5,931
1944.....	4,574	836	900	6,310
1945.....	4,569	888	774	6,231
1946.....	5,090	1,243	729	7,062
1947.....	7,188	1,338	1,084	9,610
1948.....	9,502	1,552	1,219	12,273
1949.....	7,920	1,559	1,101	10,580
1950.....	8,689	² 1,822	² 1,351	² 11,862
1951.....	9,779	² 2,079	² 1,671	² 13,529
1952.....	9,615	² 2,163	² 1,614	² 13,392
1953.....	10,249	2,337	1,796	14,382

¹ Data for 1925–46 are not strictly comparable with those for subsequent years, since for the earlier years the value of heavy clay products has not been replaced by the value of raw clays used in such products.

² Revised figure.

TABLE 2.—Mineral production in continental United States, 1950-53

Mineral	1950		1951		1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
MINERAL FUELS								
Asphalt and related bitumens (native):								
Bituminous limestone and sandstone.....	1, 184, 976	\$3, 522, 308	1, 378, 434	\$4, 159, 259	1, 570, 698	\$4, 087, 512	1, 440, 544	\$4, 349, 327
Gilsonite.....	66, 186	1, 774, 330	65, 521	1, 895, 374	60, 740	1, 779, 815	60, 505	2, 184, 328
Carbon dioxide, natural (estimated) thousand cubic feet.....	472, 334	369, 000	547, 436	161, 000	737, 000	226, 250	670, 600	203, 450
Coal:								
Bituminous 2.....	512, 528, 632	2, 489, 228, 604	529, 879, 295	2, 614, 219, 188	463, 137, 264	2, 276, 189, 066	453, 577, 946	2, 232, 698, 009
Lignite.....	3, 369, 906	8, 111, 730	3, 291, 104	8, 043, 962	3, 017, 300	8, 703, 618	2, 851, 032	6, 793, 648
Pennsylvania anthracite.....	44, 076, 703	392, 398, 006	42, 669, 997	405, 817, 963	40, 582, 558	379, 714, 076	30, 949, 152	299, 139, 687
Helium (shipments) cubic feet.....	80, 888, 900	1, 027, 913	108, 970, 000	1, 357, 000	145, 810, 332	1, 896, 096	157, 652, 134	3 2, 102, 720
Natural gas (marketed production) million cubic feet.....	6, 282, 060	408, 521, 516	7, 457, 359	542, 964, 400	8, 013, 457	623, 649, 400	8, 306, 916	774, 966, 250
Natural-gas liquids: Natural gasoline and cycle products thousand gallons.....	4, 606, 518	321, 832, 000	4, 971, 834	369, 718, 000	5, 102, 244	371, 468, 000	5, 327, 448	406, 242, 000
LP-gases.....	3, 035, 844	97, 773, 000	3, 627, 834	138, 443, 000	4, 285, 386	161, 692, 000	4, 692, 870	191, 598, 000
do.....	130, 723	1, 142, 566	194, 416	1, 489, 225	210, 852	1, 729, 511	204, 209	1, 617, 947
Petroleum (crude)..... thousand 42-gallon barrels.....	1, 973, 574	4, 963, 380, 000	2, 247, 711	5, 690, 410, 000	2, 289, 836	5, 785, 230, 000	2, 357, 082	\$ 6,327,100,000
Total mineral fuels.....		8, 689, 000, 000		9, 779, 000, 000		9, 615, 000, 000		10, 249, 000, 000
NONMETALLIC MINERALS (EXCEPT FUELS)								
Abrasive stone: 4								
Grindstones and pulpstones.....	4, 468	232, 562	5, 571	315, 871	3, 974	247, 434	2, 499	169, 951
Millstones.....	(1)	11, 300	(6)	6, 000	(9)	9, 285	(5)	18, 375
Pebbles (grinding).....	1, 923	53, 007	3, 062	84, 306	2, 804	98, 949	2, 472	81, 159
Tube-mill liners (natural).....	1, 523	62, 535	1, 408	77, 027	1, 739	67, 724	1, 219	68, 688
Asbestos.....	42, 434	2, 925, 050	51, 645	3, 912, 500	53, 864	4, 713, 032	54, 456	4, 857, 359
Barite.....	695, 414	6, 193, 906	860, 669	7, 968, 023	941, 825	8, 797, 944	944, 212	9, 435, 749
Boron minerals.....	647, 735	15, 890, 000	862, 737	20, 030, 000	583, 828	14, 105, 000	715, 228	17, 668, 000
Bromine.....	98, 502, 300	18, 794, 978	129, 563, 073	26, 179, 556	156, 201, 577	30, 639, 292	164, 143, 348	35, 372, 386
Calcium-magnesium chloride-75-percent (Ca, Mg) pounds.....	299, 921	3, 801, 508	328, 042	4, 756, 242	(8)	(7)	(6)	(5)
Cement.....	228, 787, 765	537, 651, 523	240, 331, 112	611, 751, 089	250, 821, 410	637, 746, 171	260, 696, 761	698, 268, 154
Clays.....	39, 381, 446	95, 249, 933	43, 415, 779	128, 622, 316	42, 287, 073	131, 032, 163	42, 307, 853	125, 033, 896
Emerald.....	5, 949	75, 308	11, 634	160, 212	10, 352	141, 911	10, 562	143, 974
Epsom salts from epsomite.....	407, 925	2, 558, 390	400, 439	2, 815, 587	420, 831	3, 696, 018	452, 600	8, 000
Fluorspar.....	301, 510	10, 619, 717	347, 024	14, 369, 521	331, 273	15, 353, 634	318, 036	4, 594, 450
Fluorapatite.....	9, 304	10, 793, 558	14, 050	1, 246, 947	11, 390	1, 981, 841	10, 520	15, 988, 908
Garnet (abrasive).....	(1)	480, 000	(9)	450, 000	(7)	490, 000	(5)	988, 797
Gem stones (estimated).....								492, 000

See footnotes at end of table.

	7 4, 249, 925	7 1, 822, 000, 000	9, 100	7 7, 992, 344	7 2, 079, 000, 000	4, 434	7 6, 484, 763	12, 646, 766
Total nonmetallic minerals.....								2, 337, 000, 000
METALS								
Antimony ore and concentrate.....	6, 888	1, 443, 227	9, 100	(12)	1, 667, 047	4, 434	(12)	2, 161
Bauxite..... long tons, dried equivalent.....	1, 394, 527	7, 692, 809	1, 848, 676	12, 477, 516	1, 627, 047	390, 161	10, 776, 254	13, 439, 141
Beryllium concentrate..... gross weight.....	569	170, 550	1, 848, 484	233, 757	161, 361	515	233, 757	354, 681
Chromite..... do.....	404	(12)	7, 056	510, 741	21, 304	(12)	1, 776, 981	3, 432, 872
Cobalt (content of ore)..... pounds.....	680, 025	(12)	765, 631	(12)	838, 372	12, 519	(12)	(12)
Columbium-tantalum concentrate..... gross weight.....	1, 000	2, 150	925	490, 311, 235	7, 925, 359	5, 385	16, 723	29, 780
Copper (recoverable content of ores, etc.)..... gross weight.....	903, 337	378, 284, 192	928, 329	449, 311, 235	1, 652, 704	7, 925, 359	7, 447, 873, 756	926, 448
Gold (recoverable content of ores, etc.)..... Troy ounces.....	2, 104, 969	73, 673, 565	1, 741, 026	60, 935, 910	1, 652, 704	1, 652, 704	57, 844, 640	531, 781, 152
Iron ore, usable (excluding byproduct iron sinter)..... long tons, gross weight.....	97, 150, 704	483, 358, 130	115, 621, 556	629, 837, 139	97, 236, 397	390, 161	590, 346, 970	790, 491, 229
Lead (recoverable content of ores, etc.)..... gross weight.....	430, 678	116, 283, 060	116, 388, 143	134, 297, 478	125, 631, 642	390, 161	125, 631, 642	89, 770, 370
Manganese ore (35 percent or more Mn) gross weight.....	134, 451	6, 229, 985	105, 007	6, 045, 452	115, 379	1, 009, 018	157, 536	12, 479, 759
Manganiferous ore (5 to 35 percent Mn)..... do.....	1, 087, 597	4, 609, 432	71, 171, 991	7, 523, 986	1, 009, 018	1, 009, 018	5, 116, 985	1, 289, 380
Manganiferous residuum..... do.....	183, 842	(12)	267, 751	(12)	215, 255	12, 519	(12)	293, 768
Mercury..... 76-pound flasks.....	4, 635	368, 514	7, 293	1, 532, 478	12, 519	12, 519	2, 492, 633	2, 759, 750
Molybdenum (content of ore and concentrate)..... pounds.....	44, 544, 000	37, 729, 000	37, 954, 544	36, 176, 900	36, 176, 900	42, 717, 443	40, 844, 575	53, 823, 235
Silver (recoverable content of ores, etc.)..... Troy ounces.....	42, 406, 376	38, 379, 912	39, 783, 909	35, 961, 195	35, 961, 195	39, 419, 344	35, 676, 497	33, 971, 479
Tin (content of ore and concentrate)..... long tons.....	15	31, 165	19	55, 757	55, 757	17	45, 824	(12)
Titanium concentrate.....								
Ilmenite..... gross weight.....								
Rutile..... do.....	452, 370	5, 807, 584	510, 840	7, 689, 272	522, 515	(12)	8, 022, 752	7, 222, 641
Tungsten concentrate..... 60-percent WO ₃ basis.....	(12)	(12)	(12)	(12)	(12)	(12)	(12)	702, 791
Zinc (recoverable content of ores, etc.)..... gross weight.....	4, 807	8, 156, 758	6, 265	22, 936, 638	7, 003	7, 003	28, 843, 162	35, 932, 751
Zirconium concentrate.....	623, 369	178, 667, 197	681, 188	249, 330, 389	666, 001	(12)	222, 981, 864	125, 320, 890
Undistributed: Magnesium chloride for magnesium metal, platinum-group metals (crude), vanadium, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 12.....								21, 234
Total metals.....		7 10, 218, 983		7 18, 571, 347			7 26, 782, 134	28, 818, 831
Grand total mineral production.....		7 11, 862, 000, 000		7 11, 671, 000, 000			7 11, 614, 000, 000	1, 796, 000, 000
								14, 382, 000, 000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers). Excludes uranium ores and monazite.
² Includes small quantity of anthracite mined in States other than Pennsylvania.
³ Final figure. Supersedes preliminary figure given in commodity chapter.
⁴ Excludes sharpening stones, value for which is included with "Nonmetallic minerals, undistributed."
⁵ Weight not recorded.
⁶ Value included with "Nonmetallic minerals, undistributed."
⁷ Revised figure
⁸ Basis for reporting phosphate rock has been changed from shipments to marketable production, because the latter more nearly reflects output at the mine on a calendar year basis.
⁹ Excludes abrasive stone, bituminous limestone, bituminous sandstone, and ground soapstone, all included elsewhere in table. Also excludes limestone for cement and lime.
¹⁰ Sold or used by producers. Quantity and value ground material.
¹¹ Mine production of crude material.
¹² Value included with "Metals, undistributed."

TABLE 3.—Minerals produced in continental United States and principal producing States in 1953

Rank in value	Mineral	Principal producing States	
		In order of quantity	In order of value
	Abrasive stone:		
72	Grindstones	Ohio, West Virginia	Rank same as for quantity.
82	Millstones	Not available	New York, North Carolina
79	Pebbles (grinding)	Minnesota, Wisconsin, Texas, North Carolina	Rank same as for quantity.
77	Sharpening stones	Arkansas, Indiana, New Hampshire	Do.
78	Tube-mill liners (natural)	Minnesota, North Carolina, Wisconsin	Do.
75	Antimony ore and concentrate	Idaho, Montana, Nevada	Do.
67	Apfite	Vermont	Do.
40	Asbestos	North Carolina, Arizona, California	Vermont, Arizona, North Carolina, California
38	Asphalt (native)	Texas, Alabama, Kentucky, Utah	Texas, Utah, Alabama, Kentucky
33	Barite	Arkansas, Missouri, Nevada, Georgia	Arkansas, Missouri, Georgia, Nevada
27	Bauxite	Arkansas, Alabama, Georgia	Rank same as for quantity.
68	Beryllium concentrate	South Dakota, Maine, New Mexico, Colorado	Do.
24	Boron minerals	California	Do.
21	Bromine	Texas, Michigan, California, West Virginia	Michigan, Texas, California, West Virginia
76	Brucite	Arizona	Rank same as for quantity.
41	Calcium-magnesium chloride	Michigan, California, West Virginia, Ohio	Do.
69	Carbon dioxide (natural)	New Mexico, California, Utah, Washington	New Mexico, Washington, California, Oregon
5	Cement	Pennsylvania, California, Texas, Michigan	Rank same as for quantity.
45	Chromite	California, Montana, Oregon	Do.
12	Clays	Ohio, Pennsylvania, Georgia, California	Georgia, Missouri, Wyoming, Pennsylvania
2	Coal:		
	Bituminous	West Virginia, Pennsylvania, Kentucky, Illinois	Rank same as for quantity.
	Lignite	North Dakota, Montana, South Dakota	Do.
	Pennsylvania anthracite	Pennsylvania	Do.
55	Cobalt (content of ore)	Idaho, Pennsylvania	Do.
80	Columbium-tantalum concentrate	South Dakota, North Carolina, New Mexico, Colorado	North Carolina, South Dakota, New Mexico, Colorado
7	Copper (in ores, etc.)	Arizona, Utah, Montana, New Mexico	Rank same as for quantity.
31	Diatomite	California, Nevada, Oregon, Washington	Do.
74	Emerald	New York	Do.
74	Epsomite	Washington	Do.
85	Feldspar	North Carolina, South Dakota, Colorado, New Hampshire	North Carolina, South Dakota, New Hampshire, Colorado
42	Fluorspar	Illinois, Colorado, Kentucky, Nevada	Rank same as for quantity.
26	Garnet (abrasive)	New York, Idaho, Florida	Do.
61	Gem stones	Not available	California, Oregon, Texas, Nevada
66	Gold (in ores, etc.)	South Dakota, Utah, California, Colorado	Rank same as for quantity.
17	Graphite:		
	Amorphous	Rhode Island	Do.
	Crystalline	Texas, Pennsylvania, Alabama	Texas, Pennsylvania, Alabama
23	Gypsum	Michigan, California, Iowa, Texas	Michigan, New York, Iowa, Texas
53	Hellum	Texas, Kansas, New Mexico	Rank same as for quantity.
60	Iodine	California	Do.
3	Iron ore (usable)	Minnesota, Michigan, Alabama, Utah	Minnesota, Michigan, Alabama, New York
58	Kyanite	Virginia, South Carolina	Rank same as for quantity.
14	Lead (in ores, etc.)	Missouri, Idaho, Utah, Colorado	Do.
13	Lime (open-market)	Ohio, Pennsylvania, Missouri, Illinois	Do.
52	Lithium minerals	North Carolina, South Dakota, California, Colorado	Do.

47	Magnesite (crude)	Washington, Nevada, California.	Do.
25	Magnesium chloride (for magnesium metal)	Texas, Michigan.	Do.
32	Magnesium compounds from sea water and brines (except for metal)	California, Michigan, New Jersey, Texas.	Michigan, California, New Jersey, Texas.
29	Manganese ore	Montana, Nevada, Virginia, Arkansas.	Rank same as for quantity.
36	Manganese oxide	Minnesota, Michigan, New Mexico, Nevada.	Minnesota, Michigan, Nevada, New Mexico.
50	Manganiferous residuum	New Jersey	Rank same as for quantity.
71	Calcereous	Michigan, Virginia, Wisconsin, Indiana.	Michigan, Nevada, Virginia, California.
40	Greensand	New Jersey, Nevada, Idaho, Oregon.	Rank same as for quantity.
48	Mercury	California, Nevada, Georgia, Arizona, South Dakota.	Do.
43	Mica	North Carolina, New Hampshire, Georgia, Idaho.	North Carolina, New Hampshire, Georgia, Idaho.
19	Scrap	North Carolina, New Hampshire, Connecticut, Maine.	Rank same as for quantity.
4	Sheet	Colorado, Utah, Arizona, New Mexico.	North Carolina, New Hampshire, Idaho, South Dakota.
6	Molybdenum (content of ore and concentrate)	Texas, Louisiana, Oklahoma, California.	Rank same as for quantity.
73	Natural gas liquids:	Texas, California, Louisiana, Oklahoma.	Texas, Louisiana, California, West Virginia.
54	LP-gases:	Texas, Oklahoma, Louisiana, Oklahoma, Louisiana.	Rank same as for quantity.
56	Oilvine	North Carolina, Washington.	Rank same as for quantity.
55	Peat	Washington, Ohio, Florida, Michigan.	Ohio, Michigan, New Jersey, Florida.
1	Perlite	New Mexico, Nevada, Colorado, California.	Rank same as for quantity.
16	Petroleum (crude)	Texas, California, Louisiana, Oklahoma, Florida, Tennessee, Idaho, Montana, California.	Do.
84	Platinum-group metals (crude)	California.	Do.
49	Potassium salts	New Mexico, California, Utah, Michigan.	Do.
39	Pumice and pumicite	New Mexico, California, Arizona, Idaho.	Do.
57	Pyrites	Tennessee, Virginia, Montana, California.	New Mexico, California, Arizona, Oregon.
15	Quartz from pegmatites and quartzite	Washington, North Carolina, California, Idaho.	Tennessee, Virginia, California, Montana.
37	Salt (common)	Michigan, New York, Louisiana, Ohio.	Washington, Connecticut, North Carolina, California.
9	Sand and gravel	California, Michigan, Ohio, Wisconsin.	Rank same as for quantity.
22	Sand and sandstone (ground)	Illinois, West Virginia, New Jersey, Ohio.	California, Ohio, New York, Michigan.
30	Silver (in ores, etc.)	Idaho, Utah, Montana, Arizona.	Rank same as for quantity.
28	Slate	Pennsylvania, Vermont, New York, Georgia.	Do.
38	Sodium carbonate (natural)	California, Wyoming.	Pennsylvania, Vermont, New York, Virginia.
46	Sodium sulfate (natural)	California, Texas, Wyoming.	Rank same as for quantity.
8	Stone	Pennsylvania, Ohio, Illinois, Michigan.	Do.
87	Strontium minerals	California.	Do.
10	Sulfur from Frasch-process mines	Texas, Louisiana.	Pennsylvania, Ohio, Illinois, New York.
63	Sulfur from other mines	California, Nevada.	Rank same as for quantity.
34	Sulfur, recovered elemental	Wyoming, Texas, Arkansas, California.	Do.
44	Talc, pyrophyllite, and soapstone	New York, California, North Carolina, Vermont.	Wyoming, Texas, California, Arkansas.
83	Tin (content of ore and concentrate)	Colorado.	California, New York, North Carolina, Vermont.
35	Titanium concentrate:	New York, Florida, Virginia.	Rank same as for quantity.
64	Ilmenite	Florida.	Do.
86	Rutile	Idaho.	Do.
59	Titanium-iron concentrate	Illinois, Missouri, Pennsylvania.	Missouri, Illinois, Pennsylvania.
20	Tungsten concentrate	Nevada, California, North Carolina, Colorado.	Rank same as for quantity.
51	Vermiculite	Montana, South Carolina, Wyoming, North Carolina.	Do.
81	Wollastonite	New York.	Do.
11	Zinc (in ores, etc.)	Montana, Idaho, New York, New Jersey.	Do.
62	Zirconium concentrate	Florida.	Do.

TABLE 4.—Value of mineral production in continental United States, 1950-53, by States, in thousand dollars, and principal minerals produced in 1953

State	1953				Principal minerals in order of value
	1950	1951	1952	1953	
Alabama.....	158,975	184,280	158,382	187,900	Coal, iron ore, cement, stone.
Arizona.....	207,406	246,886	251,010	255,010	Copper, zinc, cement, gold.
Arkansas.....	118,642	117,662	131,022	137,000	Petroleum, bauxite, natural-gas liquids, coal.
California.....	1,086,374	1,210,076	1,219,526	1,392,970	Petroleum, natural-gas liquids, natural gas, cement.
Colorado.....	184,888	174,485	187,680	211,880	Petroleum, molybdenum, coal, cement.
Connecticut.....	5,875	6,247	7,195	7,917	Stone, sand and gravel, lime, clays.
Delaware.....	522	584	677	659	Sand and gravel, stone, clays.
District of Columbia.....	70	82	10	10	Clays.
Florida.....	170,717	176,897	182,878	92,236	Phosphate rock, cement, stone, sand and gravel.
Georgia.....	143,394	146,675	151,459	51,393	Clays, stone, cement, sand and gravel.
Idaho.....	179,929	183,171	177,848	68,987	Lead, zinc, silver, phosphate rock.
Illinois.....	488,244	480,034	460,005	462,443	Coal, petroleum, stone, cement.
Indiana.....	166,632	174,388	162,031	169,781	Coal, petroleum, cement, stone.
Iowa.....	41,773	47,708	52,481	51,994	Cement, stone, sand and gravel, coal.
Kansas.....	368,614	406,087	403,370	413,231	Petroleum, natural gas, cement, stone.
Kentucky.....	459,956	442,264	398,446	381,742	Coal, petroleum, natural gas, stone.
Louisiana.....	693,607	787,678	848,401	965,227	Petroleum, natural gas, natural-gas liquids, sulfur.
Maine.....	7,461	8,516	8,981	10,503	Cement, sand and gravel, stone, slate.
Maryland.....	122,740	128,163	98,847	27,083	Sand and gravel, cement, stone, coal.
Massachusetts.....	116,110	117,077	117,812	17,191	Stone, sand and gravel, lime, clays.
Michigan.....	1290,194	1284,471	1264,518	286,487	Coal, petroleum, natural gas, sand and gravel.
Minnesota.....	331,587	432,577	307,440	545,845	Petroleum, natural gas, gravel, stone, manganese ore.
Mississippi.....	309,945	301,870	301,875	107,968	Iron ore, sand and gravel, stone, cement, clays.
Missouri.....	113,191	135,249	140,977	138,297	Lead, cement, stone, lime.
Montana.....	1108,625	1126,376	1122,069	132,184	Copper, petroleum, zinc, manganese ore.
Nebraska.....	14,022	18,469	20,507	33,281	Petroleum, cement, sand and gravel, stone.
Nevada.....	48,499	57,674	64,221	73,623	Copper, tungsten, gold, iron ore.
New Hampshire.....	1,711	205	1,945	73,305	Stone, sand and gravel, rilles, feldspar.
New Jersey.....	146,816	160,090	157,468	51,945	Stone, sand and gravel, iron ore, zinc.
New Mexico.....	210,294	256,302	288,500	330,797	Petroleum, potassium salts, copper, natural gas.
New York.....	1156,585	1180,816	1180,751	186,988	Cement, iron ore, stone, sand and gravel.
North Carolina.....	26,338	30,647	34,726	38,446	Stone, tungsten, sand and gravel, feldspar.
North Dakota.....	9,614	10,247	12,087	18,237	Petroleum, coal, sand and gravel, clays.
Ohio.....	274,872	302,612	292,689	302,843	Coal, stone, lime, cement.
Oklahoma.....	627,095	607,486	621,351	678,160	Petroleum, natural-gas liquids, natural gas, coal.

1953

Percent of U. S. total

Rank

Value

1952

1951

1950

State

Principal minerals in order of value

Oregon.....	21,542	28,402	26,674	24,449	39	.17	Sand and gravel, cement, stone, diatomite.
Pennsylvania.....	1,186,212	1,289,226	1,145,633	1,121,622	3	7.30	Coal, cement, stone, petroleum.
Rhode Island.....	1,425	1,278	1,250	1,462	47	.01	Sand and gravel, stone, graphite.
South Carolina.....	11,394	11,444	14,686	17,771	43	.12	Cement, clays, stone, sand and gravel.
South Dakota.....	32,716	29,652	30,455	33,901	36	.24	Gold, stone, cement, sand and gravel.
Tennessee.....	190,405	100,047	100,932	98,050	26	.68	Coal, cement, stone, phosphate rock.
Texas.....	2,674,456	3,269,199	3,379,813	3,647,913	1	25.87	Petroleum, natural gas, natural-gas liquids, sulfur.
Utah.....	1,229,966	257,145	265,501	298,629	13	2.08	Copper, coal, iron ore, gold.
Vermont.....	18,563	18,516	17,891	20,302	40	.14	Stone, asbestos, slate, copper.
Virginia.....	137,806	161,252	164,679	152,979	21	1.06	Coal, stone, cement, sand and gravel.
Washington.....	49,055	54,554	156,139	54,577	31	.88	Cement, sand and gravel, zinc, stone.
West Virginia.....	1,829,633	1,941,748	1,825,733	790,110	5	5.49	Coal, natural gas, petroleum, natural-gas liquids.
Wisconsin.....	41,693	48,350	55,710	55,271	30	.88	Sand and gravel, stone, iron ore, cement.
Wyoming.....	1,177,744	1,204,357	1,206,828	255,906	16	1.75	Petroleum, coal, clays, natural gas.
Total.....	11,862,000	13,529,000	13,392,000	14,382,000	-----	100.00	Petroleum, coal, iron ore, natural gas.

! Revised figure.

! Less than 0.005 percent.

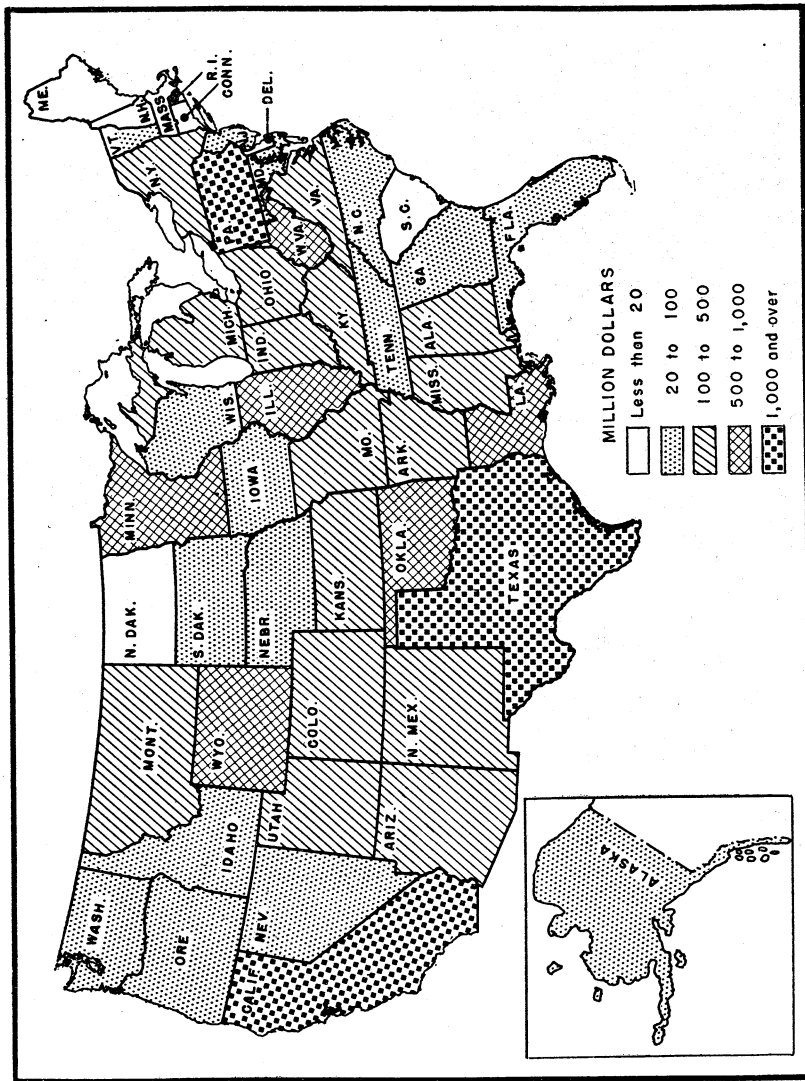


FIGURE 2. Value of mineral production in continental United States and Alaska, 1953, by States.

TABLE 5.—Mineral production in the United States, 1950-53, by States 1—Continued
ARIZONA—Continued

Mineral	1950		1951		1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Stone (except limestone for cement and lime)	228,400	\$139,810	308,881	\$353,872	235,020	\$355,709	442,358	\$618,748
Trungsten concentrate	1	(C)	11	36,643	71	251,136	1,529,976	488,858
Zinc (recoverable content of ores, etc.)	60,480	17,176,320	52,989	19,291,636	47,143	15,651,476	27,550	6,331,900
Undistributed: Asbestos, barite, beryllium concentrate (1950-51 and 1953), cement, feldspar, gem stones, lithium (1951), mercury (1951), quartz, vanadium, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)				\$ 3,566,376		\$ 5,373,512		6,165,553
Total Arizona		207,406,000		243,886,000		231,702,000		256,616,000

ARKANSAS

Barite	343,168	\$3,088,512	407,085	\$3,765,536	498,522	\$3,093,828	380,763	\$3,045,583
Bauxite	1,307,335	7,531,535	1,815,274	12,259,742	1,603,833	10,235,254	1,529,976	12,975,992
Clays	475,169	1,007,003	401,459	1,206,868	552,576	1,513,634	529,126	1,734,414
Coal	1,160,088	8,882,870	1,106,705	8,686,410	873,088	6,839,113	775,207	6,143,757
Iron ore (usable)	1,444	(C)	1,343	(C)	115	(C)	264	(C)
Lead (recoverable content of ores, etc.)	9	2,430	33	11,418	4	1,288	6	626,647
Manganese ore (35 percent or more Mn)	6,359	(C)	1,429	(C)	2,246	(C)	6,123	2,200,000
Natural gas (marketed production)	48,047	1,682,000	45,656	1,736,000	42,325	1,735,000	41,510	1,735,000
Natural-gas liquids:								
In natural gasoline and cycle products	58,596	3,926,000	58,212	4,247,000	61,782	4,580,000	58,422	4,123,000
LP-gases (do)	30,308	1,197,000	40,404	1,606,000	49,098	2,079,000	55,188	2,562,000
Petroleum (crude)	31,108	73,530,000	29,798	73,900,000	29,440	72,420,000	429,681	477,170,000
Sand and gravel	4,118,080	3,443,573	3,868,940	3,569,114	5,011,065	4,977,219	4,903,835	4,955,383
State	(C)		27,080	3,174,329	(C)		34,516	315,858
Stone (except limestone for cement and lime)	3,952,720	7,419,110	2,635,746	3,216,426	2,967,479	7,334,620	4,645,350	45,069,750
Zinc (recoverable content of ores, etc.)	8	2,272	50	18,200	26	8,632		
Undistributed: Abrasive stones, cement, gypsum, lime, ground soapstone (1863), stone (dimensional, scallaneous, 1952), recovered elemental sulfur, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3). Excludes value of clays used for cement				\$ 5,396,967		\$ 5,987,245		5,367,669
Total Arkansas		\$ 119,642,000		\$ 119,844,000		\$ 117,687,000		127,090,000

TABLE 5—Mineral production in the United States, 1950-53, by States 1—Continued

COLORADO

Mineral	1950		1951		1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Beryllium concentrate..... gross weight.....	97	\$30,500	97	\$32,339	54	\$24,688	75	\$39,215
Clays.....	501,689	762,483	657,397	1,172,109	568,730	1,087,154	777,969	1,429,780
Coal.....	4,258,500	21,668,857	4,102,639	21,165,518	3,623,015	19,211,657	3,574,850	19,197,732
Copper (recoverable content of ores, etc.).....	3,141	1,306,656	3,212	1,554,608	3,606	1,745,304	2,941	1,686,134
Feldspar..... long tons.....	59,457	323,120	50,451	283,153	38,288	224,385	43,508	267,642
Fluorspar.....	18,489	654,089	20,661	820,322	29,185	1,508,968	53,276	2,872,360
Gold (recoverable content of ores, etc.).....	130,390	4,563,650	116,503	4,077,605	124,594	4,360,790	119,218	4,172,630
Gypsum..... troy ounces.....	62,150	183,976	(3)	(3)	(3)	(3)	62,636	4,233,043
Iron ore (usable)..... long tons, gross weight.....	27,007	7,291,890	30,336	10,496,256	30,066	9,681,252	21,754	3,825,548
Lead (recoverable content of ores, etc.)..... gross weight.....	1,467	27,068	1,852	32,901	76	(3)	1,599	19,455
Mica (scrap).....	24,090,200	(3)	22,911,949	608,000	24,557,149	(3)	33,851,083	(3)
Natural gas (content of ore and concentrate)..... pounds.....	11,168	436,000	14,128	608,000	84,260	1,884,000	28,509	1,654,000
Natural gas liquids..... million cubic feet.....								
Natural gas liquids:..... thousand gallons.....								
L.P.-gases..... do.....	9,114	584,000	(3)	19,611	(3)	(3)	(3)	(3)
Petroleum.....	7,088	288,000	(3)	2,241	(3)	20,230	(3)	(3)
Petroleum (crude)..... thousand 42-gallon barrels.....	3,210	28,088	2,241	19,611	2,312	(3)	(3)	(3)
Pumice and pumicite.....	13,691	95,842	27,823	70,670,000	30,381	77,470,000	436,402	498,650,000
Sand and gravel.....	23,303	56,420,000	(3)	(3)	(3)	(3)	(3)	(3)
Silver (recoverable content of ores, etc.)..... troy ounces.....	5,154,287	3,940,439	6,916,631	4,452,469	8,461,039	6,268,367	47,919	99,700
Stone (except limestone for cement and lime).....	3,492,278	3,160,688	2,787,882	2,523,174	2,813,643	2,546,489	12,438,600	8,609,151
Stone (content of ore and concentrate)..... long tons.....	71,679,960	7,276,331	1,470,123	2,334,376	1,708,872	2,566,401	2,200,317	7,931,398
Tungsten concentrate..... 60-percent WO ₃ basis.....	15	31,165	18	54,033	13	33,723	7,883,646	71,741,926
Zinc (recoverable content of ores, etc.).....	196	302,248	336	1,092,780	625	2,354,664	817	2,902,490
Undistributed: Carbon dioxide (1952-53), cement, colum- bium-tantalum concentrate, gem stones, lithium minerals (1953), pyrites, stone (dimension, unclassified 1950, crushed basalt, 1953), sulfur ore (1950), vanadium, ver- miculite (1950), and minerals whose value must be con- cealed for particular years (indicated in appropriate column by footnote reference 3). Excludes value of clays used for cement.	45,776	13,000,384	55,714	20,279,896	53,203	17,663,396	37,809	8,696,070
Total Colorado.....	\$ 34,015,845	154,898,000	\$ 37,766,254	179,435,000	\$ 38,936,141	187,389,000	\$ 51,617,866	211,586,000

STATISTICAL SUMMARY OF MINERAL PRODUCTION

Phosphate rock 11.....long tons.....	(3)	93,990	(1)	121,044	693,127	2,122,824	866,330	2,950,160	1,001,989	4,149,943
Pumice and pumicite.....		4,281,908	3,043,905	2,971,264	4,057,391	2,971,264	38,985	141,233	51,224	159,833
Sand and gravel.....		3,700	29,600	107,738	11,968	1,077,738	9,500	7,855,201	8,776,304	2,841,440
Sand and gravel.....(ground).....		16,095,019	14,566,805	14,753,023	14,753,023	13,352,231	14,923,105	13,906,918	14,639,740	13,249,704
Silver (recoverable content of ores, etc.).....troy ounces.....		7,644,020	7,861,280	1,437,182	(3)	(3)	1,511,422	7,2,441,236	1,141,626	2,260,875
Stone (except limestone for cement).....										
Titanium-iron concentrate (montitanium use).....										
Tungsten concentrate.....		222			377	1,402,866	353	1,245,490	4,441	1,665,983
Zinc (recoverable content of ores, etc.).....		87,890	24,960,760	78,121		28,456,044	74,317	24,673,244	72,153	16,595,190
Undistributed: Barite, cement, columbium-tantalum concentrate (1953), abrasive garnet, fluorspar (1951-53), quartz (1953), stone (crushed sandstone and limestone, 1950; crushed limestone, 1952), titanium concentrate (1951), vanadium and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3).....			\$ 5,043,866			\$ 3,550,445		\$ 3,294,115		3,801,999
Total Idaho.....			\$ 79,329,000			\$ 83,171,000		\$ 77,848,000		63,987,000

ILLINOIS

Cement.....	376-pound barrels.....	7,857,989	\$16,920,234	3,019,000	(3)	8,377,387	\$19,853,132	8,710,621	\$20,600,347	8,651,385	\$21,981,761
Clays.....		2,520,183	3,405,953	3,436,000	(3)	2,589,464	1,029,294	2,337,023	3,871,051	2,305,202	4,573,001
Coal.....		56,290,622	228,137,929	54,199,875	(3)	54,199,875	228,137,929	45,789,982	187,827,712	46,009,891	181,597,988
Fluorspar.....		19,019,622	6,170,785	204,328		204,328	9,294,703	188,293	9,481,223	163,303	8,567,026
Lead (recoverable content of ores, etc.).....		2,750	736,830	3,160		3,160	1,093,390	4,262	1,372,364	3,391	888,442
Lime (open-market).....		367,485	4,461,413	462,690		462,690	5,878,289	460,775	5,917,038	519,992	6,986,560
Natural gas.....	million cubic feet.....	13,285	1,342,000	11,425		11,425	1,748,000	10,183	1,650,000	9,282	1,559,000
Natural-gas liquids.....	thousand gallons.....	41,538	3,019,000	36,982		36,982	4,727,000	(3)	(3)	(3)	(3)
Natural gasoline.....	do.....	88,966	3,436,000					(3)	(3)	(3)	(3)
Peat.....		62,028	171,820,000	60,243		60,243	166,870,000	60,089	165,850,000	2,151	170,590,000
Petroleum (crude).....	thousand 42-gallon barrels.....	18,695,433	16,531,797	20,130,667		20,130,667	19,146,502	19,584,308	19,214,195	4,59,026	20,540,549
Sand and gravel.....		263,122	2,278,237	262,488		262,488	2,300,102	19,267,180	2,342,549	21,521,806	2,461,767
Sand and gravel.....(ground).....		2,001	1,811	3,465		3,465	3,136	3,781	3,422	2,838	2,116
Silver (recoverable content of ores, etc.).....		17,911,480	21,970,537	19,298,968		19,298,968	23,474,516	22,334,887	23,326,060	22,988,732	29,736,966
Stone (except limestone for cement, and lime).....troy ounces.....		26,982	7,662,888	21,776		21,776	7,926,464	18,816	6,246,912	14,556	3,347,880
Zinc (recoverable content of ores, etc.).....											
Undistributed: Recoverable elemental sulfur (1953), tripoli and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3). Excludes value of clays used for cement.....			\$ 304,873				\$ 3,045,410		\$ 7,302,545		9,628,924
Total Illinois.....			488,144,000				489,934,000		460,005,000		462,443,000

See footnotes at end of table.

TABLE 5.—Mineral production in the United States, 1950-53, by States—Continued

INDIANA

Mineral	1950		1951		1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays.....	1,412,733	\$1,605,419	1,524,731	\$1,914,457	1,331,298	\$1,700,209	1,654,112	\$2,514,297
Coal.....	19,957,029	79,301,847	19,450,445	78,617,530	16,350,202	64,977,328	15,812,483	62,353,539
Marl, calcareous (except for cement).....	20,380	13,977	12,960	18,129	16,414	9,021	13,540	46,388
Natural gas.....	5,956	67,000	845	83,000	16,414	79,000	41,000	40,000
Peat.....	5,793	18,966	5,699	22,824	10,115	49,775	6,919	47,000
Petroleum (crude).....	10,699	29,530,000	11,100	30,530,000	12,037	33,100,000	42,823	47,570,000
Sand and gravel.....	9,723,033	7,516,509	11,030,814	8,763,936	11,646,014	9,279,908	11,203,059	9,500,914
Stone (except limestone for cement and lime).....	6,994,670	20,686,160	7,8,641,670	7,23,729,433	9,126,837	21,965,454	9,212,887	42,297,183
Undistributed: Abrasive stones, cement, lime, pyrites, stone (dimension sandstone, 1951), and recovered elemental sulfur (1952-53). Excludes value of clays used for cement.....		\$ 27,891,881		\$ 30,708,810		\$ 30,870,155		\$ 35,448,379
Total Indiana.....		166,632,000		174,388,000		162,031,000		169,781,000

IOWA

Cement.....	7,231,807	\$16,157,979	8,034,492	\$19,800,084	9,336,727	\$22,849,597	9,111,358	\$23,390,177
Clays.....	862,790	867,583	915,802	1,061,898	864,667	2,681,789	913,413	974,559
Coal.....	1,891,411	6,976,616	1,630,298	6,109,776	1,380,733	5,297,074	1,388,006	5,262,373
Gypsum.....	931,647	2,507,651	1,127,705	2,881,150	1,122,409	2,797,704	1,151,692	2,939,654
Lead.....	3,000	19,500	13,543	107,909	14,500	110,334	17,233	(18)
Sand and gravel.....	8,694,822	4,795,855	9,943,372	5,916,950	10,796,979	6,032,898	10,385,322	6,400,827
Stone (except limestone for cement).....	7,8,425,490	10,668,427	9,261,317	12,170,682	9,899,404	13,036,726	10,715,078	13,215,352
Total Iowa.....		14,41,773,000		14,47,706,000		14,52,481,000		14,51,994,000

KANSAS

Cement ¹⁵	8,759,103	\$19,400,088	8,163,916	\$19,413,144	8,811,762	\$20,956,886	8,546,250	\$21,428,636
Clays.....	729,292	601,014	731,960	728,921	665,682	769,293	670,694	749,579
Coal.....	2,124,960	8,236,527	1,961,101	7,734,473	2,028,601	7,902,590	1,715,004	7,101,386
Helium (shipments).....	9,487	2,551,490	26,288,000	3,327,000	38,509,000	1,491,000	42,762,000	6,563,923
Lead (recoverable content of ores, etc.).....	9,487	2,551,490	26,288,000	3,327,000	38,509,000	1,491,000	42,762,000	6,563,923
Natural gas (marketed production).....	364,024	24,026,000	417,538	33,521,000	412,944	34,241,000	420,607	36,172,000

Natural-gas liquids: thousand gallons.....	108,024	111,090	3,931,000	115,206	7,286,000	(3)
Natural gasoline.....	46,830	68,082	2,445,000	77,406	3,116,000	(6)
LP-gases.....do.....	61,194	42,998	1,586,000	37,800	4,170,000	(3)
Petroleum (crude)..... thousand 42-gallon barrels.....	107,586	114,522	294,320,000	114,807	293,910,000	4,908,180,000
Salt (common).....	846,374	904,917	6,639,343	911,744	6,850,027	114,566
Sand and gravel.....	9,781,123	7,670,888	4,747,544	8,350,065	8,728,291	7,480,556
Stone (except limestone for cement).....	7,630,300	7,191,483	9,058,512	8,830,871	8,769,152	5,663,308
Zinc (recoverable content of ores, etc.).....	27,176	25,904	10,521,056	25,482	12,051,740	11,303,950
Undistributed: Natural cement, gypsum, pumicite, and minerals whose value must be concealed for particular years indicated in appropriate column by footnote reference 3). Excludes value of clays used for cement.....						3,668,450
Total Kansas.....	\$ 323,479	\$ 303,946	400,087,000	\$ 386,847	403,370,000	10,137,870
	368,614,000	400,087,000		403,370,000		413,231,000

KENTUCKY

Clays.....	718,212	880,240	\$5,274,285	880,874	\$5,101,266	711,200	\$3,118,352
Chal.....	78,466,603	74,972,635	366,686,400	66,114,241	317,589,275	65,000,478	302,871,877
Fluorspar.....	86,197	68,635	2,337,485	48,368	1,836,262	47,241	2,701,964
Lead (recoverable content of ores, etc.).....			37,022	36	1,020	52	13,624
Natural gas (marketed production)..... million cubic feet.....	73,316	76,097	16,513,000	73,427	15,934,000	71,403	15,668,800
Natural-gas liquids: thousand gallons.....							
Natural gasoline.....	10,248	11,130	799,000	20,680	2,101,000	35,406	2,394,000
LP-gases.....do.....	64,470	70,822	2,193,000	156,198	3,693,000	176,232	4,993,000
Petroleum (crude)..... thousand 42-gallon barrels.....	10,381	11,822	32,180,000	11,918	32,890,000	11,518	33,820,000
Salt (common).....	2,382,672	2,801,639	2,434,799	3,334,261	2,656,053	3,052,155	2,899,832
Sand and gravel.....	17,417,200	7,048,771	8,609,609	18,817,859	7,101,816,707	7,742,939,505	79,238,237
Stone (except limestone for cement).....	731	3,457	1,258,348	3,280	1,088,960	489	112,470
Zinc (recoverable content of ores, etc.).....							
Undistributed: Native asphalt, cement, stone (crushed sandstone, 1950, and dimension sandstone, 1952-53). Excludes value of clays used for cement.....							
Total Kentucky.....	\$ 3,375,521	\$ 3,997,061	442,264,000	\$ 4,811,752	4,535,564		4,811,752
	459,956,000	442,264,000		398,446,000			381,742,000

LOUISIANA

Clays.....	327,067	306,542	\$306,542	390,136	\$433,808	624,427	\$951,612
Natural gas..... million cubic feet.....	831,771	1,054,199	61,143,000	1,237,143	82,889,000	1,283,644	106,079,000
Natural gasoline and cycle products. thousand gallons.....							
LP-gases.....do.....	613,326	657,006	49,202,000	672,042	48,579,000	665,532	55,421,000
Petroleum (crude)..... thousand 42-gallon barrels.....	238,950	237,238	15,374,000	237,444	14,890,000	237,280	12,654,000
Salt (common).....	208,966	232,281	614,680,000	243,929	645,090,000	236,632	721,150,000
Sand and gravel.....	2,278,811	2,737,149	7,662,179	2,553,448	7,907,693	3,061,234	9,189,626
Stone (except limestone for cement).....	5,505,362	6,384,328	7,419,570	6,005,119	6,736,524	4,588,387	5,162,248
Sulfur (Frasch-process)..... long tons.....	1,256,026	1,152,821	25,400,000	1,449,668	32,015,000	1,609,364	43,463,000
Undistributed: Cement, gypsum, lime (1953), stone (except limestone for cement, 1950 and 1952), and recovered elemental sulfur (1952-53). Excludes value of clays used for cement.....							
Total Louisiana.....	\$ 6,277,688	\$ 6,490,595	787,678,000	\$ 9,959,888	848,401,000		11,176,929
	693,607,000	787,678,000		965,237,000			965,237,000

See footnotes at end of table.

TABLE 5.—Mineral production in the United States, 1950-53, by States 1—Continued

MAINE

Mineral	1950		1951		1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement.....	1,127,220	\$2,705,034	1,238,299	\$3,182,918	1,457,250	\$3,750,483	2,001,464	\$5,422,272
Clays.....	31,917	26,561	21,885	21,885	26,050	26,050	29,661	27,476
Feldspar.....	17,487	124,821	19,273	154,695	18,644	147,371	17,637	117,090
Mica (scrap).....	23	592	(3)	36,870	(3)	(3)	(3)	(3)
Peat.....	2,912	61,600	1,805	36,870	1,695	57,541	2,428	73,564
Sand and gravel.....	4,867,143	1,726,217	5,366,694	1,817,317	7,078,078	2,187,531	8,071,837	2,698,386
Stone (except limestone for cement and lime).....	7,309,740	2,214,164	644,694	2,552,541	3316,874	1,798,768	7,248,601	1,215,439
Undistributed. Beryllium concentrate, columbium-tantalum concentrate (1951 and 1953), gem stones (1951), lime, lithium minerals (1950) sheet mica, quartz from pegmatites or quartzite, slate, stone (crushed sandstone, 1950) and crushed limestone, 1952-53, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3).....								
Total Maine.....		601,873		720,065		1,015,827		1,038,883
		7,461,000		8,516,000		8,981,000		10,503,000

MARYLAND

Clays.....	741,738	\$1,207,523	756,987	\$1,414,342	771,922	\$1,426,556	671,029	\$1,135,495
Coal.....	647,923	3,134,704	588,639	2,781,343	587,903	2,694,842	530,660	2,441,605
Gold (recoverable content of ores, etc.).....	20	700	1	35				
Lime (open-market).....	64,687	691,843	67,684	732,011	72,885	746,863	71,705	707,736
Natural gas.....	64,373	74,000	3,422	684,000	2,372	460,000	1,408	288,000
Sand and gravel.....	5,864,472	7,780,764	7,054,488	8,170,851	6,956,640	8,136,697	7,379,511	8,919,088
Stone (except limestone for cement and lime).....	1,975,690	3,459,605	3,181,434	5,983,380	7,339,679	7,6330,443	7,3,578,249	7,6,275,124
Undistributed. Cement, potassium salts, quartz (1952), noncommercial sand and gravel (1950), slate, stone (discussed limestone and crushed marble, 1952-53), recovered elemental sulfur (1950-51), and talc and soapstone. Excludes value of clays used for cement.....								
Total Maryland.....		\$ 6,381,853		\$ 6,396,886		\$ 7,051,145		7,337,486
		\$ 22,740,000		\$ 26,153,000		26,847,000		27,085,000

MASSACHUSETTS

Clays.....	155,279	\$139,060	150,370	\$167,646	140,148	\$160,371	162,117	\$195,809
Lime (open-market).....	139,357	1,830,625	143,316	1,930,225	1,930,225	1,999,545	136,383	2,156,205
Peat.....	650	7,575	(¹)	(¹)	(¹)	(¹)	2,061	(¹)
Quartz from pegmatites and quartzite.....	2,145	23,646	2,186	17,489	7,645,728	6,128,744	7,308,190	5,930,894
Sand and gravel.....	7,111,067	5,430,790	7,232,088	5,592,640	(¹)	(¹)	(¹)	(¹)
Sand and sandstone (ground).....	1,829	9,882	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Stone (except limestone for lime).....	3,284,470	7,848,999	7,325,839	7,917,425	3,355,819	7,933,871	3,457,708	8,821,108
Undistributed: Nonmetallic minerals.....		\$183,610		\$196,694		\$191,752		71,368
Total Massachusetts.....		\$16,110,000		\$17,077,000		\$17,812,000		17,191,000

MICHIGAN

Cement.....	12,854,423	\$29,619,766	14,112,639	\$35,121,324	14,760,783	\$36,819,042	15,863,096	\$41,880,464
Clays.....	1,271,963	1,139,430	1,511,937	1,551,313	1,776,917	1,810,916	1,645,804	1,686,113
Coal.....	11,500	116,850	7,647	74,591	21,609	10,502,316	24,097	13,631,678
Copper (recoverable content of ores, etc.).....	2,003	10,632,928	24,719	12,069,895	1,467,642	4,900,418	1,446,973	4,601,092
Gypsum.....	1,474,210	4,090,777	1,506,276	4,324,723	1,457,622	4,000,418	1,446,973	4,601,092
Iron ore (usable).....	12,821,344	72,858,822	13,611,621	51,765,748	11,779,366	76,088,835	13,312,766	94,691,612
Magnesium compounds from well brines (partly estimated).....		\$4,123,608		\$4,355,820		\$3,917,138		4,591,922
MgO equivalent.....	117,610	(¹)	69,696	(¹)	22,092	(¹)	76,251	(¹)
Manganese ore (5 to 35 percent Mn).....	218,430	1,222,912	178,010	96,639	164,519	86,529	183,685	72,781
Mari, calcareous (except for cement).....	1,269	1,483,000	(¹)	1,637,000	(¹)	1,922,000	7,774	1,275,000
Natural gas.....	3,318	161,000	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Natural-gas liquids: Natural gasoline..... thousand gallons.....	12,740	174,000	20,180	320,100	26,304	419,856	25,439	257,176
Peat.....	15,826	42,732,000	13,927	37,880,000	13,251	35,250,000	412,285	435,870,000
Petroleum (crude).....	4,446,667	18,175,755	5,137,639	21,221,330	4,778,347	21,446,382	5,127,387	22,171,988
Salt (common).....	24,559,011	10,699,203	27,540,921	20,976,632	26,193,763	22,400,879	30,459,663	23,170,802
Stone (except limestone for cement and lime).....	19,095,540	15,391,366	20,851,733	17,514,720	17,973,685	15,770,816	21,615,686	17,689,595
Undistributed: Bromine, calcium-magnesium chloride, lime, magnesium chloride or magnesium metal (1961-53), natural-gas liquids (L.P. gases 192-53), potassium salts, ground sand and sandstone (193-53), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3). Excludes value of clays used for cement.....		\$13,150,829		\$19,412,260		\$24,482,809		25,276,772
Total Michigan.....		\$230,194,000		\$268,471,000		\$254,518,000		286,487,000

MINNESOTA

Clays.....	129,220	\$151,074	129,942	\$187,605	113,492	\$160,408	91,401	\$149,384
Iron ore (usable).....	64,538,759	311,716,341	78,164,527	411,498,895	63,906,069	375,765,251	80,533,670	517,850,509
Manganese ore (5 to 35 percent Mn).....	869,838	(¹)	\$1,010,651	(¹)	912,118	(¹)	1,091,491	(¹)

See footnotes at end of table.

Natural gas.....million cubic feet.....	21	3,000	14	2,000	16	3,000	15	3,000
Petroleum (crude).....thousand 42-gallon barrels.....	32	(3)	24	(3)	21	(3)	4	39
Sand and gravel.....	6,232,421	5,969,849	6,809,857	5,969,849	6,790,422	6,122,195	5,792,058	5,233,999
Silver (recoverable content of ores, etc.).....troy ounces.....	236,273	213,839	184,424	166,913	517,432	468,302	359,781	325,620
Stone (except limestone for cement and lime).....	10,300,400	14,406,627	11,294,227	15,265,427	15,106,544	20,676,958	7,13,942,531	7,19,908,540
Zinc (recoverable content of ores, etc.).....	8,189	2,323,676	11,476	4,177,264	13,686	4,643,352	9,981	2,295,630
Undistributed: Native asphalt, manganese ore (1953), ground sand and sandstone, stone (dimension marble, 1953), tripoli, tungsten concentrate (1950), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3). Excludes value of clays used for cement.		\$ 2,236,551		\$ 1,997,134		\$ 2,283,550		3,491,361
Total Missouri.....		113,191,000		135,249,000		140,977,000		128,297,000

MONTANA

Antimony ore and concentrate.....gross weight.....	29	(3)						(3)
Chromite.....	37,617	\$87,617	39,231	\$41,631	51,304	\$73,601	26,089	\$69,958
Clays.....								38,312
Coal.....								
Bituminous.....	2,468,036	5,685,690	2,310,348	6,038,638	2,038,808	5,698,778	1,848,334	4,884,209
Lignite.....	52,130	175,504	35,070	123,263	30,550	112,953	24,803	93,551
Copper (recoverable content of ores, etc.).....	54,478	22,662,848	57,406	27,784,504	61,948	29,982,832	77,617	44,552,158
Fluorspar.....	41	(3)			16,160	(3)	5,932	(3)
Gold (recoverable content of ores, etc.).....troy ounces.....	51,764	1,811,740	30,502	1,067,570	24,161	845,635	24,768	866,880
Iron ore (usable).....long tons, gross weight.....	19,617	5,296,590	21,302	7,370,492	21,279	6,851,838	19,949	5,226,638
Lead (recoverable content of ores, etc.).....gross weight.....	131,201	(3)	100,562	(3)	100,070	(3)	113,429	(3)
Manganese ore (35 percent or more Mn).....do.....	6,810	(3)	7,598	(3)	9,357	(3)	5,598	(3)
Manganese ore (5 to 35 percent Mn).....do.....	39,186	2,077,000	36,424	2,003,000	28,714	1,752,000	27,839	1,645,000
Natural gas liquids.....million cubic feet.....								
Natural gasoline.....								
LP-gases.....do.....	4,116	350,000	4,746	392,000	(3)	(3)	(3)	(3)
Petroleum (crude).....thousand 42-gallon barrels.....	6,426	450,000	6,888	481,000	(3)	(3)	(3)	(3)
Phosphate rock.....long tons.....	8,109	20,430,000	8,958	22,130,000	9,606	21,610,000	11,920	26,020,000
Pumice and pumicite.....	244,361	1,732,904	(3)	(3)	(3)	(3)	(3)	(3)
Sand and gravel.....	9,044,125	5,140,207	9,582,843	6,201,888	6,765,955	3,579,932	3,000	15,000
Silver (recoverable content of ores, etc.).....troy ounces.....	6,590,747	5,964,959	6,393,768	5,786,683	6,138,185	5,555,367	6,203,480	2,993,575
Stone (except limestone for cement and lime).....	919,080	949,545	871,508	896,327	7,690,081	7,792,897	7,802,735	6,054,386
Tungsten concentrate.....60-percent WO ₃ basis.....	67,678	19,220,562	85,551	2,332	82,185	27,285,420	80,271	18,462,330
Zinc (recoverable content of ores, etc.).....								
Undistributed: Barite (1951-53), cement, gem stones (1950-51), gypsum, lime, pyrites, sodium sulfate (1951), stone (dimension granite, 1952-53), talc, vermiculite, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3).								
Total Montana.....		11,640,301		\$ 14,825,330		\$ 17,928,016		19,337,712
		\$ 103,625,000		\$ 126,376,000		\$ 122,069,000		182,184,000

See footnotes at end of table.

TABLE 5.—Mineral production in the United States, 1950-53, by States!—Continued
NEBRASKA

Minera	1950		1951		1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays.....	153, 830	\$149, 442	115, 845	\$116, 245	167, 228	\$167, 703	175, 856	\$186, 863
Natural gas.....	17	2, 000	3, 895	4, 600, 000	5, 668	740, 000	6, 748	911, 000
Petroleum (crude).....	1, 547	3, 300, 000	2, 558	5, 960, 000	2, 660	6, 490, 000	4, 634	17, 190, 000
Sand and gravel.....	5, 077, 792	3, 167, 659	4, 969, 243	3, 477, 000	5, 436, 940	3, 874, 106	5, 969, 898	4, 340, 163
Stone (except limestone for cement)	7, 736, 660	71, 042, 035	942, 967	1, 437, 890	1, 246, 106	1, 946, 448	1, 407, 158	2, 069, 984
Undistributed: Cement, natural-gas liquids (1951-53), pumice and pumicite, and stone (sandstone, 1950). Excludes value of clays used for cement.....		\$ 6, 360, 470		\$ 6, 978, 760		\$ 7, 378, 888		\$ 8, 582, 904
Total Nebraska.....		14, 022, 000		18, 469, 000		20, 597, 000		33, 281, 000

NEVADA

Antimony ore and concentrate.....	20	(3)	156	(1)	152	(3)	20	(5)
Barite.....	47, 608	\$268, 874	63, 201	\$387, 026	68, 062	\$391, 242	99, 525	\$614, 686
Clays.....	52, 569	(3)	3, 220	(3)	3, 938	(3)	99, 525	(3)
Copper (recoverable content of ores, etc.).....	7, 577	21, 868, 704	56, 474	27, 333, 410	57, 557	27, 847, 908	61, 860	35, 501, 900
Fluorspar.....	178, 447	6, 245, 645	121, 036	4, 236, 260	117, 203	4, 102, 105	101, 799	3, 562, 965
Gold (recoverable content of ores, etc.).....	604, 604	1, 614, 107	643, 637	1, 813, 337	608, 284	1, 666, 938	701, 584	1, 975, 053
Gypsum.....	5, 465	2, 540, 160	299, 010	388, 308	911, 657	3, 991, 970	444, 081	2, 647, 859
Iron ore (usable).....	9, 408		7, 338	2, 373, 208	6, 780	2, 186, 380	4, 371	1, 145, 202
Lead (recoverable content of ores, etc.).....	8, 642	102, 348	1, 260	(3)	695	(3)	20, 160	1, 684, 555
Manganese ore (35 percent or more Mn).....	(3)	55, 287	1, 400	(3)	7, 947	(3)	25, 064	431, 559
Manganiferous ore (5 to 35 percent Mn).....	(3)	2, 263, 258	2, 616, 690	(3)	3, 523	(3)	3, 254	628, 120
Mercury.....	1, 337, 217	1, 391, 269	981, 669	2, 637, 654	2, 068, 211	2, 380, 419	21, 269	86, 366
Pumice and pumicite.....	7, 274, 867	7, 289, 478	834, 807	888, 460	941, 195	867, 829	2, 266, 064	2, 068, 948
Sand and gravel.....	8, 531	15, 173	(3)	939, 815	830, 712	1, 168, 608	697, 066	697, 630, 898
Silver (recoverable content of ores, etc.).....	1, 123	\$170, 736	6, 910	\$ 152, 878	7, 880	\$ 180, 328	10, 100, 906	\$ 72, 971
Stone (except limestone for lime).....	21, 606	6, 136, 104	1, 432	4, 780, 237	2, 329	8, 820, 598	3, 683	13, 824, 238
Sulfur ore.....			17, 443	6, 349, 252	16, 357	5, 098, 524	5, 812	1, 336, 760
Talc and soapstone.....								
Tungsten concentrate.....								
Zinc (recoverable content of ores, etc.).....								
Undistributed: Brucite, diatomite, gem stones (1952-53), lime, magnesite, calcareous marl, molybdenum, perlite, salt, stone (crushed limestone, 1950), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)								
Total Nevada.....		5, 567, 815		4, 418, 333		4, 815, 659		5, 891, 368
		48, 499, 000		57, 674, 000		64, 231, 000		73, 523, 000

NEW HAMPSHIRE

Beryllium concentrate.....	106	\$40,310	50	\$16,670	(3)	57	\$32,640
Clays.....	22,719	17,115	28,601	28,501	(3)	45,198	41,427
Columnium-tantalum concentrate.....pounds, gross weight.....	(3)	(3)	(3)	(3)	(3)	28,961	282,069
Feldspar.....	16,171,284	16,226,424	2,260,410	517,927	(3)	90,716	382,680
Mica (sheet).....	7,15,760	7,363,667	7,62,355	7,349,606	(3)	2,249,001	506,156
Sand and gravel.....					(3)	76,701	538,897
Stone.....					(3)		
Undistributed: Abrasive stones, scrap, mica, peat, sand and gravel (commercial, 1960), stone (crushed unclassified, 1960) and crushed granite (1961) and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3).....					(3)		
Total New Hampshire.....		1,043,718		382,691			15,617
		1,711,000		1,295,000			1,805,000

NEW JERSEY

Clays.....	602,369	\$1,277,860	683,439	\$2,106,628	598,775	532,185	\$1,328,287
Iron ore (usable).....long tons, gross weight.....	588,169	5,651,563	557,950	7,310,776	685,466	815,905	10,114,970
Manganese residue.....gross weight.....	183,852	(3)	267,731	(3)	215,255	283,758	(3)
Marl (greensand).....	3,935	304,331	5,007	283,944	4,600	6,821	(3)
Peat.....	26,466	386,333	27,978	213,500	21,800	21,706	(3)
Sand and gravel.....	12 7,620,422	12 8,636,141	6,652,883	9,106,032	7,060,074	7,361,665	10,835,948
Stone (except limestone for lime).....	7 1,151,744	1 9,936,817	144,088	1,035,991	138,484	127,921	815,534
Zinc (recoverable content of ores, etc.) ¹⁾	7 4,672,080	1 9,119,251	6,457,248	10,957,705	6,102,324	6,036,259	13,307,866
Undistributed: Lime, magnesium compounds, noncommercial sand and gravel (1960), stone (unclassified, 1960), recovered elemental sulfur, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3).....	55,029	17,238,637	62,917	24,279,745	59,190	45,700	9,822,960
Total New Jersey.....		3,445,098		4,276,783			5,325,148
		46,816,000		60,099,000			51,945,000

NEW MEXICO

Beryllium concentrate.....	(3)	(3)	141	\$47,008	(3)	89	\$52,014
Carbon dioxide, natural (estimated).....thousand cubic feet.....	68,000	\$27,000	(3)	141	\$29,185	(3)	(3)
Clays.....	63,357	3,917,461	75,653	408,876	57,688	49,089	108,881
Coal.....	726,368	27,580,800	782,698	4,501,842	786,457	513,781	3,081,366
Copper (recoverable content of ores, etc.).....	66,036	742,408	24,402	35,602,072	76,112	72,477	41,601,798
Fluorspar.....	2,036	119,490	3,969	1,163,098	16,443	(3)	(3)
Gold (recoverable content of ores, etc.).....	3,414			138,565	2,949	2,614	91,460
Helium (shipments).....						11,168,000	150,127

See footnotes at end of table.

	3, 336	837, 000	3, 214	807, 000	3, 627	1, 059, 000	2, 347	742, 000
Natural gas..... million cubic feet.....	4, 143	15, 660, 000	4, 254	17, 990, 000	4, 242	17, 940, 000	3, 775	46, 307
Peat..... thousand 42-gallon barrels.....	2, 806, 927	14, 405, 352	3, 518, 715	16, 552, 890	3, 417, 443	16, 746, 462	4, 3, 800	4, 16, 260, 000
Petroleum (crude).....	21, 778, 069	18, 075, 237	21, 008, 701	19, 285, 299	20, 270, 058	18, 287, 623	3, 322, 659	17, 351, 111
Salt (common).....	32, 628	29, 530	47, 568	43, 051	38, 895	35, 202	22, 530, 891	28, 493, 857
Sand and gravel.....	151, 160	2, 054, 725	126, 070	2, 000, 106	125, 930	1, 810, 865	35, 398	32, 057
Sliver (recoverable content of ores, etc.)..... troy ounces.....	13, 121, 850	19, 728, 957	15, 559, 372	24, 328, 118	16, 234, 549	25, 244, 245	7, 15, 981, 657	1, 733, 352
Stone (except limestone for cement and lime).....	163, 874	4, 039, 973	152, 652	4, 170, 987	149, 857	4, 069, 771	10, 156, 299	7, 25, 250, 576
Talc.....	38, 321	16, 200	40, 051	14, 578, 564	32, 636	10, 855, 152	51, 529	10, 940, 541
Wollastonite.....		10, 883, 164						(8)
Zinc (recoverable content of ores, etc.).....								(8)
Undistributed: Abrasive stones (1955), natural cement, abrasive garnet, lime, calcareous marl, sheet mica (1950), pyrites (1950-52), stone (crushed, unclassified, 1953), recovered elemental sulfur (1950-52), titanium concentrate, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3). Excludes value of clays used for cement.....								
Total New York.....	\$ 6, 537, 272	\$ 156, 585, 000	\$ 8, 232, 758	\$ 138, 816, 000	\$ 7, 917, 911	\$ 180, 751, 000		8, 102, 030

NORTH CAROLINA

Abrasive stones.....	(8)	\$17, 025	(8)	\$13, 263	(8)	\$28, 992	(8)	\$16, 150
Clays.....	1, 437, 202	1, 766, 785	1, 462, 030	2, 177, 515	1, 357, 700	2, 080, 172	1, 466, 232	2, 534, 908
Coal.....	183, 027	1, 107, 061	166, 361	1, 230, 404	1, 600	12, 684	283, 042	3, 280, 495
Feldspar..... long tons.....					240, 364	2, 416, 031		
Mica.....								
Scrap.....	48, 193	1, 281, 584	52, 550	1, 441, 886	58, 576	1, 551, 071	56, 834	1, 428, 793
Sheet..... pounds.....	483, 736	1, 102, 179	464, 949	127, 204	595, 331	664, 075	619, 895	1, 308, 494
Olivine.....	4, 063	(8)	(8)	(8)	(8)	(8)	(8)	(8)
Sand and gravel.....	8, 352, 475	5, 465, 067	7, 656, 370	4, 435, 702	8, 724, 748	5, 665, 169	6, 910, 982	4, 992, 991
Stone.....	7, 711, 580	11, 894, 745	7, 8, 612, 967	7, 13, 292, 690	7, 9, 647, 513	7, 14, 694, 698	7, 9, 316, 823	7, 14, 424, 323
Talc.....	116, 895	1, 855, 163	113, 950	1, 982, 927	115, 481	1, 771, 518	10, 119, 341	10, 578, 239
Tin (content of ore and concentrate)..... long tons.....			1	1, 724	4	11, 601		
Titanium concentrate (ilmenite).....	25, 842	(8)	(8)	(8)	25, 328	177, 296	2, 074	(8)
Tungsten concentrate..... 60-percent W ₂ O ₅ basis.....	1, 240	(8)	1, 041	(8)	1, 254	(8)	(8)	(8)
Vermiculite.....	2, 366	66, 627			(8)			
Undistributed: Asbestos (1950-51 and 1953), beryllium concentrate (1951 and 1953), columbium-tantalum concentrate (1952-53), lithium minerals (1951-53), man-ganiferous ores (1953), quartz, ground sand and sand-stone (1950), stone (dimension marble, 1951-53; and crushed marble, 1952-53), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3).....								
Total North Carolina.....	\$ 2, 781, 932	\$ 26, 338, 000	\$ 4, 944, 042	\$ 29, 647, 000	\$ 5, 652, 311	\$ 34, 726, 000		9, 871, 493
								38, 446, 000

See footnotes at end of table.

TABLE 5.—Mineral production in the United States, 1950-53, by States 1—Continued

NORTH DAKOTA

Mineral	1950		1951		1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays.....	(^c)	(^c)	18, 250	\$35, 250	(^c)	(^c)	23, 084	\$47, 862
Coal (lignite).....	3, 260, 973	\$7, 757, 935	3, 224, 027	7, 784, 191	2, 983, 752	\$7, 068, 259	2, 802, 558	6, 617, 980
Natural gas..... million cubic feet.....	608	31, 000	25	24, 000	369	23, 000	498	34, 000
Petroleum (crude)..... thousand 42-gallon barrels.....	4, 270, 938	1, 660, 371	4, 573, 341	2, 140, 466	6, 557, 069	1, 841, 216	6, 173, 797	4 10, 370, 000
Sand and gravel.....	193, 250	135, 698	281, 219	213, 061	57, 064	4, 968	35, 091	2, 164, 685
Stone.....								2, 595
Undistributed: Nonmetallic minerals and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3)								
Total North Dakota.....		28, 300		50, 000		3, 119, 900		19, 237, 000

OHIO

Cement.....	10, 512, 004	\$24, 012, 983	11, 872, 278	\$29, 498, 956	11, 377, 806	\$23, 438, 500	12, 532, 437	\$32, 957, 308
Clays.....	37, 771, 130	9, 055, 222	5, 686, 630	13, 754, 057	5, 493, 830	13, 643, 742	5, 634, 596	9, 827, 706
Coal.....	2, 142, 244	143, 852, 921	37, 948, 692	146, 677, 710	36, 208, 450	138, 090, 700	34, 736, 773	131, 475, 408
Lime (open-market).....	43, 164	26, 273, 098	2, 289, 473	29, 046, 196	2, 205, 432	28, 398, 260	2, 945, 800	35, 310, 353
Natural gas..... million cubic feet.....	4, 325	8, 374, 000	38, 879	7, 854, 000	30, 993	6, 725, 000	37, 542	8, 334, 000
Natural-gas liquids: Natural gasoline..... thousand gallons.....	22, 145	344, 000	4, 494	399, 000	1, 596	114, 000	(^c)	(^c)
Peat.....	3, 583	245, 379	21, 378	261, 891	24, 828	290, 664	27, 696	260, 474
Petroleum (crude)..... thousand 42-gallon barrels.....	2, 515, 205	10, 250, 000	3, 140	9, 580, 000	3, 350	10, 020, 000	4 3, 610	4 9, 710, 000
Salt (common).....	16, 664, 175	5, 491, 553	3, 112, 472	5, 848, 478	2, 827, 455	5, 991, 626	3, 040, 237	7, 484, 795
Sand and gravel.....	20, 466, 350	16, 209, 267	19, 430, 898	21, 394, 891	20, 751, 493	23, 069, 458	24, 052, 388	27, 076, 276
Stone (except limestone for cement and lime).....		28, 628, 678	25, 190, 277	7 36, 436, 081	7 24, 693, 189	7 36, 197, 455	7 25, 784, 561	7 39, 642, 601
Undistributed: Abrasive stones, bromine (1950-51), calcium-magnesium chloride, Epsom, ground sand and sandstone, stone (crushed unclassified, 1951-52, dimension unclassified, 1952-53), recovered elemental sulfur (1953), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3). Excludes value of clays used for cement.....								
Total Ohio.....		4 1, 835, 225		4 1, 850, 746		4 1, 664, 191		1, 264, 540
		374, 872, 000		302, 612, 000		262, 689, 000		302, 843, 000

OKLAHOMA

Clays.....	555, 910	493, 659	551, 200	\$561, 841	520, 050	\$577, 420	577, 557	\$637, 082
Coal.....	2, 078, 571	14, 457, 225	2, 223, 229	13, 873, 424	2, 193, 409	12, 687, 855	2, 167, 694	13, 226, 881
Lead (recoverable content of ores, etc.).....	20, 724	5, 593, 440	16, 575	5, 734, 950	15, 137	4, 874, 114	9, 304	2, 437, 648
Natural gas..... million cubic feet.....	482, 850	23, 636, 000	538, 756	28, 554, 000	554, 633	29, 918, 000	599, 955	41, 397, 000
Natural-gas liquids:								
Natural gasoline and cycle products..... thousand gallons.....	335, 160	21, 579, 000	397, 236	27, 498, 000	405, 720	29, 459, 000	433, 650	28, 066, 000
LP-gases..... do.....	283, 026	8, 393, 000	339, 598	12, 436, 000	376, 026	14, 090, 000	414, 036	14, 886, 000
Petroleum (crude)..... thousand 42-gallon barrels.....	104, 899	429, 626, 000	136, 869	480, 250, 000	190, 435	487, 510, 000	4, 202, 570	4, 546, 940, 000
Sand and gravel.....	3, 260, 624	2, 356, 853	3, 183, 251	2, 317, 633	3, 769, 663	2, 911, 845	4, 701, 366	3, 969, 585
Stone (except limestone for cement and lime).....	5, 021, 900	2, 848, 223	6, 966, 676	6, 917, 548	7, 9, 636, 475	7, 8, 974, 334	8, 4, 04, 483	7, 4, 67, 247
Zinc (recoverable content of ores, etc.).....	40, 739	13, 273, 876	53, 450	19, 455, 800	54, 916	18, 232, 112	33, 413	7, 684, 990
Undistributed: Native asphalt, cement, gypsum, lime, sand and pumicite (1950 and 1952-53), salt, ground sand and sandstone, stone (dimension limestone, 1952), and recovered elemental sulfur (1953). Excludes value of clays used for cement.....								
Total Oklahoma.....		\$ 9, 331, 529		\$ 9, 882, 690		\$ 12, 116, 791		\$ 11, 447, 919
		527, 095, 000		607, 486, 000		621, 351, 000		678, 160, 000

OREGON

Chromite..... gross weight.....								
Clays.....	163, 145	\$129, 632	754	\$62, 972	6, 591	\$507, 981	6, 216	\$484, 453
Coal.....	1, 384	8, 410	151, 920	162, 242	277, 072	569, 968	292, 445	296, 050
Copper (recoverable content of ores, etc.).....								
Gold (recoverable content of ores, etc.)..... troy ounces.....	11, 058	7, 904	11	5, 324	1	8, 484	9	5, 166
Lead (recoverable content of ores, etc.).....	17	387, 050	7, 927	277, 445	5, 500	192, 815	8, 488	297, 080
Manganese ore (35 percent or more Mn)..... gross weight.....			2	692	1	322	5	1, 310
Manganiferous ore (5 to 35 percent Mn)..... do.....								(3)
Mercury..... 76-pound flasks.....	5	406	1, 177	247, 323	868	172, 819	271	(3)
Pelite.....	17, 397	69, 616	(3)	137, 136	(1)	(3)	648	125, 083
Pumicite and pumicite.....	79, 663	323, 533	47, 026	137, 136	59, 578	201, 809	4, 540	36, 900
Sand and gravel.....	8, 199, 900	8, 198, 293	10, 504, 230	9, 117, 343	12, 219, 486	8, 556, 218	73, 080	173, 822
Silver (recoverable content of ores, etc.)..... troy ounces.....	13, 965	12, 277	6, 218	9, 117, 343	4, 037	8, 763, 078	8, 620, 632	8, 620, 632
Stone (except limestone for cement and lime).....	7 3, 856, 550	7 5, 565, 010	8, 721, 799	10, 833, 483	6, 250, 849	8, 893, 368	7 4, 939, 080	7 6, 301, 639
Tungsten concentrate..... 60-percent WO ₃ basis.....			1	703	4	15, 960	(15)	(3)
Zinc (recoverable content of ores, etc.).....	21	5, 904	3	1, 092	1	332		
Undistributed: Asbestos (1950-51), carbon dioxide, cement, diatomite, gem stones, lime (1950-52), quartz, stone (dimension and crushed granite, 1950, and crushed granite, 1953), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3). Excludes value of clays used for cement.....								
Total Oregon.....		\$ 6, 868, 589		\$ 7, 550, 554		\$ 7, 549, 366		\$ 8, 086, 593
		21, 542, 000		28, 402, 000		26, 674, 000		24, 449, 000

See footnotes at end of table.

TABLE 5.—Mineral production in the United States, 1950-53, by States 1—Continued
PENNSYLVANIA

Mineral	1950		1951		1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement.....	39,450,611	\$94,604,230	41,560,451	\$107,035,506	40,037,761	\$103,338,586	42,092,765	\$114,002,846
Clays.....	3,482,194	8,815,318	4,230,567	14,087,550	3,731,130	12,639,864	3,575,422	9,988,133
Coal:								
Anthracite.....	44,076,703	392,398,006	42,669,997	405,817,963	40,582,558	379,714,076	30,949,152	299,139,687
Bituminous.....	105,870,121	529,461,785	108,163,843	572,194,085	89,181,232	473,475,646	93,330,871	516,436,411
Cobalt (recoverable content of ores, etc.).....	660,025	(3)	755,631	(3)	639,856	(3)	564,450	(3)
Copper (recoverable content of ores, etc.).....	4,142	1,723,072	5,297	2,563,748	3,483	1,686,740	3,027	1,737,498
Gold (recoverable content of ores, etc.).....	1,764	61,740	2,179	75,265	1,500	52,500	1,134	(3)
Iron ore (usable).....	1,116,338	11,626,216	1,215,033	(3)	992,110	(3)	1,020,826	(3)
Lime (open-market).....	1,086,451	12,663,074	1,181,100	14,260,054	1,202,981	13,842,213	1,335,300	16,010,114
Natural gas.....	91,137	23,058,000	128,175	35,654,000	108,684	30,758,000	1,105,558	30,717,000
Natural-gas liquids:								
Natural gasolines.....	9,744	702,000	8,064	656,000	7,182	548,000	(3)	(3)
LP-gases.....	588	55,000	756	71,000	7,798	75,000	1,008	90,000
Petroleum (crude).....	(3)	(3)	8,591	46,568	7,898	43,874	8,232	47,516
Sand and gravel.....	13,858,154	45,300,000	11,845	48,220,000	11,233	47,740,000	4,10,649	4,45,680,000
Sericite schist.....	10,563	17,172,215	15,737,464	21,488,540	14,696,106	19,920,003	14,715,383	20,692,900
Silver (recoverable content of ores, etc.).....	285,120	9,560	13,575	12,286	9,247	8,369	2,463	6,926
Stone (except limestone for cement and lime).....	25,493,230	5,645,014	268,830	5,688,870	214,860	4,487,648	202,386	4,412,612
Undistributed: Graphite (crystalline, 1953), mica, pyrites, ground sand and sandstone, stone (dimension unclassified, 1951; dimension basalt, 1952-53), recovered elemental sulfur (1952-53), tripoli, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3). Excludes value of clays used for cement.		42,205,691	7,27,399,564	7,46,668,590	7,25,609,812	7,44,676,456	7,26,192,607	7,48,094,029
Total Pennsylvania.....		\$ 810,570		\$ 1,685,221		\$ 12,575,843		14,461,911
		1,186,212,000		1,289,226,000		1,145,633,000		1,121,622,000

RHODE ISLAND

Sand and gravel.....	579,528	\$580,322	534,785	\$576,731	589,451	\$557,396	898,393	\$775,700
Stone.....	239,400	798,185	239,248	651,931	168,993	654,782	161,632	617,096
Undistributed: Nonmetallic minerals.....		46,500		43,945		37,500		69,000
Total Rhode Island.....		1,425,000		1,278,000		1,250,000		1,462,000

SOUTH CAROLINA

Clays.....	996,033	\$5,026,692	949,270	\$4,736,276	947,278	\$4,675,261	964,356	\$4,801,921
Sand and gravel.....	348,060	166,710	320,195	139,268	1,048,069	892,312	2,975,608	2,564,484
Undistributed: Barite, cement, kyanite, stone (crushed unclassified, 1950; dimension granite, 1951-53), and vermiculite. Excludes value of clays used for cement.....	7 2, 557, 510	7 3, 836, 056	7 2, 828, 868	7 3, 690, 114	7 2, 914, 839	7 3, 881, 178	7 2, 913, 860	7 3, 976, 370
Total South Carolina.....		5 2, 364, 075		5 2, 878, 338		5 5, 236, 961		6 4, 28, 135
		11, 394, 000		11, 444, 000		14, 686, 000		17, 771, 000

SOUTH DAKOTA

Beryllium concentrate.....	96	\$29,920	138	\$46,007	334	\$166,251	392	\$157,656
Clays.....	295,492	2,275,320	381,611	3,061,988	292,791	2,640,640	330,983	2,826,074
Coal (lignite).....	(3)	(3)	28,350	99,008	(3)	(3)	23,671	82,117
Columnium-tantalum concentrate.....			(3)	(3)	(3)	(3)	4,431	9,022
Columbium.....	43,875	249,176	48,559	280,520	40,163	220,954	50,601	321,026
Feldspar.....	567,996	19,879,860	458,101	16,033,535	482,534	16,888,690	534,987	18,724,645
Gold (recoverable content of ores, etc.).....			2	692	2	644	1,060	(3)
Iron ore (usable).....							10	(3)
Lead (recoverable content of ores, etc.).....								2,620
Mica.....	1,902	24,989	2,292	42,714	915	24,148	1,687	27,388
Scrap.....	13,018	1,684			4,308	32,034	11,174	77,352
Natural gas.....			7	350	6	300	5	6 250
Sand and gravel.....	5,392,247	2,750,847	5,037,384	2,502,340	5,846,140	2,478,314	5,402,378	2,827,726
Silver (recoverable content of ores, etc.).....	142,065	128,576	139,590	126,336	132,102	119,559	138,642	125,478
Stone (except limestone for cement and lime).....	7 1, 205, 910	7 4, 860, 858	1, 263, 322	4, 660, 074	1, 071, 187	4, 806, 882	7 1, 189, 418	7 4, 906, 197
Tungsten concentrate.....					(13)		2	(3)
Undistributed: Cement, lime, lithium minerals, stone (crushed unclassified, 1950 and dimension miscellaneous, 1955), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3). Excludes value of clays used for cement.....								
Total South Dakota.....		32,716,000		29,652,000		3,076,258		3,723,387
						30,455,000		33,901,000

See footnotes at end of table.

TABLE 5.—Mineral production in the United States, 1950-53, by States—Continued

TENNESSEE

Mineral	1950		1951		1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement.....	6,663,427	\$14,682,487	7,162,841	\$17,203,080	7,428,604	\$17,834,060	7,276,964	\$18,283,866
Clays.....	1,101,550	3,329,137	1,160,871	3,296,495	1,042,239	3,519,143	1,037,450	3,478,622
Coal.....	5,069,800	27,360,273	5,400,946	26,956,174	5,284,954	25,559,740	5,466,569	25,151,882
Copper (recoverable content of ores, etc.).....	6,851	2,850,016	7,069	3,421,396	7,620	3,688,080	7,426	4,493,946
Fluorspar.....	160	5,600	108	3,780	241	8,435	293	10,255
Gold (recoverable content of ores, etc.).....	113	30,510	35,908	142,447	(¹)	5,796	12,751	82,499
Lead (recoverable content of ores, etc.).....	98,232	958,325	14	4,844	18	9	9	2,558
Lime (open-market).....	132	13,000	108,970	1,097,874	100,189	1,005,235	114,474	1,177,461
Manganese ore (35 percent or more Mn).....	132	13,000	132	12,000	107	11,000	2	201,898
Natural gas.....	12	13,000	14	12,000	15	11,000	89	11,000
Petroleum (crude).....	1,472,017	10,736,635	1,424,516	10,798,406	1,444,737	11,306,438	1,518,912	11,305,098
Phosphate rock ¹	4,152,684	4,411,105	4,645,041	5,186,617	5,173,401	5,303,321	5,231,329	5,629,687
Sand and gravel.....	30,958	36,164	24,960	22,580	57,569	68,935	68,935	62,390
Silver (recoverable content of ores, etc.).....	7,978,590	13,802,288	7,838,796	14,765,988	10,377,320	17,652,763	7,10	7,16,948,053
Stone (except limestone for cement and lime).....	35,326	10,032,584	38,639	14,064,596	38,020	12,622,640	38,465	8,846,950
Zinc (recoverable content of ores, etc.).....								
Undistributed: Barite, pyrites, stone (dimension sand-stone, 1951 and crushed granite, 1953), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3). Excludes value of clays used for cement.....		\$ 2,153,638		\$ 3,070,648		\$ 2,363,399		2,364,412
Total Tennessee.....		\$ 90,405,000		\$ 100,047,000		\$ 100,922,000		\$ 98,050,000

TEXAS

Abrasive stone: Pebbles (grinding).....	343	\$4,709	350	\$4,710	510	\$3,100	400	\$5,500
Cement.....	17,281,521	39,677,804	17,642,654	42,648,536	19,849,455	48,042,901	19,140,193	48,497,762
Clays.....	2,039,277	4,015,391	2,217,053	4,944,965	2,069,020	4,470,182	2,370,975	4,678,974
Coal (lignite).....	18,169	30,662	(¹)	483	18	8,712		
Copper (recoverable content of ores, etc.).....		832	1	(¹)	2,600	31,200		
Fluorspar.....	(¹)	719	32	1,120	39	1,365		
Gold (recoverable content of ores, etc.).....	1,076,251	1,715	1,136,824	2,987,820	1,021,161	2,682,019	1,067,854	2,860,633
Gypsum.....	80,888,990	2,771,812	82,060,000	1,060,000	107,801,332	1,405,096	103,711,334	1,388,670
Helium (supplements).....		1,027,913						

Iron ore (usable).....long tons, gross weight.....	1,189,415	(¹)	1,063,181	(¹)	787,193	(¹)	1,014,937	(¹)
Lead (recoverable content of ores, etc.).....	104,334	34,830	43	14,878	56	56	18,032	
Lime (open-market).....	216,439	2,074,367	279,957	2,632,387	281,604	2,632,975	475,569	4,360,581
Manganese ore (35 percent or more Mn).....gross weight.....	3,126,402	146,941,000	3,781,136	204,181,000	4,147,805	287,164,000	4,383,158	333,120,000
Natural gas liquids:.....million cubic feet.....								
Natural gasoline and cycle products.....thousand gallons.....	2,268,294	166,786,000	2,516,094	189,973,000	2,689,694	188,500,000	2,750,370	200,479,000
L.P.gases.....do.....	1,665,006	50,266,000	2,042,208	71,943,000	2,456,874	88,635,000	2,777,880	109,131,000
Petroleum (crude).....thousand 42-gallon barrels.....	829,874	10,566	1,238	10,750	1,200	12,000	1,375	(¹)
Salt (common).....	1,852,138	2,147,160,000	1,010,270	2,610,790,000	1,022,139	4,402,032	4,020,332	42,777,900,000
Silver (recoverable content of ores, etc.)..... Troy ounces.....	17,972,154	2,846,789	2,401,063	4,000,100	2,640,209	2,845,190	2,845,190	5,010,624
Stone (except limestone for cement and lime).....long tons.....	7,486,550	15,707,724	18,488,463	15,651,531	18,661,403	17,275,255	16,101,226	12,846,561
Sulfur (Frasch-process).....long tons.....	4,248,688	2,221	1,381	1,250	4,672	4,228	7,9,095,109	7,8,580,320
Talc and soapstone.....do.....		7,5,580,463	7,7,351,069	7,7,626,122	3,694,468	8,664,633	3,614,838	97,601,000
Zinc (recoverable content of ores, etc.).....		80,300,000	3,835,280	81,900,000	3,691,724	78,910,000	85,058	2,202,381
Undistributed: Native asphalt, bromine, gem stones, graphite, magnesium chloride (for metal), magnesium compounds (except for metal), mercury (1951 and 1953) pumice and pumelite, sodium sulfate, stone (crushed basalt, 1950-51 and 1953, dimension granite, 1950-51), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3). Excludes value of clays used for cement.....		(¹)	(¹)	(¹)	38,402	872,134	10,16,210	
Total Texas.....	\$ 19,215,570	\$ 28,918,581	\$ 28,269,199,000	\$ 3,379,813,000	\$ 34,010,619	\$ 39,189,833	\$ 647,913,000	

UTAH

Asphalt and related bitumens, native:.....thousand cubic feet.....	66,186	\$1,774,330	65,521	\$1,895,374	60,740	1,779,815	60,905	\$2,184,328
Carbon dioxide, natural (estimated).....	104,334	42,000	97,436	10,000	84,500	10,000	(¹)	(¹)
Clays.....	303,078	936,804	293,688	1,277,763	189,723	1,125,289	198,348	1,457,515
Coal.....	6,669,896	32,050,470	6,135,957	32,652,543	6,140,305	32,410,303	6,144,145	37,689,144
Copper (recoverable content of ores, etc.).....	278,630	115,910,080	271,066	131,205,624	282,894	136,920,686	269,496	154,090,704
Fluorspar.....	18,936	337,912	17,827	398,480	17,304	438,699	15,527	374,944
Gold (recoverable content of ores, etc.)..... Troy ounces.....	457,551	16,014,285	432,216	15,127,560	435,507	15,242,745	483,430	16,920,050
Iron ore (usable).....long tons, gross weight.....	3,111,167	5,746,808	4,637,239	10,141,653	3,990,505	15,025,899	4,617,288	26,496,950
Lead (recoverable content of ores, etc.).....	44,753	12,083,310	50,451	17,456,046	50,210	16,167,620	41,522	10,878,764
Lime (open-market).....do.....	49,419	456,471	49,419	456,471	49,419	456,471	49,419	456,471
Manganese ore (35 percent or more Mn).....gross weight.....	3,041	237,000	1,369	246,000	3,397	225,000	5,155	82,316
Manganiferous ore (5 to 35 percent Mn).....do.....	3,252	20,000	3,733	3,006	3,006	7,075	(¹)	807,000
Natural gas (marketed production).....million cubic feet.....	2,585	13,072	(¹)	16,017	(¹)	(¹)	(¹)	(¹)
Natural gasoline.....thousand gallons.....	1,228	1,305	3,422	1,737	(¹)	(¹)	(¹)	(¹)
Perlite.....thousand 42-gallon barrels.....	8,719	10,891	9,422	11,478	(¹)	(¹)	1,807	4,385
Pumice and pumelite.....							3,880	

See footnotes at end of table.

TABLE 5.—Mineral production in the United States, 1950-53, by States I—Continued
UTAH—Continued

Mineral	1950		1951		1952		1953	
	Short tons (unless other- wise stated)	Value	Short tons (unless other- wise stated)	Value	Short tons (unless other- wise stated)	Value	Short tons (unless other- wise stated)	Value
Salt (common).....	116,694	\$511,938	131,444	\$570,379	136,125	\$522,721	154,088	\$772,035
Sand and gravel.....	3,435,277	2,251,515	2,971,268	2,238,750	3,260,044	2,300,412	4,627,808	3,179,690
Silver (recoverable content of ores, etc.).....	7,083,808	6,411,204	7,310,665	6,613,521	7,194,106	6,514,082	6,725,807	6,087,195
Stone (except limestone for cement and lime).....	7,929,410	880,667	1,238,710	1,231,118	7,852,351	7,123,102	9,997,530	1,446,594
Tungsten concentrate.....	.....	.....	(¹)	.....	3	.....	35	123,445
Zinc (recoverable content of ores, etc.).....	31,678	8,996,552	34,317	12,491,388	32,947	10,988,404	29,154	6,712,320
Undistributed: Native asphalt (bituminous sandstone, (1950-51), cement, diatomite (1950), gypsum, molybdenum, phosphate rock (1950-51 and 1953), potassium salts, quartz crystal (1950), stone (crushed marble, 1952) vanadium, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3). Excludes value of clays used for cement.....	.....	\$ 25,280,331	.....	\$ 23,467,351	.....	\$ 24,609,578	.....	28,722,045
Total Utah.....	.....	\$ 229,966,000	.....	257,145,000	.....	\$ 265,501,000	.....	298,629,000
VERMONT								
Copper (recoverable content of ores, etc.).....	3,504	\$1,457,664	3,774	\$1,828,616	3,774	\$1,826,616	3,947	\$2,265,578
Gold (recoverable content of ores, etc.).....	146	5,110	156	5,460	162	5,670	171	5,955
Lime (open-market).....	32,843	415,910	32,179	432,483	(¹) 17,892	(¹) 7,419,835	(¹) 10,486	(¹) 1,113,697
Pyrites.....	.....	.....	.....	.....	.....	.....	.....	.....
Sand and gravel.....	1,040,977	661,984	965,702	646,702	1,264,400	749,835	1,113,697	690,073
Silver (recoverable content of ores, etc.).....	28,205	25,527	41,300	37,379	45,861	41,004	43,128	39,063
Stone (except limestone for lime).....	238,740	4,471,869	450,980	7,253,824	404,391	6,016,520	527,100	8,859,703
Talc.....	447,310	8,038,892	450,980	7,253,824	404,391	6,016,520	527,100	8,859,703
Total.....	72,135	\$ 906,396	78,694	\$ 988,792	71,027	\$ 926,646	80,209	\$ 1,240,627
Undistributed: Asbestos, clays, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3).....	.....	\$ 2,579,909	.....	\$ 7,315,198	.....	\$ 8,324,329	.....	8,201,333
Total Vermont.....	.....	18,563,000	.....	18,516,000	.....	17,891,000	.....	20,302,000

VIRGINIA

Clays.....	681,331	\$621,189	775,245	\$825,087	940,496	\$996,351	952,266	\$927,571
Coal.....	17,666,647	96,965,407	21,399,869	115,978,072	21,579,368	114,861,137	19,119,050	102,022,118
Feldspar.....	20,879	188,153	30,979	232,099	(¹)	(¹)	(¹)	(¹)
Iron ore (usable).....	5,245	7,248	7,248	(¹)	(¹)	(¹)	(¹)	(¹)
Iron ore (recoverable content of ores, etc.).....	3,254	878,880	1,508	521,768	3,792	1,221,024	2,788	780,456
Lead (open-market).....	428,339	3,861,632	462,680	4,551,656	442,845	4,448,924	477,384	4,947,418
Lime (recoverable content of ores, etc.).....	56	(¹)	(¹)	(¹)	1,011	(¹)	(¹)	695,926
Manganese ore (35 percent or more Mn).....	52,181	53,861	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Marl, calcareous (except for cement).....	46	4,000	64	10,000	1,133	279,000	3,697	954,000
Natural gas.....	21	(¹)	12	(¹)	(¹)	(¹)	48	(¹)
Petroleum (crude).....	4,373,984	4,144,846	5,772,781	5,750,409	7,136,112	5,556,953	5,276,350	5,160,564
Sand and gravel.....	9,272,740	16,434,602	9,277,252	16,621,116	9,670,961	16,969,952	9,091,907	16,258,620
Silver (recoverable content of ores, etc.).....	12,396	3,620,464	7,332	2,668,848	13,409	4,451,788	16,676	3,835,490
Stone (except limestone for cement and lime).....								
Undistributed: Abrasive stone (millstones, 1960), apilite, cement, gypsum, kyanite, mica, pyrites, salt, ground sand and sandstone, slate, talc and soapstone, titanium concentrate, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3). Excludes value of clays used for cement.....		\$11,133,101		\$14,083,092		\$15,868,790		\$17,505,609
Total Virginia.....		137,806,000		161,252,000		164,679,000		182,979,000

WASHINGTON

Abrasive stone:	25	\$300	28	\$336	20	\$240	(¹)	(¹)
Pebbles (grinding).....	33	2,100	22	1,970	12	908	(¹)	(¹)
Pulpstones.....			110	(¹)	100	(¹)	(¹)	(¹)
Antimony ore and concentrate.....	283,459	301,781	286,364	366,808	\$291,134	\$352,576	259,421	\$312,141
Clays.....	873,989	5,828,555	857,026	6,081,400	844,197	5,986,129	689,831	5,047,928
Coal.....	5,057	2,103,712	4,089	1,979,076	4,357	2,108,788	3,740	2,146,760
Copper (recoverable content of ores, etc.).....	92,117	3,224,095	67,405	2,359,175	54,776	1,917,160	62,560	2,189,600
Gold (recoverable content of ores, etc.).....	10,334	2,790,180	8,002	2,768,692	7,900	29,625	3,800	14,250
Gypsum.....					11,744	3,781,568	11,064	2,898,708
Lead (recoverable content of ores, etc.).....								
Manganese ore (35 percent or more Mn).....	40	(¹)	(¹)	(¹)	142	(¹)	(¹)	(¹)
Manganiferous ore (5 to 35 percent Mn).....			45,304	98,955	(¹)	111,386	(¹)	104,274
Olivine.....			5,105	3,089	42,580	8,059	32,107	(¹)
Peat.....	11,013	22,672	3,604	8,532	3,604	8,059	11,854,835	9,317,793
Pumice and pumicite.....	10,605,791	7,435,340	10,546,949	7,595,837	13,322,279	9,422,117	11,182,855	280,704
Sand and gravel.....	363,656	334,943	334,943	303,145	315,645	283,675	321,202	5,890,849
Silver (recoverable content of ores, etc.).....	4,890,820	5,734,563	5,024,735	5,664,433	4,523,234	5,491,525	4,458,259	5,890,849
Stone (except limestone for cement and lime).....								
Talc and soapstone.....								28,833

See footnotes at end of table.

TABLE 5.—Mineral production in the United States, 1950-53, by States 1—Continued
WASHINGTON—Continued

Mineral	1950		1951		1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Tungsten concentrate.....60-percent WO ₃ basis.	14,807	\$4,205,188	18,189	\$33,417	20,102	\$14,008	32,786	\$19,710
Zinc (recoverable content of ores, etc.)				6,620,796		6,673,864		7,540,780
Undistributed: Barite (1953), carbon dioxide, cement, diatomite (1950, 1952-53), gem stones, lime, magnesite, quartz, ground sand and sandstone, recovered elemental sulfur (1950), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3). Excludes value of clays used for cement.				\$ 20,719,457		\$ 19,955,089		18,766,830
Total Washington.....		49,055,000		54,554,000		\$ 56,139,000		54,577,000
WEST VIRGINIA								
Clays.....	675,101	\$1,004,420	1,103,646	\$2,295,026	982,030	\$2,421,669	968,838	\$2,488,938
Coal.....	144,115,683	794,370,245	163,309,822	855,893,679	141,713,059	741,421,131	134,105,310	693,593,645
Natural gas.....million cubic feet.....	189,980	31,917,000	191,146	35,563,000	180,995	35,475,000	186,477	44,009,000
Natural-gas liquids:.....thousand gallons.....	44,016	2,899,000	46,494	3,337,000	43,302	3,069,000	44,352	3,245,000
LP-gases.....CO.....	150,150	4,195,000	161,448	5,568,000	159,794	6,187,000	163,080	6,743,000
Petroleum (crude).....thousand 42-gallon barrels.....	2,808	9,350,000	2,797	10,370,000	2,602	9,780,000	43,038	11,570,000
Salt (common).....	367,842	1,233,688	379,289	1,314,813	392,519	1,438,490	419,907	1,490,892
Sand and gravel.....	3,613,046	6,241,057	4,735,271	8,314,139	4,120,105	7,275,370	3,162,776	6,070,847
Stone (except limestone for cement and lime).....	15,367,510	77,525,653	15,794,373	78,472,639	14,869,442	76,826,113	15,501,148	78,924,411
Undistributed: Abrasive stones, bromine, calcium-magnesium chloride, cement, lime, calcareous marl, ground sand and sandstone, stone (dimension limestone), and recovered elemental sulfur. Excludes value of clays used for cement.		\$ 10,692,155		\$ 12,629,965		\$ 11,838,988		11,974,948
Total West Virginia.....		\$ 229,653,000		\$ 941,748,000		\$ 825,733,000		790,110,000
WISCONSIN								
Abrasive stone: Pebbles (grinding).....	530	\$10,600	1,327	\$26,540	723	\$17,352	(2)	(3)
Clays.....	182,611	132,056	141,746	141,746	134,453	134,403	175,311	\$175,276
Iron ore (usable).....long tons, gross weight.....	1,701,619	(3)	1,745,120	(4)	1,485,845	(5)	1,655,331	(6)
Lead (recoverable content of ores, etc.).....	532	143,640	1,391	481,266	2,000	644,000	2,094	548,628
Lime (open-market).....	124,530	1,448,095	124,852	1,562,200	107,813	1,368,556	123,967	1,566,085
Marl, calcareous (except for cement).....	22,025	13,931	20,625	12,925	17,000	8,833	15,871	7,327
Peat.....	2,263	9,536	(7)	(8)	(9)	(10)	16,366	(11)

Sand and gravel.....	19, 117, 115	11, 059, 012	19, 391, 772	24, 895, 947	16, 938, 228	23, 656, 086	16, 173, 302
Stone (except limestone for cement and lime).....	6, 999, 630	14, 494, 700	7, 009, 323	8, 078, 882	10, 794, 073	7, 400, 396	10, 089, 183
Zinc (recoverable content of ores, etc.).....	5, 722	1, 625, 048	15, 794	20, 588	6, 835, 216	16, 830	3, 870, 900
Undistributed. A. Abrasive stone (tube-mill liners), cement, quartz (1961-63), ground sand and sandstone, and minerals whose value must be concealed for particular years indicated in appropriate column by footnote reference 3). Excludes value of clays used for cement.....		\$ 11, 855, 866	\$ 13, 326, 715		\$ 13, 008, 789		16, 890, 782
Total Wisconsin.....		41, 693, 000			55, 710, 000		55, 271, 000

WYOMING

Clays.....	413, 271	\$4, 102, 122	483, 050	706, 748	\$9, 176, 507	852, 651	\$10, 036, 727
Coal.....	6, 348, 249	24, 048, 403	6, 420, 633	6, 088, 421	26, 451, 530	5, 244, 572	23, 743, 996
Copper (recoverable content of ores, etc.).....				1		1	574
Gold (recoverable content of ores, etc.).....			9		35	1	35
Gypsum.....	491, 906		(¹) 616, 949	(¹) 484, 945	(¹)	5, 493	(¹) 21, 972
Iron ore (usable).....	62, 062	3, 724, 000	71, 508	75, 313	5, 874, 000	654, 235	6, 025, 000
Natural gas.....						76, 262	
Natural-gas liquids:.....							
Natural gasoline.....	44, 436	3, 382, 000	49, 392	51, 492	4, 016, 000	(²)	(²)
L.P.gases.....	20, 706	934, 000	32, 928	38, 976	1, 881, 000	(²)	(²)
Petroleum (crude).....	61, 631	133, 120, 000	68, 929	68, 074	148, 400, 000	482, 618	4 196, 800, 000
do.....	(³)		166, 156	186, 715	1, 247, 256	(³)	(³)
Phosphate rock 11.....	1, 460	6, 353	1, 887	2, 851	10, 918	648	1, 898
Pumice.....	1, 937, 943	1, 251, 220	2, 347, 078	2, 426, 999	1, 738, 548	3, 149, 376	2, 001, 197
Sand and gravel.....	1, 841, 400	2, 214, 037	1, 645, 475	1, 466, 567	1, 688, 890	1, 431, 372	1, 839, 922
Silver (recoverable content of ores, etc.).....			(⁴)	(⁴)	(⁴)	11	10
Stone (except limestone for cement).....						403	2, 418
Vermiculite.....							
Undistributed: Cement, feldspar (1953), gem stones, man-ganiferous ores 1953, sodium carbonate and sulfate, sulfur ore, recovered elemental sulfur and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3). Excludes value of clays used for cement in 1953.....							
Total Wyoming.....		\$ 4, 961, 465	\$ 8, 025, 379	\$ 6, 343, 624	\$ 206, 828, 000		16, 432, 721
		\$ 177, 744, 000	\$ 204, 357, 000				255, 906, 000

1 Production as measured by mine shipments, sales, or marketable production (including consumption by producers). Excludes uranium and monazite.
 2 Excludes puzosian cement, value for which is included with "Undistributed."
 3 Value included with "Undistributed."
 4 Final figure. Supersedes preliminary figure given in commodity chapter.
 5 Revised figure.
 6 Estimate.
 7 Excludes certain stone, value for which is included with "Undistributed."
 8 Weight not recorded.
 9 Sold or used by producers. Quantity and value of ground material included.
 10 Mine production of crude material.
 11 Basis for reporting phosphate rock has been changed from shipments to marketable production, because the latter more nearly reflects output at the mine on a calendar year basis.
 12 Commercial." Value of "Noncommercial" included with "Undistributed."
 13 Bureau of Mines not at liberty to publish, value included in total.
 14 Includes value of nonmetallic minerals; excludes value of clays used for cement.
 15 Excludes natural cement, value for which is included with "Undistributed."
 16 "Noncommercial." Value of "Commercial" included with "Undistributed."
 17 Value reported for zinc in New Jersey is 1960-62, estimated smelting value of recoverable zinc content of ore after freight, haulage, smelting, and manufacturing charges are added. In 1963, the recoverable zinc is valued at the yearly average price of Prime Western slab zinc, East St. Louis market.
 18 Less than 1 ton.

TABLE 6.—Mineral production in Territories of the United States, 1950-53, by individual minerals

Territory and mineral	1950		1951		1952		1953	
	Short tons (unless other- wise stated)	Value	Short tons (unless other- wise stated)	Value	Short tons (unless other- wise stated)	Value	Short tons (unless other- wise stated)	Value
Alaska:								
Antimony ore and concentrate..... gross weight.	412, 455	\$3, 033, 445	301	(¹)	420	(¹)	861, 471	\$8, 451, 542
Coal.....	6	2, 496	494, 333	\$3, 766, 987	686, 218	\$5, 779, 423		
Copper (recoverable content of ores, etc.).....	289, 272	10, 124, 520	239, 637	8, 387, 295	240, 557	8, 419, 386	253, 733	8, 882, 405
Gold (recoverable content of ores, etc.)..... troy ounces.	149	40, 230	21	7, 266	1			2, 240
Lead (recoverable content of ores, etc.)..... troy ounces.			21					7, 721
Mercury..... 76-pound flasks.					28	5, 575	40	5, 079, 681
Sand and gravel.....	3, 050, 020	2, 377, 407	6, 887, 646	3, 738, 516	10, 781, 926	8, 650, 582	7, 639, 278	32, 027
Silver (recoverable content of ores, etc.)..... troy ounces.	52, 638	47, 640	32, 870	29, 749	(¹)	29, 854	47, 086	169, 711
Stone.....					82	(¹)		105, 917
Tin (content of ore and concentrate)..... long tons.	79	170, 281	69	197, 163	8	220, 956	3	(¹)
Tungsten concentrate..... 60-percent WO ₃ basis.	13	(¹)	10	(¹)	8	(¹)		
Zinc (recoverable content of ores, etc.).....	6	1, 704	31	218				
Undistributed: Gem stones (1952-53), platinum-group metals, pumice (1950), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 1).....								
Total Alaska.....		2, 054, 735		3, 441, 090		3, 195, 336		1, 520, 782
		17, 852, 000		19, 569, 000		26, 302, 000		24, 252, 000
Hawaii:								
Lime (open-market).....	8, 141	219, 861	8, 740	236, 052	8, 894	240, 786	7, 431	223, 575
Sand and gravel.....			2, 561	5, 710	111, 716	143, 541	110, 563	156, 853
Stone (except limestone for lime).....	696, 310	1, 554, 906	3 650, 094	3 1, 337, 474	705, 994	1, 545, 301	1, 518, 649	2, 918, 423
Undistributed: Other nonmetallic minerals.....				147, 063		17, 164		33, 409
Total Hawaii.....		1, 775, 000		1, 726, 000		1, 947, 000		3, 352, 000
Total Territories.....		19, 627, 000		21, 295, 000		28, 249, 000		27, 584, 000

¹ Value included with "Undistributed."² Produced in 1950, but not shipped until 1951 from a mine not active in 1951.³ Excludes certain stone value for which is included with "Undistributed."

TABLE 7.—Mineral production in possessions of the United States, 1950-53, by individual minerals

Possession and mineral	1950		1951		1952		1953	
	Short tons (unless other- wise stated)	Value	Short tons (unless other- wise stated)	Value	Short tons (unless other- wise stated)	Value	Short tons (unless other- wise stated)	Value
American Samoa:								\$425
Sand and gravel ¹							1,320	16,500
Stone ¹							74,750	
Total American Samoa.....								17,000
Canal Zone:								
Sand and gravel ¹	22,000	\$15,000	32,000	\$28,000	56,600	\$53,000	85,914	95,500
Stone (crushed) ¹	53,000	83,000	55,500	112,000	86,000	152,000	171,908	231,752
Total Canal Zone.....								
Canton, Stone (crushed).....	(c)	98,000	360	138,000	150	205,000	4,200	327,000
Guam: Stone ¹	1,238,000	3,085,000	720,000	675,000	948,000	870,000	2,080,660	8,750
Midway: Stone (crushed) ¹	(c)	(c)	(c)	(c)	7,200	46,000	204	5,573,169
Puerto Rico:								
Cement.....	3,187,451	8,299,186	4,297,553	11,232,350	3,994,453	10,517,894	3,641,135	9,335,421
Iron ore (usable).....			38,219	223,509	136,613	797,025		
Long tons.....								
Lime (open-market).....	8,106	180,828	10,350	191,415	8,575	195,000	7,338	157,467
Salt (common).....	13,545	137,225	10,566	119,338	12,676	122,138	13,682	131,460
Sand and gravel.....	101,013	103,806	99,657	122,730	122,730	164,166	228,586	280,202
Stone.....	250,010	574,709	283,697	613,751	689,320	1,807,388	648,400	1,237,236
Undistributed: Other nonmetallic minerals.....		1,375				6,328		44,466
Total Puerto Rico.....	2,540	9,297,000	11,600	12,502,000	12,900	13,610,000	10,789	11,166,000
Virgin Islands: Stone (crushed) ¹	(c)	4,000	240	47,500	4,260	8,000	11,980	45,833
Wake: Stone (crushed) ¹								20,615
Total.....		12,454,000		13,364,000		14,751,000		17,149,000

¹ Quantities are estimated equivalents of cubic yards reported.
² Data for fiscal years ended June 30.
³ Data not available.
⁴ Estimate.
⁵ Excludes certain stone value for which is included with "Undistributed."
⁶ St. Croix island only. Data for St. Thomas island not available.

TABLE 8.—Comparison of world and United States production of principal minerals and metals, 1952–53

[Compiled by Berenice B. Mitchell, Pauline Roberts, Helen Hunt, and Pearl Thompson]

Mineral	1952			1953		
	World	United States		World	United States	
	Thousand metric tons		Percent of world	Thousand metric tons		Percent of world
Coal:						
Bituminous ¹	1,362,600	420,771	31	1,371,900	412,258	30
Lignite.....	426,000	2,737	(2)	452,000	2,586	(2)
Pennsylvania anthracite.....	146,400	36,816	25	140,100	28,076	20
Coke (excluding breeze):						
Gashouse.....	\$ 34,000	41	(2)	\$ 34,000	211	(2)
Oven and beehive.....	207,000	61,919	(2)	224,000	71,519	(2)
Fuel briquets and packaged fuel.....	90,000	2,155	30	91,000	1,687	2
Natural gas ⁴ million cubic meters.....	\$ 260,000	226,920	(3)	(3)	237,779	(3)
Peat.....	54,000	191	(2)	53,000	185	(2)
Petroleum (crude)..... thousand barrels.....	4,508,956	2,289,836	51	4,768,746	2,357,082	49
Nonmetallic minerals:						
Asbestos.....	1,425	49	3	1,375	49	4
Barite.....	1,900	919	48	1,975	835	42
Cement.....	161,000	43,091	27	178,000	45,651	26
Corundum.....	10			9		
Diamonds..... thousand metric carats.....	18,694			20,080		
Diatomite.....	590	272	46	600	272	45
Feldspar.....	820	428	52	810	460	57
Fluorspar.....	1,190	301	25	1,310	289	22
Graphite.....	185	5	3	180	6	3
Gypsum.....	24,300	7,634	31	24,500	7,523	31
Magnesite.....	3,800	463	12	4,000	502	13
Mica (including scrap).....	120	69	58	115	67	58
Nitrogen, agricultural ⁴	4,500	1,096	24	\$ 4,800	\$ 1,252	26
Phosphate rock.....	25,500	12,259	48	25,500	12,705	50
Potash..... K ₂ O equivalent.....	6,400	1,511	24	6,700	1,734	26
Pumice.....	1,800	542	30	2,500	1,223	49
Pyrrites.....	15,000	1,010	7	14,000	937	7
Salt.....	53,000	17,731	33	56,000	18,859	34
Sulfur, native..... thousand long tons.....	6,000	5,293	88	5,800	5,155	89
Talc, pyrophyllite, and soapstone.....	1,500	545	36	1,550	564	36
Vermiculite ⁴	226	190	84	203	172	86
Metals, mine basis:						
Antimony (content of ore and concentrate) ⁴	45	2	4	29	(10)	1
Arsenic ⁴	48	14	29	51	10	20
Bauxite.....	12,740	1,694	13	14,000	1,605	11
Beryllium concentrate ⁴	7	(11)	7	9	1	11
Bismuth..... metric tons.....	1,800		(12)	1,900	(12)	(12)
Cadmium..... do.....	6,215	3,886	63	7,126	4,430	62
Chromite.....	3,300	19	(2)	3,600	53	1
Cobalt (contained).....	10	(13)	4	12	1	8
Columbium concentrate.....						
..... thousand pounds.....	3,400	145	(2)	5,500	1415	(2)
Copper (content of ore and concentrate).....	2,730	839	31	2,750	840	31
Gold ¹ thousand fine ounces.....	34,200	1,927	6	33,500	1,970	6
Iron ore.....	298,000	99,490	33	331,000	119,889	36
Lead (content of ore and concentrate).....	1,840	354	19	1,900	310	16
Manganese ore (35 percent or more Mn).....	7,800	105	1	9,300	143	2
Mercury..... thousand 76-pound flasks.....	151	13	9	161	14	9
Molybdenum (content of ore and concentrate).....	22	20	91	28	26	93
Nickel (content of ore and concentrate).....	186	1	(2)	203	1	(2)
Platinum group (Pt, Pd, etc.).....						
..... thousand troy oz.....	675	34	5	750	26	3
Silver..... thousand fine ounces.....	216,800	39,840	18	216,400	37,736	17
Tantalum concentrate.....						
..... thousand pounds.....	95	(14)	(14)	150	(14)	(14)
Tin (content of ore and concentrate) ⁴						
..... thousand long tons.....	174	(15)	(2)	179	(15)	(2)
Titanium concentrate:						
Ilmenite.....	895	480	54	941	466	50
Rutile.....	47	(12)	(12)	46	6	13
Tungsten concentrate.....						
..... 60-percent WO ₃	68	7	10	73	9	12
Zinc (content of ore and concentrate).....	2,570	604	24	2,580	497	19

See footnotes at end of table.

TABLE 8.—Comparison of world and United States production of principal minerals and metals, 1952-53—Continued

Mineral	1952		1953			
	World	United States	World	United States		
	Thousand metric tons	Percent of world	Thousand metric tons	Percent of world		
Metals, smelter basis:						
Aluminum.....	2,050	850	41	2,465	1,136	46
Copper.....	2,825	929	33	2,970	951	32
Iron, pig (including ferroalloys).....	152,000	57,507	38	169,000	70,025	41
Lead.....	1,760	429	24	1,790	424	24
Magnesium.....	153	96	63	154	84	55
Steel ingots and castings.....	213,000	84,520	40	236,000	101,250	43
Tin.....thousand long tons.....	171	23	13	183	38	21
Zinc.....	2,200	821	37	2,320	831	36

¹ Including Alaska.

² Less than 1 percent.

³ Includes low- and medium-temperature and gashouse coke.

⁴ World total, exclusive of U. S. S. R.

⁵ Consumption estimated by the United Nations.

⁶ Data not available.

⁷ Final figure; supersedes preliminary figure given in commodity chapter.

⁸ Year ended June 30 of year stated (United Nations).

⁹ Estimate.

¹⁰ In 1953 United States production was 337 metric tons.

¹¹ In 1952 United States production was 467 metric tons.

¹² Bureau of Mines not at liberty to publish United States figure separately.

¹³ In 1952 United States production was 379 metric tons.

¹⁴ Small quantity of tantalite and microlite is included in columbite concentrate.

¹⁵ In 1952 the United States production was 99 long tons and in 1953 56 tons.

Employment and Injuries in the Mineral Industries

By Seth T. Reese ¹



THIS CHAPTER of the Minerals Yearbook contains the overall injury and related employment experiences at bituminous-coal, lignite, and anthracite mines, coking plants, metal and nonmetallic mineral mines, metallurgical plants, and stone quarries in the United States for the year 1953. Volume I of the Yearbook includes these experiences in the metal and nonmetal industries, and volume II those in the fuel industries—coal, coke, oil, and gas. The Bureau of Mines had the authority to collect data on injuries and related employment from all sections of the mineral industries; but there is no Federal law, except the one applying to the coal-mining industry, that requires operators to submit such data. Hence, the reports received from operators, other than those engaged in the mining and preparation of coal, are voluntary responses to the Bureau's requests for information. Although the figures presented herein may not be complete for all mineral industries of the Nation, every effort has been made to make them so, and it is felt that the figures given are thoroughly representative of the hazards to which workers in these industries are exposed.

TABLE 1.—Salient statistics of employment and injury experience in the mineral industries in the United States, 1949–53, by industry groups

	1949	1950	1951	1952	1953 ¹
Average number of men working daily: ²					
Coal mines.....	485,306	483,239	441,905	401,329	350,400
Metal mines.....	71,664	68,292	71,603	74,626	72,200
Nonmetal mines (except stone quarries)	12,077	11,977	12,500	12,447	10,200
Stone quarries.....	82,209	85,730	84,802	81,879	82,900
Coke plants.....	24,471	24,347	25,715	25,241	23,440
Metallurgical plants.....	47,663	46,277	48,019	49,032	53,800
Total.....	723,390	719,862	684,544	644,554	592,940
Average number of active mine-days: ³					
Coal mines.....	170	189	202	189	199
Metal mines.....	252	271	278	265	271
Nonmetal mines (except stone quarries)	277	293	298	288	298
Stone quarries.....	275	272	277	279	272
Coke plants.....	321	341	344	315	345
Metallurgical plants.....	294	314	318	319	317
Total.....	205	221	235	226	236

See footnotes at end of table.

¹ Chief, Accident Analysis Branch.

TABLE 1.—Salient statistics of employment and injury experience in the mineral industries in the United States, 1949–53, by industry groups—Continued

	1949	1950	1951	1952	1953 ¹
Man-days worked, in thousands:					
Coal mines.....	82,437	91,231	89,365	76,003	69,619
Metal mines.....	18,067	18,522	19,913	19,770	19,572
Nonmetal mines (except stone quarries).....	3,340	3,512	3,729	3,588	3,041
Stone quarries.....	22,569	23,347	23,470	22,844	22,588
Coke plants.....	7,860	8,292	8,834	7,939	8,086
Metallurgical plants.....	14,031	14,539	15,247	15,628	17,046
Total.....	148,304	159,443	160,558	145,772	139,952
Man-hours worked, in thousands:					
Coal mines.....	642,476	711,389	697,247	593,698	544,570
Metal mines.....	144,368	147,765	159,417	158,649	157,290
Nonmetal mines (except stone quarries).....	26,948	28,456	30,130	28,955	25,140
Stone quarries.....	182,258	189,535	191,113	186,552	189,256
Coke plants.....	62,446	65,861	70,191	62,803	64,677
Metallurgical plants.....	112,095	116,430	122,088	124,967	136,330
Total.....	1,170,591	1,259,436	1,270,186	1,155,624	1,117,263
Number of injuries:					
Fatal:					
Coal mines.....	585	643	785	548	460
Metal mines.....	69	84	95	117	86
Nonmetal mines (except stone quarries).....	10	19	17	14	25
Stone quarries.....	66	54	57	74	49
Coke plants.....	7	14	10	8	8
Metallurgical plants.....	23	29	16	16	12
Total.....	760	843	980	777	640
Nonfatal:					
Coal mines.....	35,405	37,264	35,553	30,074	26,275
Metal mines.....	6,940	6,611	6,824	6,684	6,195
Nonmetal mines (except stone quarries).....	1,125	1,238	1,351	1,171	1,090
Stone quarries.....	4,826	4,762	4,945	4,503	4,165
Coke plants.....	713	780	768	546	425
Metallurgical plants.....	2,567	2,574	2,714	2,853	2,595
Total.....	51,576	53,229	52,155	45,831	40,745
Injury rates per million man-hours:					
Fatal:					
Coal mines.....	0.91	0.90	1.13	0.92	0.84
Metal mines.....	.48	.57	.60	.74	.55
Nonmetal mines (except stone quarries).....	.37	.67	.56	.48	.99
Stone quarries.....	.36	.28	.30	.40	.26
Coke plants.....	.11	.21	.14	.13	.12
Metallurgical plants.....	.21	.25	.13	.13	.09
Total.....	.65	.67	.77	.67	.57
Nonfatal:					
Coal mines.....	55.11	52.38	50.99	50.66	48.25
Metal mines.....	48.07	44.74	42.81	42.13	39.39
Nonmetal mines (except stone quarries).....	41.75	43.51	44.84	40.44	43.36
Stone quarries.....	26.48	25.12	25.87	24.14	22.01
Coke plants.....	11.42	11.84	10.94	8.69	6.57
Metallurgical plants.....	22.90	22.11	22.23	22.83	19.03
Total.....	44.06	42.26	41.06	39.66	36.47

¹ Preliminary figures based on an average of 80-percent coverage, excepting coke, which is final.

² Average number of men at work each day mine was active. Because absenteeism and labor turnover are taken into consideration, this number is lower than number of men available for work as measured by a count of names on payroll.

³ Average in which operating time of each mine is weighed by average number of workers in mine.

Employment in the mineral industries declined 8 percent in 1953 to an average daily workforce of 592,940 men. Mineral operations were active an average of 236 days, or 10 more than in 1952; however, this increase in the average number of days all plants were operated was not sufficient to offset a decrease of more than 3 percent in the total number of man-hours of worktime compared with 1952. The average worker at mineral plants in 1953 had a shift of 7.98 hours, or slightly more than his 7.93-hour shift in 1952. The average hours of work per man-year in the industries was 1,884, or 91 more than the previous year, due chiefly to the increased length of workshifts and the number of days plants were in operation. Lower rates of operating activity in 1953 were noted at coal, metal, and nonmetallic mineral operations. Slightly improved rates were obtained at stone quarries and at coke plants. Activity at metallurgical plants improved sharply.

The safety record of the mineral industries was more favorable in 1953 than in 1952. As a matter of fact, the record was the best recorded since complete statistics on all sections of the industry were made available to the Bureau in 1931. The number of deaths and nonfatal injuries decreased substantially. The number of fatalities decreased 137 to 640 (18 percent) and the number of nonfatal injuries from 45,831 to 40,745 (11 percent). In each instance satisfactorily improved frequency rates resulted. The fatality rate dropped from 0.67 to 0.57 per million man-hours (15 percent), and the nonfatal rate from 39.66 in 1952 to 36.47 per million man-hours in 1953 (8 percent).

During 1953 there were 2 major disasters (a single accident in which 5 or more men are killed) in the mineral industries. These disasters occurred in a coal-dust explosion at a bituminous-coal mine in Iowa, in which 5 men lost their lives and in an open-pit gilsonite mine in Utah, in which 8 men were killed in a dust explosion.

The fatality experience in 1953 improved in each section of the mineral industry, except at nonmetallic mines, where the frequency rate increased from 0.48 to 0.99 per million man-hours. The greatest improvement was recorded in the stone-quarrying industry, where the death rate decreased from 0.40 to 0.26 per million man-hours (35 percent). A substantial drop—26 percent—in the death rate was also reported for the metal-mining industry. The non-fatal-injury experience was also bettered in each section of the industry, except at non-metallic mines. At those operations nonfatal injuries occurred at the rate of 43.36 in 1953, whereas in 1952 the rate of occurrence was 40.44 per million man-hours of worktime. The best improvement in the non-fatal-injury rate was established in the coking industry, where a 24-percent decrease was recorded.

Work Stoppages.—The Bureau of Labor Statistics reported 473 stoppages in the mineral industries during 1953. The greatest number (392), at bituminous-coal mines, caused a loss of 418,000 man-days; 24 at Pennsylvania anthracite mines accounted for a loss of 108,000 man-days; and 15 at metal mines resulted in a loss of 255,000 man-days. In addition, 42 stoppages at nonmetal mines, stone quarries, cement plants, coke plants, and petroleum-refining operations caused a loss of 134,000 man-days. The loss of 915,000 man-days due to work stoppages in the mineral industries in 1953 was lower than the loss of 4,304,000 man-days in 1952, and during the 5-year period 1949–53 was the smallest time lost.

TABLE 2.—Work stoppages, average earnings, and labor turnover in certain mineral industries in the United States, 1949-53

Industry and year	Work stoppages ¹		Average earnings ²		Labor-turnover rates ³	
	Number	Man-days lost (thousands)	Weekly	Hourly	Accession	Separation
Coal mining:						
Anthracite:						
1949.....	34	1,400	\$56.78	\$1.88	1.5	2.1
1950.....	41	80	63.24	1.97	1.8	1.8
1951.....	30	81	66.66	2.20	1.8	2.3
1952.....	41	104	71.19	2.26	1.4	2.2
1953.....	24	108	72.91	2.48	1.4	3.1
Bituminous:						
1949.....	421	16,700	63.28	1.94	2.0	2.9
1950.....	430	9,320	70.35	2.01	2.0	2.4
1951.....	549	887	77.79	2.21	1.9	2.6
1952.....	560	2,760	78.09	2.29	1.9	2.8
1953.....	392	418	85.31	2.48	1.3	2.6
Metal mining:						
Total:						
1949.....	9	970	61.55	1.51	3.8	4.5
1950.....	14	235	65.58	1.55	4.6	4.0
1951.....	23	269	74.56	1.71	5.3	4.9
1952.....	29	1,300	81.65	1.86	5.8	5.7
1953.....	15	255	88.54	2.04	4.3	4.7
Iron:						
1949.....	(5)	(5)	58.91	1.48	2.1	2.2
1950.....	(5)	(5)	61.96	1.52	2.7	2.3
1951.....	(5)	(5)	72.68	1.71	2.7	2.5
1952.....	(5)	(5)	80.34	1.83	2.9	2.9
1953.....	(5)	(5)	90.74	2.14	1.9	2.1
Copper:						
1949.....	(5)	(5)	63.96	1.51	4.8	5.3
1950.....	(5)	(5)	72.05	1.60	5.1	4.3
1951.....	(5)	(5)	78.54	1.70	5.1	4.8
1952.....	(5)	(5)	85.73	1.88	5.4	5.1
1953.....	(5)	(5)	91.60	2.00	4.8	4.8
Lead-zinc:						
1949.....	(5)	(5)	64.79	1.57	3.9	5.5
1950.....	(5)	(5)	66.64	1.60	4.3	3.8
1951.....	(5)	(5)	76.11	1.77	5.3	4.8
1952.....	(5)	(5)	81.60	1.92	4.4	4.5
1953.....	(5)	(5)	80.06	1.92	2.7	4.9
Nonmetal mining and quarrying:						
Total:						
1949.....	17	166	56.38	1.30	(5)	(5)
1950.....	22	64	59.88	1.36	(5)	(5)
1951.....	24	53	67.05	1.49	(5)	(5)
1952.....	17	94	71.10	1.58	(5)	(5)
1953.....	26	63	75.99	1.70	(5)	(5)
Cement:						
1949.....	3	37	57.49	1.38	1.7	1.8
1950.....	12	57	60.13	1.44	2.2	2.0
1951.....	12	12	65.21	1.56	2.9	2.7
1952.....	(5)	(5)	67.72	1.62	2.7	2.6
1953.....	5	20	73.39	1.76	2.5	2.6
Coke and byproducts:						
1949.....	3	31	61.07	1.55	(5)	(5)
1950.....	2	2	62.85	1.58	(5)	(5)
1951.....	4	11	69.39	1.66	(5)	(5)
1952.....	(5)	(5)	73.74	1.76	(5)	(5)
1953.....	2	1	78.81	1.89	(5)	(5)
Petroleum refining:						
1949.....	6	39	75.33	1.87	.4	1.0
1950.....	10	638	77.93	1.93	.8	.8
1951.....	8	37	84.66	2.08	1.2	.8
1952.....	4	46	88.44	2.20	1.0	.8
1953.....	9	50	94.19	2.32	.8	.9

¹ Number of stoppages beginning during the year and man-days of work lost from only these stoppages during the year.

² Monthly averages for production and related workers only; data cover both full- and part-time employees who worked during or received pay for the pay period ended nearest the 15th of the month.

³ Monthly averages expressed as the number per 100 employees. Accessions are all additions to the work force, whether new or rehired employees; separations and all terminations of employment, including quits, discharges, layoffs, military, and miscellaneous separations. Data for metal mining, cement, and petroleum refining for 1950 are not comparable with preceding years due to changes in industry classification by the U. S. Department of Labor.

* 11-month average due to strike during February.

Figure not available.

Average Earnings.—The weekly and hourly earnings increased in 1953 over 1952 in each of the mineral-industry groups for which data are published by the Bureau of Labor Statistics, except the lead-zinc industry, which showed a very small decline in average weekly earnings and no change in the hourly average.

Labor Turnover.—Again in 1953, as in 1952 and 1951, labor turnover in the mineral industries for which data are published by the Bureau of Labor Statistics followed the same pattern, with the highest in metal mining and the lowest in petroleum refining. The accession rates were lower in 1953 than in 1952 in all groups except anthracite, which remained the same. Separation rates in 1953 were lower in most of the mineral-industry groups, the exceptions being anthracite, lead-zinc, and petroleum refining. The cement group maintained the same rate in both 1953 and 1952.

NATIONAL SAFETY COMPETITION

Safety competitions sponsored and conducted annually by the Bureau of Mines have proved effective in promoting accident-prevention work in the mineral industries of the country. The outstanding number of 270 operations of the 750 mineral plants enrolled in the National Safety Competition and the National Sand and Gravel Safety Competition made perfect safety records in 1953. Of the operations enrolled in these 2 contests, 36 percent (270 operations) attained injury-free records. The aggregate worktime of these injury-free plants exceeded 20 million man-hours, which was over 12 percent of the total man-hours worked by all participants in both competitions. In addition, the Bureau of Mines conducted four other competitions sponsored annually by national associations connected with the mineral industries. These associations are: National Sand and Gravel, National Lime, National Crushed Stone, and National Slag. In these contests, of the 277 plants enrolled in 1953, 106 (38 percent) had injury-free records during an aggregate worktime exceeding 31 million man-hours.

Trophy awards for the best safety record in each of the six groups of the 1953 National Safety Competition were made to the following:

Anthracite Underground Mines.—The Coal Brook colliery of the Hudson Coal Co., Carbondale, Pa.

Bituminous-Coal Mines.—The Hanna No. 4—A mine of the Union Pacific Coal Co., Hanna, Wyo.

Metal Underground Mines.—The Calloway-Mary mine of the Tennessee Copper Company, Ducktown, Tenn.

Nonmetal Underground Mines.—The Annandale limestone mine of the Michigan Limestone Division, United States Steel Corp., Boyers, Pa.

Open-Pit Mines.—The Mahoning mine of Pickens Mather & Co., (Mahoning Ore & Steel Co.), Hibbing, Minn.

Quarries.—The Alpena limestone quarry of the Wyandotte Chemical Corp., Alpena, Mich.

TABLE 3.—Employment and injury experience of the mineral industries of the United States, 1931-53

Year	Men working daily	Average active days	Man-days worked	Man-hours worked	Number of injuries		Injury rates per million man-hours	
					Fatal	Nonfatal	Fatal	Nonfatal
1931	784,347	188	147,602,799	1,288,135,808	1,707	94,021	1.33	72.99
1932	671,343	165	110,655,616	962,924,915	1,368	66,028	1.42	68.57
1933	677,722	181	122,737,658	1,058,245,650	1,242	70,158	1.17	66.30
1934	739,817	195	144,566,133	1,167,723,543	1,429	79,211	1.22	67.83
1935	783,139	195	152,354,170	1,215,316,764	1,495	80,070	1.23	65.88
1936	824,514	216	177,920,334	1,426,233,543	1,686	90,608	1.18	63.53
1937	859,951	217	186,790,283	1,482,241,908	1,759	94,466	1.19	63.73
1938	774,894	187	145,056,875	1,144,137,296	1,369	69,940	1.20	61.13
1939	788,925	202	159,388,490	1,251,169,210	1,334	73,253	1.07	58.55
1940	801,926	219	175,663,792	1,385,128,234	1,716	80,856	1.24	58.37
1941	835,095	234	195,425,228	1,541,335,277	1,621	87,911	1.05	57.04
1942	802,640	260	208,739,906	1,658,284,620	1,862	91,675	1.13	55.45
1943	747,486	277	207,350,643	1,668,340,394	1,799	88,449	1.08	53.02
1944	676,938	237	194,512,359	1,618,479,042	1,571	83,451	.97	51.56
1945	637,220	271	172,672,431	1,437,533,530	1,270	73,411	.88	51.07
1946	676,254	240	162,630,674	1,354,822,190	1,167	72,805	.86	53.74
1947	721,792	256	185,076,018	1,496,101,097	1,407	76,919	.94	51.41
1948	740,988	249	184,551,937	1,457,690,518	1,227	70,939	.84	48.67
1949	723,390	205	148,304,347	1,170,590,880	760	51,576	.65	44.06
1950	719,862	221	159,443,478	1,259,436,140	843	53,229	.67	42.26
1951	684,544	235	160,558,417	1,270,186,435	980	52,155	.77	41.06
1952	644,554	226	145,771,805	1,155,623,605	777	45,831	.67	39.66
1953 ¹	592,940	236	139,951,534	1,117,262,627	640	40,745	.57	36.47

¹ Includes preliminary data except coke, which is final.

The Mineral Industry of Alabama

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of Alabama.

By Avery H. Reed, Jr.,¹ and Walter B. Jones²



ALABAMA's mineral industry in 1953 consisted of the production of bauxite, clay, coal, iron ore, limestone, marble, mica, natural gas, petroleum, salt, sand and gravel, and sandstone as primary crude materials and the manufacture of cement and lime. Among the States, Alabama ranked second in the production of bauxite and third in the output of iron ore.

Alabama's mineral industry was dominated by coal and iron mining, which together composed 72 percent of the total value of the State's 1953 mineral production. Cement, stone, and lime accounted for 21 percent, and the balance was distributed among other industries.

A large segment of Alabama's mineral industry was concentrated near Birmingham, the largest city; Jefferson County accounted for 71 percent of the total value of production in the State.

The year 1953 was a record one for the mineral industries of the State. The total value of production increased 18 percent over 1952 and 2 percent over 1948, the previous record year.

Defense Minerals Exploration Administration (DMEA) activity included 1 project for iron ore in Franklin County and 3 projects for sheet mica in Clay and Randolph Counties. The total amount expended was \$92,795, of which the Government share was \$53,072 (57 percent).

TABLE 1.—Mineral production in Alabama, 1952-53¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement ².....376-pound barrels..	10,642,409	\$25,084,379	10,427,542	\$25,701,421
Clays.....	1,264,412	1,903,956	1,198,093	1,815,606
Coal.....	11,383,427	70,769,815	12,532,061	79,370,036
Iron ore (usable).....long tons, gross weight..	7,243,214	37,940,412	7,446,130	55,640,338
Lime (open market).....	424,028	4,458,604	470,541	5,018,156
Natural gas (marketed production) million cubic feet..	4	160	41	2,000
Petroleum (crude).....thousand 42-gallon barrels..	1,279	(³)	41,694	43,290,000
Sand and gravel.....	3,722,555	2,955,630	3,710,707	3,002,683
Stone (except for cement and lime).....	3,052,150	7,948,410	4,111,889	8,953,656
Undistributed: Native asphalt, bauxite, puzzolan cement, graphite, mica, salt, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3). Excludes value of clays used for cement.....		⁴ 7,330,582		5,106,503
Total Alabama.....		158,382,000		187,900,000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

² Excludes puzzolan cement, value for which is included with "Undistributed."

³ Value included with "Undistributed."

⁴ Final figure. Supersedes preliminary figure given in commodity chapter.

⁵ Revised figure.

¹ Commodity-industry analyst, Region VII, Bureau of Mines, Knoxville, Tenn.

² State geologist, Alabama Geol. Survey, Tuscaloosa, Ala.

TABLE 2.—Average unit values of mineral commodities in Alabama, 1944-48 (average) and 1949-53¹

Commodity	1944-48 (average)	1949	1950	1951	1952	1953
Bauxite.....long ton..	\$5.44	\$5.84	\$5.88	\$6.02	\$6.20	\$7.31
Cement:						
Portland.....376-pound barrel..	1.67	2.16	2.19	2.32	2.36	2.46
Puzzolan.....do..	(²)			3.16	2.96	3.16
Clay:						
Fire.....short ton..	2.03	2.02	1.76	3.48	3.44	2.88
Kaolin.....do..	(²)	9.14	9.71	5.00	5.00	9.67
Miscellaneous.....do..	.70	.73	.77	.84	1.07	.99
Coal.....do..	4.89	6.12	6.13	6.06	6.22	6.33
Iron ore:						
Hematite.....long ton..	2.78	3.48	3.88	4.08	5.16	7.70
Limonite.....do..	2.93	3.75	3.11	3.29	5.71	5.35
Lime.....short ton..	7.25	8.92	9.20	9.64	10.51	10.66
Limestone:						
Crushed.....do..	1.27	1.44	1.54	1.89	1.57	1.51
Dimension.....do..	(²)	46.63	48.27	53.47	47.90	145.14
Marble:						
Crushed.....do..	(²)	3.62	3.97	(³)	(³)	9.02
Dimension.....do..	(²)	156.80	150.85	149.25	112.04	98.14
Mica:						
Scrap.....do..	(²)				16.55	
Sheet.....pound..	(²)				1.41	6.09
Salt.....short ton..	(²)				1.08	1.08
Sand.....do..	(²)	.69	.70	.83	.71	.76
Gravel.....do..	(²)	.65	.67	.77	.86	.84
Sandstone:						
Crushed.....do..	(²)	2.44	6.61	8.90	8.90	9.09
Dimension.....do..	(²)				15.85	13.46
Stone, miscellaneous, crushed.....do..	(²)			1.35		

¹ For greater detail on prices by grades and markets, see volume I, Minerals Yearbook, 1953.

² Data not available.

³ Figure withheld to avoid disclosure of individual company operations.

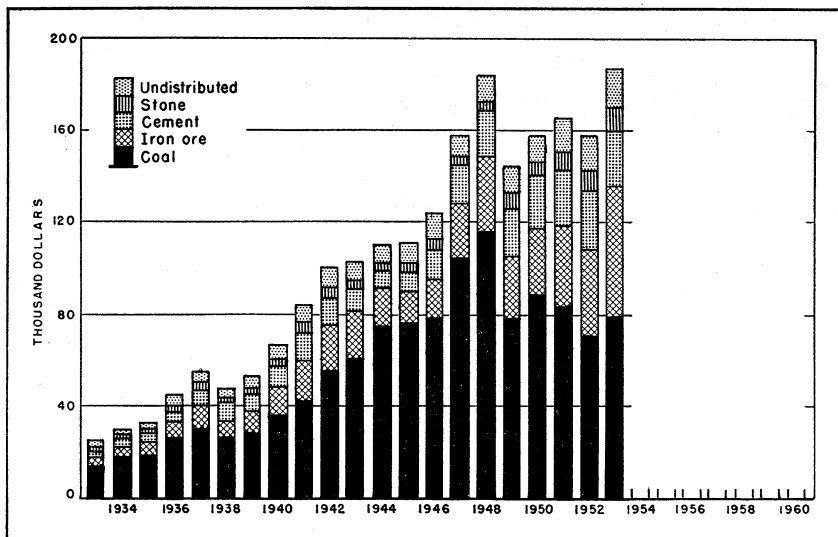


FIGURE 1.—Value of mineral production in Alabama, 1933-53.

REVIEW BY COMMODITIES

METALS

Bauxite.—Mine production of crude bauxite for chemicals and refractories decreased 26 percent below 1952, and total value decreased 13 percent.

Iron Ore.—Total shipments of iron ore increased 3 percent over 1952, and total value increased 47 percent. Of the total quantity shipped, 59 percent was direct shipping ore compared with 70 percent in 1952; 26 percent was concentrates compared with 16 percent in 1952; and 15 percent was sinter compared with 14 percent in 1952. The number of mines operating was reduced from 40 to 30, and the average usable production per mine increased from 181,000 tons to 248,000.

Four companies continued to mine red iron ore near Birmingham. The Tennessee Coal & Iron Division of United States Steel Corp. abandoned the Muscoda No. 4 mine but continued operations at the Muscoda No. 6 mine and the Wenonah group of mines; the former Ishkooda group of mines was combined with the Wenonah group as a single operation. The Woodward Iron Co. operated the Red Ore, Songo, and Pyne mines; the entire output from the Pyne mine was treated at the new company concentrating plant. Republic Steel Corp. operated the Edwards mine and the Spaulding open pit. United States Pipe & Foundry Co. operated the Sloss Red Ore and the Ruffner mines. A small quantity of red ore was mined near McCalla by the Zeigler Construction Co. The total usable hematite production increased 9 percent over 1952.

Results of investigations by the Bureau of Mines in the Woodstock and Bucksville areas were published.³

Results of investigations by the Bureau of Mines of the history, ore reserves, and concentration of ores of the Birmingham area were published.⁴

Brown-iron-ore production was continued by 17 operators at 20 mines in 10 counties; the total usable brown-ore production decreased 31 percent below 1952.

TABLE 3.—Mine production and shipments of crude iron ore, 1952–53

	1952		1953	
	Number of mines	Long tons	Number of mines	Long tons
Mine production by varieties:				
Hematite.....	13	6,273,538	10	7,339,415
Brown ore.....	27	4,970,934	20	3,630,900
By mining method:				
Open pit.....	31	5,263,769	22	3,975,618
Underground.....	9	5,980,703	8	6,994,697
Shipments from mines:				
Direct to consumers.....	11	5,089,437	7	4,428,070
To beneficiation plants.....	29	6,156,421	23	6,520,920

³ Reed, Avery H., Jr., Investigation of Red Iron Ore, Woodstock and Bucksville areas, Alabama: Bureau of Mines Rept. of Investigations 4981, 1953, 34 pp.

⁴ Thoenen, J. R., Reed, Avery H., Jr., and Clemmons, B. H., The Future of Birmingham Red Iron Ore, Jefferson County, Ala.: Bureau of Mines Rept. of Investigations 4988, 1953, 71 pp.

TABLE 4.—Production and shipments of usable iron ore, 1952-53

	1952		1953	
	Long tons	Iron content, natural (percent)	Long tons	Iron content, natural (percent)
Production of usable iron ore, by varieties:				
Hematite.....	6,186,663	36	6,736,109	37
Brown ore.....	1,053,685	45	726,270	46
Shipments of usable iron ore, by types:				
Direct shipping ore.....	5,089,437	36	4,428,077	36
Concentrates.....	1,159,863	45	1,925,887	40
Sinter.....	993,914	39	1,092,173	49

TABLE 5.—Shipments of usable iron ore, 1944-48 (average) and 1949-53

Year	Long tons	Value	Year	Long tons	Value
1944-48 (average).....	6,814,430	\$21,134,001	1951.....	8,181,737	\$34,799,951
1949.....	7,314,204	27,553,175	1952.....	7,243,214	37,940,412
1950.....	7,402,208	28,932,801	1953.....	7,446,130	55,640,338

TABLE 6.—Principal iron-ore mines in 1953, by size of crude-ore output, with accompanying usable ore production

Mine	Name of operator	Long tons	
		Crude ore	Usable ore
Wenonah.....	Tennessee Coal & Iron Div., U. S. Steel Corp.....	3,249,675	3,248,266
Pyne.....	Woodward Iron Co.....	1,636,000	1,145,237
Musoda.....	Tennessee Coal & Iron Div., U. S. Steel Corp.....	1,050,631	1,049,540
Adkins.....	Shook & Fletcher Supply Co.....	879,900	175,982
Blackburn.....	do.....	807,000	161,355
Russellville No. 16.....	United States Pipe & Foundry Co.....	565,000	112,914
Belgreen.....	Schroeder & Co.....	558,000	111,665
Edwards.....	Republic Steel Corp.....	542,867	542,867
Spaulding.....	do.....	323,064	232,669
Sloss Red Ore.....	United States Pipe & Foundry Co.....	204,921	204,921

NONMETALS

Cement.—Shipments of portland cement decreased 2 percent below those in the peak year 1952, but the total value increased 2 percent and established a new record for the State. Shipments of puzzolan cement by 2 operators decreased 6 percent below 1952, but the total value was the same.

TABLE 7.—Shipments of portland cement, 1944-48 (average) and 1949-53

Year	376-pound barrels	Value	Year	376-pound barrels	Value
1944-48 (average).....	7,553,326	\$13,012,166	1951.....	10,586,825	\$24,523,073
1949.....	9,394,348	20,320,658	1952.....	10,642,409	25,084,379
1950.....	10,574,955	23,175,772	1953.....	10,427,542	25,701,421

Clays.—Fire clay sold or used by producers increased 15 percent over 1952, but its total value decreased 4 percent.

Kaolin sold or used by producers for whiteware, firebrick and block, fertilizer, and insecticides increased 22 percent over 1952, and its total value more than doubled.

Miscellaneous clays sold or used by producers for heavy clay products decreased 15 percent below 1952, and their total value decreased 21 percent.

TABLE 8.—Fire clay sold or used by producers, 1944–48 (average) and 1949–53

Year	Short tons	Value	Year	Short tons	Value
1944–48 (average).....	127, 150	\$258, 220	1951.....	203, 339	\$707, 030
1949.....	122, 052	246, 112	1952.....	220, 009	757, 451
1950.....	167, 779	295, 764	1953.....	252, 926	727, 439

TABLE 9.—Fire clay sold or used by producers, 1952–53, by uses

Use	1952		1953	
	Short tons	Value	Short tons	Value
Heavy clay products.....	118, 801	\$523, 804	136, 502	\$354, 078
Firebrick and block.....	59, 592	130, 421	44, 253	229, 032
Fire-clay mortar.....	5, 508	54, 221	38, 140	99, 402
Other.....	36, 108	49, 005	34, 031	44, 927
Total.....	220, 009	757, 451	252, 926	727, 439

Lime.—Lime sold or used by producers increased 11 percent over 1952, and total value increased 13 percent.

TABLE 10.—Lime sold or used by producers, 1944–48 (average) and 1949–53

Year	Short tons	Value	Year	Short tons	Value
1944–48 (average).....	335, 397	\$2, 449, 647	1951.....	445, 953	\$4, 395, 922
1949.....	359, 446	3, 203, 564	1952.....	424, 028	4, 458, 604
1950.....	389, 071	3, 577, 850	1953.....	470, 541	5, 018, 156

TABLE 11.—Lime sold or used by producers, 1952–53, by uses

Use	1952		1953	
	Short tons	Value	Short tons	Value
Chemical and industrial.....	317, 400	\$3, 299, 539	376, 155	\$3, 974, 181
Building.....	94, 075	994, 460	80, 001	851, 774
Other.....	12, 553	164, 605	14, 385	192, 201
Total.....	424, 028	4, 458, 604	470, 541	5, 018, 156

Mica.—Sheet mica sold or used by producers was considerably less than was reported in 1952.

Salt.—Salt production from brine produced near McIntosh more than tripled 1952 production, as did its total value.

Sand and gravel.—Sand and gravel sold or used by producers decreased less than 1 percent below 1952, but the total value increased 2 percent.

TABLE 12.—Sand and gravel sold or used by producers, 1944–48 (average) and 1949–53

Year	Sand		Gravel		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1944–48 (average).....	(1)	(1)	(1)	(1)	2,900,771	\$1,873,733
1949.....	(1)	(1)	(1)	(1)	3,396,582	2,268,013
1950.....	1,392,692	\$979,522	2,223,671	\$1,484,200	3,616,363	2,463,722
1951.....	(1)	(1)	(1)	(1)	3,535,871	2,806,540
1952.....	(1)	(1)	(1)	(1)	3,722,555	2,955,630
1953.....	1,570,826	1,196,831	2,139,881	1,805,852	3,710,707	3,002,683

¹ Figure withheld to avoid disclosure of individual company operations.

TABLE 13.—Sand and gravel sold or used by producers, 1952–53, by uses

Use	1952		1953	
	Short tons	Value	Short tons	Value
Structural.....	1,746,572	\$1,503,563	1,616,574	\$1,407,865
Paving.....	1,524,009	1,095,253	1,436,105	1,103,139
Railroad ballast.....	238,192	118,706	432,005	234,494
Other.....	213,782	238,108	226,023	257,185
Total.....	3,722,555	2,955,630	3,710,707	3,002,683

Stone.—Crushed limestone sold or used by producers increased 33 percent over 1952, and its total value increased 29 percent.

TABLE 14.—Crushed limestone sold or used by producers, 1944–48 (average) and 1949–53¹

Year	Short tons	Value	Year		
			Short tons	Value	Value
1944–48 (average).....	2,294,334	\$2,894,381	1951.....	2,700,064	\$5,103,858
1949.....	2,373,540	3,423,831	1952.....	2,936,029	6,051,287
1950.....	2,447,960	3,777,022	1953.....	3,969,513	6,578,993

¹ Except for cement and lime.

TABLE 15.—Crushed limestone sold or used by producers, 1952–53, by uses¹

Use	1952		1953	
	Short tons	Value	Short tons	Value
Fluxing stone.....	1,816,833	\$2,330,467	2,289,242	\$3,468,741
Concrete and road metal.....	531,508	1,302,532	1,047,034	2,033,496
Agriculture.....	244,716	286,358	198,238	255,596
Railroad ballast.....	.....	.....	107,313	160,969
Riprap.....	36,440	49,194	84,924	124,232
Rock dusting.....	44,460	206,877	54,561	238,218
Other.....	262,072	1,875,859	188,201	297,741
Total.....	2,936,029	6,051,287	3,969,513	6,578,993

¹ Except for cement and lime.

Dimension limestone sold or used by producers for rubble, rough architectural, and cut and sawed dressed building stone decreased 16 percent below 1952, and its total value increased 10 percent.

Crushed marble sold or used by producers for terrazzo and whiting decreased 36 percent below 1952, and its total value decreased 61 percent.

Dimension marble sold or used by producers for rough building stone, cut and sawed dressed building stone, and sawed dressed monumental stone increased 17 percent over 1952, and its total value increased 3 percent.

Crushed sandstone sold or used by producers for refractory stone decreased 5 percent below 1952, and its total value decreased 3 percent.

Dimension sandstone sold or used by producers for rough architectural stone was 531 short tons valued at \$7,100 compared with 568 short tons valued at \$9,000 in 1952.

MINERAL FUELS

Coal.—Coal sold or used by producers increased 10 percent in quantity and 12 percent in total value over 1952. For more data on fuels, see volume II, Minerals Yearbook, 1953.

TABLE 16.—Coal sold or used by producers, 1944–48 (average) and 1949–53

Year	Short tons	Value	Year	Short tons	Value
1944–48 (average).....	18, 204, 236	\$89, 700, 118	1952.....	11, 383, 427	\$70, 759, 815
1949.....	12, 933, 830	79, 187, 827	1953.....	12, 532, 061	79, 370, 036
1950.....	14, 421, 810	88, 343, 572	Earliest record to date..	874, 212, 000	(1)
1951.....	13, 596, 982	82, 465, 625			

¹ Not available.

Natural Gas.—Marketed production of natural gas was more than 10 times that in 1952.

TABLE 17.—Marketed production of natural gas, 1950–53

Year	Cubic feet	Value	Year	Cubic feet	Value
1950.....	2, 000, 000	\$100	1952.....	4, 000, 000	\$160
1951.....	1, 000, 000	50	1953.....	41, 000, 000	2, 000

Petroleum (crude).—Production of crude petroleum increased 32 percent over 1952, and its total value increased 28 percent.

TABLE 18.—Production of crude petroleum, 1944–48 (average) and 1949–53

Year	42-gallon barrels	Year	42-gallon barrels
1944–48 (average).....	293, 000	1951.....	1, 020, 000
1949.....	462, 000	1952.....	1, 279, 000
1950.....	735, 000	1953.....	1, 694, 000

REVIEW BY COUNTIES

BALDWIN

The Fairhope Clay Products Co. mined miscellaneous clays for heavy clay products at the same rate as in 1952.

BARBOUR

Crude bauxite for chemicals and refractories was mined by the Aluminum Co. of America and by the D. M. Wilson Bauxite Co; the total quantity mined decreased 26 percent, and the total value decreased 13 percent below 1952.

TABLE 19.—Value of mineral production in Alabama, 1952–53, by counties¹ and principal minerals² produced in 1953

County	1952	1953	Principal minerals, in order of value ²
Bibb.....	\$1,301,038	\$740,708	Coal.
Blount.....	(3)	1,733,621	Coal, cement, fire clay, iron ore, sandstone.
Bullock.....	625	.....	.....
Butler.....	15,065	404,011	Iron ore.
Calhoun.....	914,131	673,841	Sandstone, sand and gravel, iron ore, fire clay, kaolin.
Covington.....	.....	18,271	Sand and gravel.
Cullman.....	220,038	248,471	Coal.
Dale.....	23,200	.....	.....
Fayette.....	32,925	(*)	Miscellaneous clays.
Greene.....	(3)	29,537	Sand and gravel.
Jackson.....	7,819	131,224	Limestone.
Jefferson.....	100,567,689	132,168,705	Coal, iron ore, cement, limestone, lime, miscellaneous clays, fire clay, sand and gravel.
Lamar.....	6,011	.....	.....
Limestone.....	.....	61,180	Sand and gravel, limestone.
Pickens.....	.....	3,599	Sand and gravel.
Pike.....	.....	51,969	Iron ore.
Sumter.....	9,223	.....	.....
Tuscaloosa.....	(3)	3,813,242	Coal, iron ore, sand and gravel.
Walker.....	16,892,115	15,703,580	Coal, fire clay.
Winston.....	22,626	13,437	Coal.
Undistributed ⁴	38,369,495	32,104,604	.....
Total Alabama.....	158,382,000	187,900,000	.....

¹ County figures exclude petroleum and natural gas.

² Other than petroleum and natural gas.

³ Figure withheld to avoid disclosure of individual company operations; included in "Undistributed."

⁴ Includes value for petroleum and natural gas and value of production for the following counties: Baldwin (miscellaneous clay), Barbour (bauxite), Blount (1952), Cherokee (iron ore, sand and gravel), Chilton (sand and gravel, fire clay, mica), Clay (sandstone, mica), Colbert (asphalt, sand and gravel), Coosa (mica), Dallas (sand and gravel, miscellaneous clay), Elmore (sand and gravel), Escambia (sand and gravel), Etowah (limestone, sand and gravel, fire clay), Fayette (1953), Franklin (iron ore, limestone, fire clay), Greene (1952), Houston (sand and gravel, miscellaneous clay), Marengo (cement, sand and gravel), Marion (sand and gravel), Madison (limestone, miscellaneous clay), Marengo (cement, sand and gravel), Marion (coal, kaolin, sand and gravel), Marshall (limestone, sand and gravel), Mobile (cement, lime, sand and gravel), Montgomery (sand and gravel, miscellaneous clay), Morgan (sand and gravel, limestone), Randolph (mica), Russell (miscellaneous clay, sand and gravel), St. Clair (cement, limestone, coal, miscellaneous clay, fire clay, iron ore), Shelby (lime, limestone, coal, iron ore, fire clay), Talladega (marble, sand and gravel, iron ore), Tuscaloosa (1952), Washington (salt), Undistributed by county (sand and gravel, limestone, mica).

BIBB

Coal sold or used by producers totaled 119,300 short tons valued at \$740,900 compared with 187,700 tons valued at \$1,301,000 in 1952.

BLOUNT

The Cheney Lime & Cement Co. produced puzzolan cement at the Graystone mill; shipments decreased 36 percent and the value of shipments 29 percent below 1952. Fireclay for firebrick and heavy clay products was mined by the Harbison-Walker Refractories Co. and by the Lehigh Coal Co.; the output was considerably more than in 1952. Coal production was 168,300 short tons valued at \$1,113,000 compared with 183,000 tons valued at \$1,197,000 in 1952. Brown iron ore was mined by the Shook & Fletcher Supply Co. at the Taits Gap mine. A single operator produced 531 short tons of rough architectural building stone valued at \$7,100 compared with 568 tons valued at \$9,000 in 1952.

TABLE 20.—Shipments of brown iron ore in Blount County, 1944-48 (average) and 1949-53

Year	Long tons	Value	Year	Long tons	Value
1944-48 (average).....	5,787	\$16,329	1952.....	36,432	\$182,775
1949-50.....			1953.....	27,695	123,240
1951.....	34,448	103,344			

BUTLER

Brown-iron-ore mining expanded during the year; operations were continued by the Greenville Mining Co., and 3 new companies were active, the Bridgewater Mining Co., the C & S Mining Co., and the Crenshaw Mining Co.; shipments were 71,700 long tons valued at \$404,000 compared with 2,700 tons valued at \$15,000 in 1952.

CALHOUN

The Donoho Foundry Co. mined fire clay for mortar; the total quantity sold or used increased 5 percent over 1952, but its total value decreased 1 percent. The C. E. Kraus Estate mined a small quantity of kaolin, which was used for whiteware. Iron-ore production declined during the year, and only one operator—M. Howell—reported shipments. John B. Lagarde, Inc., mined structural sand and gravel; the total quantity sold or used increased 51 percent, and its total value increased 98 percent over 1952. One operator produced crushed sandstone for refractory purposes; the total quantity sold or used decreased 14 percent, and its total value decreased 8 percent below 1952.

TABLE 21.—Shipments of brown iron ore in Calhoun County, 1944-48 (average) and 1949-53

Year	Long tons	Value	Year	Long tons	Value
1944-48 (average).....	56,717	\$162,402	1951.....	122,778	\$442,174
1949.....	109,719	362,568	1952.....	81,372	395,017
1950.....	79,284	264,688	1953.....	20,272	118,660

CHEROKEE

The Georgia-Alabama Ore Co. mined brown iron ore at the Hoyt Smith mine. The Wolf Creek Sand Co. produced molding sand; the total quantity sold or used increased 1 percent over 1952, but its total value decreased 1 percent.

TABLE 22.—Shipments of brown iron ore in Cherokee County, 1944-48 (average) and 1949-53

Year	Long tons	Value	Year	Long tons	Value
1944-48 (average).....	19,220	\$55,410	1951.....	31,727	\$164,077
1949.....	38,233	125,108	1952.....	22,925	119,481
1950.....	23,491	74,556	1953.....	13,531	71,863

CHILTON

Norman E. Smith mined a small quantity of fire clay, which was used for stoneware and art pottery. Ellis Inlow mined a small quantity of sheet mica. The Southeastern Sand-Gravel Co. mined structural sand and gravel; the total quantity sold or used was about the same as in 1952, but its total value decreased 14 percent.

CLAY

Graphite was mined by the Alabama Flake Graphite Co. Sheet mica sold by Dixie Mines, Inc. (Hurst mine), was considerably less than in 1952. Dixie Mines, Inc., conducted a DMEA project for sheet mica at the Hurst mine; the Smith Mica Co. conducted a DMEA project for sheet mica at the Fletcher Smith mine; the total spent on the 2 projects was \$2,400, of which the Government share was \$2,200 (90 percent). One operator crushed sandstone for refractory purposes.

COLBERT

One operator produced crushed asphaltic limestone for concrete and road metal; the total quantity and value of material sold or used increased 2 percent over 1952. The Tennessee Valley Sand & Gravel Co. operated the Sheffield and Spruce Pine pits and produced structural and paving sand and gravel; the total quantity sold or used increased 10 percent and the total value 40 percent over 1952.

COOSA

The Norris Mica Co. produced a small quantity of sheet mica at the Ivey mine.

COVINGTON

The Alabama State Highway Department mined 32,200 short tons of paving sand valued at \$18,300.

CULLMAN

Coal production was 39,900 short tons valued at \$248,500 compared with 36,300 tons valued at \$220,000 in 1952.

DALLAS

The Henry Brick Co. mined clay for heavy clay products at the same rate as in 1952. C. Pierson Cosby and the Dallas Sand & Gravel Co. produced engine and blast sands and structural, paving, and railroad-ballast gravels; the total quantity sold or used was 570,900 short tons valued at \$389,600.

ESCAMBIA

The Keego Clay Products Co. produced clay for heavy clay products; the total quantity sold or used increased 46 percent and the total value 94 percent over 1952.

ETOWAH

Clay for firebrick was mined by the Milner Sand Co. Crushed stone produced by one operator was used for riprap, flux, concrete, and road metal and in agriculture; the total quantity sold or used was 279,500 short tons valued at \$391,400 compared with 260,800 tons valued at \$356,200 in 1952. The Milner Sand Co. mined molding sand and structural sand and gravel; the total quantity sold or used decreased 19 percent and the total value 2 percent below 1952.

FAYETTE

Considerably less clay was mined by the Columbus Brick Co. for heavy clay products than in 1952.

FRANKLIN

The Tennessee Valley Sand & Gravel Co. mined clay for fire-clay mortar; the total quantity sold or used decreased 4 percent below 1952, but the total value increased 15 percent. Crushed limestone sold or used by one operator for concrete and road metal and for agriculture decreased 1 percent below 1952, but its total value increased 12 percent. Dimension limestone sold or used by one operator was considerably less than in 1952, but its total value increased 10 percent; the stone was used for rubble, rough architectural, sawed and cut dressed building stone. Brown-iron-ore mining declined during the year to the lowest level since 1949; active operators included R. S. Bowen, W. W. Duncan, the Schroeder Co. (Belgreen mine), the Shook & Fletcher Supply Co. (Blackburn and Warner mines), and the United States Pipe & Foundry Co. (Russellville No. 16 mine). The Schroeder & Co. conducted a DMEA project for iron ore at the Belgreen mine; of a total of \$76,100 spent, the Government share was \$38,100, or 50 percent.

TABLE 23.—Shipments of brown iron ore in Franklin County, 1944-48 (average) and 1949-53

Year	Long tons	Value	Year	Long tons	Value
1944-48 (average).....	256, 837	\$756, 751	1951.....	629, 704	\$2, 069, 527
1949.....	276, 555	943, 354	1952.....	681, 980	3, 867, 053
1950.....	503, 295	1, 550, 984	1953.....	406, 937	2, 112, 254

GREENE

Structural and paving sand and gravel sold or used by the Bigbee Block & Gravel Co. totaled 43,500 short tons valued at \$29,500.

HOUSTON

The Gordon Brick Co. mined clay for heavy clay products at the same rate as in 1952. The Alabama State Highway Department and the L. C. Smith Sand & Gravel Co. mined structural and paving sand.

JACKSON

The Alabama State Highway Department (Paint Rock Creek quarry) and the Jackson County Highway Department produced

106,100 short tons of crushed stone valued at \$131,200 for concrete and road metal.

JEFFERSON

Portland-cement shipments were continued by the Alpha Portland Cement Co. (Phoenixville mill), the Lehigh Portland Cement Co. (Birmingham mill), the Lone Star Cement Corp. (Birmingham mill), and the Universal Atlas Cement Co. (Leeds mill).

TABLE 24.—Portland-cement shipments in Jefferson County, 1949-53

Year	376-pound barrels	Value	Year	376-pound barrels	Value
1949.....	5,544,965	\$12,029,900	1952.....	6,289,918	\$15,007,623
1950.....	6,354,579	13,941,900	1953.....	6,090,801	15,255,438
1951.....	6,229,623	14,845,395			

The Southern Cement Co. operated the Birmingham mill throughout the year; shipments of puzzolan cement decreased 3 percent below 1952, but their total value increased 3 percent. Clay mined by the Bibby Coal, Shale & Clay Co. and the Dixie Fire Brick Co., Inc., was used for firebrick and fireclay mortar; the total quantity sold or used decreased 21 percent and the total value 6 percent below 1952. Clay for heavy clay products was mined by the Natco Corp. (successor to the National Fireproofing Corp.), the Stephenson Brick Co. (Lovick mine), and the Watkins Brick Co. (Ensley mine).

TABLE 25.—Miscellaneous clays sold or used by producers in Jefferson County, 1949-53¹

Year	Short tons	Value	Year	Short tons	Value
1949.....	142,034	\$121,321	1952.....	111,373	\$207,995
1950.....	142,238	125,276	1953.....	87,508	87,508
1951.....	149,365	140,163			

¹ Except clay for cement.

Coal production was 8,691,000 short tons valued at \$56,234,000 compared with 7,094,000 tons valued at \$45,669,000 in 1952. Red-iron-ore mining was continued by the Republic Steel Corp. (Edwards and Spaulding mines), the United States Pipe & Foundry Co. (Ruffner and Sloss Red Ore mines), the Tennessee Coal & Iron Division of the United States Steel Corp. (Muscoda and Wenonah mines), the Woodward Iron Co. (Pyne, Woodward Red Ore, and Songo mines), and the Zeigler Construction Co. (Griffin mine). Shipments were 6,714,000 long tons valued at \$51,720,000 compared with 6,180,000 tons valued at \$31,879,000 in 1952. Of the total shipments, concentrates were 1,193,000 tons valued at \$8,617,000; direct shipping ore was 4,428,000 tons valued at \$32,354,000; and sinter was 1,092,000 tons valued at \$10,749,000. The Tennessee Coal & Iron Division of the United States Steel Corp. operated the Dolonah limekiln; the total quantity sold or used increased 13 percent over 1952, and the total value increased 12 percent. Four operators continued to produce crushed limestone for use as fluxing stone, concrete and road metal, and rock dust for coal mines and in agriculture; the

total quantity sold or used increased 13 percent and the total value 33 percent over 1952. Molding sand was mined by Sam P. Acton and E. E. Vann; the total quantity sold or used was considerably less than in 1952.

LAUDERDALE

One operator crushed a small quantity of limestone for use in agriculture.

LIMESTONE

The Limestone County Board of Revenue crushed 17,200 short tons of limestone valued at \$24,100 for use as riprap, concrete, and road metal and in agriculture. The Limestone County Board of Revenue sold or used 71,600 short tons of paving gravel valued at \$37,100.

MACON

Structural sand and gravel sold or used by the Macon County Sand & Gravel Co. decreased 20 percent below 1952, but their total value remained the same.

MADISON

Miscellaneous clays sold or used by the Alabama Brick & Tile Co. (Farley mine) and the Huntsville Brick & Tile Co., Inc., for heavy clay products decreased 15 percent below 1952, and their total value decreased 5 percent. One operator crushed limestone for concrete and road metal and for use in agriculture; the total quantity sold or used was 195,000 short tons valued at \$252,900 compared with 170,000 tons valued at \$243,300 in 1952.

MARENGO

The Lone Star Cement Corp. operated the Spocari mill throughout the year; shipments of portland cement decreased 15 percent and its total value 10 percent below 1952. The Alabama State Highway Department mined 32,200 short tons of paving sand valued at \$18,300.

MARION

The Thomas Alabama Kaolin Co. mined kaolin for use in firebrick and block, fertilizer, and insecticides; the total quantity sold or used increased 22 percent over 1952, and its total value was considerably higher. Coal production was 253,500 short tons valued at \$2,192,700 compared with 303,700 tons valued at \$2,597,000 in 1952. Structural and paving sand and gravel sold or used by Guin Concrete Products decreased 31 percent and the total value 37 percent below 1952.

MARSHALL

The Alabama State Highway Department operated the Guntersville Y quarry and crushed 100,000 short tons of limestone valued at \$148,000 for concrete and road metal. The Guntersville Concrete Products Co. mined structural sand and gravel.

MOBILE

The Ideal Cement Co. operated the Mobile mill throughout the year; shipments of portland cement increased 7 percent and its total

value 8 percent over 1952. Lime sold or used by the Ideal Cement Co. (Mobile limekiln) increased 5 percent and its total value 14 percent over 1952. The Southern States Sand & Gravel Co. mined structural sand.

MONTGOMERY

The total quantity and value of miscellaneous clays sold or used for heavy clay products by the Excelsior Brick Co. and the Jenkins Brick Co. decreased 1 percent below 1952. The City of Montgomery, the City Sand & Gravel Co., Inc., Mrs. Essie D. Gilder, the Montgomery County Highway Department, the Montgomery Gravel Co., the Montgomery-Roquemore Gravel Co., and the Vandigriff Construction Co. produced structural, paving, blast and engine sand and structural, paving, and railroad-ballast gravel; the total quantity sold or used increased 11 percent and the total value 12 percent over 1952.

MORGAN

One operator crushed limestone for concrete and road metal, agriculture, and fertilizer filler. Structural and paving sand and gravel sold or used by the Decatur Sand & Gravel Co. decreased 25 percent and their total value 22 percent below 1952.

PICKENS

The production of structural and paving sand and gravel was resumed by the Aliceville Sand & Gravel Co.; the total quantity sold or used was 4,100 short tons valued at \$3,600.

PIKE

The mining of brown iron ore was resumed; active operators were Arrington Mining Co., Spurlock & Son, and Frank Spurlock; shipments totaled 10,700 long tons valued at \$52,000.

RANDOLPH

Bourne Associates operated the Anortt, Friendship No. 2, and Liberty mines; the total quantity of sheet mica sold or used was considerably less than in 1952. Bourne Associates conducted a DMEA project for sheet mica at the Liberty mine; of a total of \$14,300 spent, the Government share was \$12,800 (90 percent).

RUSSELL

Miscellaneous clays for heavy clay products sold or used by the Bickerstaff Co., Inc. (Ceramic mine), and the Bickerstaff Brick Co. (Brickyard mine) and their total value decreased 8 percent below 1952. The Consolidated Gravel Co., Inc., and the Kendrick Sand & Gravel Co. sold or used 171,500 short tons of paving sand and gravel valued at \$186,300.

ST. CLAIR

The National Portland Cement Co. operated the Ragland mill throughout the year; shipments of portland cement were about the same as in 1952, but the total value increased 8 percent. Fire clay

sold or used for refractories by the Riverside Clay Co. increased 35 percent and total value 48 percent over 1952. Miscellaneous clays sold or used for heavy clay products by the Ragland Brick Co. decreased 13 percent below 1952, but the total value was considerably above. Coal production was 8,900 short tons valued at \$52,100 compared with 21,700 tons valued at \$128,500 in 1952. J. B. Laymon shipped a small quantity of brown iron ore. One operator crushed 19,200 short tons of limestone valued at \$59,500 for asphalt filler compared with 25,700 tons valued at \$79,600 in 1952.

SHELBY

The Montevallo Clay Co. sold or used 12,500 short tons of fire clay valued at \$16,000 for refractories. Coal production was 87,900 short tons valued at \$608,900 compared with 109,400 tons valued at \$713,500 in 1952. Shipments of brown iron ore by the Shelby Sand & Ore Co. were considerably lower than in 1952. Operations were continued by the Alabaster Lime Co. (Scotrock limekiln), the Cheney Lime & Cement Co. (Landmark limekiln), the Dixie Lime & Manufacturing Co. (Pelham limekiln), the Keystone Lime Works (Keystone limekiln), the Longview Lime Corp. (Saginaw limekiln), and the Southern Cement Co. (Roberta limekiln); production reached an alltime annual peak in 1953. Crushed limestone sold or used by three operators was used for riprap, furnace flux, concrete and road metal, railroad ballast, agriculture, asphalt filler, rock dust for coal mines, and acid neutralizing.

TABLE 26.—Lime sold or used by producers in Shelby County, 1949–53

Year	Short tons	Value	Year	Short tons	Value
1949	159,992	\$1,588,831	1952	274,842	\$2,914,493
1950	193,936	1,741,184	1953	303,303	3,281,875
1951	249,429	2,583,869			

TALLADEGA

The G. B. Mining Co. shipped a small quantity of brown iron ore. The total quantity of crushed marble sold or used by 3 operators for terrazzo and whiting increased 70 percent above 1952, and the total value was considerably greater. The total quantity of dimension marble sold or used by two operators for rough interior and sawed and cut dressed interior building stone and for sawed monumental use increased 17 percent over 1952, and the total value increased 3 percent. The Alabama State Highway Department mined 32,200 short tons of paving sand valued at \$18,300.

TUSCALOOSA

Coal production was 581,300 short tons valued at \$2,761,000 compared with 540,900 tons valued at \$2,558,000 in 1952. Brown-iron-ore mining was continued by the Shook & Fletcher Supply Co. (Adkins mine). Structural sand and gravel sold or used by the Finnell Sand & Gravel Co. totaled 40,300 short tons valued at \$47,200.

TABLE 27.—Brown-iron-ore shipments in Tuscaloosa County, 1944-48 (average) and 1949-53

Year	Long tons	Value	Year	Long tons	Value
1944-48 (average).....	62, 403	\$168, 661	1951.....	190, 511	\$571, 533
1949.....	222, 326	1, 019, 740	1952.....	199, 942	1, 291, 625
1950.....	231, 705	695, 115	1953.....	175, 982	1, 004, 857

WALKER

Fire clay for heavy clay products and fire-clay mortar was sold or used by the Harris Coal & Clay Co. (Cordova mine), the Natco Corp. (successor to National Fireproofing Corp.), the Russell Coal & Clay Co., and the Taft Coal & Clay Co. Coal production was 2,579,000 short tons valued at \$15,373,000 compared with 2,901,000 tons valued at \$16,390,000 in 1952.

TABLE 28.—Fire clay sold or used by producers in Walker County, 1949-53

Year	Short tons	Value	Year	Short tons	Value
1949.....	58, 496	\$112, 315	1952.....	105, 407	\$500, 194
1950.....	91, 264	153, 227	1953.....	126, 492	330, 779
1951.....	101, 660	523, 192			

WASHINGTON

Salt sold or used by the Mathieson Chemical Corp. was more than three times the initial production in 1952.

WINSTON

Coal production was 2,200 short tons valued at \$13,400 compared with 3,800 tons valued at \$22,600 in 1952.

The Mineral Industry of Alaska

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Department of Mines, Territory of Alaska.

By William H. Kerns¹ and Phil R. Holdsworth²



DESPITE a record production of coal and an increased production of gold in Alaska in 1953, the total value of the mineral production declined 8 percent below the 1952 output. An appreciable drop in the production of sand and gravel and of platinum-group metals was primarily responsible for the decline in 1953.

Output of three commodities—gold, coal, and sand and gravel—composed 92 percent of the total value of the mineral production in Alaska in 1953. Gold was again in first place in 1953 among the Territory's mineral commodities, in terms of value of output, after ranking second to sand and gravel in 1952. Coal ran gold a close second in value of output in 1953; sand and gravel fell to third place. Silver output in 1953 increased slightly in direct proportion to the increased gold production because most of it was recovered as a by-product of gold from placer mining. A small quantity of lead was produced from ore shipped to a smelter in the United States, but no copper or zinc was produced in Alaska in 1953. Output of tin was lower in 1953, but interest and activity in tin mining and exploration were increased. A small quantity of tungsten concentrate was marketed from Alaska in 1953; the tungsten was recovered as a by-product of gold from a placer operation and from lode-prospecting work during 1951-53.

TABLE 1.—Mineral production in Alaska, 1952-53¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Antimony ore and concentrate..... gross weight.....	420	(²)		
Coal.....	686, 218	\$5, 779, 423	861, 471	\$8, 451, 542
Gold (recoverable content of ores, etc.)..... troy ounces.....	240, 557	8, 419, 495	253, 783	8, 882, 405
Lead (recoverable content of ores, etc.).....	1	386	9	2, 240
Mercury..... 76-pound flasks.....	28	5, 575	40	7, 721
Sand and gravel.....	10, 781, 926	8, 650, 582	7, 689, 278	5, 079, 681
Silver (recoverable content of ores, etc.)..... troy ounces.....	32, 986	29, 854	35, 387	32, 027
Stone.....	(²)	(²)	47, 086	169, 711
Tin (content of ore and concentrate)..... long tons.....	8	220, 956	49	105, 917
Tungsten concentrate..... 60-percent WO ₃ basis.....	82	(²)	3	(²)
Undistributed: Gem stones, platinum-group metals, and minerals whose value must be concealed for par- ticular years (indicated in appropriate column by footnote reference 2).....		3, 195, 336		1, 520, 782
Total Alaska.....		26, 302, 000		24, 252, 000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

² Value included with "Undistributed."

¹ Supervisory commodity-industry analyst, Alaska District, Region I, Bureau of Mines, Juneau, Alaska

² Commissioner of Mines, Department of Mines, Territory of Alaska, Juneau, Alaska.

TABLE 2.—Prices of selected mineral commodities in Alaska, 1952-53

Commodity	1952	1953
Antimony (domestic) ¹.....pound..	\$0.440	\$0.359
Coal, bituminous ².....short ton..	8.42	9.81
Copper ².....pound..	.242	.287
Gold ⁴.....troy ounce..	35.00	35.00
Lead ³.....pound..	.161	.131
Mercury ⁵.....76-pound flasks..	199.10	193.03
Sand and gravel ².....short ton..	.802	.661
Silver ⁶.....troy ounce..	.905+	.905+
Stone ².....short ton..	3.374	3.604
Tin (Straits quality) ¹.....pound..	1.204	.953
Tungsten concentrate.....short-ton unit WOs..	65.00	63.00
Zinc ³.....pound..	.166	.115

¹ Annual average American Metal Market quoted price.

² Average unit price f. o. b. mine or quarry, Alaska.

³ Annual average weighted price of all grades of primary metal sold by producers.

⁴ Price under authority of Gold Reserve Act of January 31, 1934.

⁵ Annual average Engineering and Mining Journal Metal and Mineral Market quoted price.

⁶ Treasury buying price for newly mined silver.

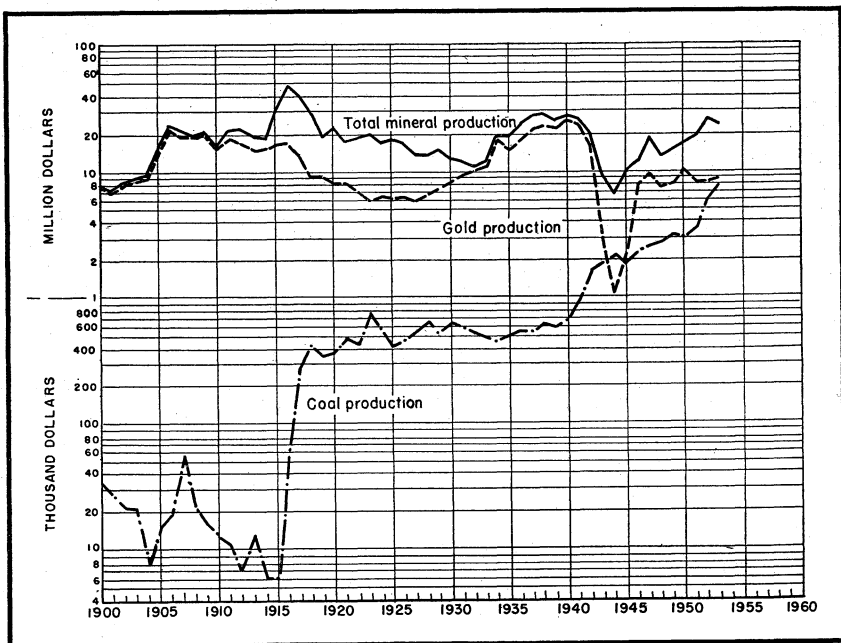


FIGURE 1.—Value of total mineral production, gold, and coal in Alaska, 1900-53.

From 1911-31 copper production accounted for most of the value of minerals other than gold and coal.

Adverse economic conditions continued to plague the mineral industry of Alaska in 1953. Labor costs continued to rise; the mining operations found that they could not compete with the high wage rates paid on construction projects under United States Government contracts on military installations. To reduce labor costs, many operations expanded mechanization to increase the amount of work done by each man or formed partnership operations where each

partner worked on the job. The cost of materials and supplies and transportation rates were higher in 1953 than in 1952. Gold mining was further hampered by an unchanged price of gold coupled with rising costs. Many gold operations were curtailed and some closed down.

Another factor adverse to development of the Alaska mineral industry was lack of risk and development capital for mining from private sources. Government assistance to the mineral industry through the Defense Minerals Exploration Administration (DMEA), Defense Minerals Procurement Agency (DMPA), and Reconstruction Finance Corporation (RFC) stimulated the exploration and development of strategic and critical materials in Alaska in 1953. During 1953 DMEA authorized new contracts to a total value of \$283,649 (in addition to the \$929,091 in 1952) for the purpose of exploring for mercury, platinum, and tin at 5 locations in Alaska. Table 3 lists a summary of DMEA activities in Alaska, 1952-53. The United States Tin Corp. continued to operate on funds from a DMPA advance against production and a loan from a commercial bank that was guaranteed by the General Services Administration (GSA). The Kenai Chrome Co. continued to develop ore and to prepare its camp and loading facilities on a GSA advance against production. Government loan assistance was available through the RFC to qualified applicants for mineral-industry projects in Alaska when financing could not be obtained from private sources. The Buffalo Coal Mining Co., Inc., rehabilitation program at its coal mine in the Matanuska field north of Anchorage and the Callahan Zinc-Lead Co. gold-placer-dredging operation north of Fairbanks were financed by RFC loans.

Consumption and Markets.—The production of coal, sand and gravel, and stone in Alaska in 1953 supplied the demand; none was imported or exported. Consumption of coal increased owing to construction of coal-utilizing power and heating plants at military installations and expanded civilian population, which required more heat and power. All sand and gravel and stone produced in Alaska in 1953 were used locally for concrete aggregate, road metal, railroad ballast, fill, and riprap.

No metal-processing plants were operated in Alaska; all direct-smelting ore and concentrate produced in Alaska were shipped to smelters or to buyers in the United States. All producers of gold and silver from placer mines sold their products in the form of nuggets, dust, bars, and amalgam to banks and gold buyers in Alaska or shipped directly to mints in the United States. A small quantity of unrefined gold in nugget or dust form was used to manufacture nugget jewelry that was sold in Alaska. A small quantity of jade produced in Alaska was cut, polished, set in jewelry, and sold locally.

Transportation.—Inadequate transportation facilities, with resultant high transportation costs to, from, and within the Territory, were among the greatest single deterrents in the development, exploration, and exploitation of the mineral resources of Alaska. Ocean and rail transportation rates have been among the highest in the world. Although the road system has been enlarged and improved each year, vast areas known to contain mineral deposits are not served. Air

TABLE 3.—Defense Minerals Exploration Administration activities in Alaska, 1952-53

Property	Operator	Location	Mineral	Total contract ¹		Status of fieldwork and contract at close of 1953
				1952	1953	
Cape Creek.....	Zenda Gold Mining Co.....	Cape Creek, Port Clarence district, Seward Peninsula region.	Tin (placer).....	\$120,000	\$39,300	Fieldwork completed; large reserves indicated. Fieldwork incomplete.
Lost River mine.....	United States Tin Corp.....	Cassiterite Creek, Port Clarence district, Seward Peninsula region.	Tin (lode).....	226,000	-----	Work recessed for winter.
Stepovich and Colbert.....	Alaska Metals Mining Co.....	Gilmore Dome, Fairbanks district, Yukon River region.	Tungsten (lode).....	179,234	-----	Crosscutting to projected position of ore shoot in progress. Fieldwork completed; ore shoot discovered.
Mertie lode.....	Admiralty-Alaska Gold Mining Co.	Funter Bay, Admiralty district, Southeastern Alaska region.	Nickel-copper-cobalt (lode).....	120,000	-----	Fieldwork completed; contract terminated.
Red Top mine.....	Wren, Waskey & Wolfe (partnership).	Marsh Mountain, Bristol Bay district, Bristol Bay region.	Mercury (lode).....	25,614	-----	Fieldwork completed; large zone of low-grade ore indicated.
Tozimoran Creek.....	I. W. Purkeypile and Sara Purkeypile.	Tozimoran Creek, Melozitna district, Yukon River region.	Tin (placer).....	18,000	-----	Fieldwork stopped after completing first stage; contract terminated.
Tillicum mine.....	Tillicum Mining Co.....	Caamano Point, Ketchikan district, Southeastern Alaska region.	Antimony (lode).....	24,695	-----	Do.
Fidalgo-Alaska mine.....	Alaska Copper Corp.....	Fidalgo Bay, Prince William Sound district, Copper River region.	Copper (lode).....	112,548	-----	Diamond drilling and drifting in progress; made substantial additions to ore reserves.
Rocky Mountain Creek.....	do.....	Rocky Mountain Creek, Nome district, Seward Peninsula region.	Tungsten (lode).....	41,000	-----	Shaft sinking and drifting in progress.
Stampede mine.....	Earl R. Pilgrim & Co.....	Stampede Creek, Kanishna district, Yukon River region.	Antimony (lode).....	62,000	-----	Work recessed for winter.
Red Devil mine.....	DeCoursey Mountain Mining Co.	On Kuskokwim River 8 miles west of Slettrute, Aniak district, Kuskokwim River region.	Mercury (lode).....	-----	88,349	Do.
DeCoursey mine.....	do.....	On DeCoursey Mountain 20 miles Northwest of Crooked Creek, Aniak district, Kuskokwim River region.	do.....	-----	81,000	Do.
Ear Mountain.....	Alaska Tin Corp.....	Ear Mountain, Port Clarence district, Seward Peninsula region.	Tin (placer).....	-----	18,000	Do.
Red Mountain.....	A. L. Howard.....	Red Mountain Goodnews Bay district, Kuskokwim River region.	Platinum (placer).....	-----	12,000	Do.
Total.....				929,091	233,649	

¹ Government participation is 90 percent of the total contract for tin, nickel, and platinum; 75 percent for tungsten, mercury, and antimony; and 50 percent for copper.

transportation for conveying passengers and freight to areas not served by ocean, rail, or highways has been improved each year.

The Alaska shipping trade has been unattractive to ship operators because it is seasonal; most oceanborne cargo to the Territory moves during the summer. Labor disputes, usually during the peak of the summer shipping season, have caused frequent ship tieups, making ocean shipping unreliable to mining operations and costly to ship operators. Only 1 major American steamship company and 2 American barge freight companies provide service to the Territory. The Jones Act prohibited foreign companies calling at ports in Alaska from hauling freight from one American port to another; they may haul only from an American to a foreign port, or vice versa.

The Alaska Railroad, Government owned and operated and the only railroad in the Territory, served the interior of Alaska on 530 miles of track from tidewater at Seward and Whittier to Fairbanks. Most of the freight was incoming, going north to Anchorage or Fairbanks. If mineral products could be provided to the railroad for a backhaul going south, the overall railroad rates could be reduced materially.

Many Alaskan mining operations that were not served by the road system received all supplies and equipment by air freight. Air-freight rates have been reduced by competition and by enlargement of existing airfields to accommodate larger aircraft; regardless of this, transportation costs were by no means cheap.

Construction progressed from the Paxson and Cantwell ends of the proposed Denali Highway between Paxson and Cantwell and between Cantwell and McKinley Park. When completed, it will extend the highway system in Alaska by linking the Richardson Highway with the existing roads in the Mount McKinley National Park. The highway will open a remote mineralized area where very little prospecting has been done. In 1953 a copper prospect was located at the head of MacLaren River 9 miles north of the proposed route of the highway.

Power.—Power used at mining operations in Alaska was generated by diesel oil, coal, or water. The New York Alaska Gold Dredging Corp. at Nyac in the Aniak district used hydroelectric power, supplemented by diesel-electric power, to operate two gold dredges. The Fairbanks unit of the United States Smelting, Refining & Mining Co. used coal to generate electric power at its powerplant at Fairbanks for 6 gold dredges in the Fairbanks district; the Nome unit used diesel oil to generate electric power at its powerplant at Nome for 3 gold dredges in the Nome district.

Power generated by the use of diesel oil, either as diesel-electric power or as machinery powered by engines that use diesel oil, has been the most widely used in Alaska because of its adaptability to mining operations in remote areas not served by water, rail, or road transportation. Diesel oil was either flown to the property from the nearest water freight terminal or freighted to the property by "cat train" over the snow and ice during the winter. The high cost of transporting the fuel to the operation caused high fuel costs. Diesel power was therefore expensive but in most instances was the only source of power available to small operations in remote areas.

Many hydroelectric plants have been developed for mining operations (usually lode mines) in Alaska. Some of these plants at inactive mines were used to supply power to adjacent communities. As an

example, the Alaska Juneau Gold Mining Co. furnished most of the power used in the communities of Juneau and Douglas and vicinity from its hydroelectric powerplants, formerly used for mining and milling operations at Juneau.

During 1952 the Aluminum Company of America investigated the possibility of utilizing the power potential of transmountain diversion of water from the chain of lakes that constitutes the source of the Yukon River in Canada to the Taiya River Valley 10 miles north of Skagway, Alaska. The cheap power thus generated was to be used to produce aluminum in a proposed plant at Dyea, near Skagway. At the close of 1952 the project had been suspended in favor of using the same water for an exclusively Canadian development on Canadian soil in the Taku River Valley near Juneau, Alaska, by Frobisher, Ltd. Surveys were conducted throughout 1953, but the results were not announced by the year end.

Labor.—The active mining season at many operations in Alaska was limited to 5 months or less because of climatic conditions; at some placer operations 110 days constituted the average actual mining season in 1953. Because of the short season, most of the skilled labor was imported from the United States for the season; round-trip costs of transportation in most instances were borne by the company or individual employer. The short season necessitated having the men work as many or more overtime hours at premium pay as at regular pay. At most placer-mining operations the men work 12 hours a day and 7 days a week throughout the short season. The cost-of-living differential in Alaska ranged from 25 to 75 percent above that in the United States; most wage rates reflect the differential.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal.—Coal mining has become an important component of the mineral industries of Alaska; the value of the coal produced composed 35 percent of the total value of all minerals produced in Alaska in 1953. The production in 1953 of 861,500 tons surpassed the previous record production of 686,200 tons in 1952 by 26 percent. In terms of value of output by commodity, coal ranked second to gold in Alaska in 1953.

All coal produced in Alaska in 1953 came from three fields: Matanuska, Cook Inlet-Susitna region; Nenana, Yukon River region; and Point Barrow, Northern Alaska region. Coal produced from the Matanuska field was marketed in Anchorage; coal produced from the Nenana field was marketed in Fairbanks; and coal produced under the auspices of the Alaska Native Service from the Point Barrow field was used locally where it was produced. Over two-thirds of the coal produced in Alaska in 1953 was purchased by the United States Army and Air Force for producing heat and power at Ladd and Eielson Air Force Bases in the Fairbanks area and at Fort Richardson and the Elmendorf Air Base in the Anchorage area. Most of the remaining one-third of the total production of coal was used by public utility companies in producing power for domestic use.

Three leading coal-mining operations, Evan Jones Coal Co. (underground and strip mines) in the Matanuska field and the Usibelli Coal Mine, Inc. (strip mine), and Healy River Coal Corp. (underground mine—holdings acquired by Suntrana Mining Co. in July 1953) in the Nenana field supplied 90 percent of the total coal production in Alaska in 1953. These and other smaller coal operations are described in detail in the Review by Regions section of this report.

Table 4 shows the production of coal in Alaska, 1880-1953.

TABLE 4.—Production of coal, 1880-1953

Year	Short tons	Value	Year	Short tons	Value
1880-1940.....	2,612,629	\$12,904,400	1948.....	407,906	\$2,789,275
1941.....	238,960	944,588	1949.....	433,533	3,309,303
1942.....	260,893	1,623,284	1950.....	412,455	3,033,445
1943.....	289,232	1,842,708	1951.....	494,333	3,766,987
1944.....	348,375	2,239,684	1952.....	686,218	5,779,423
1945.....	297,644	1,868,592	1953.....	861,471	8,451,542
1946.....	366,809	2,354,952			
1947.....	361,220	2,554,797	Total.....	8,071,678	53,462,960

¹ From published records of the Federal Geological Survey.

Petroleum and Natural Gas.—No production of crude petroleum or natural gas was recorded in Alaska in 1953. The exploration program begun in 1944 by the Navy on Navy Petroleum Reserve No. 4, situated between the Arctic Ocean and Brooks Range in the Northern Alaska region, was inactive throughout 1953. Substantial reserves of oil have been reported in this field, but no attempt has been made to produce any oil. Some gas was tapped and used to heat one of the camps in the area in 1952.

Increased interest in oil in Alaska was evident during the year. Two major oil companies continued examination and geological reconnaissance work begun in 1952. The number of oil-land leases applied for and granted during 1953 was increased. Kerr-McGee Oil Industries planned exploration drilling in the Katalla-Yakataga field, and the Alaska Oil & Gas Development Co. explored for oil near Eureka in the Nelchina district.

METALS

Antimony.—Due to lack of a market, the only activity in antimony in Alaska in 1953 was continuance of exploration work begun in 1952 at two antimony mines with DMEA assistance. Earl R. Pilgrim & Co. conducted a program of diamond drilling and surface trenching at the Stampede mine in the Kantishna district, Yukon River region. The Tillicum Mining Co. completed an exploration program consisting of trenching, shaft sinking, drifting, and long-hole percussion drilling on its antimony prospect on Caamano Point in the Ketchikan district, Southeastern Alaska region. A large, low-grade, antimony-ore zone was indicated by the work.

Table 5 shows all figures available for publication on the production of antimony in Alaska.

TABLE 5.—Production of antimony, 1943-53

Year	Ore and concentrate (shipments)			Year	Ore and concentrate (shipments)		
	Gross weight (short tons)	Content (short tons)	Value		Gross weight (short tons)	Content (short tons)	Value
1943 ¹	405	184	\$33,324	1949.....	74	44	\$31,356
1944.....	73	35	6,465	1950.....	-----	-----	-----
1945-46.....	-----	-----	-----	1951.....	301	147	(?)
1947.....	40	26	16,056	1952.....	420	210	(?)
1948.....	68	44	29,336	1953.....	-----	-----	-----

¹ Figures before 1943 not available for publication.

² Figure withheld to avoid disclosing individual company operations.

Chromium.—During 1953 the Kenai Chrome Co. constructed a camp, road, and ore bin and conducted development work on the Star Four mine on Red Mountain near Seldovia in the Homer district, Kenai Peninsula region. At the close of the year construction of a dock to facilitate the loading of the ore for shipment was begun. The GSA had contracted to buy 13,000 long tons of chrome ore from the company, but no ore was shipped during 1953.

Copper.—No copper was produced in Alaska in 1953, but the increased activity in copper was significant. Granduc Mines, Ltd., a partnership between the Newmont Mining Corp. and Granby Consolidated Mining, Smelting & Power Co., Ltd., announced that its exploration program, conducted during 1953 at the head of the Leduc River in Northwestern British Columbia 4 miles from the Alaska-British Columbia boundary line, had indicated 1 ore body of at least 900 feet length averaging 2 percent copper over an average width of 27 feet. Limits, both in length and depth, were not determined. A second ore zone was located on the surface roughly parallel to and about 500 feet east of the first. Other than prospecting, no work was reported on the claims located on the Alaskan side of the boundary line.

During 1953 the Bear Creek Mining Co., a subsidiary of the Kennecott Copper Corp., conducted an exploration program on the Orange Hill copper deposit near Nabesna in the Chisana district, Copper River region.

In 1953 E. O. Albertson and F. S. Pettyjohn, Jr., a prospecting partnership, located a copper prospect (Kathleen-Margaret) at the head of the MacLaren River, 9 miles north of the proposed route of the Denali Highway between Paxson and Cantwell in the Valdez Creek district, Cook Inlet-Susitna region. A report³ of the findings from a preliminary investigation of the prospect was published. The discovery was in a remote area in which little prospecting has been done. The discovery plus the new road stimulated further prospecting, which might open a new mining area.

A report⁴ describing Bureau of Mines investigations of the Copper Bullion claims, Rua Cove, Knight Island, in the Prince William Sound, Alaska, was published.

³ Chapman, Robert M., and Saunders, Robert H., The Kathleen-Margaret (K-M) Copper Prospect on the Upper MacLaren River, Alaska: Geol. Survey Circ. 332, 1953, 5 pp.

⁴ Rutledge, F. A., Investigation of the Copper Bullion Claims, Rua Cove, Knight Island, Alaska: Bureau of Mines Rept. of Investigations 4986, 1953, 6 pp.

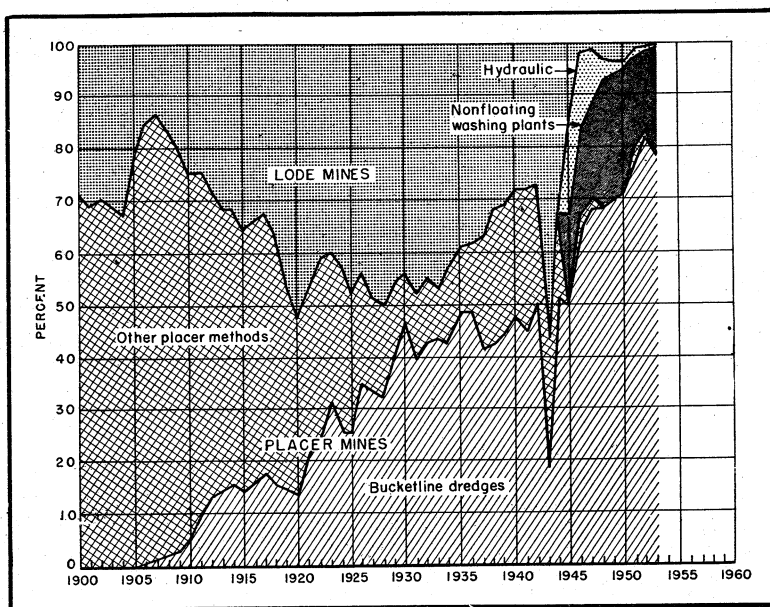


FIGURE 2.—Percentage of total Alaska gold produced at lode and placer mines and by various methods of placer mining, 1900-53; "other placer methods" includes hydraulic and nonfloating washing plants for which separate data are not available before 1943.

Gold.—Gold was in first place in 1953 in terms of value of output among the Territory's mineral commodities after being second to sand and gravel in 1952. The gold output represented 37 percent of the total value of the mineral production in Alaska in 1953. Gold production in 1953 (253,800 fine ounces valued at \$8,882,000) increased 6 percent above the output in 1952 (240,600 fine ounces valued at \$8,419,000).

The increased production in 1953 was unexpected, considering the adverse economic conditions that continued to plague gold miners. They faced an unchanged established price for their product (U. S. Treasury price of \$35 per fine ounce of gold) while the wage rates, cost of materials and supplies, and transportation rates continued to increase. In an effort to balance the higher operating costs, many placer-gold miners were forced to work only the best part of their ground, leaving marginal ground that may never be workable since the adjoining higher grade ground has been exhausted. Labor costs were reduced by increased mechanization and by forming working-partnership operations, or family operations where each member of the partnership or family worked.

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc, 1944-48 (average), 1949-53, and total 1880-1953, in terms of recoverable metals ¹

Year	Mines producing		Material sold or treated ² (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1944-48 (average)---	17	226	83, 758	174, 515	\$6, 108, 039	39, 726	\$34, 237
1949-----	18	223	78, 839	229, 416	8, 029, 560	36, 056	32, 633
1950-----	11	216	58, 668	289, 272	10, 124, 520	52, 638	47, 640
1951-----	6	140	13, 870	239, 637	8, 387, 295	32, 870	29, 749
1952-----	6	119	11, 459	240, 557	8, 419, 495	32, 986	29, 854
1953-----	3	148	3 475	253, 783	8, 882, 405	35, 387	32, 027
1880-1953 ⁴ -----			(⁵)	27, 937, 150	689, 832, 306	20, 092, 829	14, 370, 767

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1944-48 (average)---	7	\$2, 904	153	\$45, 563	9	\$2, 380	\$6, 193, 123
1949-----	4	1, 576	51	16, 116	2	496	8, 080, 381
1950-----	6	2, 496	149	40, 230	6	1, 704	10, 216, 590
1951-----	1	387	21	7, 266	1	218	8, 424, 915
1952-----			1	386			8, 449, 735
1953-----			9	2, 240			8, 916, 672
1880-1953 ⁴ -----	685, 905	226, 896, 761	25, 751	3, 028, 700	56	14, 320	934, 132, 854

¹ Includes recoverable metal content of gravel washed (placer operations); ore milled; old tailings or slimes re-treated; and ore shipped to smelters during calendar year indicated.

² Does not include gravel washed.

³ Excludes ore reported in prior years from which 223 ounces of gold, 124 ounces of silver, and 1 ton of lead were produced from mill cleanup and concentrates from inactive properties.

⁴ Figures for 1880-1952 revised to conform with Bureau of Mines published production records.

⁵ Figures not available.

Of the 253,800 fine ounces of gold recovered in Alaska in 1953, 253,100 fine ounces came from placer mines and 700 fine ounces came from lode mines. The 5 leading gold-producing mines in 1953 (all placer operations using bucketline dredges) yielded 72 percent (76 percent in 1952) of the Alaskan total output. The 15 leading producers (all placer) supplied 84 percent of the total recorded gold output of the Territory in 1953 compared with 87 percent in 1952. (See table 7.) Bucketline dredges (23 in 1951, 1952, and 1953) operated by 14 companies recovered 78 percent of the total placer-gold output in 1953 (83 percent in 1952). Placer operations using non-floating washing plants, where the gravel is delivered to sluice boxes on bedrock or to elevated sluice boxes with bulldozer or dragline excavation equipment, produced 21 percent (16 percent in 1952) of the total placer-gold output in 1953. Hydraulic and small-scale hand operations accounted for the remaining 1 percent of the gold. (See fig. 2 and table 8.) The mine production of gold by months and by regions and the number of placer and lode mines producing gold in 1953 are listed in tables 9 and 10.

TABLE 7.—Fifteen leading gold-producing mines in 1953, in order of output ¹

Rank	Mine	District	Region	Rank in 1952	Operator	Source of gold
1	Fairbanks Unit.....	Fairbanks.....	Yukon River.....	1	United States Smelting Refining & Mining Co.....	Dredge.
2	Nome Unit.....	Nome.....	Seward Peninsula.....	2	do.....	Do.
3	New York Alaska dredges 1 and 2.....	Aniak.....	Kuskokwim River.....	3	New York Alaska Gold Dredging Corp.....	Do.
4	Livengood Placers.....	Tolovana.....	Yukon River.....	4	Callahan Zinc-Lead Co.....	Do.
5	Woodchopper Creek.....	Circle.....	do.....	5	Alluvial Gold Inc.....	Do.
6	Immachuck River.....	Fairhaven.....	Seward Peninsula.....	6	Casa de Paga Gold Co.....	Do.
7	Collinsville.....	Yentna.....	Cook Inlet-Susitna.....	7	Collinsville Mine.....	Nonfloat.
8	Candle Creek.....	Fairhaven.....	Seward Peninsula.....	70	Havenstrite Oil Co. (Mining Division).....	Do.
9	Indian River.....	Hughes.....	Yukon River.....	10	Strandberg & Sons.....	Do.
10	Discovery on Otter Creek.....	Iditarod.....	do.....	11	Miscovich Bros.....	Do.
11	Colorado Creek.....	Innoko.....	do.....	(²)	Strandberg & Sons.....	Do.
12	Solomon River dredges 1 and 2.....	Nome.....	Seward Peninsula.....	18	Lee Bros. Dredging Co.....	Dredge.
13	Mohawk Asso. on Otter Creek.....	Iditarod.....	Yukon River.....	8	North American Dredging Co.....	Do.
14	Fairbanks Creek.....	Fairbanks.....	do.....	33	Alder Creek Mining Co.....	Nonfloat.
15	Yankee Creek.....	Innoko.....	do.....	12	Rosander & Reed.....	Do.

¹ Based on known output, including "natural" gold sales where fine gold was calculable.

² Did not produce in 1952.

TABLE 8.—Gold produced at placer mines, 1949–53, by classes of mines and by methods of recovery

Class and method	Mines producing ¹	Washing plants	Material treated (cubic yards)	Gold recovered		
				Fine ounces	Value	Average value per cubic yard
Surface placers:						
Gravel mechanically handled:						
Bucketline dredges:						
1949.....	21	29	14,663,000	157,306	\$5,505,710	\$0.375
1950.....	20	28	12,557,000	205,641	7,197,435	.573
1951.....	15	23	14,560,000	187,216	6,552,560	.450
1952.....	14	23	13,470,000	198,524	6,948,340	.516
1953.....	14	23	14,080,000	197,701	6,919,535	.491
Nonfloating washing plants: ²						
1949.....	117	117	3,392,000	57,979	2,029,265	.598
1950.....	116	116	4,908,500	68,199	2,386,965	.486
1951.....	84	84	2,667,000	47,244	1,653,540	.620
1952.....	78	78	2,137,000	39,661	1,388,135	.650
1953.....	87	87	3,591,000	53,991	1,889,685	.526
Gravel hydraulically handled:						
1949.....	33	-----	252,500	5,087	178,045	.705
1950.....	24	-----	135,300	2,097	73,395	.542
1951.....	17	-----	166,500	2,798	97,930	.588
1952.....	9	-----	39,000	660	23,100	.592
1953.....	14	-----	36,000	820	28,700	.797
Small-scale hand methods (wet):						
1949.....	50	-----	55,330	693	24,255	.438
1950.....	50	-----	18,000	905	31,675	1.760
1951.....	20	-----	17,000	1,026	35,910	2.112
1952.....	17	-----	16,400	422	14,770	.901
1953.....	33	-----	17,000	604	21,140	1.244
Underground placers (drift):						
1949.....	2	-----	170	24	840	4.941
1950.....	6	-----	2,200	269	9,415	4.280
1951.....	4	-----	500	243	8,505	17.010
1952.....	1	-----	600	23	805	1.342
1953.....	-----	-----	-----	-----	-----	-----
Grand total placers:						
1949.....	223	-----	18,363,000	221,089	7,738,115	.421
1950.....	216	-----	17,621,000	277,111	9,698,885	.550
1951.....	140	-----	17,411,000	238,527	8,348,445	.479
1952.....	119	-----	15,663,000	239,290	8,375,150	.535
1953.....	148	-----	17,724,000	253,116	8,859,060	.500

¹ Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.

² Includes all placer operations using power excavator and washing plant, both on dry land; when washing plant is movable, outfit is termed "dry-land dredge."

TABLE 9.—Mine production of gold, silver, and lead in 1953, by months, in terms of recoverable metals¹

Month	Gold (fine ounces)	Silver (fine ounces)	Lead (short tons)	Month	Gold (fine ounces)	Silver (fine ounces)	Lead (short tons)
January.....	119	307	1	August.....	37,304	4,777	-----
February.....	134	10	2	September.....	46,227	5,993	-----
March.....	463	608	6	October.....	39,256	5,146	-----
April.....	622	537	-----	November.....	30,610	4,238	-----
May.....	17,917	2,638	-----	December.....	10,859	1,390	-----
June.....	29,698	4,331	-----	Total.....	253,783	35,387	9
July.....	40,614	5,412	-----				

¹ Based on mint and smelter receipts; data are adjusted to exclude receipts during the first part of 1953 previously credited to 1952 production and to include expected receipts in 1954, which are a part of actual output in 1953. No copper or zinc produced in 1953.

TABLE 10.—Mine production of gold, silver, and lead in 1953, by regions, in terms of recoverable metals ¹

Region	Mines producing		Gold (lode and placer)		Silver (lode and placer)		Total value
	Lode	Placer	Fine ounces	Value	Fine ounces	Value	
Cook Inlet-Susitna.....	1	11	5,348	\$187,180	774	\$701	\$187,881
Copper River.....		8	312	10,920	47	43	10,963
Kuskokwim River.....		7	15,001	525,035	1,201	1,087	526,122
Northwestern Alaska.....		3	1,130	39,550	122	110	39,660
Seward Peninsula.....		37	45,203	1,582,105	5,243	4,745	1,586,850
Southeastern Alaska.....	(²)		203	7,105	123	111	7,360
Yukon River.....	2	82	186,586	6,530,510	27,877	25,230	* 6,557,836
Total.....	3	148	253,783	8,882,405	35,387	32,027	* 8,916,672

¹ No copper or zinc produced in 1953.

² No producing mines; cleanup of mills at 3 inactive mines in 1953.

³ Includes value of 1,100 pounds of lead (\$144) from Southeastern Alaska region and 16,000 pounds of lead (\$2,096) from Yukon River region.

Gold was recovered from lode-gold mining operations from ore mined and milled by Renshaw & Brown while doing assessment work at the Gold Cord mine and from a mill cleanup at the Lucky Shot mine in the Willow Creek district, Cook Inlet-Susitna region; from a cleanup at the Alaska Juneau mill in the Juneau district, Southeastern Alaska region; from ore mined and milled by Jokela & Lazeration at the Greenback mine; and from 1 ton of ore mined and shipped to a smelter by Billy Vuicich from a prospect on Ester Dome in the Fairbanks district, Yukon River region. Mine production of gold, by classes of ore, by methods of recovery, by types of material processed in terms of recoverable metal and in terms of gross metal content, and by districts is shown in tables 11-15. Extensive exploration and development programs were conducted on the Big Hurrah mine in the Nome district, Seward Peninsula region, and on the Nixon Fork mine in the McGrath district, Kuskokwim River region. Substantial quantities of gold have been produced from both mines in previous years.

TABLE 11.—Mine production of gold, silver, and lead in 1953, by classes of ore and other source materials, in terms of recoverable metals ¹

Source	Number of mines	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Lead (pounds)
Lode ore:					
Dry gold.....	3	² 441	660	199	1,100
Lead.....	(³)	34	7	802	16,000
Other "lode" material: Old tailings ⁴					
Total "lode" material.....	3	² 475	667	1,001	17,100
Gravel (placer operations).....	148		253,116	34,386	
Total, all sources.....	151	² 475	253,783	35,387	17,100

¹ No copper or zinc produced in 1953.

² Includes 150 tons of old tailings from which gold, silver, and lead production cannot be segregated.

³ No producing mine; ore was mined in 1952 and shipped in 1953.

⁴ Included with dry gold ore.

Iron.—During 1953 increased interest in iron was indicated by the activity on the magnetite deposits in Southeastern Alaska. The known magnetite deposits of Southeastern Alaska are at Klukwan and Snettisham in the Juneau district and at Duke Island in Union Bay on Cleveland Peninsula and at several locations on Prince of Wales Island in the Ketchikan district.

TABLE 12.—Mine production of gold, silver, and lead in 1953, by types of material processed and methods of recovery in terms of recoverable metals ¹

Types of material processed and methods of recovery	Gold (fine ounces)	Silver (fine ounces)	Lead (pounds)
Lode:			
Amalgamation:			
Ore and old tailings ²	437	69	-----
Concentration and smelting concentrates: Ore and old tailings ²	204	121	1,100
Direct smelting: Ore.....	26	811	16,000
Total.....	667	1,001	17,100
Placer.....	253,116	34,386	-----
Grand total.....	253,783	35,387	17,100

¹ No copper or zinc produced in 1953.

² Figures for recoverable metals from ore and old tailings cannot be segregated.

TABLE 13.—Mine production of gold, silver, and lead in 1953, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals ¹

A. For material treated at mills

BY REGIONS

	Material treated (short tons)	Recoverable in bullion		Concentrate shipped to smelters ² and recoverable metal			
		Gold (fine ounces)	Silver (fine ounces)	Concentrate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Lead (pounds)
Cook Inlet-Susitna.....	³ 200	47	2	4	19	2	-----
Southeastern Alaska.....	(⁴) 18	18	4	28	185	119	1,100
Yukon River.....	240	372	63	-----	-----	-----	-----
Total: 1953.....	³ 440	437	69	32	204	121	1,100
1952.....	11,457	1,186	195	6	81	30	400

BY CLASSES OF MATERIAL TREATED

Dry gold: Ore and old tailings.....	³ 440	437	69	32	204	121	1,100
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BY CLASSES OF CONCENTRATE SHIPPED TO SMELTERS ²

Dry gold: 1953.....	32	204	121	1,100
1952.....	6	81	30	400

For footnotes, see end of table.

TABLE 13.—Mine production of gold, silver, and lead in 1953, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals ¹—Continued

B. For ore shipped directly to smelters

BY REGION

	Recoverable metal content			
	Ore shipped (short tons)	Gold (fine ounces)	Silver (fine ounces)	Lead (pounds)
Yukon River: 1953.....	35	26	811	16,000
1952.....	2	-----	233	2,000

BY CLASSES OF ORE TREATED

Ore:				
Dry gold.....	1	19	9	-----
Lead.....	34	7	802	16,000
Total.....	35	26	811	16,000

¹ No copper or zinc produced in 1952 and 1953.

² Excludes concentrates treated only by amalgamation and/or cyanidation.

³ Includes 150 tons of old tailings from which recoverable gold and silver cannot be segregated from ore.

⁴ Ore reported in years before 1953; concentrate and bullion shipped in 1953.

TABLE 14.—Mine production of gold, silver, copper, and lead in 1953, by methods of recovery (except placer) and classes of material processed, in terms of gross metal content ¹

CONCENTRATE SHIPPED TO SMELTERS

Class of material	Quantity shipped or treated (short tons)	Gross metal content			
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)
Dry gold: 1953.....	32	294	121	-----	2,025
1952.....	6	81	30	24	658

ORE SHIPPED DIRECTLY TO SMELTERS

Dry gold.....	1	19	9	-----	-----
Lead.....	34	7	802	-----	17,447
Total: 1953.....	35	26	811	-----	17,447
1952.....	2	-----	233	24	2,242

¹ No zinc produced in 1952 and 1953.

TABLE 15.—Mine production of gold, silver, and lead in 1953, by regions and districts, in terms of recoverable metals ¹

Region and district ²	Mines producing ³		Ore and old tailings (short tons)	Gold (fine ounces)			Silver (fine ounces)			Lead (pounds)	Total value
	Lode	Placer		Lode	Placer	Total	Lode	Placer	Total		
Cook Inlet-Sustina region:											
Willow Creek.....	1	11	4 200	66	5,282	66	4	770	4	\$2,314	185,567
Yentna.....											
Copper River region:											
Chistochina.....		4			30			3		1,053	4,224
Nalchana.....		1			120			26		3,369	487,405
Nizina.....		2			96			10		39,478	465,675
Kuskokwim River region: Aniak.....		4			14,184			1,066		32,983	1,057,562
Seward Peninsula region:											
Council.....		4			1,125			114		1,702	3,306
Fairhaven.....		5			13,261			1,702		1,92	1,100
Kougarok.....		8			940			92		3,306	123
Nome.....		16			29,560			293		9,018	136,571
Southeastern Alaska region: Juneau.....			(^c)							1,277	2,893
Yukon River region:										8,423	11,663
Circle.....		12			9,018			1,258		20,191	21,065
Fairbanks.....		12	275	398	136,173		874	20,191		281	44,949
Fortymile.....		8			1,277			778		1,354	101,959
Hot Springs.....		5			2,893			1,554		1,553	296,050
Iditarod.....		9			8,423			1,553		75	409,611
Innoko.....		10			11,663			128		994	30,868
Kayukuk.....		9			880			75		58	34,906
Marshuk.....		1			994			128		280	26,162
Rampart.....		4			746			58		8,651	303,522
Ruby.....		3			1,735			814		6,065	212,752
Talovana.....		4			8,651			527		1,001	35,387
Other districts ⁴		16			6,065			527		17,100	8,916,672
Total Alaska.....	73	148	9 475	667	253,116	263,783	1,001	34,386	35,387		

¹ No copper or zinc produced in 1953.² Only those districts are shown separately for which Bureau of Mines is at liberty to publish; others, producing listed in footnote 8 and their output are included with "Other districts."³ Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property, years from which 20 ounces of gold and 1 ounce of silver were produced from a mill cleanup at an inactive property in 1953.⁴ Excludes ore produced in 1953 from which 20 ounces of gold and 1 ounce of silver were produced from a mill cleanup at an inactive property in 1953.⁵ Excludes ore produced in 1953 from which 20 ounces of gold and 1 ounce of silver were produced from a mill cleanup at an inactive property in 1953.⁶ Ore reported in prior years; concentrate and bullion shipped in 1953.⁷ Excludes 1 property from which 7 ounces of gold, 802 ounces of silver, and 16,000 pounds of lead were produced in 1953 from 34 tons of ore mined in 1952 but not shipped until 1953.⁸ Includes the following districts from which quantities and values cannot be shown separately (number of operators in parentheses): Yakutatga (1), Copper River region; Goodnews Bay (3), Kuskokwim River region; Klana (1) and Shungnak (2), North-western Alaska region; Koryk (2) and Port Clarence (2), Seward Peninsula region; Chandalar (1), Eagle (1), Hughes (2) and Melzaitna (1), Yukon River region.⁹ Excludes ore indicated in footnotes 4 and 6.

Quebec Metallurgical Industries, Ltd., a subsidiary of Frobisher, Ltd., conducted an exploration project on part of the Klukwan titaniferous magnetite deposit in 1953. In addition to the exploration work, a 150-ton metallurgical sample was taken from the alluvial deposit at the foot of the lode deposit by screening the boulders and coarse gravel from the outwash material. The sample was shipped to the Federal Bureau of Mines at Juneau, Alaska, for magnetic concentration to provide a 50-ton sample of magnetite concentrate for electric smelting tests at the Bureau of Mines Northwest Electrometallurgical Laboratory, Albany, Oreg. A report⁵ was published to summarize the results of laboratory beneficiation testing of ore samples from the Klukwan iron deposit.

The titaniferous Snettisham magnetite deposit was held by W. S. Pekovich and Robert Coughlin, of Juneau, Alaska. The Bureau of Mines completed a diamond-drilling program of 6,425 feet of drill hole on the deposit in 1953. The program was designed to obtain basic information about the size, grade, and metallurgical characteristics of the magnetite deposit. Drill-hole locations were based on a magnetometer dip-needle survey by the Territorial Department of Mines and the Federal Bureau of Mines.

Lead.—The output of lead in Alaska in 1953 was recovered from lead ore mined during 1952 by Fred Wackwitz from a surface prospect at the head of Cleary Creek on Cleary Summit in the Fairbanks district and shipped to a smelter in the United States in 1953. A small quantity of lead was produced by the Alaska Juneau Gold Mining Co. in 1953 from concentrate recovered from a cleanup of its mill at Juneau. The ore had been mined and milled before operations were suspended in 1944.

Mercury.—During 1953 the DeCoursey Mountain Mining Co., Inc., conducted exploration work with DMEA assistance at the Red Devil mine 8 miles west of Sleitmute on the Kuskokwim River in the Aniak district and at the DeCoursey mine 20 miles northwest of Crooked Creek in the Aniak district, Kuskokwim River region. The company produced 35 flasks of mercury at the Red Devil mill from ore that had been mined from the Red Devil mine by previous operators before 1953. Assisted by a DMEA contract, Wren, Waskey & Wolfe (partnership) conducted an exploration program on a mercury-lode prospect known as the Red Top mine 20 miles northwest of Dillingham near Aleknagik in the Bristol Bay district. The company reported that a small quantity of mercury ore was mined during the year and stockpiled. Five flasks of mercury, retorted at the Red Top mine in November 1952 and not previously reported, were credited to the 1953 production. Table 16 shows all Alaska mercury production for 1946 to 1953.

Nickel.—Exploration was continued throughout 1953 on the Mertie lode, a nickel-copper-cobalt deposit at Funter Bay on Admiralty Island in Southeastern Alaska, by the Admiralty Alaska Gold Mining Co. This exploration program, which was begun in 1952, is being continued with DMEA assistance.

⁵ Wells, R. R., and Thorne, R. L., Concentration of Klukwan, Alaska, Magnetite Ore: Bureau of Mines Rept. of Investigations 4984, 1953, 15 pp.

TABLE 16.—Production of mercury, 1946–53

Year	Number of mines	Flasks (76 pounds)	Price ¹ (per flask)	Value
1946.....	2	699	\$98.24	\$68,670
1947.....	1	127	83.74	10,635
1948.....	1	100	76.49	7,649
1949.....	1	100	79.46	7,946
1950-51.....				
1952.....	1	28	199.10	5,575
1953.....	1	40	193.03	7,721

¹ Annual average Engineering and Mining Journal Metal and Mineral Market quoted price at New York.

Platinum.—Mining of platinum continued to be an important factor in the mineral industry of Alaska. The recovery of crude platinum-group metals in 1953 was substantial but considerably less than in 1952. The Goodnews Bay Mining Co. continued to be the only producer of platinum-group metals in Alaska and the only operator in the United States or its Territories that actively mined platinum as a primary product. A. L. Howard, assisted by a DMEA contract, conducted an exploration program on a placer-platinum prospect on Red Mountain adjacent to the Goodnews Bay Mining Co. operation in the Goodnews Bay district, Kuskokwim River region.

Silver.—Of the 35,400 fine ounces of silver produced in Alaska in 1953 (33,000 ounces in 1952), 97 percent was a byproduct of gold from placer mining (99 percent in 1952); the remaining 3 percent was recovered from gold ore milled, gold ore and lead ore smelted, and concentrate from cleanup at mills. Therefore, the increased output of silver in 1953 (7 percent above the 1952 output) directly reflected the increased output of gold in 1953. The United States Smelting, Refining & Mining Co. was the principal producer of silver in Alaska in 1953. The company recovered silver as a byproduct of gold from dredging operations in the Fairbanks district, Yukon River region, and in the Nome district, Seward Peninsula region. The 5 leading producers of gold recovered 69 percent of the total silver output in 1953 (compared with 75 percent in 1952); the 15 leading producers of gold recovered 79 percent of the total silver output in 1953 (compared with 85 percent in 1952). See tables 1, 6, 7, and 9–15.

Tin.—Production of tin in Alaska in 1953 was 49 long tons compared with 82 long tons in 1952. Table 17 shows the production of tin in Alaska, 1902–53. Although the production was less, interest and activity in tin mining and exploration were greater in 1953 than in 1952. Most of the drop in output was accounted for by the fact that the tin concentrate produced by the United States Tin Corp. from the Lost River mine on Cassiterite Creek in the Port Clarence district was held at the mine for re-treatment and therefore was not counted as production for 1953. The Northern Tin Co. produced tin concentrate from its placer-tin operation on Buck Creek in the Port Clarence district.

Exploration programs for placer tin were conducted under DMEA contracts by Zenda Gold Mining Co. by drilling on Boulder Creek in the Cape Mountain area and by the Alaska Tin Co. by drilling on

TABLE 17.—Production of tin, 1902-53

Year	Long tons (Sn content)	Value	Year	Long tons (Sn content)	Value
1902-40 ¹	1,517	\$1,635,800	1949.....	51	\$114,800
1941.....	41	54,500	1950.....	79	170,281
1942.....	3	3,300	1951.....	69	197,163
1943.....	(?)	70	1952.....	82	220,956
1944-46.....			1953.....	49	105,917
1947.....	1	2,200			
1948.....	5	10,172	1902-53 total.....	1,897	2,515,159

¹ Smith, Philip S., Mineral Industry of Alaska in 1940: Geol. Survey Bull. 933-A, 1942, p. 81.

² Less than 1 ton.

Tuttle, Krueger, and Eldorado Creeks in the Ear Mountain area, Port Clarence district, Seward Peninsula region.

Tungsten.—The recorded output of 3 short tons of 60-percent tungsten concentrate from Alaska in 1953 was produced by 2 operators. Russel R. Schaefer recovered a small quantity of tungsten concentrate as a byproduct of gold from a placer-gold operation on Forty-Seven Creek in the Aniak district, Kuskokwim region. The Rocky Mountain Mining Co. shipped tungsten ore from its property on Rocky Mountain Creek in the Nome district, Seward Peninsula region. The ore had been produced and stockpiled from prospecting work during 1951-53. The United States Tin Corp. did not process any ore from its Lost River lode-tin mine that contained recoverable tungsten. The exploration program, begun in 1951, by the Alaska Metals Mining Co. on the lode-tungsten deposit on Gilmore Dome (Stepovich and Colbert property) was continued throughout 1953 with DMEA assistance.

Zinc.—No zinc was produced in Alaska in 1953.

NONMETALS

A preliminary report ⁶ was published on the nonmetallic deposits accessible to the Alaska Railroad as possible sources of raw materials for the construction industry. A report ⁷ was published on a study of the six largest deposits of gypsiferous rock in the upper Matanuska Valley. The gypsum deposits near Iyoukeen Cove on Chichagof Island in Southeastern Alaska were described.⁸

Clays.—During 1953 the Basic Building Products, Inc., of Anchorage acquired land for a plant site, constructed a building, and purchased machinery for the purpose of manufacturing building products from Alaskan minerals. The company announced that the initial products would be firebrick, facing brick, Roman brick, terra cotta, and various types of tile.

Gem Stones.—The Empire Jade Co. and the Shungnak Jade Products Co. produced small quantities of nephrite jade from the Shungnak district, Northwestern Alaska region, during 1953. By

⁶ Rutledge, F. A., Thorne, R. L., Kerns, W. H., and Mulligan, J. J., Preliminary Report; Nonmetallic Deposits Accessible to the Alaska Railroad as Possible Sources of Raw Materials for the Construction Industry: Bureau of Mines Rept. of Investigations 4932, 1953, 129 pp.

⁷ Eckhart, Richard A., Gypsiferous Deposits on Sheep Mountain, Alaska: Geol. Survey Bull. 989-C, 1953, 21 pp.

⁸ Flint, G. M., Jr., and Cobb, E. H., Gypsum Deposits Near Iyoukeen Cove, Chichagof Island, Southeastern Alaska: Geol. Survey Bull. 989-B, 1953, 10 pp.

careful selection and cutting gem-quality jade was obtained from this material. Jewelry set with Alaska jade was manufactured and was available in most jewelry stores and curio shops in Alaska and in some jewelry stores in the United States. Scraps from cutting the material and inferior quality material with impurities and flaws, not suitable for use as gem stones, were cut into blocks, slabs, book ends, and the like and sold as souvenirs to tourists. A small quantity of Alaska petrified wood and agate was cut and polished and was sold in Alaska in 1953.

Sand and Gravel.—The production of sand and gravel in Alaska dropped from 10,782,000 short tons (valued at \$8,651,000) in 1952 to 7,689,000 short tons (valued at \$5,080,000) in 1953. The 29-percent decrease in quantity and 41-percent decrease in value (compared with 1952) were caused principally by reduced production of sand and gravel for construction and rehabilitation of roads in Alaska by the Alaska Road Commission and by the Bureau of Public Roads. Production of sand and gravel for the construction and enlargement of military establishments in Alaska in 1953 about equaled the 1952 production. Output of sand and gravel by the commercial producers for use in constructing private housing facilities declined slightly in 1953 compared with 1952.

Stone.—The output of stone in Alaska in 1953 was considerably less than in 1952, when the highest yearly production was recorded. Stone was used principally for fill and riprap in constructing causeways and seawalls.

REVIEW BY REGIONS

A report ⁹ was published to standardize and define the regions and districts in Alaska as they are used by the Bureau of Mines in statistical and economic studies of the mineral industry of the Territory.

COOK INLET—SUSITNA

The commodities produced in the Cook Inlet-Susitna region in 1953, in order of value of output, were coal, sand and gravel, gold, and silver. The value of the coal produced exceeded by far the value of any other commodity. The 5 active coal mines, all in the Willow Creek district (Matanuska Valley), supplied 35 percent of the total coal produced in the Territory.

A 57-percent decrease in the value of sand and gravel output (compared with 1952) was caused principally by a reduced program of construction and rehabilitation of roads.

Gold production was recorded from 1 active lode mine and a clean-up at 1 inactive lode mine in the Willow Creek district and from 11 active placer mines in the Yentna district.

The discovery of the Kathleen-Margaret copper prospect at the head of the MacLaren River in the Valdez Creek district in 1953 is described in the review by mineral commodities (copper) section of this report.

Examination and geological reconnaissance work begun in 1952 by two major oil companies was continued in the region in 1953.

⁹ Ransome, Alfred L. and Kerns, William H., Names and Definitions of Regions, Districts, and Sub-districts in Alaska: Bureau of Mines Inf. Circ. 7679, 1954, 91 pp.

TABLE 18.—Value of mineral production in Alaska, by regions, 1952–53

Region	1952	1953	Minerals produced in 1953, in order of value
Bristol Bay		\$965	Mercury.
Cook Inlet-Susitna	\$5,505,414	4,415,008	Coal, sand and gravel, gold, silver.
Copper River	1,655,244	336,045	Sand and gravel, stone, gold, silver.
Kuskokwim River	2,903,899	2,316,047	Platinum-group metals, gold, sand and gravel, mercury, tungsten, silver.
Northwestern Alaska	16,107	139,660	Gold, silver.
Seward Peninsula	1,955,653	1,703,526	Gold, tin, stone, silver, tungsten.
Southeastern Alaska	1,166,971	578,462	Sand and gravel, stone, gold, lead, silver.
Yukon River	13,030,306	14,099,608	Gold, coal, sand and gravel, silver, lead.
Undistributed ²	68,013	762,705	
Total	26,302,000	24,252,000	

¹ Value of gem stones included with "Undistributed" to avoid disclosure of individual output.

² Value of production from regions combined to avoid disclosure of confidential data; in 1953 includes value of production of sand and gravel and stone in Aleutian Islands, Bering Sea, Kenai Peninsula, and Kodiak regions, and value of production of gem stones in Northwestern Alaska region (as indicated in footnote reference 1).

Willow Creek District.—Five coal mines (all in the Matanuska Valley) were reported active in the district in 1953. The Evan Jones Coal Co. was the largest producer of coal in the district as well as in the Territory. Between July and the end of the year the company produced coal by both underground and strip mining and by re-treating in its heavy-medium cleaning plant a dump of previously unmarketable coal and waste. In addition, the company purchased, washed, and marketed, along with its own coal, the production of the Mrak Coal Co., Inc., from a strip mine near Eska. The Houston Coal Co. operated the Houston strip mine from May through July 1953 to fulfill a military contract that had been carried over from the year before. All work of rehabilitating the underground mine and surface plant at the Buffalo mine on Moose Creek by the Buffalo Coal Mining Co., Inc., begun in August 1952 with the help of an RFC loan, was suspended on April 1, 1953. The Pioneer Coal Co. produced coal from the Pioneer mine during September 1953. In October the Alaska Matanuska Coal Co. leased the mine and operated it throughout the remainder of the year.

In 1953 the Federal Bureau of Mines continued its diamond-drilling program to determine the extent and position of minable coal beds in the Matanuska field, Willow Creek district. At the Buffalo mine in the Moose Creek area of the Matanuska field, 3 drill holes established continuity of the formerly worked Premier (Buffalo) series of coalbeds for an additional 1,700 feet downdip from the bottom of the old mine workings. Two other holes established the existence of the overlying Jonesville series of coalbeds, thereby greatly increasing the indicated reserves.

The Federal Geological Survey continued its program of detailed geologic mapping of the coalfields and its exploration for coal deposits along the Little Susitna River.

Brown & Renshaw recovered a small quantity of gold from ore mined and milled at the Gold Cord mine on Fishhook Creek (under lease from the Gold Cord Development Corp.) while doing annual assessment work during July and August 1953. A small quantity of gold was recovered by Willow Creek Mines from a cleanup of the mill at the Lucky Shot mine on Craigie Creek. The ore had been mined

and milled before 1942. The Fern mine on Archangel Creek and the Independence mine on Fishhook Creek, which in the past have been large producers of gold, were idle throughout the year.

Yentna District.—The Collinsville mine was the largest producer of gold in the Yentna district and the seventh largest gold producer in the Territory in 1953. The company recovered a substantial quantity of gold from 195,000 cubic yards of gravel washed in its nonfloating washing plant (dry-land dredge fed by a dragline) from June 1 to October 17, 1953, on Mills Creek. Harold Stanton operated a placer mine on Thunder Creek from May 10 to September 20, 1953; he recovered 117 fine ounces of gold and 17 fine ounces of silver from 8,000 cubic yards of gravel washed in sluice boxes placed on bedrock and fed by a bulldozer. Other larger operations that recovered small to moderate quantities of gold from placer mining were Mike A. Trepte on Bird Creek (under lease from the Alaska Exploration & Mining Co.), James G. Beaver and Forrest Englehorn on Cache Creek, and Eddie J. Barge and Andrew Blair on Dutch Creek.

COPPER RIVER

Eight placer mines in the Copper River region produced small quantities of gold in 1953—4 in the Chistochina, 1 in the Nelchina, 2 in the Nizina, and 1 in the Yakataga districts. The largest producer of gold in the region was George Belanger & Jack Cameron (partnership) on Albert Creek in the Nelchina district; 120 ounces of gold and 26 ounces of silver were recovered from 3,000 cubic yards of gravel washed between April 22, and September 20, 1953.

Oil-drilling equipment and camp facilities were landed at Icy Bay in the Yakataga district by Kerr-McGee Oil Industries. The company will do exploration drilling for oil for Phillips Petroleum Co. in the Katalla-Yakataga field. The Alaska Oil & Gas Development Co. did exploration drilling for oil near Eureka in the Nelchina district. The company had drilled a hole to a depth of 717 feet by the time the operation was forced to close for the winter.

The Bear Creek Mining Co., a subsidiary of the Kennecott Copper Corp., conducted an exploration program on the Orange Hill copper deposit near Nabesna in the Chisana district in 1953.

KUSKOKWIM RIVER

A wide variety of minerals was produced in the Kuskokwim River region in 1953. Three bucketline dredges (operated by 2 companies) and 5 other placer operations produced gold and silver. One operation each, respectively, produced mercury, platinum-group metals, and tungsten concentrate. In addition to the operations that produced minerals, 3 operations conducted exploratory work at 1 lode-gold mine, 1 lode-mercury mine, and 1 platinum-group-metals placer prospect, respectively.

Aniak District.—In 1953 the New York Alaska Gold Dredging Corp. was again (as in the previous 4 years) the third largest gold producer in the Territory and the largest in the Kuskokwim River region. The company operated 2 electrically powered bucketline dredges and 1 dragline-bulldozer-hydraulic combination in the vicinity of Nyac, 60 air-miles east of Bethel at the mouth of the

Kuskokwim River. One dredge on California Creek was equipped with eighty 6-cubic-foot buckets, and 1 dredge on the Tuluksak River was equipped with sixty-five 1½-cubic-foot buckets. On Rock Creek the company used a dragline with a 1½-cubic-yard bucket to dig the gold-bearing gravels and deliver them to an elevated sluice box for washing to recover the gold. Two other placer-mining operations in the district in 1953—Canyon Creek Mining Co. on Canyon Creek and Russel R. Schaefer on Forty-Seven Creek (a tributary of the Holitna River)—each produced a moderate quantity of gold by using a bulldozer to dig and deliver gravel to sluice boxes placed on bedrock. As a byproduct of the gold, Russel R. Schaefer produced and marketed a small quantity of tungsten concentrate.

During 1953 the DeCoursey Mountain Mining Co., Inc., conducted exploration work at the Red Devil and DeCoursey mines and produced 35 flasks of mercury at the Red Devil mill from ore that had been mined before 1953.

Goodnews Bay District.—The Goodnews Bay Mining Co. operated its electrically-powered bucketline dredge (with ninety-three 8-cubic-foot buckets) and a dragline-bulldozer-hydraulic combination on a bench of the Salmon River near Platinum in 1953. Platinum was the primary product recovered, but a moderate quantity of gold was produced as a byproduct. Adjacent to the Goodnews Bay Mining Co. operation, A. L. Howard, assisted by a DMEA contract, conducted an exploration program on a placer-platinum prospect on Red Mountain.

Mumtrak Miners, a new operation in 1953, produced 562 ounces of gold and 135 ounces of silver between June 1 and October 20, 1953, from 31,000 cubic yards of gravel washed at its mine on Watamuse Creek. A dragline was used to dig the gold-bearing gravel and deliver it to a set of elevated sluice boxes, where it was washed to recover the gold. Two bulldozers were used for moving tailing and overburden.

McGrath District.—Strandberg & Sons continued the exploration and development work begun in 1952 on the Nixon Fork lode-gold mine 10 miles north of Medfra on the Kuskokwim River upriver from McGrath. The company did not operate its dredge on Candle Creek near Takotna in 1953.

NORTHWESTERN ALASKA

Two properties in the Northwestern Alaska region changed hands in 1953. Ted Tronstad & Sig Goodwick (partnership) sold their placer ground on Dahl Creek 4 miles northwest of Kobuk in the Shungnak district to Kobuk Mines (Charles E. Stout & William P. Thomas). Kobuk Mines recovered a moderate quantity of gold between August and October, using a bulldozer to deliver gravel to sluice boxes and to move tailing and overburden. Lammers Exploration Co. purchased placer ground on Klery Creek in the Kiana district from Helcolicon Mines, Inc.

The Empire Jade Co. and the Shungnak Jade Products Co. produced small quantities of nephrite jade from the Shungnak district during 1953.

SEWARD PENINSULA

In 1953 the value of the minerals produced in the Seward Peninsula region composed 7 percent of the total value of the minerals produced in the Territory. The value of the gold output was 93 percent of the total value of the minerals produced in the region in 1953. Seventy-eight percent of the gold was produced by 8 bucketline dredges operated by 5 companies. Thirty-two other operations produced gold by using hydraulic giants, bulldozers, draglines, and handtools, either separately or in combination.

Council District.—The Alaska Placers Co. operated its flume-type bucketline dredge equipped with sixty-six 3-cubic-foot buckets from June 12 to September 19, 1953, on benches of the Niukluk River. The Dutch Creek Mining Co., a three-way partnership composed of C. E. Anderson, P. S. Maphis, and T. J. Shaw, recovered a moderate quantity of gold from placer mining on Dutch Creek, a tributary of Ophir Creek. The company used a bulldozer to remove overburden, to deliver gravel to a sluice box for washing, and to move tailing away from the sluice box. The Last Chance Mining Co. (William Munz, owner), operated the Last Chance placer mine on Rock Creek during the period June through August 1953, using a bulldozer and a hydraulic giant.

Fairhaven District.—The Casa de Paga Gold Co. operated two 3-cubic-foot flume-type bucketline dredges on the Inmachuk River 20 miles south of Deering from May 10 to November 1, 1953. The company was the largest producer of gold in the Fairhaven district, second largest in the Seward Peninsula region, and sixth largest in the Territory. The company removed 103,300 cubic yards of overburden with bulldozers and dug and washed 328,800 cubic yards of gold-bearing gravel with the dredges to recover 4,955 fine ounces of gold and 539 fine ounces of silver. Havenstrite Oil Co., Mining Division, recovered a moderate quantity of gold from its placer-mining operation on Candle Creek. Hydraulic giants were used for removing overburden, bulldozers for digging and delivering gold-bearing gravel to the sluice boxes, and draglines for moving tailing. O. F. Weinard recovered a moderate quantity of gold from claim No. 3 below Discovery on Mud Creek, using hydraulic giants for removing overburden, one bulldozer for digging and delivering gravel to the sluice boxes and another for moving and stacking tailing from the sluicing operation. Other smaller placer operations in the district were Sankovich & Peterson (partnership) on Glacier Creek and George R. Miller on Eldorado Creek.

Kougarok District.—During 1953, N. B. Tweet & Sons (last operated in 1951 on Mascot Gulch) recovered a moderate quantity of gold from placer ground on the Kougarok River (owned by Kougarok Consolidated Placers, Inc., and last worked in 1950). The company had spent the 1952 mining season checking and repairing equipment and testing the ground preparatory to mining in 1953. A combination hydraulic-bulldozer-dragline placer-mining method was used. Atlas Mines (George J. Waldhelm) moved from Atlas Creek to Dahl Creek during 1953. Most of the season was spent removing 22,000 cubic yards of overburden with 3 No. 1 hydraulic giants and 1 bulldozer. The company had a bad year because it needed a greater

than average supply of water for its program of removing overburden; unfortunately, it was a particularly dry year. The Macklin Creek Mining Co. (Axel Johnson) operated a placer mine on Macklin Creek under lease from the Grant Mining Co. to recover a moderate quantity of gold. The Grant Mining Co. did not actively mine any of its properties in 1953; it used its excavating equipment to build an airfield on Quartz Creek for the Territory of Alaska. Other placer-mining operations in the district were Andrew Wirum on Dome Creek and S. A. Montague and Frank Whaley at the Rainbow mine on the Noxapaga River.

Koyuk District.—Sweepstake Mines produced a moderate quantity of gold from a placer-mining operation on Sweepstake Creek in 1953. S. A. Tucker recovered a few ounces of gold by reworking tailing from a previous placer-mining operation on Sweepstake Creek by hand methods.

Nome District.—Two-thirds of the 1953 gold output from the Seward Peninsula region was produced in the Nome district. During 1953, 6 floating bucketline dredges were operated by 3 companies in the Nome district. Thirteen other companies, partnerships, or individuals produced gold in the district; at 4 operations the gold-bearing gravel was mined with bulldozers and draglines which delivered it to nonfloating washing plants, and at 9 it was mined by hand methods.

The United States Smelting, Refining & Mining Co. (Nome unit) was the largest producer of gold in the Nome district and in the Seward Peninsula region and the second largest producer of gold in the Territory in 1953. The company operated 3 of its fleet of 4 electrically powered bucketline dredges in the vicinity of Nome from May 8 to November 3, 1953. Of the 3 dredges operated, 2 were equipped with 78 9-cubic-foot buckets and 1 with 134 9-cubic-foot buckets. The fourth dredge, formerly operated by the company near Cooper Gulch, turned over in the dredge pond when the ice melted early in the spring before the 1953 mining season began. The machinery was salvaged from the dredge, and it was planned to install it in a new dredge hull. The new dredge was to be constructed on the "Submarine Beach" in 1955. The "Submarine Beach" is about a quarter of a mile inland from the present ocean beach at Nome; its name was derived from the fact that it is actually below sea level.

Lee Bros. Dredging Co., the second largest gold producer in the district in 1953, operated 2 diesel-powered flume-type bucketline dredges on the benches of the Solomon River from June 7 to November 1, 1953; 1 dredge was equipped with sixty-six $3\frac{1}{2}$ -cubic-foot buckets, and 1 with seventy-four 5-cubic-foot buckets. The company devised an inexpensive method of thawing the gravel on the benches ahead of the dredges. Part of the Solomon River was diverted to the benches with a bulldozer, where it was confined in a large dredge pond. Because it was at a higher level than the river, the water in the pond percolated down through the gravel to thaw it.

The Kougarok Freight & Mining Co., Earl Towner and Elmer Straub, a partnership, operated its bucketline dredge on Buster Creek for 30 days in 1953 from July 24 to August 23. The dredge was flume-type, diesel-powered, and equipped with thirty-five 1-cubic-foot buckets. The dredge was home built by the operators in 1950 from

salvaged materials and parts from abandoned mechanical equipment; pontoons were oil drums that were secured together with cable, buckets were from an earth excavator for digging ditches, and the bucket chain was fabricated from old bulldozer tracks (rails). Reports were received that Towner and Straub have designed and plan to build a second small dredge.

A few of the larger placer-mining operations in the district in 1953 (all used various combinations of dragline-bulldozer-hydraulic equipment for mining) were Ace Mining Co. on Darling Creek, H. W. Edwards on Penny Creek and at the Quigley mine on the Solomon River, and Herbert Engstrom on Basin Creek.

The Big Hurrah mine on Big Hurrah Creek near Solomon was dewatered, sampled, and mapped by Alaskan Associates, Ltd., during 1953; it had been flooded since 1907. A substantial quantity of gold had been produced from the mine before 1908. During 1952 Lane & Owens had recovered a moderate quantity of gold by cyaniding mill tailing from the former operation.

The Rocky Mountain Mining Co. shipped tungsten ore (produced and stockpiled from prospecting work done during the years 1951 through 1953) from its property on Rocky Mountain Creek.

Port Clarence District.—The Northern Tin Co. continued to mine placer tin at its property on Buck Creek during 1953; it produced 79 short tons of 70-percent tin concentrate from 40,000 cubic yards of gravel washed. An electrically powered nonfloating washing plant, commonly referred to as a "dry-land dredge," equipped with jigs and capable of handling 50 cubic yards of gravel an hour, was used. A bulldozer was employed for moving tailing, and a dragline was used for stripping overburden and for digging and delivering gravel to the washing plant. A small quantity of gold was recovered as a byproduct of the tin mined.

The United States Tin Corp. mined and milled tin ore at the Lost River mine on Cassiterite Creek. During 1953 the company produced 76.7 short tons of tin concentrate which contained about 43 percent tin. The concentrate was held at the mine awaiting the installation of new mill equipment with which the company expects to upgrade the concentrate to avoid excessive smelter penalties and to reduce the shipping and handling expenses. The company operated under a Government loan made as an advance against future production and continued exploration work begun in 1952 with DMEA assistance.

During 1953 Zenda Gold Mining Co. received additional assistance through the DMEA and continued its placer-tin exploration program begun in 1952 by drilling Boulder Creek in the Cape Mountain area.

The Alaska Tin Co. received a DMEA contract and began an exploration program for placer tin in the Ear Mountain area by drilling on Tuttle, Krueger, and Eldorado Creeks in 1953.

Investigations of lode-tin prospects on Ear Mountain were begun by the Federal Bureau of Mines on August 12, 1953, and were suspended for the year on September 10 because of unfavorable weather. A number of bulldozer trenches were started, but none was completed because of mechanical troubles with the bulldozer. The Winfield shaft was reopened and sampled.

SOUTHEASTERN ALASKA

Commodities produced in the Southeastern Alaska region in 1953, in order of value of output, were sand and gravel, stone, gold, lead, and silver. The small quantity of gold, silver, and lead reported as production from the region in 1953 was recovered from cleanup operations at three lode mines (ore mined and milled before 1953). No gold-placer operations were reported active in the region in 1953.

Exploration work begun in 1952 by the Admiralty Alaska Gold Mining Co. (with DMEA assistance) at its nickel-copper-cobalt lode mine, Mertie lode, at Funter Bay, Admiralty Island, was continued throughout 1953.

At the close of 1953 fieldwork was completed on an exploration program conducted on a DMEA contract by the Tillicum Mining Co. on its lode-antimony property on Caamano Point on the southern tip of Cleveland Peninsula near Ketchikan.

An extensive exploration program was conducted by the Granduc Mines, Ltd., on its lode-copper property in Northwestern British Columbia at the head of the Leduc River 4 miles from the Alaska-British Columbia boundary line. The exploration program indicated two copper ore bodies of considerable size and stimulated prospecting on the claims on the Alaskan side of the boundary line.

Three reports¹⁰ on some lead-zinc and zinc-copper deposits in the Southeastern Alaska region were published in 1953.

A Federal Bureau of Mines diamond-drilling program on the titaniferous magnetite deposit at Snettisham in the Juneau district is described in the review by mineral commodities (iron) section of this report.

YUKON RIVER

The values of the gold, coal, sand and gravel, silver, and lead (in order of value of output) produced in the Yukon River region in 1953 composed 58 percent of that of all minerals produced in Alaska. The gold, which was produced by 2 lode-gold operations, by 7 companies that operated 12 dredges and by 75 other placer operations that used various types of equipment with nonfloating washing plants in the region in 1953, was 74 percent of the total gold output of the Territory in 1953. The 12 dredges alone recovered 59 percent of the total Alaska gold output.

Sixty-four percent of the 1953 coal output in the Territory came from 2 strip mines and 1 underground mine in the Nenana field of the Bonnifield district.

Bonnifield District.—Of the three companies that produced coal from the Nenana field in the Bonnifield district in 1953, Usibelli Coal Mine, Inc., operating its strip mine on the Healy River, had the greatest output. The coal was loaded directly into trucks at the pit and hauled to the railroad at Suntrana. Hydraulic giants, assisted by bulldozers, were employed to thaw and strip the overburden from the coal beds. Water was pumped from the Healy River to supply

¹⁰ Gault, H. R., and Fellows, R. E., Zinc-Copper Deposit at Tracy Arm, Petersburg District, Alaska: Geol. Survey Bull. 998-A, 1953, 11 pp.

Gault, H. R., Rossman, D. L., Flint, G. M. Jr., and Ray, R. G., Some Zinc-Lead Deposits of the Wrangell District, Alaska: Geol. Survey Bull. 998-B, 1953, 44 pp.

Robinson, G. D., and Twenhofel, W. S., Some Lead-Zinc and Zinc-Copper Deposits of the Ketchikan and Wales Districts, Alaska: Geol. Survey Bull. 998-C, 1953, 25 pp.

hydraulic giants, and wherever possible the river was diverted to thaw and wash away the overburden. At the close of the year the company announced that in 1954 it expected to open and operate an underground coal mine, in addition to its opencut strip-coal mine. The latest type of equipment for underground mining was being purchased. A heavy-medium coal-washing plant was also to be included in new equipment to be purchased.

The Healy River Coal Corp. underground coal mine and improvements at Suntrana were acquired by the Suntrana Mining Co., Inc., in late June 1953. An old fire in the No. 3 seam reappeared on October 21, 1953; the seam was sealed off with an iron door and totally abandoned. This did not interfere seriously with the output of coal from the mine.

The Cripple Creek Coal Co. produced coal from its strip mine on Cripple Creek (a tributary of the Healy River) from September throughout the remainder of 1953 to supply coal under military contract. Methods similar to those used at the Usibelli Coal Mine, Inc., mine (described previously) were used by the company for thawing and stripping the overburden from the coal and for mining and hauling the coal to the railroad at Suntrana.

Circle District.—Alluvial Golds, Inc., was by far the largest producer of gold in the Circle district in 1953. The company mined and washed 408,000 cubic yards of gold-bearing gravel with its diesel-powered dredge (equipped with seventy-two $4\frac{1}{2}$ -cubic-foot buckets) on Woodchopper Creek 10 miles west of Coal Creek from April 16 to October 26, 1953. The company prepared ground ahead of the dredge by removing 240,000 cubic yards of overburden from the gold-bearing gravel with bulldozer excavation equipment. The practice of the company has been to prepare several years of ground ahead of the dredge to take advantage of solar thawing of the gravels.

The second largest producer of gold in the district in 1953 was the P. R. & H. Mining Co. placer operation on property owned by the C. J. Berry Dredging Co. on Mastodon Creek. This was the first year of operation for the company on Mastodon Creek, but it had been a large and steady producer of gold from Lower Deadwood Creek until it discontinued operations at the end of the 1951 mining season. The company used bulldozers to dig and deliver the gold-bearing gravel to the sluice boxes placed on or near bedrock.

A dredge owned by the C. J. Berry Dredging Co. and operated on Lower Deadwood Creek in 1952 was purchased by the Circle Dredging Co., Inc., Tury F. Anderson, president, in June 1953. The dredge (equipped with fifty-eight $3\frac{1}{2}$ -cubic-foot buckets) was operated on Crooked Creek from June 11 to October 11, 1953.

The placer-mining operation of the Deadwood Mining Co. on Independence Creek recovered 813 fine ounces of gold and 205 fine ounces of silver from approximately 40,000 cubic yards of gravel washed between April 1 and September 26, 1953. The overburden was removed from the gold-bearing gravel with a dragline. The gravel was dug and delivered to the sluice boxes by a bulldozer and by hydraulic giants. Here the hydraulic giants assisted the bulldozer to improve the gold recovery because the gravel contained a clayey material that needed an extra prewash and breaking up before it

reached the sluice boxes. The dragline removed and stacked the tailing away from the tail of the sluice boxes.

During 1953 the Timberline Placers (K. C. Spaid and H. L. Stout, partners) recovered a substantial quantity of gold from its placer-gold mine on Porcupine Creek. The property formerly was owned and operated by the Four A Mining Co. The new owners used bulldozers to deliver the gold-bearing gravel to sluice boxes, where the gravel was washed to recover the gold and a dragline to remove the tailing from the operation. Robert R. Wilkinson continued to operate his placer mine on Miller Creek in 1953; he was one of the larger producers of gold in the district. The Lucky Seven Mining Co. (Walter E. Romon, owner) recovered a substantial quantity of gold from its placer-mining operation on Mastodon Creek in 1953.

Three other placer mines (on each of which combinations of bulldozers, hydraulic giant, and sluice boxes were used), were operated by Paul Bittner on Deadwood Creek; by Frasca & Hering on McGown Bench, First Tier, Right Limit, on Eagle Creek; and by H. C. Carstens on property owned by the W. W. Estes Estate on Portage Creek.

Eagle District.—Burnett F. Hansen had the only active mining operation in the Eagle district in 1953; he recovered 176 fine ounces of gold and 19 fine ounces of silver from Crooked Creek, a tributary of the Seventymile River 25 miles northwest of Eagle.

Fairbanks District.—Fifty-four percent of the gold produced from Alaskan placer mines in 1953 came from the Fairbanks district. During 1953 gold and silver were produced by 12 placer- and 2 lode-mining operations in the district. Lead ore mined during 1952 was shipped from the district to a smelter in the United States in 1953.

The United States Smelting, Refining & Mining Co. (Fairbanks unit) operated six bucketline dredges in the district in 1953. As in previous years, it was by far the largest producer of gold in the district and in the Territory. Power was supplied to the electrically powered dredges from a centrally situated coal-burning generating plant at Fairbanks. Water was supplied to its stripping, thawing, and dredging operations north of Fairbanks by the 90-mile-long Davidson Ditch from the head of the Chatanika River to Fairbanks. Water was pumped from the Chena River for the stripping, thawing, and dredging operations in the Ester area. Dredges operated by the company in 1953 were Nos. 2, 4, 5, 8, 10, and 6 on Fairbanks, Pedro, Little Eldorado, Engineer, Cripple Creeks, and Gold Hill (a bench on the Left Limit of Ester Creek), respectively. The digging equipment is comprised of one 3-cubic-foot (68 buckets), three 6-cubic-foot (68, 78, 78 buckets, respectively), and two 10-cubic-foot (93 and 106 buckets, respectively) dredges. The company also removed approximately 9 million cubic yards of overburden with 180 hydraulic giants and an electrically powered 8- to 12-cubic-yard dragline to prepare ground for future dredging.

The second and third largest producers of gold in the district in 1952 did not produce any gold in 1953; the Brinker-Johnson Co. did not operate its dredge on Caribou Creek in 1953. The Wolf Creek Mining Co. spent the 1953 mining season thawing and stripping 100,000 cubic yards of overburden from its placer ground.

Alder Creek Mining Co., the second largest producer of gold in the district in 1953, recovered 2,209 fine ounces of gold and 350 fine ounces of silver from 275,000 cubic yards of gravel mined by open-cut methods with dragline and bulldozer excavation equipment on Fairbanks Creek and washed in a nonfloating washing plant (sluice boxes) between June 1 and September 20, 1953.

The Hassel Mining Co. (formerly Hassel & Sticha) operated a placer-mining operation on Ready Bullion Creek during the open season from May 1 to October 15, 1953. A bulldozer delivered gravel to sluice boxes placed on bedrock, and a dragline moved tailing from the washing operation and stripped overburden from the gold-bearing gravels.

Other operators that produced moderate quantities of gold from placer mines by using combinations of dragline, bulldozer, and hydraulic equipment with sluice boxes in the Fairbanks district in 1953 were Chatham Creek Mining Co. on Chatham Creek, Hope mine (Robert V. Watkins) on Faith Creek, Ernest Maurer on First Chance Creek, James Murnion on Ester Creek, Al Swatch on Corpus Christi Creek, and Williams Mining Co. on Gilmore Creek.

Vern Jokela & Charles Lazeration mined gold ore from the old Creighton mine (Cheechako) on the Greenback claims in 1953 and milled it at the Cleary Hill Mines Co. mill on Cleary Creek. Billy Vuicich shipped 1 ton of gold ore to a smelter in the United States from a prospect on Ester Dome in 1953. Fred Wackwitz shipped 34 tons of lead ore that had been mined in 1952 to a smelter in the United States in 1953 from the Polaris mine at the head of Cleary Creek.

The Alaska Metals Mining Co. continued its exploration program (with DMEA assistance) on the lode-tungsten deposit on Gilmore Dome (Stepovich and Colbert property) throughout 1953. The work was begun in 1951.

Fortymile District.—In 1953 the United States Smelting, Refining & Mining Co. began a stripping program to prepare its placer ground at Chicken on Chicken Creek, a tributary of Mosquito Fork, for a possible future dredging operation. Water was pumped from Mosquito Fork to supply the hydraulic giants that were used for thawing and stripping the overburden from the gold-bearing gravels.

The Franklin Mining Co., operating a dragline-bulldozer-hydraulic combination (bulldozers to deliver gravel to the sluice boxes, hydraulic giant to assist in feeding the gravel to the sluice boxes, and a dragline to remove and stack the tailing), was the largest gold producer in the district in 1953.

Other operations that recovered moderate quantities of gold from placer mines by using combinations of dragline, bulldozer, and hydraulic equipment with sluice boxes in the Fortymile district in 1953 were Purdy Bros. on Myers Fork and on Atwater Bar (South Fork of the Fortymile River), George F. Robinson on Wade Creek, William Meldrum on claim No. 1 on Stonehouse Creek, Jack Wilkey on Squaw Gulch, and Vern Weaver & John Rambaud on Napoleon Creek. Frank Barrett (claim No. 5 above Discovery on Stonehouse Creek) and Jack LaCross (Turk Creek) recovered small quantities of gold from their placer mines.

Hot Springs District.—Five placer operations produced gold in the Hot Springs district in 1953; all operations used various combinations

of dragline, bulldozer, and hydraulic equipment with nonfloating washing plants (sluice boxes) to recover the gold. Strandberg & Sons, the largest producer of gold in the district in 1953, operated a mine on Eureka Creek that was purchased from L. McGee in 1952. The company also continued a development program on the Sullivan Creek property that consisted of ditchwork and stripping. A. W. Pringle operated on Rhode Island Creek, Tony Lanning on claim No. 11 above Discovery on Omega Creek, Oscar Enstrom and Peter McDougall (partnership) on American Creek, and Pete Johnson and Robert Isaacson (partnership) on Eureka Creek.

Hughes District.—Strandberg & Sons recovered a substantial quantity of gold from its placer operation on the Indian River in 1953. A dragline dug and fed the gold-bearing gravel to a portable, nonfloating, washing plant (hopper, trommel screen, tables, stacker, and track mounted); this type of washing plant commonly is called a "dry-land dredge." L. F. James conducted a placer operation on Felix Fork in 1953.

Iditarod District.—Of the 9 active placer mines in the Iditarod district in 1953, 2 used bucketline dredges to dig and wash the gold-bearing gravels, 6 used bulldozers to dig and deliver gravel to sluice boxes (nonfloating washing plants), and 1 used hydraulic giants exclusively to deliver gravel to sluice boxes. The North American Dredging Co. operated its diesel-powered bucketline dredge (equipped with seventy $3\frac{1}{2}$ -cubic-foot buckets) on the Mohawk Association on Otter Creek at the mouth of Flat Creek from April 7 to November 2, 1953. Steen & Ogriz (partnership) operated the J. E. Riley Investment Co. bucketline dredge, equipped with fifty-eight $3\frac{1}{2}$ -cubic-foot buckets, on Otter Creek in 1953. The dredge had not been operated since the close of the 1942 mining season.

Of the six placer operations in the district in 1953 that used bulldozers to dig and deliver gravel to sluice boxes, the Miscovich Bros. operation on Discovery claim, Otter Creek, was the largest producer of gold. The tailing from former operations was rewashed, and the blocky bedrock was dug with a hoe shovel to recover the gold left by the first operation. Other placer operations (all used bulldozers for handling the gravel) that produced moderate quantities of gold were Hatton & Turner on Chicken Creek, Patrick Savage (Alpha Mining Co.) on the Alpha Association on Flat Creek, Prince Creek Mining Co. (Harry Agoff) on Prince Creek, Harry Francis on Flat Creek, and Jules Stuver on Happy Creek.

Gust Backstrom, on the Idaho mine on Chicken Creek Dome at the head of Flat Creek, recovered 152 fine ounces of gold and 23 fine ounces of silver from 1,500 cubic yards of gravel that was fed to sluice boxes by hydraulic giants.

Innoko District.—Two placer-mining operations were new to the district in 1953—Ophir Mining Co. on Ganes Creek and Strandberg & Sons on Colorado Creek. The bucketline dredge on Ganes Creek, last operated during the 1951 mining season by the Innoko Dredging Co., was operated during 1953 by the Ophir Mining Co.; this diesel-powered dredge (equipped with forty-five $3\frac{1}{2}$ -cubic-foot buckets) was operated from May 31 to October 31, 1953. The Strandberg & Sons operation on Colorado Creek, upstream from the Colorado Creek

Mining Co. operation, used mining and washing equipment similar to that at its Indian River operation in the Hughes district. A dragline dug and delivered the gold-bearing gravel to a portable, nonfloating, track-mounted, washing plant with a hopper, trommel screen, tables, and stacker (dry-land dredge).

The J. A. Degan Mining Co. moved its placer-mining operation from Little Creek in the Ophir area to Esperanto Creek in the Tolstoi area of the Innoko district during the winter of 1952-53. The operation recovered a substantial quantity of gold from Esperanto Creek during the 1953 mining season. The company used a combination of dragline, bulldozer, and hydraulic equipment with sluice boxes on bedrock.

The Bedrock Mining Co., a newcomer in the district in 1952, recovered moderate quantities of gold from placer operations on Little and Bedrock Creeks.

Other placer operations that produced moderate to substantial quantities of gold in the district in 1953 and have been steady producers of gold in prior years were Rosander & Reed (partnership) on Yankee Creek, Colorado Creek Mining Co. on Colorado Creek, Uotila & Hard (partnership) on Ophir Creek, and Eric Hard on Forgotten Bench on Bear Creek and on Last Chance claim on Cripple Creek. All operations used combinations of dragline, bulldozer, and hydraulic equipment with nonfloating washing plants (sluice boxes) to handle and wash the gravel to recover the gold.

Kantishna District.—During 1953 Earl Pilgrim & Co. (with DMEA assistance) continued an exploration program that was begun in 1952 at the Stampede Antimony mine; at the close of 1953 diamond drilling and drifting were in process. A substantial addition was made to the ore reserves, but no ore was mined or shipped from the property in 1953.

Koyukuk District.—The Myrtle Creek Exploration Co. on Myrtle Creek was the largest producer of gold in the Koyukuk district in 1953. It was a placer-mining operation that employed power-excavating equipment with a nonfloating washing plant to recover the gold. Eight other placer mines were active in the district in 1953; the largest operations were (in order of output) Andy Schwaesdall on Myrtle Creek, Fred Pitts on Lake Creek, Joseph B. Blundell on Jim Pup, Wakeup, and California Creeks, Erling Nesland on Vermont Creek, Oliver Chappel on Thompson Gulch, Harry Leonard on Smith Creek, A. W. Withrow on Bedrock Bar on the Koyukuk River, and John D. Irwin on the Wild River.

Marshall District.—Lars Ostnes & Co. was the only producer of gold in the Marshall district in 1953. The company recovered 994 fine ounces of gold and 128 fine ounces of silver from its placer mine on Willow Creek between June 5 and October 1, 1953. The company used two hydraulic giants for removing overburden, a bulldozer to deliver gold-bearing gravel to sluice boxes placed on bedrock, and a dragline for the movement of trailing.

Melozitna District.—In 1953 the Iditarod Operating Co. produced a substantial quantity of gold from its placer mine 30 miles west of Tanana on Golden Creek.

During 1953 I. W. and Sara Purkeypile completed the field work that was begun in 1952 on a placer-tin prospect on Tozimoran Creek.

The exploration program was conducted with the assistance of a DMEA contract.

Rampart District.—The gold produced in the Rampart district in 1953 came from four placer operations (all using bulldozers to deliver gravel to sluice boxes)—Little Minook Mining Co. on Little Minook Creek, Melo Jackovich on Hunter Creek, Swanson Bros. on Hunter Creek, and Quail Creek Mining Co. (Willie H. Redig and Melvin Haugdahl, partners) on Quail Creek. Ira Weisner conducted some preparatory work on his placer prospect on Little Minook Jr. Creek in 1953.

Ruby District.—Gold was produced in the Ruby district in 1953 by three placers that had been steady producers of gold for several years before 1953. Long Creek Mining Co. operated its placer mine on Long Creek; Clarence Zaiser moved his placer-mining outfit from Spruce Creek to Rabbit claim on Greenstone Creek and operated throughout the 1953 mining season; Granite Creek Mining Co. (William Carlo) operated its placer mine on Ophir Creek. The Misovich Bros. spent the summer doing work to prepare for placer mining on Poorman Creek; 2 bulldozers were used to build 4 miles of water ditch and to remove overburden.

Tolovana District.—For the third consecutive year the Callahan Zinc-Lead Co. operated a bucketline dredge (eighty-six 6-cubic-foot buckets) on Livengood Creek in the Livengood district on a management basis for R.F.C. Olive Creek Mines recovered a substantial quantity of gold from Olive Creek by using bulldozers to dig and deliver the gold-bearing gravel to sluice boxes placed on bedrock and a dragline to move and stack the tailing from the washing operation. Two smaller placer operations were L. Tom Car and John Jurich on Lillian Creek and Bentley Falls on Wilbur Creek.

The Mineral Industry of Arizona

By Paul Luff¹



DESPITE a decline in production of copper—the most important mineral by far produced in Arizona—in 1953 the total value of the State's 1953 mineral production, exclusive of uranium and manganese, rose to \$256,616,000, the highest annual total value ever recorded and an 11-percent gain over the 1952 value of \$231,702,000. This gain resulted mainly from a higher average price of copper (\$0.287 per pound in 1953 compared with \$0.242 in 1952) and from substantial increases in the production of some nonmetallic minerals.

Outstanding features that affected Arizona's mining activities in 1953 were the continued decline in the number of lead-zinc producers and in the mining of lead-zinc ore and copper-zinc ore; marked decreases in the production of asbestos, barite, feldspar, and perlite; a record production of manganese ore and tungsten, resulting from the Government's guaranteed price program; significant increases in the production of fluorspar, lime, pumice and pumicite, sand and gravel, and quartz and quartzite; and a continued rise in the production of cement, gypsum, and copper ore from open pits. Although more copper ore was mined in 1953 than in any other year, the production of the metal was slightly less than in 1952, owing to a marked decrease in production of copper from copper-zinc ore.

Of the total value in 1953, copper contributed 88, zinc 3, gold 2, silver 1, sand and gravel 1, lead 1, and other minerals 4 percent. Five metals—copper, gold, lead, silver, and zinc, valued in all at \$242,572,000—composed 95 percent of the total value. The value of the metals recovered from copper ore (including precipitates)—copper, gold, lead, molybdenum, silver, and zinc—was \$229,528,000 in 1953, or 89 percent of the State total. The value of the metallic production in 1953 was \$244,530,000, 95 percent of the total value; nonmetallic, \$12,054,000, 5 percent of the total value; and mineral fuels (coal), \$32,000.

In 1953 Arizona remained the largest producer of copper in the United States and ranked 3d in chrysotile asbestos, 4th in silver, 5th in gold, 7th in lead, and 10th in zinc. It also produced cement, clays, lime, manganese ore, molybdenum, pumice and pumicite, sand and gravel, silica (quartzite), and tungsten.

Except for copper, lead, and zinc, markets and prices for metallic minerals were stable throughout the year. The Government copper-control price of 24.5 cents per pound for electrolytic copper, delivered Connecticut Valley, established January 26, 1951, was decontrolled February 25, 1953. The price rose immediately to a range of 27.5

¹ Commodity-industry analyst, Region IV, Bureau of Mines, Denver, Colo.

to 34.5 cents per pound. By the end of April domestic copper prices had settled to a range of 29.5 to 30 cents per pound. The 3 leading producers continued to quote domestic copper at 30 cents beyond the end of the year, with other sellers quoting that price or slightly less. Despite a good demand for domestic lead and zinc throughout the year, the market prices for these metals dropped to lower levels, owing to an influx of low-cost foreign production. The year opened with lead quoted at 14.75 cents per pound and zinc at 12.50 cents per pound, but the price of zinc advanced to 13 cents on January 2. The price of lead dropped to 14.5 cents on January 7 and after subsequent decreases reached a low for the year of 12 cents on April 20; however, the price began to strengthen at the end of April and by July 23 had risen to 14 cents—on September 16 it declined to 13.5 cents and remained at that figure to the end of the year. The price of zinc declined gradually through January and February until it reached 11 cents per pound on March 5. The price of 11 cents prevailed until September, when it dropped to 10 cents, the low for the year, and remained at that figure to the end of the year.

Wages.—An average of 15,000 men were employed in the mineral industries in Arizona during 1953—13,000 in the copper industry alone. No serious strikes occurred during the year. Some of the major mines operated 7 days a week, and others 6 days; in general, mills operated 7 days a week.

Defense Minerals Exploration Administration.—The Federal Government's assistance in financing exploration projects in search of reserves of strategic and critical minerals, authorized by the Defense Production Act of 1950, continued throughout 1953 for most of the minerals. From January 1951 through December 31, 1952, the Government assisted in financing 18 projects in Arizona. The cost of these projects totaled \$920,857, with the Government providing \$550,964 and private industry \$369,893. In 1953, 13 projects were approved, as follows: Asbestos (6), copper (1), copper-zinc (1), lead (1), manganese (1), tungsten (2), and zinc (1). The cost of these projects totaled \$378,838, with the Government providing \$245,704 and private industry \$133,134. Details covering the various 1953 projects are given in table 3.

Mills, Smelters, and Purchase Depots.—Seventy-two milling plants operated in Arizona in 1953—25 on base-metal ore, 24 on manganese ore and tungsten ore, 10 near Globe on asbestos ore, and 13 on miscellaneous ores. The most important mills that operated nearly all year were the copper concentrators at Morenci (45,000 tons a day), Ajo (30,000 tons increased from 25,000 tons), Miami (18,000 tons), Inspiration (18,000 tons), Hayden (12,000 tons), Castle Dome (10,000 tons), Bagdad (4,000 tons), Superior (1,500 tons), and Bisbee (900 tons); the copper-leaching plants at Inspiration (9,000-ton) and Miami (3,000-ton); the lead-zinc concentration mills at Humboldt (Iron King 670-ton), Patagonia (Trench 200-ton), and Klondyke (Athletic 100-ton); and the copper-zinc concentrators at Clarkdale (United Verde 2,100-ton, closed down in March), Dragoon (Coronado 200-ton), Yucca (Antler 130-ton, closed down in April, and Copper World 100-ton, closed down in October), Bagdad (Hillside 100-ton), and the B. S. & K. 100-ton mill near Red Rock. The old 500-ton con-

centrator at the Christmas mine began treating copper ore in October. The Iron King and Trench mills treated various types of custom ores in addition to company ore. The following plants treated various types of material: Arizona Barite at Mesa (barite), Arizona Portland Cement Co. at Rillito (cement rock), Consolidated Feldspar at Kingman (feldspar and silica), Holmestake at Blaisdell (fluorspar), Arizona Gypsum at Phoenix (gypsum rock), Huntley Industrial at Kingman (mica), Buckeye at Buckeye (mica), and American Arizona Mines, Inc., at Aguila (mica). Perlite Industries of Arizona operated a plant near Phoenix that produced expanded perlite, and four plants—Grand Canyon Lime & Cement Co. of Arizona at Nelson, Hoopes & Co. at Globe, Paul Lime Plant at Paul Spur, and Phelps Dodge Corp. at Morenci—produced lime.

Arizona had six copper smelters—Phelps Dodge Corp. at Ajo, Douglas, and Morenci, International Smelting & Refining Co. at Miami, American Smelting & Refining Co. at Hayden, and Magma Copper Co. at Superior; each smelter operated throughout the year. The State had no lead or zinc smelters; all of the lead concentrate produced at milling plants was shipped to a smelter at El Paso, Tex., and all the zinc concentrate was shipped to smelters at Amarillo, Corpus Christi, and Dumas, Tex.; Bartlesville, Okla.; St. Louis, Mo.; Anaconda and Great Falls, Mont.; and Kellogg, Idaho. Small lots of base-metal ores were purchased in 1953 by Hawley & Hawley at Douglas, T. E. Harper at Prescott, and Robert Lenon at Patagonia. The better grades (1, 2, and 3 fiber) of asbestos produced in Arizona in 1953 were purchased by the General Services Administration (Government depot at Globe); tungsten ore or concentrate was purchased by R. L. Brown (Tombstone), E. Fernstrom (Tucson), and Elmer Walker (Dragoon), all of Arizona; Black Rock Mining Corp., C. W. Jones, National Hardware & Supply Co., and United States Vanadium Co., all of Bishop, Calif.; General Services Administration, San Francisco, Calif.; and Molybdenum Corp. of America, Pittsburgh, Pa. All of the manganese ore and concentrate was shipped to the National Strategic Stockpile depots at Wenden, Ariz., and Deming, N. Mex.; and most of the molybdenite concentrate was shipped to eastern buyers. Some facts regarding the manganese depot at Wenden were published in November 1953.²

New Plant or Projects and New Industries.—The principal projects under development in 1953 were the San Manuel underground copper property near Tiger, Pinal County, by San Manuel Copper Corp. (wholly owned subsidiary of Nagma Copper Co.); Lavender open pit (copper) at Bisbee, Cochise County, by Phelps Dodge Corp.; Silver Bell copper property (Oxide and El Tiro open pits) in Pima County by American Smelting & Refining Co.; Copper Cities open pit (copper) near Miami, Gila County, by Copper Cities Mining Co. (wholly owned subsidiary of Miami Copper Co.); expansion of mining and milling copper ore at the Bagdad open pit at Bagdad, Yavapai County, by Bagdad Copper Corp.; and development of copper-ore reserves in a new area at the underground Miami mine at Miami,

² Mining World, Government Manganese Purchase Depot at Wenden: Vol. 15, No. 12, November 1953, pp. 53-56.

Gila County, by Miami Copper Co. When these projects are completed, 638 million tons of ore averaging approximately 0.75 percent copper will be available for milling, and 61 million tons averaging 0.43 percent copper will be available for leaching. Details regarding the above projects were published in July 1953.³

Copper-Lead-Zinc-Silver-Gold Ore Output.—The total ore, old tailing, and cleanings mined and treated was 45,701,000 short tons in 1953 compared with 45,385,000 tons in 1952, a 1-percent gain. Of the total material treated, 99 percent was copper ore from the Ajo, Copper Mountain, Eureka, Globe-Miami, Mineral Creek, Pioneer, and Warren districts; the remainder was largely lead-zinc ore from the Aravaipa, Big Bug, Harshaw, and Warren districts and copper-zinc ore from the Cochise, Cedar Valley, Eureka, and Verde districts. The output of copper ore reached a record total of 45,188,000 tons in 1953, a 2-percent gain over 1952. Of the total copper ore output, 38,628,000 tons (85.5 percent) containing an average of 0.867 percent copper per ton, came from 6 open pits; this is a gain of 1,150,000 tons or 3 percent over 1952 but a decrease of 0.041 percent in the average grade of the ore. The output of copper ore from underground has been declining in recent years, and the output in 1953 dropped to a low of 6,560,000 tons, a decrease of 434,000 tons (6 percent) from 1952. The output of lead-zinc ore in 1953 was 275,300 tons and that of copper-zinc ore 145,000 tons, decreases of 184,300 tons (40 percent) and 193,000 tons (57 percent), respectively, from 1952. These marked losses resulted from the closing in 1952 and 1953 of several lead-zinc and copper-zinc producers caused by continued reductions in the domestic prices of lead and zinc. The output of gold ore declined 5,800 tons (72 percent), gold-silver ore 7,100 tons (74 percent), and copper-lead-zinc ore 3,100 tons (71 percent), but that of silver ore increased 7,500 tons (50 percent) and zinc ore 1,900 tons (36 percent); the output of lead ore decreased slightly (64 tons). Of the 45,701,000 tons of base-metal ores, old tailing, and cleanings mined and treated in 1953 in Arizona, 41,423,000 tons (91 percent) was treated at 25 milling plants, 3,577,000 tons (8 percent) at 1 straight leaching (copper) plant, and 700,800 tons (1 percent) was shipped direct to smelters. Crude ore treated at milling plants comprised chiefly 40,997,000 tons of copper ore averaging 0.914 percent copper and containing minor quantities of gold, lead, silver, and zinc per ton; 269,600 tons of lead-zinc ore averaging 0.10 ounce of gold and 3.65 ounces of silver to the ton, 0.27 percent copper, 3.64 percent lead, and 8.47 percent zinc; and 145,000 tons of copper-zinc ore averaging 0.01 ounce of gold and 0.75 ounce of silver to the ton, 2.57 percent copper, 0.07 percent lead, and 7.59 percent zinc.

³ Engineering and Mining Journal, New Copper Projects Operating, in Construction, or Planned: Vol. 154, July 1953, pp. 110-116.

TABLE 1.—Mineral production in Arizona, 1952-53 ¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Brucite.....			100	\$1,250
Clays.....	247,329	\$579,175	197,401	715,248
Coal.....	5,003	33,000	5,140	32,135
Copper (recoverable content of ores, etc.).....	395,719	191,527,996	393,525	225,883,350
Fluorspar.....	434	(²)	1,951	113,270
Gold (recoverable content of ores, etc.) troy ounces.....	112,355	3,932,425	112,824	3,948,840
Gypsum.....	11,314	28,285	13,484	43,824
Lead (recoverable content of ores, etc.).....	16,520	5,319,440	9,428	2,470,136
Lime (open-market).....	53,019	757,390	96,408	1,238,204
Manganese ore (35 percent or more Mn) gross weight.....	203	(²)	(²)	(²)
Mica (scrap).....	(²)	(²)	3,721	114,870
Molybdenum (content of ore and concentrate) pounds.....	2,022,832	1,987,418	1,446,557	1,425,552
Perlite.....	2,747	14,568	(²)	(²)
Pumice and pumicite.....	(²)	(²)	123,797	425,985
Sand and gravel.....	1,824,330	1,635,903	3,446,821	2,680,470
Silver (recoverable content of ores, etc.) troy ounces.....	4,701,330	4,254,941	4,351,429	3,938,263
Stone (except limestone for cement and lime).....	235,020	355,709	442,358	618,748
Tungsten concentrate—60-percent WO ₃ basis.....	71	251,136	134	468,858
Zinc (recoverable content of ores, etc.).....	47,143	15,651,476	27,530	6,331,900
Undistributed: Asbestos, barite, beryllium concentrate, 1953, cement, feldspar, gem stones, silica quartz, vanadium, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2).....		\$ 5,373,512		6,165,553
Total Arizona.....		\$ 231,702,000		256,616,000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers) Excludes uranium.

² Value included with "Undistributed."

³ Revised figure.

TABLE 2.—Average prices of certain mineral commodities in Arizona, 1952-53 ¹

Commodity	1952	1953
Asbestos..... short ton.....	(²)	(²)
Clays:		
Fire and common..... do.....	\$0.934	\$1.015
Bentonite..... do.....	3.393	4.833
Copper ³ pound.....	.242	.287
Fluorspar (concentrate)..... short ton.....	(⁴)	58.057
Gold ⁵ troy ounce.....	35.000	35.000
Gypsum (crude)..... short ton.....	2.500	3.250
Lead ⁶ pound.....	.161	.131
Lime..... short ton.....	12.817	12.843
Molybdenum..... Mo content, pound.....	.982	.985
Perlite (crude)..... short ton.....	4.943	6.502
Pumice and pumicite..... do.....	6.000	3.441
Sand and gravel:		
Commercial..... do.....	1.073	.974
Noncommercial..... do.....	.276	.439
Silica (quartz)..... do.....		14.270
Silver ⁶ troy ounce.....	.905+	.905+
Stone:		
Dimension..... short ton.....	10.309	10.083
Crushed and miscellaneous..... do.....	1.499	1.255
Tungsten..... short-ton unit contained in 60-percent WO ₃ concentrate.....	58.830	58.930
Zinc ⁷ pound.....	.166	.115

¹ Prices are based on average value f. o. b. mines or mills reported by the producers, except where otherwise noted.

² Price varied from \$150 to \$1,500 per ton, depending upon grade.

³ Yearly average weighted price of all grades of primary metal sold by producers.

⁴ Bureau of Mines not at liberty to publish.

⁵ Price under authority of Gold Reserve Act of Jan. 31, 1934.

⁶ Treasury buying price for newly mined silver.

TABLE 3.—Defense Minerals Exploration Administration contracts in 1953 and total value of contracts from January 1951 through Dec. 31, 1953

Name of commodity and contractor	Property	County	Date of contract	Participation	
				Government	Private
<i>Asbestos</i>					
Bore Tree Saddle Asbestos Co.	2 unpatented lode-mining claims.	Gila.....	July 20, 1953	\$9, 725	\$1, 081
Jaquays Mining Corp.....	Asbestos King No. 2, 3, 4 and 5.	.....do.....	Jan. 26, 1953	10, 800	1, 200
Do.....	Regal Mine.....	.....do.....	Aug. 24, 1953	23, 400	2, 600
Metate Asbestos Corp.....	Apache Mines.....	.....do.....	Jan. 7, 1953	2, 745	305
Jack L. Neal & Dennis E. Green.	6 unpatented lode-mining claims known as the Mystery Mines Nos. 1 through 6.	.....do.....	May 22, 1953	24, 242	2, 694
W. A. Scott, Harry R. Scott and R. D. Vinck.	2 unpatented lode-mining claims.	.....do.....	Apr. 1, 1953	12, 722	1, 414
<i>Copper</i>					
Richard E. Chilson.....	2 patented and 1 unpatented lode-mining claims.	Pima.....	Sept. 28, 1953	13, 575	13, 575
<i>Copper-zinc</i>					
Coronada Copper & Zinc Co.	10 mining claims.....	Cochise.....	May 18, 1953	49, 525	49, 525
<i>Lead</i>					
Gordon R. French.....	Crown Point, Silver Cloud and Wedge patented mining claims.	Pinal.....	Aug. 11, 1953	9, 750	9, 750
<i>Manganese</i>					
Ace Building & Roofing Supplies.	2 unpatented lode-mining claims.	Greenlee.....	Feb. 27, 1953	17, 880	5, 960
<i>Tungsten</i>					
A. R. Floreen, George B. Dryden & L. N. Duryea.	2 unpatented mining claims.	Yuma.....	May 21, 1953	14, 715	4, 905
Carl Hovgard.....	10 unpatented lode-mining claims.	Mohave.....	Oct. 30, 1953	24, 750	8, 250
<i>Zinc</i>					
Globe Miami Copper-Zinc Corp.	9 unpatented mining claims.	Gila.....	Jan. 16, 1953	31, 875	31, 875
Total, 1953.....				245, 704	133, 134
Total of contracts through Dec. 31, 1952.....				550, 964	369, 893
Grand total through 1953.....				796, 668	503, 027

REVIEW BY MINERAL COMMODITIES

METALS

Beryllium.—A small quantity of beryllium ore was produced and marketed in 1953.

Copper.—Copper production in Arizona in 1953 was only 2,194 tons (1 percent) less than in 1952—a marked decrease of 3,668 tons (53 percent) in production of copper from copper-zinc ore and of 1,524 tons from copper precipitate in 1953 more than offset an increase of 3,797 tons in production from copper ore. Of the total copper produced in 1953 (393,525 short tons), 277,664 tons (71 percent) came from 6 open pits at Ajo, Bagdad, Inspiration, Miami (Castle Dome), Morenci, and Ray; however, production from this source was 1 percent less than in 1952 because the grade of the ore dropped from an average of 0.907 to 0.867 percent per ton. On the other

hand, production of copper from underground copper mines increased to 91,538 tons—23 percent of the total—in 1953, a 7-percent gain over 1952; most of the production came from mines at Bisbee, Inspiration, Miami, Ray, and Superior. In 1953 the 7 principal copper-producing districts in Arizona—Copper Mountain, Globe-Miami, Ajo, Mineral Creek, Warren, Pioneer, and Eureka—produced 387,079 tons of copper compared with 385,427 in 1952. This gain was more than offset by a marked decrease of 3,898 tons (86 percent) in copper production from the Verde district, formerly one of the most important copper-producing areas in Arizona. The United Verde mine, a large producer of copper in the Verde district since 1881, was closed down permanently March 23, 1953, owing to exhaustion of ore reserves. The Morenci open pit was again the largest copper producer in Arizona; it was followed in order by the New Cornelia (open pit), Ray (open pit and underground), Inspiration (open pit and underground), Copper Queen (underground), Miami (underground), Magma (underground), Castle Dome (open pit), and Bagdad (open pit) properties. These 9 properties produced 98 percent of the State total.

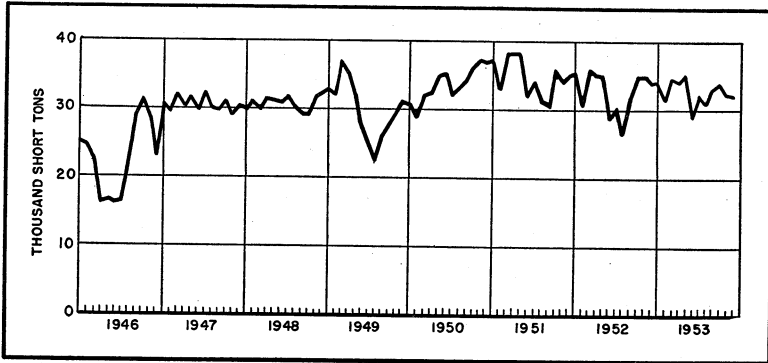


FIGURE 1.—Mine production of copper in Arizona, 1946-53, by months, in terms of recoverable metal.

Gold.—Arizona's gold production increased slightly from 112,355 fine ounces in 1952 to 112,824 ounces in 1953—the increase of 6,032 ounces of gold from copper ore more than offset a decrease of 5,335 ounces from copper-zinc ore and lead-zinc ore. Most (80 percent) of the State's 1953 gold production was recovered as a byproduct from the treatment of copper ore that came mainly from the Ajo, Copper Mountain, Globe-Miami, Pioneer, and Warren districts. The remainder was recovered chiefly from lead-zinc ore produced at a mine in the Big Bug district. Gold production from placers increased from 70 ounces to 109; nearly all of it came from operations on Lynx Creek, Yavapai County, and from the Colorado River Placers, Yuma County. The quantity of gold produced from gold ore declined from 1,109 ounces in 1952 to 626 in 1953. The New Cornelia copper mine of the Phelps Dodge Corp. (Pima County) continued to be the leading gold producer in Arizona; it was followed by the Copper Queen mine of the Phelps Dodge Corp. (Cochise County), the Iron King mine (Yavapai County), the Magma mine

(Pinal County) and the Morenci mine of the Phelps Dodge Corp. (Greenlee County); these 5 properties produced 93 percent of the total gold.

TABLE 4.—Mine production of gold, silver, copper, lead, and zinc, 1944-48 (average), 1949-53, and total, 1860-1953, in terms of recoverable metals ¹

Year	Mines producing		Material sold or treated ² (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1944-48 (average)---	259	27	35,357,538	94,751	\$3,316,292	4,125,569	\$3,361,904
1949-----	340	32	38,372,870	108,993	3,814,755	4,970,736	4,498,767
1950-----	309	24	42,709,272	118,313	4,140,955	5,325,441	4,819,793
1951-----	265	18	43,820,353	116,093	4,063,255	5,120,985	4,634,750
1952-----	187	7	45,385,327	112,355	3,932,425	4,701,330	4,254,941
1953-----	163	6	45,700,618	112,824	3,948,840	4,351,429	3,938,263
1860-1953-----			(³)	11,642,084	294,968,095	326,564,159	247,924,633

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1944-48 (average) -	335,214	\$116,921,789	24,394	\$6,150,767	44,418	\$10,850,158	\$140,600,910
1949-----	359,010	141,449,940	33,568	10,607,488	70,658	17,523,184	177,894,134
1950-----	403,301	167,773,216	26,383	7,123,410	60,480	17,176,320	201,033,694
1951-----	415,870	201,281,080	17,394	6,018,324	52,999	19,291,636	235,289,045
1952-----	395,719	191,527,996	16,520	5,319,440	47,143	15,651,476	220,686,278
1953-----	393,525	225,883,350	9,428	2,470,136	27,530	6,331,900	242,572,489
1860-1953-----	13,886,856	4,553,806,458	535,815	98,830,780	645,402	157,063,433	5,352,593,399

¹ Includes recoverable metal content of gravel washed (placer operations), ore milled, old tailings or slimes retreated, and ore, old tailings, or copper precipitates shipped to smelters during the calendar year indicated.

² Does not include gravel washed or tonnage of precipitates shipped.

³ Figure not available.

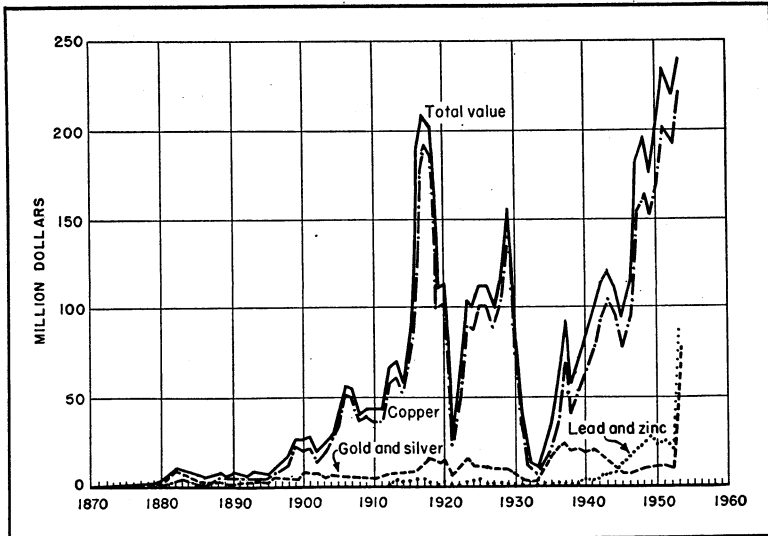


FIGURE 2.—Value of mine production of gold, silver, copper, lead, and zinc in Arizona, 1870-1953.

TABLE 5.—Mine production of gold, silver, copper, lead, and zinc in 1953, by months, in terms of recoverable metals ¹

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January.....	10,000	371,600	33,960	850	2,600
February.....	9,305	352,925	31,425	830	2,600
March.....	10,045	414,970	34,850	885	2,560
April.....	10,120	380,060	34,285	860	2,320
May.....	9,220	362,030	35,050	815	2,230
June.....	8,265	332,100	29,140	690	2,015
July.....	9,085	325,000	32,340	820	2,135
August.....	7,400	333,400	30,710	710	2,100
September.....	9,070	365,900	33,300	710	2,140
October.....	10,100	377,915	33,900	810	2,300
November.....	10,132	363,015	32,352	731	2,275
December.....	10,082	367,514	32,163	717	2,205
Total.....	112,824	4,351,429	393,525	9,428	27,530

¹ Mine production comprises ore, gravel, or other mineral material sold or treated and metal recovered as natural gold or as bullion from cyanidation or amalgamation and the estimated recoverable metal (or gross metal as indicated) contained in concentrates, ores, tailings, and other mineral materials shipped directly to smelters or sold to ore buyers within the year.

TABLE 6.—Gold produced at placer mines, 1944-48 (average) and 1949-53, by classes of mines and methods of recovery

Class and method	Mines producing	Material treated (cubic yards)	Gold recovered		
			Fine ounces	Value	Average value per cubic yard
Surface placers:					
Gravel mechanically handled:					
Dragline dredges:					
1944-48 (average).....	(1)	32,000	37	\$1,295	\$0.04
1949-52.....					
1953.....	1	9,500	49	1,715	.18
Nonfloating washing plants: ²					
1944-48 (average).....	1	21,300	157	5,509	.26
1949.....	3	76,800	426	14,910	.19
1950.....	1	100	75	2,625	26.25
1951.....	1	150	61	2,135	14.23
1952.....	1	200	58	2,030	10.15
1953.....					
Small-scale hand methods:					
Wet and dry:					
1944-48 (average).....	20	3,592	256	8,960	2.49
1949.....	27	4,365	130	4,550	1.04
1950.....	20	2,740	48	1,680	.61
1951.....	15	1,265	89	3,115	2.46
1952.....	5	530	11	385	.73
1953.....	5	870	60	2,100	2.41
Underground placers:					
Drift:					
1944-48 (average).....	6	137	16	560	4.09
1949.....	2	320	9	315	.98
1950.....	3	450	19	665	1.48
1951.....	2	150	6	210	1.40
1952.....	1	50	1	35	.70
1953.....					
Grand total placers:					
1944-48 (average).....	27	57,029	466	16,324	.29
1949.....	32	81,485	565	19,775	.24
1950.....	24	3,290	142	4,970	1.51
1951.....	18	1,565	156	5,460	3.40
1952.....	7	780	70	2,450	3.14
1953.....	6	10,370	109	3,815	.37

¹ Less than 1.

² Includes all placer operations using power excavator and washing plant, both on dry land; an outfit with movable washing plant is termed a "dry-land dredge."

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in 1953, by counties, in terms of recoverable metals

County	Mines producing		Material sold or treated ¹ (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
Cochise.....	18	-----	676,025	31,202	\$1,092,070	1,360,502	\$1,231,323
Coconino.....	1	-----	23	-----	-----	1	1
Gila.....	17	-----	11,592,056	2,310	80,850	143,487	129,863
Graham.....	5	-----	16,603	25	875	14,576	13,192
Greenlee.....	3	-----	16,201,215	6,526	228,410	537,633	486,585
Maricopa.....	7	-----	212	16	560	1,485	1,344
Mohave.....	12	-----	20,253	59	2,065	9,689	8,769
Pima.....	19	-----	9,621,160	37,376	1,308,160	487,343	441,070
Pinal.....	25	-----	6,037,878	15,659	548,065	894,033	809,145
Santa Cruz.....	22	-----	59,347	156	5,460	218,642	197,882
Yavapai.....	25	5	1,473,612	19,290	675,150	679,368	614,862
Yuma.....	9	1	2,234	205	7,175	4,670	4,227
Total: 1953.....	163	6	45,700,618	112,824	3,948,840	4,351,429	3,938,263
1952.....	187	7	45,385,327	112,355	3,932,425	4,701,330	4,254,941

County	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
Cochise.....	31,242	\$17,932,908	1,487	\$389,594	5,431	\$1,249,130	\$21,895,025
Coconino.....	2	1,148	-----	-----	-----	-----	1,149
Gila.....	87,108	49,999,992	6	1,572	1	230	50,212,507
Graham.....	52	29,848	904	236,848	1,732	398,360	679,123
Greenlee.....	123,789	71,054,886	-----	-----	-----	-----	71,769,881
Maricopa.....	10	5,740	-----	-----	-----	-----	7,644
Mohave.....	272	156,128	65	17,030	416	95,680	279,672
Pima.....	66,664	38,265,136	6	1,572	1,336	307,280	40,323,218
Pinal.....	72,672	41,713,728	78	20,436	9	2,070	43,093,444
Santa Cruz.....	750	430,500	2,469	646,878	4,552	1,046,960	2,327,680
Yavapai.....	10,951	6,285,874	4,367	1,144,154	14,053	3,232,190	11,952,230
Yuma.....	13	7,462	46	12,052	-----	-----	30,916
Total: 1953.....	393,525	225,883,350	9,428	2,470,136	27,530	6,331,900	242,572,489
1952.....	395,719	191,527,996	16,520	5,319,440	47,143	15,651,476	220,686,278

¹ Does not include gravel washed or tonnage of precipitates shipped.

Lead.—Arizona's production of recoverable lead dropped to 9,428 short tons in 1953—a decrease of 7,092 tons (43 percent) from 1952. This loss resulted from continued reductions in the domestic prices of lead and zinc, which caused two large producers and many small producers of lead-zinc ore in 1952 and some producers in 1953 to suspend operations. The number of lead-zinc producers declined from 33 in 1952 to 18 in 1953 and the tons of ore from 459,567 to 275,275. Of the total lead produced in 1953, 93 percent was recovered from lead-zinc ore mined chiefly from 5 mines in the Aravaipa, Big Bug, California, and Harshaw districts; the remainder was recovered mostly from lead ore mined from 4 mines in the Mineral Creek, Swisshelm, and Turquoise districts. The Iron King lead-zinc mine in the Big Bug district continued to be the leading lead producer in Arizona; it was followed by the Flux lead-zinc mine near Patagonia, Aravaipa lead-zinc property near Klondyke, and Hilltop lead-zinc mine at Hilltop.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1953, by classes of ore or other source materials, in terms of recoverable metals

Source	Number of mines ¹	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode ore:							
Dry gold.....	16	2,252	626	1,318	7,200	2,700	-----
Dry gold-silver.....	4	2,467	778	14,716	2,910	3,560	-----
Dry silver.....	11	22,497	632	198,616	185,700	-----	-----
Total.....	31	27,216	2,036	214,650	195,810	6,260	-----
Copper.....	83	45,187,838	89,724	3,164,255	738,404,453	3,820	55,500
Copper-lead.....	1	1	-----	8	90	140	-----
Copper-lead-zinc.....	2	1,260	-----	6,759	54,400	100,200	184,900
Copper-zinc.....	7	144,910	1,144	73,931	6,517,400	90,420	15,723,200
Lead.....	31	4,513	1,339	52,240	8,380	1,066,950	49,600
Lead-zinc.....	18	275,275	17,872	827,866	937,530	17,454,260	36,240,700
Zinc.....	3	7,279	18	2,030	173,190	1,050	2,706,600
Total.....	133	45,621,076	110,097	4,127,089	746,095,443	18,716,840	54,960,500
Other "lode" material:							
Old tailings, etc. ²	-----	52,326	582	9,671	323,900	132,900	99,500
Copper precipitates.....	-----	26,399	-----	-----	40,434,847	-----	-----
Total.....	-----	78,725	582	9,671	40,758,747	132,900	99,500
Total "lode" material.....	163	45,727,017	112,715	4,351,410	787,050,000	18,856,000	55,060,000
Gravel (placer operations).....	6	109	19	19	-----	-----	-----
Total, all sources.....	169	45,727,017	112,824	4,351,429	787,050,000	18,856,000	55,060,000

¹ Detail will not necessarily add to totals because some mines produce more than 1 class of material.
² Old tailings: Silver, 275 tons; copper, 50,005 tons; lead, 1,500 tons; zinc, 340 tons. Cleanings: Copper, 126 tons; lead, 46 tons. Mill cleanings: Lead-zinc, 34 tons.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1953, by methods of recovery and types of material processed, in terms of recoverable metals

Type of material processed and method of recovery	Material treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode:						
Amalgamation.....	(1)	72	25	-----	-----	-----
Concentration, and smelting of concentrates:						
Ore.....	41,421,525	84,291	2,897,972	629,543,042	15,979,970	54,077,200
Old tailings.....	1,500	2	937	-----	92,000	-----
Total.....	41,423,025	84,293	2,898,909	629,543,042	16,071,970	54,077,200
Direct smelting:						
Ore.....	649,973	27,770	1,443,742	53,931,737	2,743,130	883,300
Old tailings, etc.....	50,826	580	8,734	323,900	40,900	99,500
Copper precipitates ³	26,399	-----	-----	40,434,847	-----	-----
Total.....	727,198	28,350	1,452,476	94,690,484	2,784,030	982,800
Other: Straight leaching of copper ore ⁴	3,576,794	-----	-----	62,816,474	-----	-----
Placer.....	-----	109	19	-----	-----	-----
Grand total.....	45,727,017	112,824	4,351,429	787,050,000	18,856,000	55,060,000

¹ Included with concentration and smelting of concentrates.
² Distributed as follows: Cochise County, 311,400 pounds; Gila County, 23,155,157 pounds; Greenlee County, 8,642,200 pounds; Pima County, 2,400 pounds; Pinal County, 8,240,190 pounds; and Yavapai County, 83,500 pounds.
³ All from 1 plant in Gila County.

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1953, by methods of recovery and classes of material processed

Class of material	Ore and old tailing treated at mills—gross metal content					
	Short tons	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Dry gold.....	1,434	176	66	-----	-----	-----
Copper.....	40,996,882	80,604	2,341,326	749,534,913	782	6,799
Copper-lead-zinc.....	1,260	-----	7,172	66,410	109,748	225,483
Copper-zinc.....	144,910	1,744	108,256	7,454,302	201,476	22,001,119
Lead (ore and old tailing).....	1,694	8	1,860	-----	141,565	-----
Lead-zinc.....	269,566	27,222	982,666	1,451,920	19,630,468	45,674,450
Zinc.....	7,279	35	24,528	214,483	1,710	3,522,286
Total: 1953.....	41,423,025	109,789	3,465,874	758,722,028	20,085,739	71,430,137
1952.....	41,002,438	114,749	4,140,979	769,770,747	37,141,691	124,623,105
	Concentrate shipped to smelters ¹ —recoverable metal content					
Dry gold.....	16	87	22	-----	-----	-----
Copper.....	1,239,026	66,152	2,064,186	627,947,697	63,120	223,500
Copper-lead.....	122	-----	4,754	24,100	103,970	7,470
Copper-lead-zinc.....	181	-----	12,857	37,700	127,860	24,200
Iron (from lead-zinc ore).....	18,119	3,056	48,698	45,015	475,668	1,758,010
Lead.....	6,245	215	188,712	236,770	6,821,971	768,885
Lead-zinc.....	14,709	13,208	458,967	255,500	7,585,000	2,114,200
Zinc.....	52,797	1,575	120,713	996,260	894,381	49,180,935
Total: 1953.....	1,331,215	84,293	2,898,909	629,543,042	16,071,970	54,077,200
1952.....	1,363,172	86,879	3,421,122	630,911,814	30,479,812	93,551,202
	Ore treated by straight leaching—recoverable metal content					
Copper.....	3,576,794	-----	-----	62,816,474	-----	-----
Total: 1953.....	3,576,794	-----	-----	62,816,474	-----	-----
1952.....	3,735,773	-----	-----	65,034,878	-----	-----
	Crude material shipped to smelters—recoverable metal content					
Dry gold.....	818	467	1,271	7,200	2,700	-----
Dry gold-silver.....	2,467	778	14,716	2,910	3,560	-----
Dry silver:						
Ore.....	22,497	632	198,616	185,700	-----	-----
Old tailing.....	275	3	887	-----	-----	-----
Copper:						
Ore.....	614,162	24,538	1,159,223	53,695,282	3,780	50,300
Cleanings.....	126	11	396	40,000	-----	-----
Old tailing.....	50,005	358	5,111	282,000	-----	-----
Precipitate.....	26,399	-----	-----	40,434,847	-----	-----
Copper-lead.....	1	-----	8	90	140	-----
Lead:						
Ore.....	4,319	1,337	51,960	8,340	1,045,710	49,600
Cleanings.....	46	5	92	-----	10,600	-----
Lead-zinc:						
Ore.....	5,709	18	17,948	32,215	1,687,240	783,400
Mill cleanings.....	34	2	270	300	6,500	3,200
Zinc: Old tailing.....	340	201	1,978	1,600	23,800	96,300
Total: 1953.....	727,198	28,350	1,452,476	94,690,484	2,784,030	982,800
1952.....	678,028	25,020	1,280,062	95,491,308	2,560,188	734,798

¹Excludes concentrate treated only by amalgamation or cyanidation.

TABLE 11.—Mine production of gold, silver, copper, lead, and zinc in 1958, by counties and districts, in terms of recoverable metals

County and district	Mines producing		Material sold or treated ¹ (short tons)	Gold (fine ounces)		Silver (fine ounces)		Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value	
	Lode	Placer		Lode	Placer	Lode	Placer					Total
Cochise County:												
California.....	3		4,246		2	11,217		18,000	1,075,000	509,000	\$214,748	
Cochise (Dragoon).....	1		76,886		12	28,889		3,698,000	7,786,000		1,983,282	
Das Cabezas and Tevis.....	1		9		3	15			400		13,871	
Smelter.....	(2)		172		16	488		40,000	10,600		142,179	
Swissheim (Elfrida).....	3		2,510		42,854	42,854		3,000	434,000		5,702	
Tombstone.....	4		1,128		25	2,538		36,400	18,000		104,188	
Turquoise.....	5		1,950		37	8,348		58,688,000	480,000		19,430,884	
Warren (Bisbee).....	6		590,174		29,840	1,266,153		4,000	2,364,000		1,149	
Cocconino County: Francis.....	1		23									
Gila County:												
Banner (Christmas).....	5		27,188		110	4,215		1,252,000	8,500		368,102	
Globe-Miami.....	8		11,564,784		2,197	139,211		172,955,000	3,500		49,841,662	
Green Valley.....	3		48		3	55		4,700			1,504	
Summit.....	1		56		6	6		4,300			1,239	
Graham County:												
Aravaipa.....	2		16,549		25	14,564		102,900	1,804,800	3,464,000	678,377	
Lone Star.....	2		38		7	7		1,100			322	
Stanley Butte.....	1		16		5	5			3,200		424	
Greenlee County:												
Ash Peak.....	1		17,359		631	168,163		247,578,000			174,281	
Copper Mountain (Morenci).....	2		16,183,856		5,895	369,470					71,595,600	
Maricopa County:												
Agua Fria.....	1		25		5	5		6,200			1,784	
Cave Creek and Camp Creek.....	4		66		3	1,429		7,400			3,522	
Vulture.....	1		16		1	1		1,300			408	
White Peacho.....	1		105		12	51		5,100			1,930	
Mohave County:												
Bentley (Grand Wash Cliffs).....	2		128		2	273		38,300			11,309	
Cedar Valley.....	3		19,728		33	6,633		499,300	42,200	783,000	246,030	
Owens.....	1		48		159	159			6,200		6,956	
Wallapai (Chloride, Cerbat, Stockton Hill).....	6		349		24	2,624		6,400	81,600	49,000	21,377	

See footnotes at end of table.

TABLE 11.—Mine production of gold, silver, copper, lead, and zinc in 1953, by counties and districts, in terms of recoverable metals—Continued

Country and district	Mines producing		Material sold or treated (short tons)	Gold (fine ounces)			Silver (fine ounces)			Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
	Lode	Placer		Lode	Placer	Total	Lode	Placer	Total				
Pinna County:													
Alto.....	1		9, 874, 478	36, 599	36, 599	435, 940		435, 940	129, 460, 000				\$38, 880, 533
Arizola.....	34		62			8		8	800				237
Cabral (Comobabi).....	3		3			74		74	600	200			452
Greaterville.....	1		2, 258	750	750	214		214	2, 400				37, 935
Grover.....	1		139			28		28	600				197
Halveta (Rosamont).....	1		8, 168	1	1	912		912	19, 100				5, 709
Herna (Sierritas, Papago, Twin Buttes).....	7		28, 811	8	8	26, 771		26, 771	2, 706, 300	11, 800	21, 600		805, 247
Quijotes.....	1		31			31		31	2, 000				402
Silver Bell.....	1		7, 058	18	18	1, 888		1, 888	170, 400		2, 647, 800		355, 740
Pinah County:													
Blackwater.....	1		35			28		28	1, 300				398
Casa Grande.....	2		45			2		2	2, 300				662
Crozier Peak.....	1		18			3		3	600				175
Goldfields.....	1		1, 420	155	155	44		44					5, 465
Mineral Creek (Ray).....	5		5, 604, 241	1, 021	1, 021	285, 857		285, 857	95, 146, 700	145, 400	18, 000		27, 604, 570
Mineral Hill.....	1		101	1	1	23		23		8, 300			1, 143
Old Hat (Oracle, Mammoth).....	4		69	2	2	164		164	5, 100				1, 682
Owl Head.....	15					5		5					1, 149
Pioneer (Superior).....	7		431, 905	14, 480	14, 480	627, 890		627, 890	50, 186, 300	2, 300			15, 478, 540
Saddle Mountain.....	3		3			16		16					315
Vekol.....	1		26			1		1	1, 200				345
Santa Cruz County:													
Harshaw.....	5		50, 665	121	121	176, 073		176, 073	412, 700	4, 208, 500	8, 372, 000		1, 796, 129
Nogales (Gold Hill).....	2		10	1	1	46		46		1, 300			247
Oro Blanco (Ruby).....	(*)		34	2	2	270		270	300	6, 500	3, 200		1, 619
Pajarito.....	1		4			58		58		2, 800			1, 419
Palmetto.....	1		21			14		14	1, 400				415
Patagonia (Duquesne).....	9		7, 566	24	24	36, 478		36, 478	1, 081, 300	244, 100	514, 300		485, 308
Tyndall.....	3		1, 015	8	8	5, 604		5, 604	4, 200	468, 800	214, 500		92, 638
Wrightson.....	1		32			99		99	100	6, 000			905
Yavapai County:													
Agua Fria.....	1		198	5	5	53		53	16, 600				4, 987
Big Bug.....	4		191, 163	17, 788	17, 788	591, 388		591, 388	436, 800	8, 678, 200	20, 952, 000		4, 829, 476
Black Canyon.....	2		593	245	245	474		474	9, 600				16, 960
Castle Creek.....	3		125	4	4	169		169	11, 700				3, 651

Manganese Ore.—In 1953 Arizona mines produced more manganese ore than in any other year in the State's history; virtually all of the output was shipped to the Government Stockpile depots at Wenden, Ariz., and Deming, N. Mex. Of the total output, 50 percent was low-grade ore (5 to 35 percent) from 22 claims in Yuma County; the remainder was largely low-grade ore that came mainly from 100 claims in Coconino, Gila, Maricopa, Mohave, Santa Cruz, and Yavapai Counties. The largest producer was the Doyle property in Yuma County; the ore averaged 15.79 percent Mn.

Shipments to Government purchasing depots for stockpiling and future treatment were not credited to 1953 production but will be credited to the year in which the beneficiated product is shipped.

Molybdenum.—In 1953, as in 1952, all molybdenum produced in Arizona was a byproduct of copper ore that came from three mines in the Eureka, Globe-Miami, and Copper Mountain districts. Shipments of concentrates, averaging 52.91 percent Mo per ton, totaled 1,367 short tons in 1953 compared with 1,951 tons and 51.84 percent in 1952. The largest producer in both years was the Morenci mine of the Phelps Dodge Corp. in the Copper Mountain district.

Silver.—Arizona's silver production declined to 4,351,000 fine ounces in 1953, a 7-percent loss from 1952. A decrease of 679,321 ounces (43 percent) in silver production from copper-zinc ore and lead-zinc ore more than offset an increase of 263,404 ounces (9 percent) in silver from copper ore. Of the total silver produced in 1953, 73 percent was recovered from copper ore mined chiefly from 8 mines in the Ajo, Copper Mountain, Eureka, Globe-Miami, Mineral Creek, Pioneer, and Warren districts; 19 percent from lead-zinc ore mined largely from 2 mines in the Big Bug and Harshaw districts; 4 percent from silver ore mined from 1 mine in the Ash Peak district; and most of the remainder from lead ore and copper-zinc ore mined from 6 mines in the Cedar Valley, Cochise, Eureka, Swisshelm, and Verde districts. The Copper Queen mine of the Phelps Dodge Corp. in the Warren district continued to be by far the largest producer of silver in Arizona; it was followed by the Magma copper mine at Superior, Iron King lead-zinc mine at Humboldt, New Cornelia copper mine at Ajo, Morenci copper mine at Morenci, Ray copper mine at Ray, Fux lead-zinc mine near Patagonia, and Ash Peak silver property near Duncan.

Tungsten.—Arizona's tungsten production in 1953 was 8,055 units valued at \$468,858, the largest annual output in the State history and an 89-percent gain over 1952. This marked rise resulted mainly from increased activity at mines in the Arivaca and Eureka districts. The principal tungsten mills that operated in 1953 were Fernstrom's at Arivaca, Black Pearl, and Hillside at Bagdad, Boriana near Yucca, Kramer's at Pomerene, Goldfield near Apache Junction, Nobles' near Dripping Springs, and Stetler's at Quartzsite. In 1953 Cochise County produced 1,080 units of tungsten, Mohave County 1,130, Pima County 2,431, Pinal County 281, Yavapai County 2,484, Yuma County 538, and miscellaneous districts 111. The Black Pearl mine at Bagdad was the largest producer of tungsten in 1953, followed closely by the Las Guijas property near Arivaca, Tungstona mine at Bagdad, and Boriana mine near Yucca.

Uranium.—Under regulations of the Atomic Energy Commission, uranium-production figures cannot be published; however, output in-

creased somewhat when an outlet for Arizona uranium ores was provided through erection of a mill at Bluewater, N. Mex., by Anaconda Copper Mining Co. A new mill to process Arizona uranium ores was being constructed late in 1953 at Shiprock, N. Mex., by Kerr-McGee Oil Industries, Inc.

Uranium operations expanded in 1953 at properties in Apache, Coconino, Gila, and Navajo Counties. Most of Arizona's uranium production in 1953 came from property operated by the Navajo Uranium Co. in the Lukachukai Mountains, Apache County, and from claims operated by the American Uranium Co., 16 miles east of Holbrook, Navajo County. Some uranium was produced also from the Red Bluff group, 35 miles north of Globe, from the Arrowhead Uranium Co. property near Cameron, and from a claim in the Monument Valley Area of Arizona. A large part of the ore has been discovered in the Navajo Indian Reservation; royalties paid the Indians have meant much to their welfare.

The Shinarump formation and the Salt Wash member of the Morrison sandstone formation continue to be the principal sources of uranium ore.

Besides greater activity in exploration and development by private companies, valuable assistance in various forms was afforded uranium operators in 1953 by the Atomic Energy Commission, Federal Geological Survey, and Federal Bureau of Mines.

Vanadium.—Some vanadium was recovered from uranium-vanadium ores, but because of the close relationship between the production of vanadium and uranium, production figures on vanadium cannot be published.

Zinc.—Arizona's production of recoverable zinc dropped to 27,530 short tons in 1953—a decrease of 19,613 tons (42 percent) from 1952. Production from lead-zinc ore declined 10,452 tons (37 percent) and that from copper-zinc ore 9,282 tons (54 percent). These marked losses resulted mainly from closing in 1952 of two large producers of lead-zinc ore and from suspension of mining copper-zinc ore in 1953 at several mines. Of the total zinc produced in 1953, 66 percent was recovered from lead-zinc ore mined chiefly from 5 mines in the Aravaipa, Big Bug, California, Harshaw, and Warren districts; 29 percent from copper-zinc ore mined largely from 4 mines in the Cedar Valley, Eureka, and Verde districts; and most of the remainder from zinc ore mined chiefly from 1 mine in the Silver Bell district. The Iron King lead-zinc mine at Humboldt continued to be by far the largest zinc producer in Arizona; it was followed by the Flux lead-zinc mine near Patagonia, Republic-Mammoth copper-zinc property near Dagoon, Old Dick copper-zinc mine at Bagdad, Aravaipa lead-zinc property near Klondyke, lead-zinc unit of the Copper Queen mine at Bisbee, and United Verde copper-zinc mine at Jerome.

NONMETALS

Asbestos.—Although Arizona's 1953 asbestos production decreased 849 tons (33 percent) from 1952, its value increased \$121,666 (18 percent). The increased value was due to a uniform market price scale provided by the General Services Administration through establishment of a Government purchase depot at Globe in December 1952.

In 1953, as in 1952, all of Arizona's asbestos production came from several mines north of Globe, Gila County.

Barite.—Barite production in 1953 decreased 72 percent from 1952, owing to a sharp decline in output of ore from the Macco Corp. (formerly Arizona Barite Co.) underground mine near Granite Reef Dam (Maricopa County), Arizona's only producer of barite. The ore was hauled to the corporation mill at Mesa, where it was processed for well-drilling purposes.

Brucite.—A small quantity of brucite was produced in 1953 from the White House property near Oatman, Mohave County; however, operations were abandoned as the ore was too low grade for shipment to the west coast.

Cement.—The Arizona Portland Cement Co. operated its plant at Rillito, Pima County, all year and produced 22 percent more cement than in 1952. The company obtains its limestone from quarries near the plant, gypsum from deposits at Feldman, Ariz., and iron ore from Fierro, N. Mex.

Clays.—Although Arizona's 1953 clay production declined 49,928 tons (20 percent) from 1952, its value increased \$136,073 (23 percent). Of the total output in 1953 (197,401 short tons), 134,850 tons (68 percent) was bentonite produced from the McCarrell open pit near Sanders, Apache County, and shipped to a processing plant in California for use by oil refineries; the remainder was chiefly miscellaneous clays produced and used by 4 brick companies in Maricopa and Pima Counties.

Feldspar.—Feldspar production in 1953 was less than in 1952. As in past years, the entire production came from the Consolidated Feldspar Corp. property near Kingman, Mohave County. The crude feldspar was ground in the corporation plant at Kingman, and most of the resulting product was shipped to the ceramic industry in California.

Fluorspar.—Fluorspar production increased from 434 short tons in 1952 to 1,911 in 1953. This marked gain resulted from new production that came from the treatment of old tailing at the Castle Dome, De Luce, and Sonora properties in the Castle Dome district, Yuma County, by the Holmestake Mining Co. Some fluorspar was produced also from two properties in Graham and Greenlee Counties. Most of the fluorspar produced in 1953 was shipped to chemical companies in California and Texas for the manufacture of hydrofluoric acid.

Gem Stones.—Gem stones, largely agate from parts of the Saddle Mountain area in Graham and Pinal Counties, were produced and sold in 1953. Some chrysocolla was produced from the Inspiration mine in the Globe-Miami district, Gila County, and some turquoise from claims in the Globe-Miami district and from the Mineral Park area in Mohave County.

Gypsum.—Arizona's gypsum production continued to expand in 1953—it has increased from 6,686 short tons in 1951 to 13,484 tons in 1953; the 1953 production was 2,170 tons (19 percent) more than in 1952. As in past years, the total output came from the Arizona Gypsum Corp. property at Feldman, Pinal County; most of it was shipped to the plant at Rillito for the manufacture of cement.

Lime.—Four plants—Paul Lime Plant (Cochise County), Hoopes & Co. (Gila County), Phelps Dodge Corp. (Greenlee County), and

Grand Canyon Lime & Cement Co. of Arizona (Yavapai County)—produced 96,408 short tons of lime in 1953. Most (89,954 tons) of it was chemical lime used at copper flotation mills and copper smelters in Arizona.

Mica.—As a result of new operations at the Buckeye property, Maricopa County, Arizona's mica production increased to 3,721 short tons in 1953. Some mica was produced also from another claim in Maricopa County and from three properties in Mohave, Pima, and Yuma Counties. All of the 1953 production was scrap mica, used mainly in paint and roofing products.

Perlite.—The number of perlite producers in Arizona declined from 4 in 1952 to 2 in 1953, and as a result the output of crude perlite also dropped. Most of it was processed at a plant at Phoenix for use as an aggregate in making plaster and concrete blocks. All of the 1953 output came from properties near Superior, Pinal County; the largest producer was the Perlite Industries of Arizona.

Pumice and Pumicite.—Pumice and pumicite, used mainly as an aggregate in making concrete blocks, were produced from 3 properties in 1953 compared with 1 in 1952. The 3 properties—2 near Williams, Coconino County, and 1 near Solomonsville, Graham County—produced 123,797 short tons in 1953; all of the 1952 output came from Coconino County. The Haigler property near Williams was by far the largest producer in 1953.

Sand and Gravel.—In 1953, 7 counties produced 3,447,000 short tons of sand and gravel, an increase of 1,662,000 tons (89 percent) over 1952. Of the total output, 2,182,000 tons was commercial (produced by private companies) and 1,264,000 tons noncommercial (produced and used by county highway departments); 74 percent of the total output came from 12 pits in Maricopa County, where most of it was used for constructing roads.

Silica (Quartz and Quartzite).—Production of ground silica and crushed quartzite increased to 264,582 short tons in 1953 owing to inclusion in the State production of crushed quartzite used for fluxing purposes at copper smelters in Arizona. Formerly, high-grade quartz from the Consolidated Feldspar Corp. property near Kingman, Mohave County, was the only silica recorded in the State production. High-grade quartz for use by the ceramic industry in California continued to be produced in 1953, but the principal output was quartzite used for fluxing purposes at copper smelters. The largest production of quartzite came from the Phelps Dodge Corp. properties in Cochise and Greenlee Counties. Some quartzite was produced also from another property in Cochise County and from a property in Pima County.

Stone.—Arizona's 1953 stone production comprised 140 short tons of basalt, 17,382 tons of granite, 110,439 tons of limestone, 930 tons of marble, 7,180 tons of dimension sandstone, 259,476 tons of crushed quartzite, and 46,811 tons of miscellaneous stone, a total of 442,358 short tons compared with 235,020 tons in 1952. Of the total production, 25 percent was crushed limestone from 2 quarries in Cochise and Greenlee Counties that was used for flux in copper smelting and for improving roads. The remainder was largely miscellaneous stone and crushed granite from two quarries in Pima and Pinal Counties that was used for improving roads. All of the dimension sandstone

came from Coconino and Yavapai Counties, the marble from Cochise County, and the basalt from Apache County.

MINERAL FUELS

In 1953, as in 1952, coal was the only mineral fuel produced in Arizona; 5,140 short tons were produced from a mine in Navajo County.

REVIEW BY COUNTIES

APACHE

Bentonite from the McCarrell open pit near Sanders continued to be the principal mineral production in Apache County; 134,900 short tons of crude bentonite was shipped from the pit in 1953 to a processing plant in California compared with 141,600 tons in 1952. The property was the only producer of bentonite in the State. Other county production was 140 tons of crushed basalt used as an aggregate in constructing roads and some uranium ore produced mainly from claims in the Lukachukai district. The uranium ore was hauled to the Kerr-McGee millsite at Shiprock, N. Mex., for future treatment.

TABLE 12.—Value of mineral production in Arizona, 1952-53, by counties and principal minerals ¹ produced in 1953

County	1952	1953	Minerals produced in 1953, in order of value
Apache.....	\$480,430	\$652,052	Clays (bentonite), stone.
Cochise.....	20,717,125	22,649,797	Copper, zinc, silver, gold, lead.
Coconino.....	241,784	483,010	Pumice, and pumicite, sand and gravel, stone, copper.
Gila.....	47,094,741	51,746,206	Copper, asbestos, molybdenum, lime.
Graham.....	792,274	727,521	Zinc, lead, pumice and pumicite, copper.
Greenlee.....	62,469,489	73,223,532	Copper, molybdenum, silver, lime.
Maricopa.....	1,305,527	2,129,092	Sand and gravel, mica, clays, barite.
Mohave.....	790,104	436,109	Copper, zinc, tungsten, silica.
Navajo.....	43,100	45,081	Coal, sand and gravel.
Pima.....	40,273,579	46,081,720	Copper, cement, gold, silver.
Pinal.....	37,960,627	43,380,407	Copper, silver, gold, sand and gravel.
Santa Cruz.....	2,879,795	2,327,680	Zinc, lead, copper, silver.
Yavapai.....	16,523,059	12,480,206	Copper, zinc, lead, gold.
Yuma.....	93,931	163,622	Fluorspar, tungsten, lead, copper.
Undistributed ²	³ 36,435	89,965	
Total.....	³ 231,702,000	256,616,000	

¹ Exclusive of uranium produced in 1952-53 and manganese-ore shipments in 1952-53 to the Government purchase depots at Deming, N. Mex., and Wenden, Ariz.

² Includes value of beryllium ore, gem stones, vanadium, and some tungsten that cannot be assigned to specific counties.

³ Revised figure.

COCHISE

In 1953 Cochise County, again the largest producer of silver in Arizona, ranked first in quartzite, second in gold, lime, limestone, and zinc, third in lead, fourth in tungsten, and fifth in copper. The Warren district was by far the most important producing area in the county.

California District.—The American Zinc, Lead & Smelting Co. operated the Hilltop mine all year and shipped 4,243 tons of ore containing 11,023 ounces of silver, 22,065 pounds of copper, 1,093,933 pounds of lead, and 652,625 pounds of zinc. Small lots of lead ore and copper ore were produced from the King of Lead and Willie Rose claims.

Cochise District.—The Coronado Copper & Zinc Co. operated its Republic and Mammoth mines and 200-ton flotation mill near Dragoon all year. The mill treated 76,836 tons of zinc-copper ore in 1953, which yielded 6,040 tons of copper concentrate and 7,489 tons of zinc concentrate. The property ranked 3d in zinc production in Arizona in 1953 and 10th in copper.

Swisshelm (Elfrida) District.—Two mines—Scribner and Swisshelm—and a prospect in the Swisshelm district produced 2,510 tons of ore in 1953 containing 1,267 ounces of gold, 42,854 ounces of silver, 3,709 pounds of copper, 443,464 pounds of lead, and 14,848 pounds of zinc. Lead ore (1,364 tons) from the Swisshelm mine, rich in gold and silver, was the most important production.

Tombstone District.—The Alkey, Gallagher, Quartzite, and Toughnut-Empire properties were operated by lessees in 1953; 78 tons of gold-silver ore was produced from the Quartzite and Toughnut-Empire groups and 50 tons of lead-silver ore from the Alkey, Gallagher, and Quartzite mines.

Turquoise (Courtland, Pearce, Gleeson) District.—The principal output in the Turquoise district in 1953 was 970 tons of lead ore from the Defiance mine operated all year by Giacoma Bros.; the ore contained 30 ounces of gold, 6,391 ounces of silver, 1,509 pounds of copper, 396,575 pounds of lead, and 23,000 pounds of zinc. Other district output included 338 tons of lead-zinc ore, 57 tons of lead ore, and 48 tons of copper ore from various claims of the Shannon group; 369 tons of copper ore from the Tejon mine; and 139 tons of zinc ore from the Abril group.

Output from the Smelter district was 172 tons of cleanup material (copper and lead) from the unloading station at Douglas.

The remainder of Cochise County production was 930 tons of marble from the Ligier quarries near Dragoon, used mainly as chips in roofing and flooring materials, and more than 1,000 tons of tungsten ore produced from claims near Benson, Dragoon, Hereford, and Tombstone. The largest producer of tungsten was the Black Rock (formerly Tungsten King) claim near Benson operated by S. C. Kramer; 1,000 tons of scheelite ore averaging 0.50 percent WO_3 was treated in 1953. The property and mill were sold in August to the Standard Tungsten Corp. of New York City. Other tungsten producers included the Little Fanny (Robles Camp) near Dragoon, Southwestern Mines and St. John near Hereford, and various claims near Tombstone. Most of the tungsten was sold to E. Fernstrom, Tucson; Elmer Walker, Dragoon; R. L. Brown, Tombstone; and C. W. Jones, Bishop, Calif.

Warren (Bisbee) District.—The output of copper ore, with by-product gold and silver, from the Copper Queen mine of the Phelps Dodge Corp. at Bisbee continued to be the most important production in Cochise County. The corporation reported that the mine produced 579,169 tons of copper ore and 11,005 tons of lead-zinc ore in 1953 compared with 497,216 and 43,242 tons, respectively, in 1952. In addition, 344 tons of copper precipitates was produced. Mining of copper ore was continuous throughout the year; however, mining of lead-zinc ore ceased in June, owing to the decline in lead and zinc prices. Both copper ore and lead-zinc ore were treated in the corporation 900-ton flotation mill at Bisbee.

According to the Phelps Dodge Corp. annual report for 1953, the Copper Queen mine produced 58,758,811 pounds of copper, 749,878 pounds of lead, and 1,889,995 pounds of zinc compared with 55,279,692, 2,818,278, and 7,729,458 pounds, respectively, in 1952. The total footage of drifting and raising was greater than in 1952, and an active diamond-drilling program was carried on throughout the year; however, no new important ore body was discovered.

The corporation continued to develop the open pit at the Bisbee East ore body (Lavender pit) and moved 19,885,140 tons of waste; from 1951 to the end of 1953 a total of 37,661,632 tons of waste had been moved, at a cost of \$8,604,644. Ore reserves are estimated to be 41 million tons of milling ore averaging 1.14 percent copper and 31 million tons of leaching ore averaging 0.42 percent copper. The new 12,000-ton concentrator being erected was scheduled to begin operating some time during the last quarter of 1954. Quartzite needed for fluxing purposes at the Phelps Dodge copper smelter at Douglas was mined in 1953 from the Wade Hampton pit of the Phelps Dodge Corp. at Bisbee, and limestone needed for fluxing purposes was quarried from Paul's pit at Douglas. The total limestone output of the pit was 50,141 short tons, of which 26,611 tons was used for fluxing purposes; the remainder was used chiefly as an aggregate in constructing roads. Also 1,875 tons of quartzite from Paul's pit was quarried and ground. All of the county lime production came from the Paul lime plant at Douglas; most—26,942 short tons—of it was quicklime produced for use as a reagent at copper-concentration plants in Arizona.

COCONINO

Mineral production in Coconino County in 1953 comprised 2 tons of copper, approximately 1,500 tons of manganese ore and low-grade manganese ore, 103,797 tons of pumicite, 219,800 tons of sand and gravel, and 4,106 tons of stone. Pumicite from the Haigler and Superlite properties near Williams was the most important production; the material was shipped to two plants at Phoenix, where most of it was used as an aggregate in making concrete blocks. Nearly all of the sand and gravel produced in the county in 1953 came from a pit at Flagstaff; 219,100 short tons was sold by a contractor to the United States Bureau of Public Roads for construction of county highways. Dimension sandstone (4,106 short tons), used mainly for flagging, was produced from several quarries near Ashfork and shipped largely to the building trade in California. Production of manganese ore expanded greatly in 1953 through operation of the Campbell-Denison and Johnson-Hayden groups south of Heber (Mogollon Rim district) by Bosley Mining Co.; the company shipped several hundred tons of manganese ore and jig concentrate under the Government domestic manganese purchase program. Other county output was 23 tons of copper ore from the Blue Bonnet claim in the Francis district.

GILA

Gila County continued to be the only asbestos-producing area in Arizona and to rank second in copper and molybdenum production, third in lime, sixth in gold, and seventh in silver. In

1953 it produced also some lead, manganese ore, sand and gravel, tungsten, and zinc. However, the value of the copper production in 1953 (\$49,999,992) was by far the largest of any mineral commodity in the county. All of the asbestos, lime, manganese ore, molybdenum, and sand and gravel and most of the copper, gold, and silver came from the Globe-Miami district.

Banner (Christmas) District.—Copper ore and old tailings from the Christmas property were the principal output in 1953. The Sam Knight Mining Lease, Inc., operated the property the first 6 months of the year and shipped 3,633 tons of ore averaging 4.40 percent copper. In July the property was taken over by Riviera Mines Co., which rehabilitated part of the old 500-ton mill at Christmas; during the last quarter of the year the mill processed 13,018 tons of copper ore. Old tailing (10,110 tons), containing high silica and some copper, was shipped from the Christmas property by American Smelting & Refining Co. to the company smelter at Hayden. Other district output was mainly 384 tons of copper ore from the Chilito mine.

Globe-Miami District.—The Globe-Miami district, with a production of 172,955,000 pounds of recoverable copper in 1953 (186,158,500 pounds in 1952), continued to rank second among the important copper-producing areas in Arizona. Most of the production came from three properties—Castle Dome, Inspiration, and Miami. The Inspiration property, with a yield of 79,406,335 pounds of copper in 1953, remained the leading copper producer in the county and ranked fourth in the State. The Inspiration Consolidated Copper Co. reported that 3,576,794 tons of ore, averaging 1.015 percent copper, was treated in 1953 by acid ferric sulfate in the main leaching plant; 316,400 tons of slime, removed from ore at the main leaching plant, was treated by flotation; and 13,499 tons of copper ore and 9,206 tons of cement copper were sent direct to the smelter at Miami. Of the total ore treated in 1953 (3,906,693 tons), 3,008,432 tons (77 percent) came from the open pit and 898,261 tons from underground. According to the company annual report to stockholders, copper production in 1953 was 5,664,057 pounds less than in 1952, due mainly to partial disruption of leaching-plant activities caused by tank-wall repairs. The source of copper production in 1953 was as follows: Electrolytic copper produced directly from leach solution 54,394,873 pounds, leaching-in-place 9,960,118 pounds, leaching plant 8,421,601 pounds, slimes-leaching plant 4,719,139 pounds, slime concentrator 1,539,663 pounds, and direct-smelted ore 370,941 pounds. Details regarding the combination of underground and open-pit mining methods at the Inspiration property were published in September 1953.⁴ The Miami mine of the Miami Copper Co. and the Castle Dome Copper Co., Inc. (a wholly owned subsidiary of the Miami Copper Co.), produced 93,241,431 pounds of copper in 1953 (52,425,833 pounds from the Miami and 40,815,598 pounds from the Castle Dome), a decrease of 7,298,248 pounds from 1952. Copper production from underground operations at the Miami mine was greater than in 1952; but production from open-pit operations at the Castle Dome property was less, owing to mining of lower-grade ore and cessation of operations December 4. Operations ceased owing to exhaustion of ore

⁴ Mining World, Inspiration Is Combining Open Pit and Underground Haulage: Vol. 15, September 1953, pp. 42-45.

reserves. According to the annual report of the Miami Copper Co., 44,101,480 pounds of copper was produced in 1953 from the Miami mine by concentration and 8,324,353 pounds by acid leaching of material overlying the mined-out areas. The company 18,000-ton concentrator treated 3,705,113 tons of ore averaging 0.685 percent copper and containing small quantities of gold, molybdenite, and silver. From the re-treatment of the copper concentrate, 470,987 pounds was recovered. As of January 1, 1954, minable ore reserves were estimated to be 27,600,000 tons. The 10,000-ton concentrator at the Castle Dome property treated 3,952,775 tons of ore averaging 0.614 percent copper and containing small quantities of gold and silver. After conclusion of operations at the Castle Dome property December 4, the company made preparations to have the concentrator dismantled and moved to the Copper Cities property near Miami. Operations at the property of the Copper Cities Mining Co. (wholly owned subsidiary of the Miami Copper Co.) were mainly stripping 4,929,633 tons of waste overlying the ore body in developing an open pit. Of the 20 million tons of total waste to be moved before mining of ore can begin, 14,101,083 tons had been moved by the end of 1953; treatment of ore was scheduled to begin some time during the third quarter of 1954. As of January 1, 1954, ore reserves were estimated to be 33,000,000 tons averaging 0.69 percent copper.

In 1953, as in 1952, all of Arizona's asbestos production came from several mines near Globe. However, the 1953 production was 33 percent less than in 1952, but the value of the production was 18 percent greater. The increase in value was due to a uniform market-price scale provided by the General Services Administration through establishment of a Government purchase depot at Globe in December 1952. In 1953 the following companies operated plants that processed asbestos-bearing rock: American Fibre Co., American Asbestos Cement Co., Bear Canyon Mining Co., Crown Asbestos Mines, Inc., Arthur Enders, Jacquays Mining Corp., Kyle Asbestos Mines of Arizona, Metate Asbestos Corp., Phillips Asbestos Mines, and Western Chemical Co. Other asbestos producers were Arizona Asbestos Mining Co., Ancha Asbestos Co., O. W. Guthrie, Grady Gullede, and Sorsen Asbestos Corp.

The Globe-Miami district became a fairly large producer of low-grade manganese ore in 1953; approximately 4,000 tons of ore averaging 22.50 percent manganese was shipped to the stockpile depot at Deming, N. Mex., from several mines near Globe. The largest producer by far was the Darius mine, operated by F. A. Sitton. Other producers included the Garnet, Henderson, Johnnie Belle, Magnet, New Doughboy, and Vacy Constance claims.

All (13,750 short tons) of the county lime production and all (86,280 short tons) of the county sand and gravel production came from the Globe-Miami district. All of the lime production was quicklime produced at Hoopes & Co. plant near Globe for use as a reagent in milling copper ore. Of the total sand and gravel production, 64,683 tons was noncommercial from a pit at Globe worked by the Gila County Highway Department; the remainder was commercial—used largely for construction of buildings—from a pit at Globe owned and operated by the H. J. Hagen Construction Co.

The remainder of the Globe-Miami district output was chiefly 92 tons of silver ore from the Four Bagger and Vacy Constance mines, 57 tons of copper ore from the Rising Sun claim, and 31 tons of lead ore from the Brownie claim.

Green Valley District.—Mineral output in 1953 was chiefly 33 tons of copper ore from the Cracker Jack claim near Payson and 12 tons of gold ore from the Pay Rock claim.

Summit District.—Leasing operations at the Gibson group produced 56 tons of copper ore.

Other Gila County production was 40 tons of tungsten ore from the El Oso Mines near Tonto Basin. No mercury ore was treated from the property of the Ord Mercury Mines near Tonto Basin in 1953; work was limited to exploration and development.

GRAHAM

Zinc-lead ore from the Aravaipa group of the Athletic Mining Co. in the Aravaipa district continued to be the main source of mineral production in Graham County; however, the county also produced some copper ore, lead ore, fluorspar, manganese ore, and pumicite.

Aravaipa District.—The Athletic Mining Co. operated its Aravaipa group and 100-ton flotation mill all year. The company reported that 10,109 tons of ore was treated containing 60 ounces of gold, 18,000 ounces of silver, 285,000 pounds of copper, 3,091,198 pounds of lead, and 5,150,128 pounds of zinc. The property ranked third in lead production in Arizona in 1953 and fifth in zinc. Other district production was 440 tons of lead-zinc ore from the Sein Fein mine operated by Pointer & Fox.

Lone Star and Stanley Butte Districts.—The Lone Star mine was worked for a short time in 1953, and 36 tons of copper ore was marketed. Lead ore (16 tons) was produced from the Rawhide claim in the Stanley Butte district.

The remainder of the county output was 20,000 tons of pumicite from the Haigler claims near Solomonsville, 175 tons of fluorspar concentrate produced from ore from the Spar mine near Fort Thomas, and a little manganese ore from the Blackhawk mine southeast of Klondyke.

GREENLEE

Greenlee County, with a production of 247,578,000 pounds of recoverable copper in 1953, continued to be the chief copper-producing area in Arizona, although its output had dropped from 249,764,000 in 1952, 287,842,000 in 1951, and 309,378,100 in 1950. The county also ranked first in lime and molybdenum production in 1953, ranked second in silica (quartzite), fourth in silver, and fifth in gold; and produced some fluorspar, limestone, and manganese ore. The Copper Mountain (Morenci) district was by far the most important producing area in the county.

Ash Peak District.—The Ash Peak lease continued operating the Ash Peak mine and shipped 17,359 tons of siliceous fluxing ore, averaging 0.036 ounce of gold and 9.69 ounces of silver to the ton, to the copper smelter at Miami. A few cars of manganese ore were produced from the Denton and Black Cat claims and shipped to the National Stockpile depot at Deming, N. Mex.

Fluorspar was produced in 1953 from Foster's Eureka claim near Duncan and sold to the Arizona Eastern Fluorspar Corp. at Duncan, where it was processed for use by the ceramic industry.

Copper Mountain (Morenci) District.—Despite a decrease in copper production in 1953 caused by a drop in the grade of ore mined, the Morenci mine of the Phelps Dodge Corp. remained the outstanding producer of copper in Arizona and ranked first in molybdenum and fifth in gold and silver. The corporation reported that the 45,000-ton Morenci concentrator treated 16,119,028 tons of copper ore in 1953 compared with 15,588,946 tons in 1952. In addition, 61,033 tons of crude copper ore and 5,844 tons of copper precipitate were shipped direct to the corporation Morenci smelter. According to the Phelps Dodge Corp. annual report, the Morenci mine produced 248,358,787 pounds of copper in 1953 compared with 251,978,047 pounds in 1952; 808 tons of molydenite concentrate was recovered as a byproduct from the copper concentrate. The quantity of material mined at the open pit in 1953 set a new record of 46,350,869 tons, of which 16,180,061 tons was ore and 30,170,808 tons waste, a 1.86:1 ratio of waste to ore compared with 1.85:1 in 1952.

The Phelps Dodge Corp. produced also several thousand tons of quicklime for use as a reagent in concentrating copper ore and several thousand tons of crushed quartzite and limestone for use as flux at its Morenci smelter. Other Copper Mountain district production was 3,759 tons of copper ore from the Molinar-Alaska group operated under lease by Charles E. Stevens.

MARICOPA

Of the total value (\$2,129,092) of Maricopa County's 1953 mineral production, \$1,945,959 (91 percent) was the value of the sand and gravel production; the county was the largest producer of sand and gravel in Arizona. Next in importance were manganese ore, mica, clays, and barite. The county also produced some copper ore, copper-silver ore, and gold ore.

The 1953 sand and gravel production of 2,541,392 short tons nearly doubled the 1952 production of 1,280,889 tons. Sixty-one percent of the sand and gravel produced in 1953 was used for paving and 37 percent for structural purposes; most of it came from 8 pits near Mesa and Phoenix. The principal commercial producers were the Acme Materials-Daley Construction Co., Arizona Sand & Rock Co., Superior Sand & Gravel Co., Southside Sand & Rock Co., and Union Rock & Materials Co.; the largest noncommercial producer was the Maricopa County Highway Department. In 1953, as in 1952, the Granite Reef mine of the Macco Corp. (formerly Arizona Barite Co.) was the only producer of barite in Arizona; production of ground barite in 1953, however, was 72 percent less than in 1952. The crude barite was hauled from the mine near the Granite Reef Dam to the corporation mill at Mesa. Clay production in the county consisted mainly of shale used in manufacturing of brick and heavy clay products. Crude mica from the Buckeye mine at Buckeye was ground in the Buckeye Mica Co. mill and the resulting product sold to paint and roofing and wire manufacturers.

Output of manganese ore in the county increased considerably in 1953, owing to the establishment, in December 1952, of the Government manganese depot at Wenden; approximately 12,600 long tons of low-grade ore was shipped from numerous claims in the Big Horn district to the National Stockpile depot at Wenden. The largest producers were the Black Eagle, Black Nugget, Black Raven, Black Rock, Black Crow, and Purple Pansy claims. Other county production was largely 105 tons of copper ore from the Daniels group in the White Picacho district, 28 tons of copper-silver ore from the Red Rover mine in the Cave Creek and Camp Creek district, and 25 tons of copper ore from the Jack Pot claim in the Agua Fria district.

MOHAVE

Mining copper-zinc ore at the Antler and Copper World mines near Yucca (Cedar Valley district) continued to be the most important operation in Mohave County, followed by mining low-grade manganese ore in the Artillery Peak area of the Owens district, tungsten production in the Borianna area of the Cedar Valley district, and silica (quartz) and feldspar production in the Wallapai district. The county also produced some brucite and mica.

Bentley (Grand Wash Cliffs) District.—Two mines—Cox Ross and Savannic—produced 125 tons of carbonate copper ore.

Cedar Valley District.—The Antler mine and 130-ton mill were operated by Yucca Mining & Milling Co. until April 30, when operations ceased owing to the low market price of zinc. The mine produced 9,412 tons of ore containing approximately 55 ounces of gold, 5,500 ounces of silver, 315,000 pounds of copper, 96,700 pounds of lead, and 950,000 pounds of zinc. The Copper World mine and 100-ton mill were operated by Allison Steel Manufacturing Co. until October 15; the mill yielded 567 tons of copper concentrate and 343 tons of zinc concentrate from the treatment of 10,316 tons of ore. Dye and Bathrick operated the Borianna tungsten mine and mill near Yucca all year; the mill treated 8,025 tons of ore averaging 0.11 percent tungsten. In addition to tungsten concentrate, the mill yielded 26 tons of byproduct copper concentrate. The Bull Canyon mine, adjoining the Borianna mine, was operated by Dalton Robinett; ore averaging 3.50 percent tungsten was hauled to the Borianna mill for processing.

Tungsten ore was produced also from the Phillips & Williams Tungsten mines near Wickieup (Greenwood district), and from the Florescent and Midway claims near Kingman. Most of the county tungsten concentrate produced in 1953 was sold to buyers in Bishop, Calif.

Owens (McCracken and Artillery Peak) District.—Mining of low-grade manganese ore expanded greatly in 1953 in the Artillery Peak area of the Owens district, owing to operation throughout the year of the Government ore-purchasing depot at Wenden; production increased to approximately 26,000 long tons and the number of producers to 18. Of the total output, 87 percent came from the Lake and Love claims operated by Al Stovall. Other producers included the Black Diamond, Kanab No. 4, Katherie Carpenter, Magnesite, Oversite,

and Priceless claims. Other Owens district production was 48 tons of lead ore from the McCracken claim.

Wallapai (Cerbat, Chloride, Mineral Park, Stockton Hill) District.—Mineral production in the Wallapai district in 1953 was mainly feldspar and silica (quartz) from the Consolidated Feldspar property near Kingman. The crude material was ground in a mill at Kingman for use by the ceramic industry in California. The mill of the Merlo Mica Mining Co. at Kingman was purchased March 1, 1953, by the Huntley Industrial Minerals, Inc. During the year some mica was ground in the mill and the resulting product sold to roofing manufacturers. Other district production was 229 tons of lead-zinc ore from the Champion, Diplomat, and Fountainhead mines, 89 tons of copper ore from the Detroit and Flynn mines, and 31 tons of gold-silver ore from the Rico claim.

The White Horse brucite property near Oatman (San Francisco district) was operated under lease a short time in 1953 by the United States Brucite Corp. In driving a tunnel 240 feet, some brucite was discovered, and a small quantity was sold for testing purposes, however, the ore proved unsatisfactory, and the lease was terminated.

NAVAJO

Mineral production in Navajo County in 1953 comprised 5,140 short tons of coal, 17,209 short tons of sand and gravel, and some uranium ore. All of the coal came from 1 mine; 10,800 tons of sand and gravel was produced and used by the Navajo County Highway Department, and 6,409 tons was produced by contractors for various Government agencies. Some uranium ore was produced from claims near Holbrook and hauled to the mill of the Anaconda Copper Mining Co. at Bluewater, N. Mex., for processing.

PIMA

Copper mining at Ajo continued to be the most important mineral industry in Pima County, followed by cement production at Rillito, sand and gravel from pits near Tuscon, zinc ore from a mine in the Silver Bell district, and tungsten ore mainly from mines in the Arivaca district. The county produced also some clays, mica, manganese ore, silica, and stone.

Ajo District.—The Ajo district, through operations of the New Cornelia mine of the Phelps Dodge Corp., remained the largest gold producer in Arizona; it ranked third in copper and fourth in silver. According to the 1953 annual report of the Phelps Dodge Corp., the New Cornelia open pit produced a record total of 24,105,551 tons of material, of which 9,537,083 tons was copper ore and 14,568,468 tons waste. The corporation 30,000-ton concentrator treated 9,534,583 tons of copper ore in 1953 compared with 9,298,458 tons in 1952; copper production increased from 128,602,215 pounds to 130,983,013. In addition, 39,895 tons of old siliceous copper tailing was shipped to the corporation Ajo smelter for fluxing purposes. By the addition of 2 new ball mills in 1953, the capacity of the concentrator was raised from 25,000 tons of ore a day to 30,000, and an additional flotation cell was installed to handle the increased tonnage of concentrate.

Other district production was 2,000 tons of silica (quartzite) and 5 tons of scrap mica from the San Antonio mine; the silica was used as flux material at the Ajo copper smelter.

Arivaca District.—The principal output in the Arivaca district in 1953 was tungsten ore from the Las Guijas mine and waste dumps; the mine, operated all year by L. G. Fernstrom, was the second largest producer of tungsten in Arizona. Other tungsten producers were the Good Enough and Scheely properties. Small lots of lead ore were produced from the Honey House and McCafferty claims and 56 tons of silver ore from the Come-What-May claim.

Fresnal District.—The Old Gold Mining Co. operated the Allison mine near Sells and shipped 2,358 tons of siliceous gold-silver ore to the Ajo copper smelter.

Greaterville District.—Nineteen tons of low-grade copper ore and some tungsten ore were produced from the Laura claim by S. J. Lemas.

Growler District.—Operations in the Growler district were confined entirely to the Jeff Milton copper property; the Montana-Arizona Mining Co. operated the property the first 3 months of the year and shipped 136 tons of copper ore.

Helvetia (Rosemont) District.—The mineral production in the Helvetia district in 1953 was 8,168 tons of ore containing 10,027 ounces of silver, 994,436 pounds of copper, and a little zinc. All of the production came from the King in Exile mine operated by R. E. Chilson.

Pima (Sierritas, Papago, Twin Buttes) District.—From 1943 to 1952 the Pima district was an important producer of lead, silver, and zinc through operations of the San Xavier mine near Sahuarita by the Eagle-Picher Co. However, the 1953 production of lead and zinc was small, as the San Xavier mine was idle all year, due to the low market prices of lead and zinc. The district's principal output in 1953 was 28,364 tons of ore containing 26,762 ounces of silver, 2,773,178 pounds of copper, and small quantities of lead and zinc from the Alpha mine of the Pima Mining Co., and the Copper Queen mine of the Banner Mining Co.; both mines were operated all year. At the Copper Queen mine a 400-ton flotation mill was being erected under a Defense Minerals Production Administration contract. Other district production was mainly 387 tons of copper ore from the Copper John, High Hill, and New Year's Eve properties.

Silver Bell District.—Production in the Silver Bell district in 1953 was 7,058 tons of zinc ore from the Atlas mine operated all year by B. S. & K. Mining Co.; the ore, which was treated in the company 100-ton flotation mill, contained 35 ounces of gold, 24,323 ounces of silver, 209,960 pounds of copper, and 3,449,255 pounds of zinc. The mine was shut down at the end of December because of the low market price of zinc. The American Smelting & Refining Co. worked its Oxide and El Tiro mines (Silver Bell unit) all year in removing waste preparatory to open-pit copper operations and in erecting a 7,500-ton flotation mill. Ore reserves are estimated at 32 million tons; copper production was planned to begin some time during the second quarter of 1954.

The cement plant at Rillito, owned and operated by the Arizona Portland Cement Co., is the only one in Arizona. Cement production at the plant has increased each year since 1949, and the 1953 pro-

duction was 22 percent more than in 1952. Limestone required for making cement was obtained from a quarry near the plant, gypsum from deposits at Feldman, and iron ore from Fierro, N. Mex. The county clay output dropped 57 percent in 1953 from the 1952 figure, as the number of producers declined from 3 to 2. All of the 1953 output was produced and used by the Grabe Brick Co. and Louis DeVry & Son, Tucson, for making common brick. Operators of pits near Tucson produced 416,233 short tons of sand and gravel in 1953 compared with 271,987 tons in 1952. Of the total 1953 production, 225,883 tons was produced by private contractors for use largely in constructing buildings, and 190,350 tons was produced and used by the Pima County Highway Department for construction of roads. The county 1953 output of 17,382 short tons of stone was crushed granite produced and used by the Pima County Engineering Department for construction of roads. Other county production was largely a few hundred tons of low-grade manganese ore from the Black Dragon claim near Sells.

PINAL

In 1953 Pinal County ranked second in silver production in Arizona, third in copper, and fourth in gold; it produced all of the State gypsum and perlite. Other mineral production included lead, manganese, sand and gravel, stone, tungsten, and zinc. The most important operation by far was copper mining in the Mineral Creek (Ray) and Pioneer (Superior) districts. Lead-zinc mining was important in the Old Hat (Oracle) district from 1942 to 1952; however, closing of the Mammoth-Collins group of the St. Anthony Mining & Development Co., Ltd., in December 1952 and continued declines in domestic prices of lead and zinc resulted in cessation of lead-zinc mining in Pinal County.

Mineral Creek (Ray) District.—A record output of 5,598,701 tons of copper ore was made in 1953 in the Mineral Creek district as a result of expanded open-pit operations at the Ray property of the Kennecott Copper Corp. However, copper production in 1953 was 3 percent less than in 1952, because the average grade of ore from the Ray mine declined from 1.096 percent copper to 1.018 percent. Nevertheless, the mine continued to rank third in copper production in Arizona; it was also a fairly large producer of gold and silver. The corporation reported that 4,728,249 tons of ore was mined from the open pit and 861,330 tons from underground in 1953 compared with 4,329,763 and 920,726 tons, respectively, in 1952. In addition, 5,116 tons of copper precipitate was shipped to the corporation smelter at Hurley, N. Mex. The crude ore was coarse-crushed in a 15,000-ton mill at the mine, and the resulting product was hauled by rail 26 miles to the corporation concentrator at Hayden; the copper concentrate was smelted at the American Smelting & Refining Co. plant also at Hayden. Details regarding open-pit operations at the Ray property were published in January 1953.⁵ Other district production comprised mainly 9,045 tons of siliceous copper ore from the opencut at the Copper Butte mine, 5,057 tons of copper-silver ore from the Monitor mine, and 549 tons of oxide-lead ore from the Ray Silver-Lead property.

⁵ Mining World, Kennecott Copper's Newest Big Open Pit: Vol. 15, January 1953, pp. 26-30.

Old Hat (Oracle) District.—Tungsten was the principal mineral produced in the Old Hat district in 1953; output increased from 176 units in 1952 to 269 in 1953. The largest producer was the Morning Star mine, operated by Nikas Mining Co.; it was followed by the Maudina mine, operated by Albert Jansen. Ore from the Morning Star mine was hauled to the old gold mill of the Goldfield Mines, Inc., near Apache Junction for processing. Other district production was largely 44 tons of copper ore from the Copper Rose mine.

The San Manuel Copper Corp. (wholly owned subsidiary of Magma Copper Co.) continued shaft sinking and underground development at its property near Tiger (Old Hat district). By the end of 1953 a total of 28,929 feet of development had been done from the No. 1 and No. 2 shafts; sinking on No. 3A and 3B ore shafts and No. 4 service shaft began late in the year. In the early part of the year a contract was awarded for designing and constructing the entire surface plant, including a 30,000-ton concentrator, smelter, railroad right-of-way, and auxiliaries; and a final agreement was made with contractors to finance and build a town to accommodate San Manuel's employees. Ore reserves are estimated at 479,500,000 tons averaging 0.77 percent copper; production is planned to begin in 1956.

Pioneer (Superior) District.—The Magma mine of the Magma Copper Co. continued to be one of the most important producers of gold, silver, and copper in Arizona; in 1953 it ranked second in silver production, fourth in gold, and seventh in copper. From 1950 to 1952 it was also a large producer of zinc; zinc production ceased in August 1952, as copper-zinc ore reserves had been largely exhausted. According to the annual company report for 1953, the Magma mine produced 389,708 tons of milling ore and 42,041 tons of smelting ore, which together contained an average of 0.034 ounce of gold and 1.49 ounces of silver to the ton and 6.21 percent copper. The quantity of each metal produced in 1953 was greater than in 1952; the 1953 gold production was 12,626 ounces, silver 606,458 ounces, and copper 49,637,988 pounds. Development on the main ore body failed to add new ore to the reserves. However, work on the far east replacement ore body and on the Koerner vein added a substantial tonnage of new ore to the reserves in these areas of the mine.

Two companies—Chemi-Cote Perlite Corp. and Perlite Industries of Arizona—in the Pioneer district produced all of the State perlite in 1953. However, production dropped from 1952, as the number of producers declined from 4 to 2. The Perlite Industries of Arizona—the largest producer—has a plant at Phoenix to make expanded material for use as an aggregate in plaster and concrete. Other district production was mainly 86 tons of copper ore from the Bomboy, Grand Pacific, Red Horse, and Robles Wash properties.

The Arizona Gypsum Corp. quarry at Feldman, Pinal County, was the only producer of gypsum in Arizona. The corporation reported that 13,484 short tons of crude gypsum was quarried in 1953, an increase of 2,170 tons over 1952; the crude gypsum was processed in the corporation plant at Phoenix for use as an aggregate in making cement at the Rillito plant of the Arizona Portland Cement Co. The county output of sand and gravel in 1953 was 151,104 short

tons, a decrease of 24,535 tons from 1952. Of the total output, 92,025 tons was produced chiefly by contractors for use by the Pinal County Highway Department, and 59,079 tons was produced from a pit at Coolidge by the Coolidge Sand & Rock Co. for use mainly in making concrete for the construction of buildings. The Coolidge Sand & Rock Co. also produced 46,811 short tons of crushed stone that was used mainly for constructing roads. Other county production was largely 1,420 tons of gold ore, treated by amalgamation and concentration, from the Mammoth (Goldfield Mines) group near Apache Junction (Goldfield district), 101 tons of lead ore from the Silver King mine in the Mineral Hill district, and some low-grade manganese ore from claims near Casa Grande and Superior.

SANTA CRUZ

In 1953 Santa Cruz County ranked second in lead production in Arizona, third in zinc, fourth in manganese ore, and sixth in silver. The principal production was lead-silver-zinc ore from the Flux mine of the American Smelting & Refining Co. in the Harshaw district.

Harshaw District.—The Flux mine and 200-ton flotation mill were operated continuously throughout the year; the mill treated 52,859 tons of ore, of which 49,389 tons was lead-silver-zinc ore from the Flux mine and 3,470 tons various types of base-metal ores that came mainly from the Duquesne group in the Patagonia district (Santa Cruz County). The Flux mine was the second largest producer of lead and zinc in Arizona in 1953 and ranked seventh in silver. Other district production was mostly 1,225 tons of ore averaging 8.05 percent copper from the Sunnyside mine, operated under lease by Strong & Harris Inc.; and several hundred tons of low-grade manganese ore from the Mina Prieta mine.

Patagonia (Duquesne) District.—Mineral production in 1953 was principally 7,544 tons of various types of base-metal ores from 7 claims of the Duquesne group operated by lessees and several thousand tons of low-grade manganese ore from the Fernando Bender and Mowry properties. Of the total ore from the Duquesne group, 4,412 tons containing 24 ounces of gold, 17,670 ounces of silver, 1,027,510 pounds of copper, 246,500 pounds of zinc, and a little lead was shipped direct to a smelter, and 3,132 tons containing 19,919 ounces of silver, 99,850 pounds of copper, 265,957 pounds of lead, and 586,450 pounds of zinc was hauled to a mill. The manganese ore, which averaged 22.45 percent Mn, was shipped to the Government purchase depot at Deming, N. Mex.

Tyndall District.—Three mines in the Tyndall district produced 1,015 tons of base-metal ores—997 tons was lead-zinc ore from the Glove group operated all year by the Sunrise Mining Co. Virtually all of the remainder was lead-zinc ore from the Tiajuana Mines.

YAVAPAI

In 1953 Yavapai County was the largest producer of lead, tungsten, and zinc in Arizona; ranked third in gold, molybdenum, and silver, and was sixth in copper and manganese. The county produced also

some lime and dimension sandstone. Most of the production was copper ore, copper-zinc ore, and tungsten ore from the Eureka district, iron-lead-zinc ore from the Big Bug district, and copper-zinc ore from the Verde district.

Agua Fria District.—The Lone Pine and Stoddard mines were operated a short time in 1953; the total output was 318 tons of ore containing 17 ounces of gold, 192 ounces of silver, and 25,983 pounds of copper.

Big Bug District.—Despite low market prices of lead and zinc in 1953, the Iron King mine and flotation mill of the Shattuck Denn Mining Corp. at Humboldt operated continuously throughout the year at about the same rate as in 1952. The mill treated 190,680 tons of iron-lead-zinc ore in 1953 compared with 196,026 tons in 1952. The corporation reported that the mill produced 18,123 tons of gold-iron concentrate, 14,712 tons of lead concentrate, and 19,075 tons of zinc concentrate in 1953, which altogether contained 18,091 ounces of gold, 624,070 ounces of silver, 510,388 pounds of copper, 9,074,378 pounds of lead, 24,051,130 pounds of zinc, and some iron. In addition, 340 tons of old zinc-lead tailing was shipped direct to a smelter. The mine continued to be the largest producer of lead and zinc in Arizona and ranked third in gold and silver. Details regarding close control at the Iron King mill and revised mining methods in the mine were published in February and March 1953.⁶ Other district production was 18 tons of copper-gold ore from the McCabe and Monopolist claims.

Black Canyon District.—Operations in the Black Canyon district in 1953 were mainly treating some copper-zinc ore in the flotation mill of the Cedar Talisman Consolidated Mining Co. at Cleator and mining a little manganese ore from claims near Bumble Bee.

Castle Creek District.—The Abe Lincoln, Crusader, and Lone Star mines were operated a short time in 1953 and produced a total of 125 tons of copper ore, which was shipped to smelters in Arizona. Some low-grade manganese ore was mined from the Black Buck claim near Castle Hot Springs.

Copper Creek District.—The Piedmont and Rosalie mines east of Bumble Bee were operated in 1953 by the White Mining Co.; production was 518 tons of ore containing 6 ounces of gold, 115 ounces of silver, 19,200 pounds of copper, and 1,763 pounds of lead.

Eureka (Bagdad) District.—The Bagdad open pit, the ninth ranking copper producer in Arizona, was operated all year by Bagdad Copper Corp.; copper production in 1953 exceeded that in 1952 by 8 percent. The corporation 4,000-ton concentrator operated 7 days a week in 1953, treating 1,232,591 tons of ore that contained an average of 1.02 percent copper and small quantities of molybdenite and silver. Ore reserves at the Bagdad property are estimated to be 30 million tons of milling ore averaging 0.754 percent copper and 30 million tons of leaching ore averaging 0.435 percent copper. The corporation is planning to raise the capacity of its mill from 4,000 tons of ore a day to 9,000 tons and add a leaching plant. Details regarding new ideas

⁶ Mining World, Iron King Uses Close Control: Vol. 15, February 1953, pp. 26-29. Revised Mining at Iron King: Vol. 15, March 1953, pp. 34-39.

for Bagdad Copper were published in March 1953.⁷ The Old Dick mine at Bagdad was operated all year by Manhattan Consolidated Mines Development Co. The mine produced 17,387 tons of ore containing an average of 0.61 ounce of silver to the ton, 4.21 percent copper, 0.29 percent lead, and 23.36 percent zinc; most of the ore was processed in custom mills at Bagdad, Ariz., and Deming, N. Mex. The mine ranked fourth in zinc production in Arizona in 1953. The Eureka district was not only a large copper- and zinc-producing area but in 1953 was the largest tungsten-producing area in Arizona through operations of the Black Pearl group by Black Pearl Mining Co. and the Tungstona mine by Hillside Mining & Milling Co. The district tungsten production increased from 1,295 units in 1952 to 2,449 in 1953. The Hillside Mining & Milling Co. was erecting a new mill at the end of the year for processing wolframite ore. Some tungsten ore was produced also from claims in the Martinez (Congress) and Pine Grove (Crown King) districts.

Humbug District.—J. B. Johnston operated the Golden Anchor mine and shipped 39 tons of gold ore to a smelter; 6 tons of lead-silver ore was produced from the Mount Hope claim.

Lynx Creek District.—All of the mineral output in the Lynx Creek district in 1953 was placer gold and silver, recovered mainly by drag-line dredging at the Myrtle claims by Parker & Raymond Co.

Peck District.—Leased operations at the old Swastika mine near Crown King produced 63 tons of ore containing 4,540 ounces of silver and 336 pounds of copper.

Tip Top (Rock Springs) District.—The mineral output in the Tip Top district in 1953 was 109 tons of copper ore from the Kay Copper waste dump and some manganese ore from claims at Rock Springs.

Verde (Jerome) District.—Mining operations in the Verde district ceased in March 1953, owing to the fact that ore reserves at the United Verde mine of the Phelps Dodge Corp. became exhausted. According to the corporation 1953 annual report, the United Verde 2,100-ton concentrator shut down March 30. During the 3-month operation, the mill treated 30,464 tons of copper-zinc ore, which, with 70 tons of copper precipitate and several hundred tons of cleanup material, yielded 2,020,981 pounds of copper, 2,199,620 pounds of zinc, and some gold and silver. After operations ceased, all usable equipment and materials were salvaged from the underground area of the mine, the concentrator was dismantled, and certain properties, consisting of real estate, buildings, and miscellaneous equipment, were sold.

Weaver (Octave) District.—Gold ore (409 tons) from the Monica mine was the only mineral production in the Weaver district in 1953.

Other Yavapai County production was lime, produced at the Nelson plant of the Grand Canyon Lime & Cement Co. of Arizona for use as a reagent at copper-flotation mills in Arizona; 3,124 short tons of stone, nearly all of which was dimension sandstone, from quarries near Drake and Paulden; and several hundred tons of low-grade manganese ore from claims in the Blue Tank, Black Rock, and White Picacho districts.

⁷ Engineering and Mining Journal, New Ideas for Bagdad Copper: Vol. 154, March 1953, pp. 88-93.

YUMA

In 1953 Yuma County was the largest producer of manganese ore and fluorspar in Arizona and ranked fifth in tungsten; it also produced some copper, gold, lead, mica, and silver. Approximately 52,000 long tons of manganese ore averaging 16.23 percent Mn was hauled to the National Stockpile depot at Wenden; production came from 22 claims in the Alamo, Cienega, Ellsworth, Eureka-Silver Camp (Trigo Mountains), Plomosa, and Santa Maria districts. All of the fluorspar production was recovered from old tailings in the Castle Dome district, and all of the tungsten came from mines in the Ellsworth and Plomosa districts.

Alamo District.—Through operations of the Doyle claim by Al Stovall, the Alamo district near the Artillery Peak area of adjoining Mohave County was the largest producer of manganese ore in Arizona in 1953. Ore averaging 15.79 percent Mn was hauled from the claim to the National Stockpile depot at Wenden. Other producers of manganese ore were the Springs and Steel Maker claims.

Castle Dome District. The Holmestake Mining Co. operated a flotation mill in 1953 to recover fluorspar from old tailings dump at the Castle Dome, De Luce, and Sonora groups. The company reported that 10,405 tons of material was processed, which yielded 1,606 short tons of high-grade fluorspar concentrate and 75 tons of byproduct lead concentrate. The fluorspar concentrate was shipped to chemical companies in California and Texas and the lead concentrate to a smelting company in Texas.

Cienega District.—Four mines—Billy Mack, Empire-Arizona, Lucky, and Mammon—produced 303 tons of ore containing 21 ounces of gold, 18 ounces of silver, and 19,271 pounds of copper; the Mammon mine, operated by Harryman & Osborne, was the largest producer. Other district production was a little low-grade manganese ore from the Manganese King claim near Parker.

Ellsworth (Harqua Hala) District.—The most important mineral production in the Ellsworth district in 1953 was 150 units of tungsten from 7 properties; the chief producers were the Blue Eagle, Jack Pot, and Three Musketeers claims. Other district production was 117 tons of copper-gold ore from the Critic mine, 85 tons of gold ore from the Magic mine, and some low-grade manganese ore shipped to Wenden.

Eureka-Silver Camp (Trigo Mountains) District.—The mineral output in the Eureka-Silver Camp District was a few thousand tons of low-grade manganese ore shipped to Wenden from numerous claims; the largest producer was the Power group near Cibola.

Plomosa District.—The principal mineral output in the Plomosa district in 1953 was tungsten ore from six claims; the Tunghill mine near Quartzite, operated by J. J. Stetler, was by far the largest producer. Stetler reported that 324 units of tungsten was recovered in 1953 from the treatment of 1,479 tons of scheelite ore that averaged 0.45 percent WO_3 . Other district production was 118 tons of silver ore from the R. & A. mine, several hundred tons of low-grade manganese ore shipped to Wenden from claims near Bouse, and a small quantity of scrap mica from the Lucky Chance mine near Quartzite.

Santa Maria (Bill Williams) District.—R. L. Fleming worked his Green Streak claim three months in 1953 and shipped 109 tons of copper-gold ore. Other district production was some low-grade manganese ore shipped to Wenden.

Trigo District.—Gold and silver were recovered in 1953 from the treatment, by gravity concentration, of gold-bearing gravel at the Colorado Placers 50 miles north of Yuma.

The Mineral Industry of Arkansas

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Division of Geology, Arkansas Resources and Development Commission.

By F. F. Netzeband,¹ Norman F. Williams,² and W. G. Diamond³



THE 1953 VALUE of mineral output in Arkansas was a record \$127 million, 8 percent higher than the 1952 value of \$118 million (table 1). Thirteen minerals and five mineral fuels were produced. Arkansas was the leading producer in the United States of barite and bauxite and ranked fifth in the value of petroleum produced in 1953. Important quantities of coal, stone, sand and gravel, natural gas, natural-gas liquids, and cement were also produced. The mineral fuels—petroleum, natural gas, natural-gas liquids, and coal—were Arkansas' most important minerals, furnishing 73 percent of the total mineral value; metals supplied 11 percent and nonmetals 16 percent.

TABLE 1.—Mineral production of Arkansas, 1952-53¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Barite (crude).....	428, 522	\$3, 963, 828	380, 763	\$3, 945, 583
Bauxite..... long tons, dried equivalent.	1, 603, 833	10, 235, 254	1, 529, 976	12, 975, 992
Clays.....	552, 576	1, 513, 934	529, 126	1, 734, 414
Coal.....	873, 088	6, 839, 113	775, 207	6, 143, 757
Iron ore (usable)..... long tons, gross weight.	115	(²)	254	(²)
Lead (recoverable content of ores, etc.).....	4	1, 288	-----	-----
Manganese ore (35 percent or more Mn)..... gross weight.	2, 246	(²)	6, 123	526, 647
Manganiferous ore (5 to 35 percent Mn)..... do.	896	(²)	-----	-----
Natural gas..... million cubic feet.	42, 325	1, 735, 000	41, 510	2, 200, 000
Natural-gas liquids:				
Natural gasoline and cycle products				
LP-gases..... thousand gallons.	61, 782	4, 580, 000	58, 422	4, 123, 000
do..... do.	49, 098	2, 079, 000	55, 188	2, 562, 000
Petroleum (crude)..... thousand 42-gallon barrels.	29, 440	72, 420, 000	29, 681	77, 170, 000
Sand and gravel.....	5, 011, 095	4, 977, 219	4, 903, 835	4, 955, 383
Slate.....	(³)	(³)	34, 516	315, 858
Stone (except limestone for cement and lime).....	2, 967, 479	3, 346, 201	4 3, 545, 350	4 5, 069, 750
Zinc (recoverable content of ores, etc.).....	26	8, 632	-----	-----
Undistributed: A abrasive stones, cement, gypsum, lime, slate (1952), stone (dimension miscellaneous, 1952), ground soapstone, recovered elemental sulfur and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2). Excludes value of clays used for cement.	-----	\$ 5, 987, 245	-----	5, 367, 669
Total Arkansas.....	-----	117, 687, 000	-----	127, 090, 000

¹ Production as measured by mine shipments or mine sales (including consumption by producers), except that fuels are strictly production.

² Estimate.

³ Value included with "Undistributed."

⁴ Final figure. Supersedes preliminary figure given in commodity chapter.

⁵ Revised figure.

¹ Commodity-industry analyst, Region VI, Bureau of Mines, Amarillo, Tex.

² Director, Division of Geology, Arkansas Resources and Development Commission.

³ Statistical clerk, Region VI, Bureau of Mines, Amarillo, Tex.

CONSUMPTION AND MARKETS

Arkansas processed considerable quantities of its minerals and imported others for treatment within its boundaries. Oil refineries processed Arkansas crude oil; alumina and aluminum-reduction plants used Arkansas and foreign bauxite; zinc smelters treated out-of-State ores; portland cement, brick, tile, and pottery plants used Arkansas clays; and building, road, and construction companies used stone and sand and gravel produced in the State. An ample labor supply and ready access to supplies of low-cost natural gas, electric power, and ground water offered special opportunities for new industries and expansion of established ones.

TRENDS AND DEVELOPMENTS

The National Lead Co., under a Defense Materials Production Administration (DMPA) contract conducted research of the feasibility of using domestic brookite (titanium dioxide) in producing titanium metal and welding-rod coating. The Federal Bureau of Mines was investigating deposits of this mineral at Magnet Cove, Hot Spring County, Ark. Brookite is similar to rutile—an important source of titanium—in composition but differs from it in crystal structure. Nearly half of the domestic titanium metal and 40 percent of the titanium welding-rod coatings were produced from rutile. About seven-tenths of the domestic supply of rutile in 1953 was imported from Australia.

The Federal Bureau of Mines continued a major research project to develop methods of recovering columbium from the black sands of bauxite deposits in Pulaski and Saline Counties. Major domestic requirements of this metal were being met by imports from Nigeria and the Belgian Congo.

The Aluminum Co. of America began production at its new alumina plant at Bauxite, Saline County. Annual rated capacity of this new plant is 400,000 tons of alumina. A new alumina-chemical-products plant was being built in conjunction with the alumina plant.

The new Robert P. Patterson reduction works of Reynolds Metals Co., near Arkadelphia, Clark County, was nearing completion as 1953 ended. The company operated another reduction plant at Jones Mill, Hot Spring County. Alumina used in these reduction plants was supplied from the company Hurricane Creek plant.

The Reynolds Metals Co. began bauxite shipments from its Jamaican deposits to its Hurricane Creek alumina plant the latter part of 1953 at the annual rate of 550,000 tons. This Jamaican ore will also be used to supply bauxite to the company La Quinta plant in Texas. The ore assigned to Arkansas will be unloaded from ocean-going ore boats at Mobile, Ala., and transshipped by rail to Hurricane Creek. These imports will supplement but not replace the company Arkansas bauxite production.

The oil industry of Arkansas proved the new Horsehead field in Columbia County with 14 producing wells. Extensions and new pays were developed in Miller, Ouachita, and Union Counties. The natural-gas industry brought in 2 new gas discoveries, 1 each in Franklin and Washington Counties. The Sunray Oil Co. was laying a 341-mile oil line, mostly 10-inch from West Memphis, Crittenden County, Ark., to Duncan, Okla., to be completed about midyear of 1954.

SMELTERS

The zinc-retort smelter of the Athletic Mining & Smelting Co. treated ores from the Tri-State district of Oklahoma, Kansas, and Missouri and from Illinois, Kentucky, Tennessee, Arizona, New Mexico, and foreign sources. The Reynolds Metals Co. was building a new aluminum-reduction works at Arkadelphia, which will add 55,000 tons of primary metal to the company 97,000-ton output for Arkansas.

DMEA AND DMPA CONTRACTS IN ARKANSAS

The 1953 program of the Defense Minerals Exploration Administration continued on a smaller scale than in 1952. Systematic investigation of occurrences of strategic and critical minerals was encouraged through financial assistance extended under Government contracts. These funds were repayable from royalties on ore discovered and subsequently mined. The DMEA contract with the Inland Mining Corp. was terminated; no discovery of manganese ore was certified.

EMPLOYMENT, ACCIDENTS, AND WAGES IN MINERAL INDUSTRIES

Employment.—Total employment in Arkansas mineral-fuels industries, except coal, increased over 1952 in 1953. More than 5,000 people were employed in the oil and gas industries in 1953, 3 percent in exploration, 3 percent in drilling, 14 percent in production, 15 percent in pipeline operation, 40 percent in refining, and 25 percent in miscellaneous. Employment in the coal industry declined 30 percent to approximately 950 in 1953 from that of 1952. Employment in the metallic and nonmetallic industries in 1953 exceeded 2,100 and was composed of 61 percent in the metals industry and 39 percent in nonmetals. Zinc smelters employed nearly 1,750 workers.

Accidents.—No major disaster was reported in any mineral or mineral-fuels industries of Arkansas in 1953. One fatality was reported in nonmetals and none in metal mining or smelting.

Wages.—Wages of mineral-fuels and nonmetallic workers increased in 1953 following the national trend in industrial wages. Wages of metal miners declined slightly during the year.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal.—The 1953 production of coal in Arkansas was 775,200 short tons, valued at \$6,144,000 (table 2), a decrease of 11 percent in quantity and 10 percent in value from 1952. Coal was produced in Johnson, Sebastian, Logan, Franklin, and Pope Counties.

TABLE 2.—Coal production, 1944-48 (average) and 1949-53

Year	Short tons	Value		Year	Short tons	Value	
		Total	Average per ton			Total	Average per ton
1944-48 (average)	1,798,195	\$10,686,962	\$5.94	1951	1,106,705	\$8,686,410	\$7.85
1949	961,511	7,534,415	7.84	1952	873,088	6,839,113	7.83
1950	1,169,068	8,883,000	7.60	1953	775,207	6,143,757	7.93

Natural Gas.—The marketed production of natural gas in 1953 decreased 2 percent in quantity to 41,510 million cubic feet and increased 27 percent in value to \$2,200,000 over 1952 (table 3). In addition to the marketed production, 20,003 million cubic feet of gas was used for repressuring and 3,587 million cubic feet was vented. Venting and wasting loss was greater in 1953 than in 1952. Natural-gas production was reported from 10 counties in Arkansas. The five leading producers were Columbia, Lafayette, Union, Franklin, and Sebastian Counties.

Of the 149 wildcats drilled in 1953, 13 were productive for an average of 9 percent, and 136 holes were dry. Estimated proved reserves of natural gas, as of December 31, 1953, increased 23 percent over 1952 to 1,211,266 million cubic feet.⁴

Arkansas had 4,270 miles of natural-gas pipelines in 1953, 210 miles of field and gathering lines, and 4,060 miles of transmission lines.⁵

Natural-Gas Liquids.—Arkansas production of natural-gas liquids in 1953 increased 2 percent in quantity to 113,610,000 gallons and less than 1 percent in value to \$6,685,000 over 1952 (table 4). Production of natural gasoline and cycle products decreased about 1 percent in volume and 10 percent in value from 1952. LP-gases increased 12 percent in quantity and 23 percent in value. Proved reserves of natural-gas liquids in Arkansas in 1953 were estimated at 49,585,000 barrels, down about 3 percent from 1952 estimates.⁶

Petroleum.—Production of petroleum in 1953 was 29,681 thousand barrels valued at \$77,170,000, an increase of less than 1 percent in volume and 7 percent in value over 1952 (table 7). Production was reported from 8 counties, with Columbia and Union the leading producers.

TABLE 3.—Marketed production of natural gas, 1944–48 (average) and 1949–53, in million cubic feet¹

Year	Quantity	Value	Mills value per thousand cubic feet	Year	Quantity	Value	Mills value per thousand cubic feet
1944–48 (average)	48,561	\$1,543,000	32	1951	44,656	\$1,786,000	40
1949	47,788	1,912,000	40	1952	42,325	1,735,000	41
1950	48,047	1,682,000	35	1953	41,510	2,200,000	53

¹ Comprises gas either sold or consumed by producers including losses in transmission, amounts added to storage, and increases in gas pipelines.

TABLE 4.—Natural-gas liquids produced, 1944–48 (average) and 1949–53, in 42-gallon barrels

Year	Natural gasoline and cycle products		LP-gases		Total	
	Barrels	Value	Barrels	Value	Barrels	Value
1944–48 (average)	1,251,548	\$3,183,600	817,743	\$1,161,200	2,069,291	\$4,344,800
1949	1,426,833	4,080,000	852,831	1,492,000	2,279,714	5,572,000
1950	1,395,000	3,926,000	938,000	1,197,000	2,333,000	5,123,000
1951	1,386,000	4,247,000	962,000	1,606,000	2,348,000	5,853,000
1952	1,471,000	4,580,000	1,169,000	2,079,000	2,640,000	6,659,000
1953	1,391,000	4,123,000	1,314,000	2,562,000	2,705,000	6,685,000

⁴ American Petroleum Institute, Petroleum Facts and Figures: 11th ed., 1953 data, p. 132.

⁵ American Gas Association, Gas Facts: 1953, p. 62.

⁶ American Petroleum Institute, Petroleum Facts and Figures: 11th ed., 1953 data, p. 133.

TABLE 5.—Production of natural-gas liquids in 1953, by type of product, in thousand gallons

Type of product	Thou- sand gallons	Value	Type of product	Thou- sand gallons	Value
Natural gasoline.....	52, 878	\$3, 664, 000	Other products.....	3, 150	\$220, 000
LP-Gases.....	55, 188	2, 562, 000	Total.....	113, 610	6, 685, 000
Finished gasoline and naphtha.	2, 394	239, 000	Natural gas treated (million cubic feet).....	71, 257	-----

There were 4,190 producing oil wells in Arkansas in 1953, 260 more than in 1952. The average daily output per well in 1953 was 20.0 barrels compared with 20.8 barrels in 1952. The average price per barrel of crude at the well was \$2.60 in 1953 compared with \$2.46 in 1952.

Exploratory drilling decreased slightly in 1953, when 120 wells were completed, including 18 oil producers, 1 gas well, and 101 dry holes (table 11). Estimated proved reserves as of December 31, 1953, were 358 million barrels, up 1 percent over 1952 estimated reserves.

Arkansas refineries received 22,848,000 barrels in 1953; 21,518,000 barrels was Arkansas production, 743,000 barrels came from Texas, and 587,000 barrels came from Louisiana. The daily average demand for crude oil in 1953 was 81,900 barrels compared with 79,300 in 1952. Crude-oil stocks at Arkansas refineries, as of December 31, 1953, were 426,000 barrels; 1,515,000 barrels was in pipelines and tank farms.

TABLE 6.—Production of crude petroleum 1944-48 (average) and 1949-53, in thousand 42-gallon barrels

Year	Thou- sand barrels	Value		Year	Thou- sand barrels	Value	
		Total	Average per barrel			Total	Average per barrel
1944-48 (average)	29, 607	\$46, 086, 000	\$1. 56	1951.....	29, 798	\$73, 900, 000	\$2. 48
1949.....	29, 986	74, 360, 000	2. 48	1952.....	29, 440	72, 420, 000	2. 46
1950.....	31, 108	76, 530, 000	2. 46	1953.....	29, 681	77, 170, 000	2. 60

TABLE 7.—Production of crude petroleum in Arkansas, 1949-53, by fields
(Thousand barrels)

Field	1949	1950	1951	1952	1953 ¹
Atlanta.....	1, 080	999	841	810	649
Buckner.....	778	798	719	722	645
Dorcheat-Macedonia.....	930	983	875	877	841
Fouke.....	945	894	929	1, 053	1, 429
McKamie.....	1, 156	1, 179	1, 175	1, 446	1, 369
Magnolia.....	4, 292	4, 547	4, 407	4, 223	4, 029
Midway.....	2, 685	2, 786	2, 684	2, 674	2, 642
Schuler.....	3, 140	2, 854	2, 626	2, 377	2, 318
Smackover.....	3, 900	3, 991	3, 910	3, 814	3, 892
Stephens.....	1, 611	1, 774	1, 476	1, 308	1, 223
Village.....	1, 850	1, 677	1, 247	1, 018	840
Wesson.....	3, 053	3, 452	3, 647	3, 510	3, 296
Other fields ²	4, 566	5, 174	5, 262	5, 608	6, 508
Total.....	29, 986	31, 108	29, 798	29, 440	29, 681

¹ Final figures.

² Includes oil consumed on leases and net change in stocks held on leases for entire State

TABLE 8.—Production of crude petroleum in 1953, by months

Month	Thousand barrels	Month	Thousand barrels
January.....	2,511	August.....	2,560
February.....	2,270	September.....	2,554
March.....	2,526	October.....	2,505
April.....	2,449	November.....	2,377
May.....	2,458	December.....	2,448
June.....	2,451		
July.....	2,572	Total.....	29,681

TABLE 9.—Indicated demand for petroleum in 1953, by months
(Thousand barrels)

Month	Indicated demand	Month	Indicated demand
January.....	2,694	August.....	2,560
February.....	2,366	September.....	2,266
March.....	2,627	October.....	2,397
April.....	2,459	November.....	2,366
May.....	2,627	December.....	2,625
June.....	2,571		
July.....	2,339	Total: 1953.....	29,897
		1952.....	29,018

TABLE 10.—Sales of petroleum products, 1949-53
(Thousand barrels)

Product	1949	1950	1951	1952	1953
Gasoline.....	8,445	9,147	10,119	10,672	11,025
Kerosine.....	1,556	1,741	1,777	1,736	1,390
Range oil.....	892	964	1,050	1,051	876
Distillate fuel oil.....	2,162	2,414	2,244	2,325	2,222
Residual fuel oil.....	1,833	2,273	2,051	1,497	1,006

TABLE 11.—Oil- and gas-well drilling in 1953

County	Proved field wells			Exploratory wells			Total		
	Oil	Gas	Dry	Oil	Gas	Dry	Oil	Gas	Dry
Arkansas.....						3			3
Ashley.....			1			2			3
Bradley.....						1			1
Calhoun.....	3		2				3		2
Cleveland.....						1			1
Columbia.....	28		16	4		10	32		26
Conway.....						2			2
Crawford.....					1	2		1	2
Crittenden.....						1			1
Dallas.....						2			2
Drew.....						4			4
Franklin.....					4	4		4	4
Hempstead.....						3		4	3
Howard.....						1			1
Independence.....						1			1
Jackson.....						1			1
Johnson.....					1	2		1	2
Lafayette.....	19		15	2		10	21		25
Madison.....						2			2
Miller.....	32		29	6		17	38		46
Nevada.....	28		12	1		3	29		15
Ouachita.....	32	1	18	2		13	34	1	31
Phillips.....						1			1
Saline.....						1			1
Sebastian.....					2				2
Union.....	129	1	53	10		23	139	1	76
Washington.....					2	6		2	6
White.....						4			4
Yell.....						1			1
Total.....	271	2	146	25	10	121	296	12	267

TABLE 12.—Capacity of petroleum refineries and cracking plants in 1953

(Barrels per day)

Company	Location	Crude-oil capacity, operating	Cracked-gasoline capacity, operating
Berry Asphalt Co.....	Stephens.....	1,800	
Do.....	Waterloo.....	1,500	
Henry H. Cross Co.....	Smackover.....	6,000	
Lion Oil Co.....	El Dorado.....	24,000	5,500
Macmillan Petroleum Corp.....	Norphlet.....	4,000	
Pan-Am Southern Corp.....	El Dorado.....	32,600	16,900
Total.....		69,900	22,400

Pipelines carried most of the crude oil shipped to Arkansas refineries in 1953; tank cars and trucks carried the balance, as reported below. ⁷

Type of transportation	Quantity shipped, barrels	
	Intrastate	Interstate
Pipelines.....	21,348,000	1,166,000
Tank cars and trucks.....	170,000	164,000

There were six refineries in Arkansas in 1953 operated at a daily crude capacity of 69,900 barrels, as of January 1, 1954. There was an additional daily cracking-plant capacity of 22,400 barrels (table 12).

METALS

Bauxite.—Production of bauxite in 1953 was 1,530,000 long tons valued at \$12,976,000 (table 13), a decrease of 5 percent in quantity and an increase of 27 percent in value over 1952. Arkansas will have 2 alumina and 2 reduction plants when the Aluminum Co. of America completes its new plant at Bauxite and the Reynolds Metals Co. its new reduction works at Arkadelphia. These additions will increase the State's alumina capacity to over 1 million tons annually and its reduction capacity to about 150,000 tons of metal.

TABLE 13.—Mine production of bauxite and shipments from mines and processing plants to consumer, 1944-48 (average) and 1949-53, in long tons

Year	Mine production			Shipments from mines and processing plants to consumers		
	Crude	Dried bauxite equivalent	Value	As shipped	Dried bauxite equivalent	Value
1944-48 (average).....	1,708,460	1,440,923	\$8,067,450	1,655,173	1,439,750	\$8,604,526
1949.....	1,287,358	1,094,924	6,433,964	1,232,883	1,132,330	8,119,574
1950.....	1,552,047	1,307,335	7,531,535	1,418,724	1,301,374	9,277,076
1951.....	2,153,786	1,815,274	12,259,742	1,583,320	1,493,557	11,994,882
1952.....	1,903,101	1,603,833	10,235,254	2,067,241	1,849,287	14,084,274
1953.....	1,802,797	1,529,976	12,975,992	1,889,206	1,689,207	15,042,236

⁷ American Petroleum Institute, Petroleum Facts and Figures: 11th ed., 1953 data, p. 185.

Iron Ore.—A small tonnage of hematite iron ore was produced in Nevada County. Production increased about 121 percent over 1952.

Manganese.—Under the Government purchase plan, production of Arkansas manganese ore of metallurgical grade increased more than 170 percent in quantity in 1953 over 1952 (table 14). All production originated in Independence County.

TABLE 14.—Manganese and ferruginous manganese ores shipped from mines 1944-48 (average) and 1949-53, in short tons

Year	Manganese ore ¹		Ferruginous manganese ²	
	Gross weight	Mn content	Gross weight	Mn content
1944-48 (average).....	3, 185	1, 327	6, 957	1, 511
1949.....	2, 851	1, 284	5, 555	1, 388
1950.....	1, 224	473	6, 359	1, 667
1951.....	3, 718	1, 442	1, 429	395
1952.....	2, 246	1, 007	896	269
1953.....	6, 123	2, 812	-----	-----

¹ Containing 35 percent or more manganese (natural).

² Containing 10 to 35 percent manganese (natural).

NONMETALS

Abrasive Stone.—Production of oilstones and whetstones in Garland County increased 22 percent in quantity and decreased 26 percent in value during the year.

Barite.—Arkansas remained the Nation's leading producer of barite in 1953, although output dropped 13 percent to 380,763 tons from 1952. The 1953 value approximated that of 1952 (table 16). All barite was produced in Hot Spring County and was used for oil-well drilling mud.

TABLE 15.—Primary barite produced and sold or used, 1944-48 (average) and 1949-53

Year	Production (short tons)	Sold or used		Year	Production (short tons)	Sold or used	
		Short tons	Value ¹			Short tons	Value ¹
1944-48 (average)	289, 424	289, 424	\$2, 023, 006	1951.....	407, 085	407, 085	\$3, 765, 586
1949.....	363, 382	363, 382	2, 907, 056	1952.....	428, 572	428, 522	3, 963, 828
1950.....	343, 168	343, 168	3, 088, 612	1953.....	380, 813	380, 763	3, 945, 583

¹ Estimate.

Cement.—Shipments from the cement mill near Okay, Howard County, decreased 8 percent in 1953.

Clays.—Arkansas production of clay was 529,126 short tons valued at \$1,734,414. This was a 4-percent decrease in quantity and a 15-percent increase in value over 1952. Fire clay comprised 63 percent of total clay produced, with miscellaneous clays composing the remainder. Clay was produced in 11 counties, principally Hot Spring and Sebastian. Clay was mainly for heavy clay products, such as brick, tile, and pipe.

TABLE 16.—Clays sold or used by producers, 1944-48 (average) and 1949-53, by kinds

Year	Miscellaneous clays		Fire clay		Total clay	
	Short tons	Value	Short tons	Value	Short tons	Value
1944-48 (average).....	177, 112	\$147, 710	170, 851	\$530, 297	347, 963	\$678, 007
1949.....	175, 758	182, 687	276, 245	897, 917	452, 003	1, 080, 604
1950.....	219, 117	217, 127	256, 042	789, 876	475, 159	1, 007, 003
1951.....	171, 518	184, 532	319, 941	1, 022, 326	491, 459	1, 206, 858
1952.....	166, 465	176, 392	386, 111	1, 337, 542	552, 576	1, 513, 934
1953.....	197, 874	209, 549	331, 252	1, 524, 865	529, 126	1, 734, 414

Gypsum.—Gypsum was produced in Arkansas by the Arkansas Gypsum Co. from its open pit near Murfreesboro, Pike County. This output was greater in 1953 than in 1952.

Lime.—The lime plants in Independence and Saline Counties increased the total State production 30 percent in 1953.

Perlite.—Crude perlite is not known to occur in Arkansas. However, in 1952 a plant at Little Rock, Pulaski County, using crude rock from deposits in Western States, produced expanded perlite for use mainly as a lightweight aggregate, replacing heavier materials in plaster and concrete.

Sand and Gravel.—Sand and gravel were produced in 19 counties in 1953 for a total of 4,904,000 short tons valued at \$4,955,000 (table 17). This was a 2-percent decrease in volume from 1952, but the

TABLE 17.—Sand and gravel sold or used by producers, 1952-53, by class of operations and uses

	1952			1953		
	Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per ton
Commercial operations:						
Sand:						
Building.....	669, 973	\$383, 742	\$0. 57	751, 745	\$405, 955	\$0. 54
Paving.....	324, 229	242, 736	. 75	308, 649	226, 618	. 73
Grinding and polishing.....						
Gravel:						
Building.....	89, 977	101, 071	1. 12	64, 404	67, 694	1. 05
Paving.....	843, 329	883, 173	1. 05	707, 351	823, 496	1. 16
Railroad ballast.....	245, 549	195, 129	. 79	277, 324	220, 587	. 80
Other.....	57, 298	60, 104	1. 05	(¹)	(¹)	(¹)
Undistributed ²	213, 890	404, 003	1. 89	268, 473	554, 425	2. 07
Total commercial sand and gravel.....	2, 444, 245	2, 269, 958	. 93	2, 377, 946	2, 298, 775	. 97
Government-and-contractor operations:						
Sand:						
Paving.....	144, 855	106, 080	. 73	197, 500	144, 325	. 73
Gravel:						
Paving.....	2, 421, 995	2, 601, 181	1. 07	2, 328, 389	2, 512, 283	1. 08
Total Government-and-contractor sand and gravel.....	2, 566, 850	2, 707, 261	1. 05	2, 525, 889	2, 656, 608	1. 05
Grand total.....	5, 011, 095	4, 977, 219	. 99	4, 903, 835	4, 955, 383	1. 01

¹ Figure withheld to avoid disclosure of individual company operations.

² Includes glass, molding, engine, fire, railroad ballast, and other sand and other gravel; Bureau of Mines not at liberty to publish separately.

value was approximately the same. Sand was used mainly for paving and commercial building and gravel for paving purposes.

Slate.—Production of slate at Caddo Gap, Montgomery County, in 1953 increased considerably over 1952.

Soapstone.—Arkansas production of soapstone originated at Benton and Bryant, Saline County.

Stone.—Stone production in Arkansas in 1953 totaled 3,545,000 short tons valued at \$5,070,000 (table 18). Production included limestone, sandstone, marble, and miscellaneous stone, an increase of 19 percent in volume and 52 percent in value over 1952.

Stone was produced in nine counties in 1953. Limestone production was reported in Benton, Independence, and Izard Counties and was used as flux for agricultural and metallurgical purposes and for concrete and road metal. Miscellaneous stone was produced in Logan and Pulaski Counties and was used for concrete, road metal, and railroad ballast. Sandstone was quarried in six counties and used for road metal, building stone, and flagging. A small quantity of dimension marble was prepared in Independence County, and railroad stone was produced in Hot Spring County.

TABLE 18.—Stone sold and used by producers, 1949–53, by kinds

Year	Marble		Limestone		Sandstone		Miscellaneous stone		Total stone	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1949..	890	\$16,600	1,261,200	\$2,166,285	17,160	\$64,351	(1)	(1)	² 1,279,250	² \$2,247,236
1950..	1,350	17,250	2,470,490	5,848,341	180,370	235,822	1,300,510	\$1,317,697	3,952,720	7,419,110
1951..	1,525	95,200	826,896	1,298,154	-----	-----	1,707,325	1,823,072	2,535,746	3,216,426
1952..	321	14,588	778,380	910,459	28,271	115,017	2,160,507	2,306,137	² 2,967,479	³ 3,346,201
1953..	349	9,500	1,161,752	1,984,316	264,907	432,830	2,118,342	2,643,104	⁴ 3,545,350	⁴ 5,069,750

¹ Figures withheld to avoid disclosing individual company operations.

² Incomplete figure, excludes miscellaneous stone.

³ Incomplete figure, excludes dimension miscellaneous stone.

⁴ Final figure. Supersedes figure given in commodity chapter.

REVIEW BY COUNTIES

Production of metallic and nonmetallic minerals and mineral fuels was reported in 40 of the 75 counties in Arkansas. Independence, Nevada, Pulaski, and Saline Counties produced metallic minerals. Nonmetallic minerals were produced mainly in the western half of the State. Petroleum production originated in the southwestern part of the State. Natural gas was produced in southern and northwestern Arkansas. Natural-gas liquids were produced in the southern counties—Columbia, Lafayette, Union, Hempstead, and Miller.

ASHLEY

Petroleum was produced in Ashley County.

BAXTER

Paving sand and gravel were produced by the Department of Agriculture in Baxter County.

BENTON

Crushed limestone was produced by the Independent Gravel Co. and the Rogers Lime & Materials Co. The limestone was used for agricultural purposes.

CALHOUN

Petroleum was produced in Calhoun County. The St. Francis Materials Corp., operating near Harrell, produced sand and gravel, and Sam D. Crawford produced gravel used for paving and railroad ballast. Calhoun County was the fourth largest producer of sand and gravel in the State.

TABLE 19.—Value of mineral production in Arkansas, by counties, 1952-53

County	1952	1953	Principal commodities produced in 1953, in order of value
Calhoun.....	\$272, 163	\$493, 339	Petroleum, sand and gravel.
Columbia.....	26, 837, 583	27, 117, 661	Petroleum, natural-gas liquids, natural gas.
Craighead.....	39, 800	98, 325	Sand and gravel, clays.
Franklin.....	320, 915	342, 023	Natural gas, coal.
Hempstead.....	506, 232	504, 592	Natural-gas liquids, clays.
Hot Spring.....	5, 605, 861	5, 465, 121	Barite, clays, sand and gravel.
Independence.....	1, 250, 054	1, 447, 186	Lime, manganese ore, stone.
Izard.....	720, 161	968, 973	Stone, sand and gravel.
Johnson.....	2, 502, 981	2, 841, 149	Coal, stone, clays.
Lafayette.....	13, 742, 422	14, 568, 202	Petroleum, natural-gas liquids, natural gas.
Logan.....	1, 165, 663	391, 041	Coal, stone.
Miller.....	3, 440, 759	4, 667, 977	Petroleum, natural-gas liquids, clays.
Onachita.....	13, 627, 859	17, 093, 631	Petroleum, sand and gravel, clays.
Pope.....	191, 070	270, 323	Stone, sand and gravel, coal.
Pulaski.....	4, 100, 739	4, 309, 249	Stone, bauxite, sand and gravel.
Saline.....	8, 813, 694	12, 173, 887	Bauxite, lime, clays.
Sebastian.....	3, 166, 613	2, 651, 694	Coal, clays, natural gas.
Sevier.....	29, 019		
Union.....	21, 527, 321	20, 514, 756	Petroleum, natural-gas liquids, natural gas.
Washington.....	153, 000		
Other counties.....	1, 379, 098	3, 782, 236	
Undistributed ¹	8, 204, 086	7, 388, 856	Sand and gravel, stone.
Total.....	117, 687, 000	127, 090, 000	

¹ Includes value of mineral production and principal minerals produced in 1953 for the following counties: Ashley (petroleum), Baxter (sand and gravel), Benton (stone), Chicot (sand and gravel), Clark (clays), Conway (stone), Crawford (sand and gravel, natural gas), Cross (sand and gravel), Dallas (sand and gravel), Drew (sand and gravel), Garland (grindstones), Greene (sand and gravel), Howard (cement), Jackson (sand and gravel), Jefferson (sand and gravel), Madison (1952 only), Marion (1952 only), Mississippi (sand and gravel), Montgomery (slate), Nevada (petroleum, iron ore), Pike (gypsum), Folk (clays), St. Francis (sand and gravel), Yell (stone).

CHICOT

The Army Corps of Engineers produced paving sand in Chicot County.

CLARK

Shale for the manufacture of brick was produced by the Hope Brick Works at its pit near Arkadelphia.

COLUMBIA

Columbia County was the State's leading producer of petroleum, natural gas, and natural-gas liquids.

CONWAY

Crushed sandstone was produced in Conway County by the Army Corps of Engineers for concrete and road metal.

CRAIGHEAD

Paving gravel was produced by the Cotton Belt Gravel Co., and railroad-ballast gravel was produced by Jewell Hoffman. Railroad gravel was also produced. The Hall-Wheeler Brick Co., Inc., produced red clay at its pit near Jonesboro for the manufacture of heavy clay products.

CRAWFORD

The Arkhola Sand & Gravel Co. produced sand and gravel used for construction purposes. Natural gas was produced in Crawford County.

CROSS

Paving gravel was produced by the Cross County Gravel Co. at its pit near Wynne.

DALLAS

The St. Francis Materials Corp. produced paving sand and gravel from deposits near Sparkman.

DREW

Gravel was produced from deposits in Drew County by the Wilson Estate.

FRANKLIN

Franklin County was the fourth largest producer of natural-gas liquids in Arkansas. Coal was mined in the county and used chiefly for steam purposes.

GARLAND

The State's entire oilstone and whetstone production originated in Garland County. Producers included the Norton Pike Co., Lewis Whetstone Co., Archer J. Smith, and J. A. Thomas.

GREENE

Paving gravel was produced by the B. & S. Gravel Co. from its pit 8 miles west of Paragould.

HEMPSTEAD

Hempstead County was the fourth largest producer of natural-gas liquids and the third largest producer of clay in value. Fire clay was produced by the Hope Brick Works near Hope.

HOT SPRING

Hot Spring County was the sole producer of barite in Arkansas. Unbleached ground barite was produced by the Baroid Sales Division of the National Lead Co. and the Magnet Cove Barium Corp. Hot Spring County was also the leading producer of clay and the third largest producer of sand and gravel. Clay was produced by the Acme Brick Co. and the Malvern Brick & Tile Co. Paving sand and gravel and railroad-ballast gravel were produced by the Malvern Gravel Co. Stone for use by railroads was also produced.

HOWARD

Cement was produced by the Arkansas Portland Cement Division of the Ideal Cement Co. in the State's only cement mill at Okay.

INDEPENDENCE

The Batesville White Lime Co. produced lime for building, chemical, and industrial purposes near Batesville. Manganese was produced by several small operators in the Batesville district. Independence County ranked third in the production of stone. Crushed limestone was produced by the Batesville White Lime Co. for use as flux. Dimension limestone and sandstone were produced by the Jamison Stone Quarry, and dimension marble was produced by the P. H. Scheid Cut Stone Co.

IZARD

Izard County ranked first in the value of production of sand and gravel and second in the production of stone. Glass sand and molding sand were produced by the Silica Products Co. at its plant near Guion. Crushed limestone for use as a metallurgical flux for the aluminum industry was produced by the Arkansas Limestone Co. near Myersville and by the Love Hollow Limestone Co.

JACKSON

The Mobley Construction Co. produced sand and gravel for building and paving purposes from deposits near Newport.

JEFFERSON

The Pine Bluff Sand & Gravel Co. produced building sand at its pit near Pine Bluff.

JOHNSON

Johnson County was the leading coal producer in the State and ranked fifth in the value of stone produced. Coal from the eastern part of the county was used for domestic purposes and coal from the western part was sold exclusively to steel mills. The Texas Ledge Stone Co. produced dimension sandstone near Lamar.

LAFAYETTE

Lafayette County ranked second in the production of natural gas and natural-gas liquids and fourth in the production of petroleum. Paving gravel was produced by the Meriweather Gravel Co.

LOGAN

Coal for domestic purposes was produced in Logan County, which ranked third in coal production. Dimension sandstone for building and flagging was quarried by the Logan County Building Stone Co. near Paris. The Schwartz Bros. quarry produced miscellaneous stone used for rubble and flagging.

MILLER

The W. S. Dickey Clay Manufacturing Co. produced shale for making heavy clay products. Miller County ranked fifth in the production of petroleum, natural gas, and natural-gas liquids.

MISSISSIPPI

Paving gravel and other gravel were produced by Elliott Sartain Sand Co. from deposits in Mississippi County.

MONTGOMERY

Slate granules and flour were produced by Bird & Son, Inc., at Caddo Gap.

NEVADA

H. Dean Scott produced hematite iron ore in Nevada County. The ore was used to produce pig iron and steel.

OUACHITA

Ouachita County ranked third in the production of petroleum in Arkansas. Natural gas was produced. The Hope Brick Co. mined plastic clay for use in making fire brick at Chidester. Paving sand and gravel were produced near Camden by the Standard Gravel Co.

PIKE

The Arkansas Gypsum Co. quarried gypsum from its open-pit operation near Murfreesboro.

POLK

Shale for making heavy clay products was produced by the W. S. Dickey Manufacturing Co.

POPE

Crushed sandstone for concrete and road metal was produced by the Army Corps of Engineers. The Mobley Construction Co., Inc., produced structural and paving sand and gravel near Dardanelle. Coal was mined in Pope County by several operators. Natural gas was produced in Pope County.

PULASKI

Pulaski County was the State's leading producer of stone and sand and gravel. The Big Rock Stone & Material Co. produced miscellaneous stone near Little Rock. The same company produced sand from pits near Little Rock for building, paving, fire or furnace, and other uses. The Pulaski County Highway Department produced paving gravel.

Crude bauxite was produced by Aluminum Co. of America, the American Cyanamid Co., Dulin Bauxite Co., and the Riffe Construction Co. Dried, calcined, and activated bauxite was also produced in the county.

Expanded perlite was produced at the Little Rock plant of Tennessee Products & Chemical Corp., Nashville, Tenn.

ST. FRANCIS

Paving sand and gravel and other gravel were produced by the St. Francis Materials Corp. at its Crow Creek plant near Forrest City.

SALINE

Most of the Nation's domestic production of bauxite comes from deposits in Saline County. Aluminum Co. of America, the American Cyanamid Co., Dulin Bauxite Co., the Norton Co., and the Reynolds Mining Corp. produced crude bauxite in 1953. Reynolds Mining Corp. and Aluminum Co. of America supplied most of the production. Dried and calcined bauxite was produced by Aluminum Co. of America. The Norton Co. produced calcined bauxite.

Lime for chemical and industrial purposes was produced by Aluminum Co. of America. Plastic clay was mined by the A. P. Green Fire Brick Co. Soapstone was produced by the Arkansas Talc Co., Inc., near Bryant and the Milwhite Co. near Benton.

SEBASTIAN

Sebastian County was the second largest coal-producing region in the State. The Acme Brick Co. mined shale for heavy clay products near Fort Smith. Natural gas was produced in Sebastian County.

UNION

Union County ranked second in petroleum production and third in the production of natural gas and natural-gas liquids. The El Dorado Brick Works produced common and face brick from clay mined near El Dorado.

YELL

Crushed sandstone for concrete and road metal was produced by the Army Corps of Engineers.



The Mineral Industry of California

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the California Department of Natural Resources, Division of Mines.

By R. B. Maurer¹ and Robert E. Wallace²



CALIFORNIA'S mineral production in 1953 set a new value record of \$1,392,975,000, an increase of \$177,849,000 (15 percent) over the previous high of \$1,215,126,000 in 1952. Although there were noteworthy increases in the quantities of minerals produced, the upward adjustments of prices were proportionately higher, particularly in fuels and nonmetallic minerals. The output of mineral fuels, which comprised 80 percent of the State total in value, for the first time in State history surpassed the billion-dollar mark. Reflecting the unprecedented demand for petroleum, natural gas, and natural-gas liquids, the 1953 figure was \$1,121,501,000 an increase of \$151,724,000 (16 percent) compared with 1952.

Nonmetallic minerals as a group were valued at \$233,448,000—17 percent of the State total—in 1953; this was an increase of \$30,541,000 (15 percent) over \$202,907,000—the value in 1952. Construction materials, particularly cement, sand and gravel, and stone, were prominent in this advance, due largely to the need for these basic materials in the increased building, highway, and water-resources developments within the State. Salines recovered from mined material and dry-lake brines in the arid regions of southern California, from sea water and salt-works bitterns in the coastal areas, and from brines of the Los Angeles Basin petroleum fields, represented about 20 percent of the State 1953 nonmetallic mineral value. This group of minerals, which includes considerable material surplus to California's needs, increased 13 percent in value over 1952. Of the principal ceramic materials, the total clay output declined in quantity but increased in value, and talc, pyrophyllite, and soapstone production was higher than the previous year. The consumption of lime produced from California limestone and dolomite in the chemical and construction industries increased, and diatomite production returned to normal in 1953 after a prolonged labor strike in the industry that had an adverse effect on the 1952 yield. Pumice output declined in 1953, as this material was now in direct competition with other lightweight-aggregate materials and abrasives. The yield of sulfur ore surpassed that of any prior year owing to its demand as a raw

¹ Chief, Mineral Industry Division, Region III, Bureau of Mines, San Francisco, Calif.
² Commodity-industry analyst, Region III, Bureau of Mines, San Francisco, Calif.

TABLE 1.—Mineral production in California, 1952-53¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Antimony ore and concentrate..... gross weight.....	9	(²)		
Boron minerals.....	583, 828	\$14, 105, 000	715, 228	\$17, 668, 000
Cement..... 376-pound barrels.....	29, 736, 245	79, 457, 745	32, 002, 317	90, 872, 741
Chromite..... gross weight.....	14, 713	* 1, 269, 000	26, 512	2, 078, 461
Clays.....	2, 743, 130	4, 852, 266	2, 429, 888	4, 952, 723
Coal (lignite).....	2, 998	30, 700	(⁴)	
Copper (recoverable content of ores, etc.).....	800	387, 200	382	219, 268
Gem stones.....	(⁵)	100, 000	(⁵)	(²)
Gold (recoverable content of ores, etc.).....				
..... troy ounces.....	258, 176	9, 036, 160	234, 591	8, 210, 685
Gypsum.....	1, 236, 430	2, 721, 134	1, 199, 489	2, 855, 983
Iron ore (usable)..... long tons, gross weight.....	1, 463, 239	(²)	1, 697, 652	(²)
Lead (recoverable content of ores, etc.).....	11, 199	3, 606, 078	8, 664	2, 269, 968
Lime (open-market).....	238, 957	3, 752, 738	301, 422	4, 653, 303
Magnesium compounds from sea water and bitterns (partly estimated) MgO equivalent.....	* 50, 277	3, 529, 362	55, 886	3, 483, 483
Manganese ore (35 percent or more Mn).....				
..... gross weight.....	8, 081	(²)	7 5, 413	(⁷) (²)
..... do.....	56	(²)	7 534	7 10, 355
Marl, calcareous.....			6, 028	21, 102
Mercury..... 76-pound flasks.....	7, 241	1, 441, 683	9, 290	1, 793, 249
Natural gas (marketed production).....				
..... million cubic feet.....	517, 450	86, 414, 000	531, 346	104, 675, 000
Natural-gas liquids:				
Natural gasoline and cycle products				
..... thousand gallons.....	870, 996	64, 945, 000	910, 350	85, 691, 000
LP-gases..... do.....	393, 792	16, 700, 000	397, 572	21, 961, 000
Peat.....	10, 527	76, 706	9, 196	73, 897
Perlite.....	(²)	(²)	15, 282	112, 790
Petroleum (crude)..... thousand 42-gallon barrels.....	359, 450	801, 570, 000	* 365, 085	* 909, 060, 000
Pumice and pumicite.....	129, 780	793, 716	* 433, 105	* 647, 910
Salt (common).....	1, 148, 693	4, 880, 392	1, 123, 365	6, 263, 059
Sand and gravel.....	53, 051, 200	43, 633, 125	58, 429, 528	53, 224, 203
Silver (recoverable content of ores, etc.).....				
..... troy ounces.....	1, 099, 658	995, 246	1, 036, 372	937, 969
Stone (except limestone for cement and lime).....	14, 374, 930	17, 697, 085	14, 514, 150	18, 479, 152
Strontium minerals.....			50	1, 000
Sulfur ore..... long tons.....	(²)	(²)	152, 203	(²)
Talc, pyrophyllite and soapstone.....	¹⁰ 120, 574	¹⁰ 2, 988, 255	¹¹ 126, 442	¹¹ 1, 132, 700
Tungsten concentrate..... 60-percent WO ₃ basis.....	2, 980	11, 360, 569	2, 382	8, 939, 146
Zinc (recoverable content of ores, etc.).....	9, 419	3, 127, 108	5, 358	1, 232, 340
Undistributed: Asbestos (1953), barite, bromine, calcium-magnesium chloride, carbon dioxide, diatomite, feldspar, iodine, lithium minerals, magnesite, molybdenum, platinum group metals (crude), potassium salts, pyrites, quartz, ground sand and sandstone, slate, sodium carbonate and sulfate, stone (dimension limestone and crushed marble, 1953), recovered elemental sulfur, titanium-iron concentrate (nontitanium use), wolastonite (1952), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2). Excludes value of clays used for cement.....		* 35, 775, 838		41, 454, 895
Total California.....		* 1, 215, 126, 000		1, 392, 975, 000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

² Value included with "Undistributed."

³ Estimate.

⁴ 2,390 short tons produced for nonfuel use.

⁵ Weight not recorded.

⁶ Revised figure.

⁷ Shipments to Government low-grade depots and custom mills not included, but quantity and value for this material are as follows: Manganese ore, 3,917 short tons, \$285,685; manganese ore, 7,797 short tons, \$307,290.

⁸ Final figure. Supersedes preliminary figure given in commodity chapter.

⁹ Includes volcanic cinders (352,291 short tons, \$196,411).

¹⁰ Sold or used by producers. Quantity and value of some ground material included.

¹¹ Mine production of crude material.

material for sulfuric acid in a new Nevada copper-leaching development. Curtailed planting in some California districts reduced the agricultural requirements of crude gypsum for soil aid, although as a construction material demand was greater in 1953 than in 1952.

Metals produced in 1953 were valued at \$38,026,000 (3 percent of the State total). The apparent sharp drop compared with \$42,443,000 in 1952 (3 percent of the 1952 total value) is explained in part by the change in reporting tungsten-concentrate production. In 1952 tungsten output credited to California included some low-grade concentrate from other States shipped to California either for final concentration or chemical digestion, whereas in 1953 the output credited to the State included only the product of California ore. Iron ore (produced largely for California blast furnaces), chromite and manganese ore (supported by Government purchases), mercury in good demand (at a somewhat lower average price than 1952), and rare-earth metals concentrates all showed production increases. Declines in mine output were reported for gold, silver, lead, zinc, and platinum (a by-product of placer-gold mining), mainly because of unfavorable prices; the decline in copper yield was due largely to the close association of copper and zinc in California complex ores. Shipments of molybdenum concentrate derived from tungsten ores were somewhat lower in 1953. Antimony and cadmium were contained in some California ores and concentrates shipped to smelters, but the specific quantities ultimately recovered from residues is not known. Consumption of scrap metals at California plants increased over 1952.

Los Angeles County, with 23 percent of California's total mineral value in 1953, ranked first among the 57 counties reporting production and was followed in order by Kern, Ventura, Orange, and Fresno Counties.

TABLE 2.—Average United States prices of selected mineral commodities produced in California, 1944-48 (average) and 1949-53¹

Commodity	1944-48 (average)	1949	1950	1951	1952	1953
Antimony.....cents per pound..	23.82	38.7	29.4	44.2	44.0	35.9
Antimony ore, 50-55 percent Sb dollars per short-ton unit Sb..	3.02- 3.14	3.74- 3.93	2.92- 3.05	5.57- 5.82	4.08- 4.34	2.45- 2.70
Cement (average net mill realization) dollars per barrel..	1.80	2.30	2.35	2.54	2.54	2.67
Copper ².....cents per pound..	16.1	19.7	20.8	24.2	24.2	28.7
Gold ³.....dollars per troy ounce..	35.00	35.00	35.00	35.00	35.00	35.00
Iron ore (average value at mine) ..dollars per long ton..	3.18	4.50	4.99	5.46	6.09	6.76
Lead ².....cents per pound..	10.8	15.8	13.5	17.3	16.1	13.1
Mercury ⁴.....dollars per 76-pound flask..	102.34	79.46	81.26	210.13	199.10	193.03
Molybdenum concentrate, 90 percent MoS ₂ concentrate.....cents per pound MoS ₂ ..	45.0	54.0	59.0	60.0	60.0	60.0
Silver ⁵.....cents per troy ounce..	80.8+	90.5+	90.5+	90.5+	90.5+	90.5+
Tungsten concentrate dollars per short-ton unit WO ₃ ..	23.28	26.38	28.25	64.67	65.00	62.55
Zinc ².....cents per pound..	9.86	12.4	14.2	18.2	16.6	11.5

¹ Prices are discussed in detail in the commodity chapters of volume I, Minerals Yearbook.

² Yearly average weighted price of all grades of primary metal sold by producers. Price in 1946-47 includes bonus payments by Office of Metals Reserve for overquota production.

³ Price under authority of Gold Reserve Act of Jan. 31, 1934.

⁴ Average quoted price at New York.

⁵ Treasury buying price for newly mined silver, 1943 to June 30, 1946—\$0.71111111; July 1, 1946 to Dec. 31, 1947—\$0.905; 1948-52—\$0.9050505.

⁶ Based on average of GSA purchases.

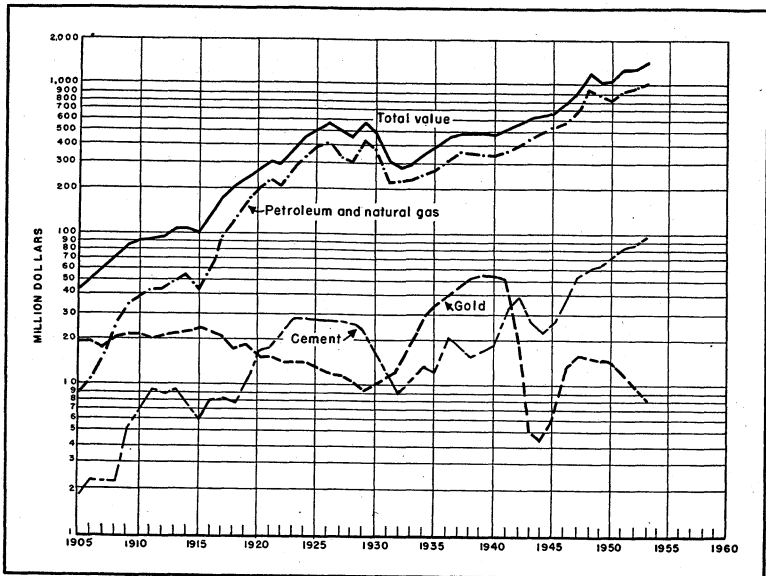


FIGURE 1.—Value of gold, petroleum and natural gas, cement, and total value of mineral production in California, 1905–53.

CONSUMPTION AND MARKETS

California ranked second among the Nation's mineral producers in 1953 and was one of the larger consumers of minerals. As the State population and industries expanded during the decade 1944–53 and construction was accelerated, the self-sufficiency of California has been challenged, owing to the variety of mineral commodities consumed within its boundaries.

The diversity of State mineral products and industry has resulted in a wide variety of marketing practices. Some mineral producers have dealt directly with the Government, such as gold producers who sold to the mint, or chromite producers who sold to General Services Administration. Some converted their raw mineral into a finished product, as does the contractor who mines and washes the sand and gravel with which he builds concrete structures. The petroleum companies were an example of an integrated industry, consisting of prospectors, developers, producers, transporters, refiners, and finally retailers.

General Services Administration Purchase Depots and Stockpiles.—GSA did not maintain purchase depots in California, despite the protests of some chromite and manganese producers, who claimed that freight costs to the depots in other States were excessive. Virtually all the State chromite production was shipped to the Grants Pass, Oreg., Depot, and a large percentage of the California manganese ore and concentrate yield was shipped to the Wenden, Ariz., low-grade stockpile by the producers. Tungsten concentrate, in specified minimum quantities, was accepted at designated milling points in California by GSA, and carlots of manganese ore and concentrate destined to high-grade stockpiles were received at railheads.

Custom Mills, Commercial Grinding Plants, and Smelters.—The principal metallurgical plants and grinding plants that received

TABLE 3.—Principal custom mills, commercial grinding plants, and primary smelters in 1953

Name	County	Nearest city or town	Minerals processed	Remarks
Industrial Minerals & Chemical Co.	Alameda	Berkeley	Nonmetallic minerals.	Grinding by contract or minerals purchased.
Yuba Milling Co.	do.	Emeryville	do.	Do.
American Smelting & Refining Co.	Contra Costa	Sely	Gold, silver, and lead ores and concentrates.	Gold and silver refinery and slag-fuming plant operated in conjunction with lead smelter.
El Dorado Chrome Co. (Church)	El Dorado	El Dorado	Chromite.	Gravity concentrator.
Stephen Kirkpatrick (Sequoia)	Fresno	Funlap	Tungsten ore.	24-ton-a-day gravity concentrator.
Twining Laboratories	do.	Fresno	Tungsten ore and nonmetallic minerals.	Tungsten ore concentrator and nonmetallic minerals ground.
Benware Concentrating Co. (Benware)	Inyo	Bishop	Tungsten ore and concentrate.	50-ton-a-day gravity-flotation concentrator.
El Diablo Mining Co.	do.	do.	do.	24-ton-a-day gravity concentrator.
Shepard Lane Milling Co.	do.	do.	do.	50-ton-a-day gravity concentrator.
United States Vanadium Co.	do.	do.	do.	1,000-ton-a-day flotation-chemical plant.
Burton Bros.	Kern	Keosauqua	Gold-silver ores.	300-ton-a-day gravity concentrator.
Butte Lodge Mining Co.	do.	Randsburg	Tungsten ore.	38-ton-a-day gravity concentrator.
Macco Corp. (Champo)	do.	Rosamond	Nonmetallic minerals.	Commercial fine grinding.
American Minerals Co.	do.	Los Angeles	Clays and other non-metallic minerals.	Commercial grinding.
Hill Bros. Chemical Co.	do.	do.	Asbestos, soft, non-metallic minerals.	Custom mills, small lots of nonmetallic minerals.
Kennedy Minerals Co.	do.	do.	Talc, clays, and other nonmetallic minerals.	Commercial grinding.
Los Angeles Chemical Co.	do.	do.	Sulphur, pyrophyllite, mineral colors, miscellaneous nonmetallic minerals.	Grinding by contract or minerals purchased.
Ontario Rock Milling Co.	do.	Paramount	Nonmetallic minerals.	Contract grinding. Roofing granules prepared.
southern California Milling Co.	do.	Los Angeles	do.	Contract grinding.
Sun Valley Tungsten Co.	do.	Sun Valley	Tungsten ore and concentrate.	50-ton-a-day gravity concentrator.
Western Talc Co.	do.	Los Angeles	Nonmetallic minerals.	Contract grinding.
Price Mining & Milling Co.	Monoc.	Riss	Tungsten ore.	50-ton-a-day gravity concentrator.
Empire Star Mines Co., Ltd.	Nevada	Grass Valley	Gold-silver ore.	500-ton-a-day amalgamation-cyanide mill.
Evylite Mining & Milling Co.	San Bernardino	Barstow	Tungsten ore.	80-ton-a-day gravity concentrator.
Commercial Minerals Co.	San Francisco	San Francisco	Nonmetallic minerals.	Grinding by contract or minerals purchased.
Palo Alto Mining Co.	Santa Clara	Coyote	Chromite	100-ton-a-day gravity concentrator.
Tulare County Tungsten Mines	Tulare	Exeter or Lindsay	Tungsten ore and concentrates.	Do.

¹ Mill controlled by Molybdenum Corp. of America after October 1953.

custom ores, concentrates, and nonmetallic minerals for processing in 1953 are listed in table 3. Although the activity at small tungsten deposits continued to expand, the tendency was toward small concentration plants at individual mines rather than an increased number of custom mills. The largest metallurgical custom plant in California—the Selby lead plant and refinery of the American Smelting & Refining Co., at Selby, Contra Costa County—continued to be the only smelter in California treating primary nonferrous material.

Mineral Brokers and Bullion Buyers.—Transaction in small lots of tungsten concentrate not accepted by GSA was the principal activity by mineral brokers. These purchases were accumulated for resale. Brokers also handled some small tonnages of chromite and iron ore for distribution within the State and larger tonnages of Utah and Nevada iron ore destined for export from California ports. Purchases of gold bullion by licensed buyers were seasonal and minor.

NEW PLANTS OR PROJECTS

A slag-fuming plant began operations at the American Smelting & Refining Co. Selby lead smelter in 1953.³ The lead ore and lead concentrate reduced at the lead plant contained variable quantities of zinc, which entered the furnace slag with a small percentage of lead. Such an operation brings accumulations of old slag into the classification of new zinc deposits. The current hot slag was usually mixed with some cold slag from dumps and was dezincing down to about 1 percent zinc at the fuming plant. The densified and delead zinc fume contained an average of 78 percent zinc and less than 1 percent lead. This product was marketed. A lead fume that also contains some zinc was returned to the lead-smelting system.

Production of sulfur ore at the Leviathan mine, Alpine County, was begun in 1953. This sulfur deposit, the largest ever worked in California, supplied material for the Anaconda Copper Mining Co. sulfuric acid plant at Yerington, Nev.

Plans were being prepared by Gladding, McBean & Co. and Owens Illinois Glass Co. for a plant in the Ione area of Amador County that would separate silica sand and white clay in the kaolinite group from material in an extensive deposit near Buena Vista. The sand is the type used in the glass industry, and the clay has refractory properties.

The new plant of Basalt Rock Co., Inc., at Napa Junction, Napa County, produced expanded-shale lightweight aggregate in volume in 1953, bringing a new supply of that material to northern California and reviving shale mining in Solano County. The operation was described in a trade journal.⁴

FLOW OF MINERALS

Moving California minerals was usually a complex integration of the available modes of transport. Basically, railroads handled a large percentage of the materials requiring long hauls, and motortrucks were used predominantly in the shorter trips. However, combination

³ Engineering and Mining Journal, Slag Fuming at Selby: December 1953, pp. 95-97.

⁴ Utley, Harry F., New Basaltite Produced at Napa Junction Plant—700 Cubic Yards per Day: Pit & Quarry, December 1953, pp. 76-80.

truck-railroad movement of minerals to their destination was common practice. There were exceptions to the general rule—as, for example, the long truck haulage of tungsten ore and concentrate to custom mills and chromite and manganese ore to depots outside the State. Transportation of minerals by water, formerly common practice in intra-state movements, was at a minimum. The following tabulation shows the modes of transporting a selected group of construction materials shipped in 1953.

TABLE 4.—Sand and gravel, crushed stone, and portland cement sold or used, in 1953, by method of transportation

Material	Tonnage transported, by method				Total
	Railroad	Motor truck	Waterway	Not stated ¹	
Sand and gravel (commercial).....	4, 286, 273	33, 901, 419	41, 710	5, 620, 288	43, 849, 690
Crushed stone (commercial).....	2, 411, 509	7, 420, 610	894, 001	2, 931, 463	13, 657, 583
Portland cement.....	1, 667, 373	4, 426, 960	22, 103	-----	6, 016, 436
Total.....	8, 265, 155	45, 748, 989	957, 814	8, 551, 751	63, 523, 709

¹ Includes interplant transfers to batching units, etc.

Domestic Imports and Exports.—California's high self-sufficiency has been lessened considerably by the rapid rise in local requirements of raw minerals occasioned by the State's industrial expansion. Barite, coal (both for fuel and coke), elemental sulfur, special clays, silica sand, fluorspar, gypsum, limestone, phosphate rock, crude perlite, asbestos, natural gas, and some petroleum were all noteworthy among the minerals and fuels imported into California from other States. Owing to heavy local production, surpluses of other minerals and mineral materials, which include cement, diatomite, magnesia, salines, talc, mercury, lump iron ore, and some special sands, were exported to other States. California was an important supplier of tungsten concentrate, molybdenum concentrate, chromite, and rare-earth metal (cerium group) concentrate for consumption outside of California.

Imports and Exports.—California's refractory materials requirements necessitated the importation of considerable quantities of refractory chromite, as its chromite is largely unsuited for this use. Similarly, bauxite and kyanite, both high-alumina materials consumed in manufacturing refractories, and some mica were imported. Gypsum from Lower California supplemented local output in the cement industry. Foreign imports also included crude petroleum. Conversely, California petroleum products were exported, particularly to the United States Territorial possessions, as was cement. Of the California mineral surpluses in 1953 some materials of the saline group, salt in particular, also were exported.

EMPLOYMENT IN MINERAL INDUSTRIES

Employment.—The accompanying table shows fluctuations in employment in California mineral industries during recent years.

TABLE 5.—Estimated number of wage and salary workers in the mineral-extraction industry, 1944-48 (average) 1949-53 ¹

Year	Metal mining	Crude-petroleum and natural-gas production	Nonmetallic mining and quarrying	Total mineral-extraction industry
1944-48 (average).....	3,700	24,100	5,000	34,800
1949.....	3,200	26,000	5,300	34,400
1950.....	3,100	23,300	5,800	32,300
1951.....	3,400	25,000	6,600	35,000
1952.....	3,400	26,100	6,400	35,900
1953.....	3,400	26,400	6,800	36,600

¹ Data from Division of Labor Statistics and Research, California Department of Industrial Relations, in cooperation with the Bureau of Labor Statistics.

Accidents.—No major disaster occurred in any California mineral industry during 1953. Accident statistics for 1952 and 1953 are shown in table 6.

TABLE 6.—Fatal and nonfatal disabling work injuries, mineral-extraction industry, 1952-53 ¹

Industry	1952			1953			Disabling work injuries per 1,000 workers ²	
	Fatal	Non-fatal	Total	Fatal	Non-fatal	Total	1952	1953
Metal mining.....	15	380	395	5	434	439	* 113	129
Crude-petroleum and natural-gas production.....	16	1,027	1,043	12	946	958	96	92
Oil- and gas-field contract services.....	18	1,455	1,473	10	1,466	1,476		
Rock, sand, and gravel quarrying.....	4	537	541	4	492	496	106	95
Other nonmetallic mining and quarrying.....	5	131	136	2	145	147		
Total mineral extraction.....	58	3,530	3,588	33	3,483	3,516	100	96

¹ State of California Department of Industrial Relations, Division of Labor Statistics and Research: California Work Injuries, 1953, p. 14.

² A disabling work injury is defined as one that causes disability beyond the day of the accident.

* Corrected.

Wages.—Data furnished by the State of California Department of Public Relations, through the Bureau of Labor Statistics, on wages in the mineral-extraction industry in 1953, with comparative figures for 1952 and 1951 in parentheses, follow: Average hourly earnings in metal mining in 1953 were \$1.90 (\$1.79) (\$1.70), and average weekly earnings were \$83.18 (\$77.70) (\$75.09); in crude-petroleum and natural-gas production, average hourly earnings, \$2.33 (\$2.16) (\$2.05) and average weekly earnings \$92.33 (\$85.89) (\$81.44); in nonmetallic mining and quarrying, \$2.14 (\$2.02) (\$1.92) hourly, and \$89.30 (\$83.12) (\$79.79) weekly.

GOVERNMENT ASSISTANCE

Defense Minerals Exploration Administration Program.—The DMEA program, designed to provide Government aid in finding new sources of strategic and critical minerals in the United States, was initiated May 16, 1951. Twelve contracts, having an approved total project cost of \$733,000, were executed with mines in California

TABLE 7.—Defense Minerals Exploration Administration projects, initiated or still active in 1953

Operator	Status	Property	County	District or area	Commodity	Government participation	Total contract
Copper Hill Venture, R. E. Fitzgerald, trustee.	B	Copper Hill.....	Amador.....	West Belt.....	Copper-zinc.....	\$10,310	\$20,620
New Penn Mines, Inc.....	A	Penn.....	Calaveras.....	West Belt (Campo Seco).....	do.....	84,561	169,122
Jonas & Johnson.....	A	Mount Diablo.....	Contra Costa.....	Mount Diablo.....	Mercury.....	66,705	88,940
Providence-Tuolumne Gold Mines.....	A	Copper Bluff.....	Humboldt.....	Hoopa.....	Copper-zinc.....	14,410	28,820
H. E. Briggs.....	B	Red Cloud.....	Inyo.....	South Park.....	Lead-zinc.....	8,650	17,310
L. D. Foreman.....	B	Defense.....	do.....	Modoc.....	do.....	6,120	12,240
Northfield Mines, Inc.....	B	Adamson.....	do.....	Bishop (Pine Creek).....	Tungsten.....	33,540	44,720
Abaca Mining Co.....	A	Big Osear.....	Kern.....	Kernville.....	Antimony.....	5,625	7,500
Uranium Mines, Inc.....	A	Rosamond.....	do.....	Mojave.....	Uranium.....	15,867	17,630
Walabu Mining Co.....	A	Walabu (Cuddeback).....	do.....	Keene.....	Mercury.....	19,500	26,000
California Quicksilver Mines, Inc.....	C	Abbott.....	Lake.....	Sulphur.....	do.....	66,705	88,940
Strawberry Tungsten Mines, Inc.....	A	Strawberry.....	Madera.....	Jackass.....	Tungsten.....	13,986	18,648
Black Rock Mining Corp.....	A	Black Rock.....	Mono.....	Yellow Jacket Spring.....	do.....	86,250	115,000
Lakeview Manganese Mines.....	B	Iron Dyke-Lakeview-Trail.....	Pumas.....	Crecent Mills.....	Manganese.....	9,750	13,000
New Idria Mining & Chemical Co.....	B	New Idria-West Idria.....	San Benito.....	Idria.....	Mercury.....	182,612	243,349
Hidden Hills Co.....	B	Birthday Star.....	San Bernardino.....	Danby.....	Tungsten.....	12,600	16,800
Surcease Mining Co.....	B	Atolla.....	do.....	Randsburg (Atolla).....	do.....	25,050	33,400
Cordeiro Mining Co.....	A	New Almaden.....	Santa Clara.....	Almaden.....	Mercury.....	150,621	200,828
Glidden Co.....	B	Bully Hill.....	Shasta.....	Bully Hill.....	Copper-zinc.....	128,172	256,344
Keystone Asbestos Corp.....	A	Keystone.....	Shasta-Trinity.....	Tamarack Lake.....	Asbestos (chrysotile).....	9,008	10,009
Do.....	A	do.....	Siskiyou.....	Scott River (Callahan).....	do.....	2,709	3,010

A, Initiated in 1953.

B, Initiated before but active in 1953.

C, Initiated before and abandoned in 1953.

in 1953. The Government agreed to advance \$441,000 to the projects. Of these, 3 were copper-zinc properties; 3, mercury; 2, tungsten; 2, asbestos (chrysotile); 1, uranium; and 1, antimony.

Other Government Assistance Activities.—The Bureau of Public Roads, which expended public funds—under sec. 6, Defense Highway Act of 1941 (55 Stat. 765) and sec. 12, Federal Highway Act of 1950—to construct access roads to several California mines in 1952, did not continue the general program in 1953, and only projects authorized by the Atomic Energy Commission were considered.

REVIEW BY MINERAL COMMODITIES

METALS

Antimony.—No production of antimony from antimony ore was recorded in California in 1953. There was very little activity in developing antimony mines due to the lower domestic prices for the ore. Some exploration for antimony ore was pursued in the Kernville district, Kern County, under a DMEA loan. An undetermined quantity of antimony in California precious-metal and other base-metal ores, particularly lead ore, was recovered at smelters.

Cadmium.—Zinc concentrate shipped from the Coso district, Inyo County, to a zinc smelter contained some recoverable cadmium. An undetermined quantity was recovered in the process of smelting and refining.

Chromite.—The State chromite output, highest in the Nation in 1953, exceeded the 1952 yield by 80 percent in quantity and 64 percent in value. The Grants Pass, Oreg., Depot received 99 percent of

TABLE 8.—Shipments of chromite ore and concentrate, by counties, in 1953

County	Active mines ¹	Rank in State	Material shipped (gross weight, short tons)				Total value
			Under 45 percent Cr ₂ O ₃		45 percent Cr ₂ O ₃ and over		
			Ore	Concentrate	Ore	Concentrate	
Alameda.....	2	10		(2) 643		(2)	
Butte.....	2	7	377			\$53, 654	
Del Norte.....	28	3	1, 910	91	1, 595	31	310, 012
El Dorado.....	4	6	96	358	244	9	55, 426
Fresno.....	1	4	18			2, 196	194, 906
Glenn.....	1	15		(3)	(3)	13	(3)
Lake.....	4	13	20	24	11		4, 574
Napa.....	2	9	87	3 373	3 43		3 40, 932
Placer.....	4	14		8	27		3, 697
San Luis Obispo.....	7	1	112	10, 547	50	289	733, 574
Santa Barbara.....	1	16		2 1, 102	(4)		(4)
Santa Clara.....	1	8		8			2 88, 265
Shasta.....	3	12	8	9			4, 876
Siskiyou.....	21	2	820	158	3, 848	29	467, 224
Sonoma.....	1	17			4 13		4 1, 124
Tehama.....	10	5	28	442	552	35	97, 946
Trinity.....	6	11	146		66	27	22, 251
Total.....	98		3, 622	13, 755	6, 449	2, 686	2, 078, 461

¹ 1953 mine production of chromite from Calaveras and Tuolumne Counties not included. Concentrate was unsold and in stock.

² Alameda County combined with Santa Clara County.

³ Glenn County combined with Napa County.

⁴ Santa Barbara County combined with Sonoma County.

this output, and 1 percent was sold in the open market, principally for refractories. Of the total production 62 percent was concentrate and 38 percent ore. In 1952, of the total tonnage shipped 79 percent was ore and 21 percent concentrate. The peak output of chromite in California in recent years was 62,500 tons produced in 1943.

The following 5 leading producers of chromite shipped 58 percent of the State total in 1953, evaluated in terms of chromic oxide content: Castro Mining Co., Castro mine, near San Luis Obispo, San Luis Obispo County (concentrate); Ruth Robertson, Cyclone Gap mine; Preston Peak district, Siskiyou County (ore); J. R. Holman, Mistake mine, Coalinga district, Fresno County (concentrate); H—J Chrome Co., Sweetwater and Norcross mines, Santa Lucia Range, San Luis Obispo County (concentrate); and Pierce Bros., Hard Face and London mines, Santa Lucia Range, San Luis Obispo County (concentrate).

Copper.—California copper production was the lowest since the depression year 1934; it decreased 52 percent in quantity and 43 percent in value below the minor yield of 1952. Straight copper ore was the source of 35 percent of the 1953 copper output, and 65 percent was a byproduct, largely from lead-zinc and tungsten ores. Principal producers of copper from copper ore were: The Noonday mine, West Belt district, El Dorado County, and H. J. Buchenau, Jessie Belle mine, West Belt district, Madera County. Although there was virtually no activity in mining the State's complex zinc ores, which contain copper, exploration was active under DMEA loans in the copper-zinc deposits of the West Belt district, Calaveras County, the Hoopa district, Humboldt County, and the Bully Hill district, Shasta County.

Gold.—For the third consecutive year, California gold production declined, as a fixed Treasury price of gold at \$35 per ounce remained in effect with no respite from high operating costs at mines. The 1953 output fell 9 percent below 1952. Placer mines furnished 53 percent of the total gold in 1953 (55 percent in 1952), and lode mines contributed 47 percent (45 percent in 1952). A bright spot in the generally gloomy outlook on gold was development of the Siskon Corp.⁵ open-pit mine on Dillon Creek in Siskiyou County. This property, which had been explored for copper ore, ranked ninth in gold output in the State in 1953 from gold ore cyanided. The following 10 leading gold-producing properties in California, in 1953, listed in order of output, yielded 94 percent of the total gold, the 5 leaders producing 82 percent: The Natomas Co., American River district, Sacramento County (dredging); Yuba Consolidated Gold Fields, Yuba County (dredging); Empire Star Mines Co., Ltd., Empire Star group of mines, and Idaho Maryland Mines Corp., Brunswick mine, both in the Grass Valley-Nevada City district, Nevada County (gold ore); Original Sixteen to One Mine, Inc., Original Sixteen to One mine, Alleghany district, Sierra County; Best Mines Co., Inc., Brush Creek mine,

⁵ Mining World, Siskon Corporation Opens California's Newest Gold Mine: Vol. 15 No. 13, December 1953, p. 56.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1953, by counties, in terms of recoverable metals

County	Mine producing ¹		Gold					
			Lode		Placer		Total	
	Lode	Placer	Fine ounces	Value	Fine ounces	Value	Fine ounces	Value
Amador.....	5	6	3,028	\$105,980	226	\$7,910	3,254	\$113,890
Butte.....	2	6	5	175	192	6,720	197	6,895
Calaveras.....	5	8	195	6,825	741	25,935	936	32,760
Del Norte, Merced and Yuba ²	1	3	(⁴)	(⁴)	48,866	1,710,310	⁴ 48,866	⁴ 1,710,310
El Dorado.....	9	7	7,356	257,460	75	2,625	7,431	260,085
Fresno.....		2			170	5,950	170	5,950
Humboldt.....		(⁵)			10	350	10	350
Imperial, Modoc, and Mono ³	6		193	6,755			193	6,755
Inyo, Madera ⁴	20		1,248	43,680			1,248	43,680
Kern.....	10	5	2,937	102,795	72	2,520	3,009	105,315
Los Angeles.....	1	1	3	105	155	5,425	158	5,530
Madera ⁵	2	5	(⁶)	(⁶)	98	3,430	⁵ 98	⁵ 3,430
Mariposa.....	11	1	430	15,050	261	9,135	691	24,185
Monterey.....	1		4	140			4	140
Nevada.....	8	11	⁴ 69,942	⁴ 2,447,970	337	11,795	⁴ 70,279	⁴ 2,459,765
Placer.....	10	16	8	280	525	18,375	533	18,655
Plumas.....	4	3	49	1,715	157	5,495	206	7,210
Riverside.....	6		14	490			14	490
Sacramento.....	2	9	54	1,890	65,136	2,279,760	65,190	2,281,650
San Bernardino.....	16	2	675	23,625	15	525	690	24,150
San Diego.....		(⁷)			14	490	14	490
San Mateo.....		(⁸)			1	35	1	35
Shasta.....	5	2	98	3,430	62	2,170	160	5,600
Sierra.....	12	12	21,161	740,635	425	14,875	21,586	755,510
Siskiyou.....	7	7	3,738	130,830	129	4,515	3,867	135,345
Trinity.....	3	14	35	1,225	5,662	198,170	5,997	199,395
Tulare.....	1							
Tuolumne.....	12	3	72	2,520	17	595	89	3,115
Total.....	150	123	111,245	3,893,575	123,346	4,317,110	234,591	8,210,685

County	Silver					
	Lode		Placer		Total	
	Fine ounces	Value	Fine ounces	Value	Fine ounces	Value
Amador.....	674	\$610	34	\$31	708	\$641
Butte.....	1	1	21	19	22	20
Calaveras.....	1,636	1,481	58	52	1,694	1,533
Del Norte, Merced and Yuba ²	(⁴)	(⁴)	3,422	3,097	⁴ 3,422	⁴ 3,097
El Dorado.....	2,915	2,638	19	17	2,934	2,655
Fresno.....			23	21	23	21
Humboldt.....						
Imperial, Modoc and Mono ³	2,343	2,120			2,343	2,120
Inyo, Madera ⁴	988,500	894,642			988,500	894,642
Kern.....	3,844	3,479	14	13	3,858	3,492
Los Angeles.....			29	26	29	26
Madera ⁵	(⁶)	(⁶)	26	24	⁵ 26	⁵ 24
Mariposa.....	94	85	35	32	129	117
Monterey.....	3	3			3	3
Nevada.....	⁴ 18,047	⁴ 16,333	33	30	⁴ 18,080	⁴ 16,363
Placer.....	3	3	64	58	67	61
Plumas.....	14	13	17	15	31	28
Riverside.....	64	58			64	58
Sacramento.....	17	15	2,769	2,506	2,786	2,521
San Bernardino.....	3,392	3,070	3	3	3,395	3,073
San Diego.....			15	14	15	14
San Mateo.....						
Shasta.....	15	14	7	6	22	20
Sierra.....	5,280	4,779	41	37	5,321	4,816
Siskiyou.....	2,125	1,923	19	17	2,144	1,940
Trinity.....	9	8	576	521	585	529
Tulare.....	137	124			137	124
Tuolumne.....	34	31			34	31
Total.....	1,029,147	931,430	7,225	6,539	1,036,372	937,969

See footnotes at end of table.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1953, by counties, in terms of recoverable metals—Continued

County	Copper		Lead		Zinc		Total value
	Pounds	Value	Pounds	Value	Pounds	Value	
Amador.....							\$114, 531
Butte.....							6, 915
Calaveras.....	56, 000	\$16, 072	4, 100	\$537	61, 200	\$7, 038	57, 940
Del Norte, Merced and Yuba ²							1, 713, 407
El Dorado.....	158, 000	45, 346	38, 000	4, 978	19, 900	2, 288	315, 352
Fresno.....							5, 971
Humboldt.....							350
Imperial, Modoc, and Mono ³			3, 300	432	4, 000	460	9, 767
Inyo, Madera ⁴	404, 900	116, 207	17, 262, 500	2, 261, 388	10, 625, 200	1, 221, 898	4, 537, 815
Kern.....			4, 200	550			109, 357
Los Angeles.....							5, 556
Madera ⁵	(⁶)	(⁶)					3, 454
Mariposa.....							24, 302
Monterey.....							143
Nevada.....	9, 300	2, 669					2, 478, 797
Placer.....							18, 716
Plumas.....							7, 238
Riverside.....	600	172	2, 100	275			995
Sacramento.....							2, 284, 171
San Bernardino.....	78, 400	22, 501	11, 200	1, 467	5, 600	644	51, 835
San Diego.....							504
San Mateo.....							35
Shasta.....	55, 900	16, 043					21, 663
Sierra.....	900	258					760, 484
Siskiyou.....			1, 100	144			137, 429
Trinity.....							199, 924
Tulare.....			1, 500	197	100	12	333
Tuolumne.....							3, 146
Total.....	764, 000	219, 268	17, 328, 000	2, 269, 968	10, 716, 000	1, 232, 340	12, 870, 230

¹ Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.

² Combined to avoid disclosure of individual output.

³ From property not classed as a mine.

⁴ Yuba County lode gold and lode silver included with Nevada County.

⁵ Madera County lode gold and lode silver and copper combined with Inyo County to avoid disclosure of individual output.

Downieville district, Sierra County (gold ore); Hazel Creek Mining Corp., Hazel Creek mine, East Belt district, El Dorado County (gold ore); Fairview Placers, Trinity River district, Trinity County (dredging); Siskon Corp., Siskon mine, Klamath River district, Siskiyou County (gold ore); and Central Eureka Mining Co., Old Eureka mine, Mother Lode district, Amador County (gold ore).

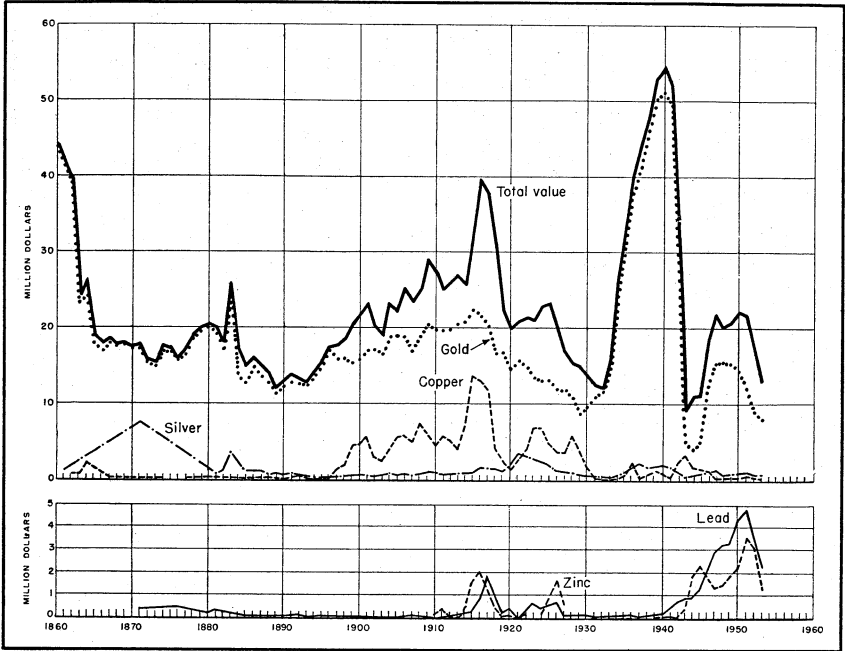


FIGURE 2.—Value of mine production of gold, silver, copper, lead, and zinc and total value in California, 1860-53.

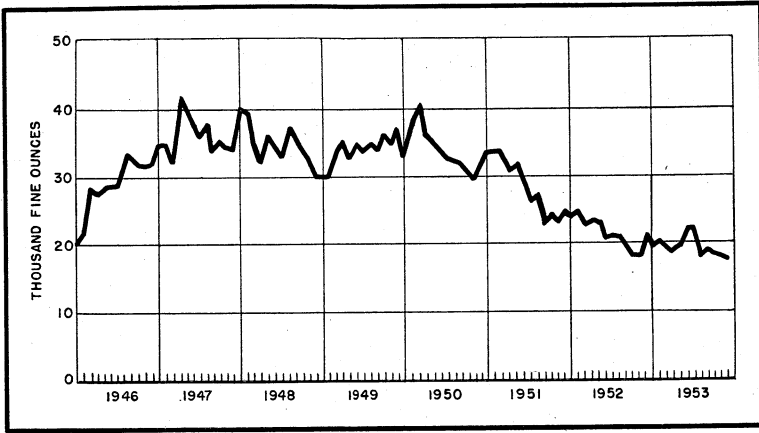


FIGURE 3.—Mine production of gold in California, 1946-53, by months, in terms of recoverable gold.

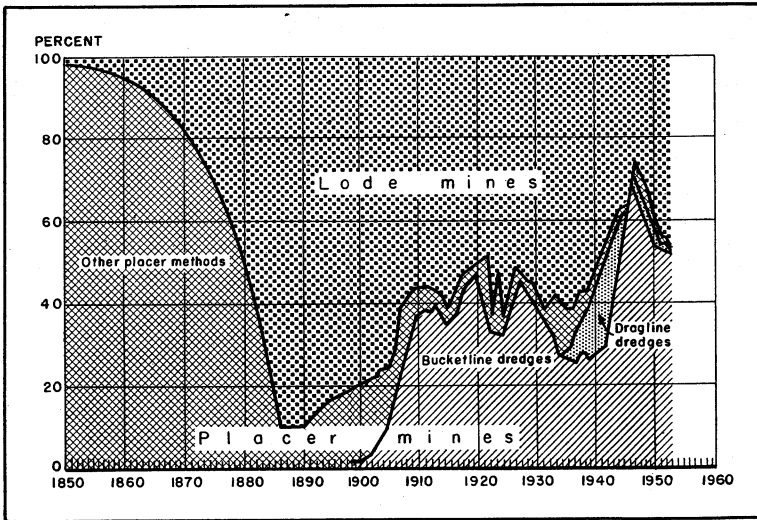


FIGURE 4.—Percentage of total California gold produced at lode and placer mines and by various methods of placer mining, 1850-1953.

TABLE 10.—Gold production at placer mines, 1944-48 (average), 1949-53, and total, 1848-1953, by classes of mines and methods of recovery ¹

Class and method	Mines producing ²	Washing plants (dredges)	Material treated (cubic yards)	Gold recovered		
				Fine ounces	Value	Average value per cubic yard
Surface placers:						
Gravel mechanically handled:						
Bucketline dredges:						
1944-48 (average).....	17	27	64,132,440	185,252	\$6,483,806	\$0.101
1949.....	20	34	83,571,900	226,838	7,939,330	.095
1950.....	14	26	82,514,000	223,164	7,810,740	.095
1951.....	13	25	68,714,600	175,870	6,155,450	.090
1952.....	6	16	49,881,800	131,806	4,613,210	.092
1953.....	3	14	45,528,800	119,022	4,165,770	.091
Dragline dredges: ³						
1944-48 (average).....	23	22	2,937,480	13,612	476,427	.162
1949.....	28	24	2,906,600	14,616	511,560	.176
1950.....	16	14	3,417,900	15,499	542,465	.156
1951.....	13	11	1,363,000	6,652	232,820	.166
1952.....	7	7	1,447,700	6,655	232,925	.161
1953.....	8	7	302,600	935	32,725	.107
Suction dredges:						
1944-48 (average).....	3	2	33,180	210	7,350	.222
1949.....	10	11	267,000	1,364	47,740	.179
1950.....	16	13	263,300	1,407	49,245	.187
1951.....	13	9	180,500	717	25,095	.139
1952.....	9	9	74,100	305	10,675	.144
1953.....	7	8	87,700	341	11,935	.136
Nonfloating washing plants: ³						
1944-48 (average).....	15	15	348,000	1,967	68,845	.198
1949.....	25	26	95,000	3,452	120,820	.4903
1950.....	30	30	76,500	3,293	115,255	.1295
1951.....	16	16	99,900	2,210	77,350	.4562
1952.....	18	18	11,600	1,462	51,170	2.040
1953.....	24	24	40,800	1,143	40,005	.486
Gravel hydraulically handled:						
1944-48 (average).....	20	-----	326,520	1,177	41,195	.126
1949.....	27	-----	447,900	1,587	55,545	.124
1950.....	32	-----	383,400	1,468	51,380	.134
1951.....	13	-----	55,000	440	15,400	.280
1952.....	9	-----	53,100	409	14,315	.270
1953.....	16	-----	216,200	469	16,415	.076
Small-scale hand methods: ⁶						
1944-48 (average).....	63	-----	340,620	4,755	166,411	.489
1949.....	68	-----	126,060	2,596	90,860	.721
1950.....	59	-----	204,050	3,029	106,015	.520
1951.....	43	-----	59,200	1,513	52,955	.895
1952.....	48	-----	51,900	1,576	55,160	1.063
1953.....	53	-----	76,500	1,271	44,485	.583
Underground placers:						
Drift:						
1944-48 (average).....	7	-----	5,540	306	10,731	1.937
1949.....	12	-----	1,500	95	3,325	2.217
1950.....	19	-----	9,500	443	15,505	1.632
1951.....	10	-----	2,800	222	7,770	2.775
1952.....	11	-----	3,700	130	4,550	1.230
1953.....	12	-----	3,330	165	5,775	1.734
Grand total placers:						
1944-48 (average).....	148	-----	68,123,780	207,279	7,254,765	.106
1949.....	190	-----	87,415,900	250,548	8,769,180	.100
1950.....	186	-----	86,868,650	248,303	8,690,605	.100
1951.....	121	-----	70,475,000	187,624	6,566,840	.093
1952.....	108	-----	51,523,900	142,343	4,982,005	.097
1953.....	123	-----	46,255,930	123,346	4,317,110	.093
1848-1953.....	-----	-----	(7)	67,083,052	1,483,644,466	(7)

¹ For historical data by years, see Minerals Yearbook, Review of 1940, p. 219.² Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.³ Includes commercial rock plants and tungsten mines that produced byproduct gold from gravels; byproduct gold is included with gold recovered, but material treated and average value per cubic yard refer only to straight gold dredging.⁴ Revised figure.⁵ Includes all placer operations using power excavator and washing plants, both on dry land; when washing plant is movable outfit is termed "dry-land dredge."⁶ Includes all operations in which hand labor is principal factor in delivering gravel to sluices, long toms, dip boxes, pans, rockers, dry washers, etc.⁷ Complete data not available.

TABLE 11.—Mine production of gold, silver, copper, lead, and zinc, 1944-48 (average), 1949-53, and total, 1848-1953, in terms of recoverable metals ¹

Year	Mines producing ²		Material sold or treated (short tons) ³	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1944-48 (average)	159	148	689,451	295,005	\$10,325,175	1,086,120	\$888,427
1949.....	242	190	494,906	417,231	14,603,085	783,880	709,451
1950.....	243	186	547,241	412,118	14,424,130	1,071,917	970,139
1951.....	173	121	494,151	339,732	11,890,620	1,145,219	1,036,481
1952.....	141	108	424,783	258,176	9,036,160	1,099,658	995,246
1953.....	150	123	390,583	234,591	8,210,685	1,036,372	937,969
1848-1953.....			(⁴)	104,395,955	2,355,962,077	115,659,347	93,891,867

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1944-48 (average)	5,264	\$1,555,167	8,404	\$2,095,856	7,199	\$1,722,980	\$16,587,605
1949.....	649	255,706	10,318	3,260,488	7,209	1,787,832	20,616,562
1950.....	646	268,736	15,831	4,274,370	7,551	2,144,484	22,081,859
1951.....	921	445,764	13,967	4,832,582	9,602	3,495,128	21,700,575
1952.....	800	387,200	11,199	3,606,078	9,419	3,127,108	17,151,792
1953.....	382	219,268	8,664	2,269,968	5,358	1,232,340	12,870,230
1848-1953.....	632,110	204,090,232	238,821	45,050,923	130,086	30,372,168	2,729,367,267

¹ Includes recoverable metal content of gravel washed (placer operations); ore milled; old tailings or slimes re-treated; tungsten ore; and ore, old tailings, slag, flue dust, and pyritic ore residue shipped to smelters during calendar year indicated.

² Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.

³ Does not include gravel washed.

⁴ Figure not available.

TABLE 12.—Mine production of gold, silver, copper, lead, and zinc in 1953, by months, in terms of recoverable metals ¹

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January.....	19,730	98,522	58	871	495
February.....	20,035	100,296	32	753	402
March.....	19,995	126,725	32	868	429
April.....	18,603	83,827	26	784	451
May.....	19,810	73,871	34	619	453
June.....	22,175	77,562	32	623	402
July.....	22,042	58,161	20	644	562
August.....	18,114	83,972	23	707	441
September.....	19,441	69,019	32	626	356
October.....	18,715	84,623	26	777	500
November.....	18,362	89,561	44	700	435
December.....	17,569	90,233	23	692	432
Total.....	234,591	1,036,372	382	8,664	5,358

¹ Mine production comprises ore, gravel, or other mineral material sold or treated and metal recovered as natural gold or as bullion from cyanidation or amalgamation and the estimated recoverable metal contained in concentrates, ores, tailings, and other mineral materials shipped directly to smelters or sold to ore buyers within the year.

TABLE 13.—Mine production of gold, silver, copper, lead, and zinc in 1953, by methods of recovery and types of material processed, in terms of recoverable metals

Type of material processed, and method of recovery	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode:					
Amalgamation:					
Ore.....	1 74, 138	12, 718			
Old tailings.....	65	16			
Total.....	74, 203	12, 734			
Cyanidation:					
Ore.....	21, 363	11, 733			
Old tailings.....	10	119			
Total.....	21, 373	11, 852			
Total recoverable in bullion.....	1 95, 576	24, 586			
Concentration, and smelting of concentrates:					
Ore.....	14, 181	679, 301	510, 100	13, 982, 800	10, 017, 700
Old tailings ^{2 4}	264	9, 525	101, 600	1, 400	
Total.....	14, 445	688, 826	611, 700	13, 984, 200	10, 017, 700
Direct smelting:					
Ore.....	703	308, 692	76, 100	3, 124, 800	424, 700
Old tailings, etc. ^{3 4}	521	7, 043	76, 200	219, 000	273, 600
Total.....	1, 224	315, 735	152, 300	3, 343, 800	698, 300
Placer.....	123, 346	7, 225			
Grand total.....	234, 591	1, 036, 372	764, 000	17, 328, 000	10, 716, 000

¹ Includes gold recovered as "natural gold."² Includes tungsten-ore concentrate.³ Includes slag and copper precipitate.⁴ Combined to avoid disclosure of individual output.

TABLE 14.—Mine production of gold, silver, copper, lead, and zinc in 1953, by classes of ore or other source materials, in terms of recoverable metals

Source	Number of mines ¹	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode ore:							
Dry gold.....	111	238,655	109,186	32,894	20,800	38,000	19,900
Dry silver.....	2	107	4	2,038	-----	2,300	2,300
Total.....	113	238,762	109,190	34,932	20,800	40,300	22,200
Copper.....	6	8,454	307	1,696	308,600	-----	-----
Copper-zinc.....	1	3,049	77	1,582	35,800	4,100	61,200
Lead.....	13	7,393	166	298,902	16,300	2,915,600	351,100
Lead-zinc.....	7	126,543	645	675,332	204,700	14,147,600	10,007,900
Total.....	27	145,439	1,195	977,512	565,400	17,067,300	10,420,200
Other "lode" material:							
Old tailings ²	15	6,261	388	8,266	20,600	216,200	273,600
Copper precipitates and tungsten ore ³	3	463	70	8,037	157,200	-----	-----
Old slag.....	2	58	402	400	-----	4,200	-----
Total.....	20	6,382	860	16,703	177,800	220,400	273,600
Total "lode" material.....							
Gravel (placer operations).....	150	390,583	111,245	1,029,147	764,000	17,328,000	10,716,000
	123	(⁴)	123,346	7,225	-----	-----	-----
Total, all sources.....	273	-----	234,591	1,036,372	764,000	17,328,000	10,716,000

¹ Detail will not necessarily add to total, because some mines produce more than one class of material.

² Metal recovered by class of old tailings, as follows: Gold, 2,885 tons—361 ounces of gold, 1,652 ounces of silver, 20,400 pounds of copper, 300 pounds lead; copper-zinc, 2 tons—2 ounces of gold, 26 ounces of silver, 100 pounds of copper, 800 pounds zinc; lead, 46 tons—4 ounces of gold, 33 ounces of silver, 100 pounds of copper, 1,100 of lead; lead-zinc, 3,328 tons—21 ounces of gold, 6,555 ounces of silver, 214,800 pounds of lead, 272,800 pounds of zinc.

³ Combined to avoid disclosure of individual output.

⁴ Tungsten ore tonnage not included.

⁵ 46,255,930 cubic yards. Does not include material washed at commercial gravel plants and tungsten mines to produce 585 ounces of byproduct gold and 67 ounces of byproduct silver included in placer totals.

TABLE 15.—Mine production of gold, silver, copper, lead, and zinc in 1953, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals

A. For material treated at mills

	Material treated (short tons)	Recoverable in bullion		Concentrate shipped to smelters ¹ and recoverable metals					
		Gold (fine ounces)	Silver (fine ounces)	Concentrate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES									
Amador.....	5,863	3,018	671	4	7	2			
Butte.....	2	2							
Calaveras.....	3,143	111	40	156	26	1,561	35,800	4,100	61,200
El Dorado.....	16,324	4,905	560	928	2,438	2,349	158,000	38,000	19,900
Imperial & Mad- era ²	4,015	148	44	258	135	988	102,800		
Inyo.....	126,224	29	6	25,344	723	675,685	285,300	13,938,400	9,934,300
Kern.....	2,426	2,921	2,584						
Los Angeles.....	20	3							
Mariposa.....	518	430	94						
Mono.....	1,102	176	755	7		1,052		2,300	2,300
Nevada.....	³ 182,639	³ 59,717	³ 13,177	3,544	10,219	4,868	9,300		
Placer.....	13	8	3						
Plumas.....	1,610	43	10	2	6	4			
Riverside.....	83	9	5	2	4	33	100	1,100	
Sacramento.....	141	54	17						
San Bernardino.....	1,598	367	260	145	193	1,460	20,400	300	
Shasta.....	54	96	15	1	2				
Sierra.....	26,032	20,108	4,330	132	692	824			
Siskiyou.....	6,252	3,336	1,988	1					
Trinity.....	61	35	9						
Tuolumne.....	156	60	18						
Total: 1953.....	378,276	95,576	24,586	30,524	14,445	688,826	611,700	13,984,200	10,017,700
1952.....	401,050	101,033	40,994	36,412	7,915	810,040	1,306,900	15,510,800	17,025,000
BY CLASSES OF MATERIAL TREATED									
Dry gold:									
Crude ore.....	238,307	95,305	24,387	4,183	13,358	7,611	9,300	38,000	19,900
Old tailings and tungsten ore ²	⁴ 2,831	75	135	416	260	9,492	101,500	300	
Dry silver ore.....	100			7		1,052		2,300	2,300
Copper ore.....	7,800	142	42	690	161	1,433	260,800		
Copper-zinc ore.....	3,049	54	22	155	23	1,560	35,800	4,100	61,200
Lead:									
Crude ore.....	94			7	4	192		4,900	300
Old tailings.....	46			2	4	33	100	1,100	
Lead-zinc ore.....	126,049			25,064	635	667,453	204,200	13,933,500	9,934,000
Total 1953.....	378,276	95,576	24,586	30,524	14,445	688,826	611,700	13,984,200	10,017,700
BY CLASSES OF CONCENTRATE SHIPPED TO SMELTERS ¹									
Dry gold.....				4,183	13,358	7,611	9,300	38,000	19,900
Copper.....				⁵ 1,191	⁵ 443	⁵ 12,282	⁵ 394,700	4,000	
Lead.....				17,141	590	629,301	149,000	13,422,200	1,764,100
Lead-zinc.....				10		1,113		5,300	2,600
Zinc.....				7,999	54	38,519	58,700	514,700	8,231,100
Total 1953.....				30,524	14,445	688,826	611,700	13,984,200	10,017,700

See footnotes at end of table.

TABLE 15.—Mine production of gold, silver, copper, lead, and zinc in 1953, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals—Continued

B. For material shipped directly to smelters

	Material shipped (short tons)	Recoverable metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES						
Amador.....	1	3	1			
Butte.....	1	3	1			
Calaveras.....	49	58	35	20,200		
El Dorado.....	2	13	6			
Inyo.....	11,055	218	311,777	16,800	3,324,100	690,900
Kern.....	58	16	1,260		4,200	
Madera.....	1		1			
Mariposa.....	10					
Modoc, Mono, Nevada ¹	26	18	537		1,000	1,700
Monterey.....	5	4	3			
Riverside.....	4	1	26	500	1,000	
San Bernardino.....	988	115	1,672	58,000	10,900	5,600
Shasta.....	38			55,900		
Sierra.....	32	361	126	900		
Siskiyou.....	9	402	137		1,100	
Tulare.....	2		137		1,500	100
Tuolumne.....	26	12	16			
Total: 1953.....	12,307	1,224	315,735	152,300	3,343,800	698,300
1952.....	26,362	6,885	240,150	293,100	6,867,200	1,813,000
BY CLASSES OF MATERIAL						
Dry gold:						
Crude ore.....	348	523	896	11,500		
Old tailings.....	54	96	62			
Old slag.....	8	402	131			
Dry silver: Crude ore.....	7	4	986			
Copper:						
Crude ore.....	654	4	221	47,800		
Precipitates.....	63			76,100		
Copper-zinc: Old tailings.....	2	2	26	100		800
Lead:						
Crude ore.....	7,299	162	298,710	16,300	2,910,700	350,800
Old tailings and slag.....	50		269		4,200	
Lead-zinc:						
Crude ore.....	494	10	7,879	500	214,100	73,900
Old tailings.....	3,328	21	6,555		214,800	272,800
Total 1953.....	12,307	1,224	315,735	152,300	3,343,800	698,300

¹ Excludes concentrate treated only by amalgamation and/or cyanidation.

² Combined to avoid disclosure of individual output.

³ Includes ore milled and contained recoverable metal from Yuba County.

⁴ Tungsten ore tonnage not included with material treated.

⁵ Includes concentrate and contained recoverable metal from tungsten ore.

TABLE 16.—Mine production of gold, silver, copper, lead, and zinc in 1953, by methods of recovery (except placer) and classes of material processed, in terms of gross metal content

Class of material	Quantity shipped or treated (short tons)	Gross metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
CONCENTRATE SHIPPED TO SMELTERS						
Dry gold.....	4,183	13,358	7,611	12,476	38,535	23,411
Copper.....	11,191	1,443	112,282	1,405,532	7,218	23,616
Lead.....	17,141	590	629,301	175,345	13,654,332	2,205,235
Lead-zinc.....	10	1,113	102	5,331	3,076	8,535,812
Zinc.....	7,999	55	38,629	60,589	553,814	8,535,812
Total: 1953.....	30,524	14,446	688,936	654,044	14,259,230	10,791,150
1952.....	36,412	7,954	815,304	1,477,485	15,886,864	18,500,829
ORE, ETC., SHIPPED DIRECTLY TO SMELTERS						
Dry gold:						
Crude ore.....	348	524	897	11,830		
Old tailings.....	54	96	62		14	
Slag.....	8	402	131			
Dry silver: Crude ore.....	7	4	986			
Copper:						
Crude ore.....	654	4	221	49,135		
Precipitates.....	63			78,362		
Copper-zinc: Old tailings.....	2	2	26	154	22	893
Lead:						
Crude ore.....	7,299	162	298,960	19,834	2,971,116	512,276
Slag and old tailings.....	50		269		4,212	
Lead-zinc:						
Crude ore.....	494	10	7,879	724	216,381	89,046
Old tailings.....	3,328	21	6,555		216,995	320,991
Total: 1953.....	12,307	1,225	315,986	160,040	3,408,740	923,206
1952.....	26,362	6,889	240,534	317,761	7,023,039	2,356,988

¹ Includes concentrate and contained metal from tungsten ore.

TABLE 17.—Mine production of gold, silver, copper, lead, and zinc in 1953, by counties and districts, in terms of recoverable metals ¹

County and district	Mines producing ²		Lode material (short tons)	Gold (fine ounces)			Silver (lode and placer, ³ fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
	Lode	Placer		Lode	Placer	Total					
Amador County:											
East Belt ⁴ :	2	2	401	20	60	80	13				\$2,812
McKeen River:	3	1			34	34	2				1,192
Mother Lode ⁵ :	2	2	5,463	3,008	13	3,021	672				106,343
Butte County:											
Forbestown:	1	(⁶)	2	2	7	9	1				316
Honeyt:	1		1	3	4	4					140
Mariposa:	1	(⁶)			7	7	1				106
Magalia:		(⁶)			7	7	1				246
Merriam:		(⁶)			11	11	3				388
Yanase Hill:		1		15	15	15					525
Calaveras County:											
East Belt ⁴ :	2	1	93	34	4	38	0				1,335
McKenna River:	1	(⁶)	24	53	1	24	51				35
Mother Lode ⁵ :	2	4	3,075	103	156	214	1,634	56,000	4,100	61,200	7,536
West Belt ⁴ :					580	633					49,031
El Dorado County:											
Cosumnes River:	5	(⁶)	1,699	109	13	13	4				458
Mother Lode ⁵ :		1			36	145	27				5,100
Fresno County: Kings River:					8	8					280
Humboldt County:											
Gold Bluff:		(⁶)			1	1					35
Orleans:		(⁶)			9	9					315
Inyo County:											
Chloride Cliff:	1		10	26		26	10				919
Le Moyne:	1		345	8	8	8	986	100	179,800	40,100	23,366
Lee:	1		77	2	2	2	5,790	400	13,400	23,400	9,871
Modoc:	3		1,205	19	19	19	28,918	4,400	394,500	39,600	84,334
South Park:	4		1,668	26		26	4				914
Kern County:											
Green Mountain (Plute):	(⁶)		1	12		12	5				425
Greenhorn Mountain:	1		10	15		15	7				531
Mojave:	4		2,081	2,673		2,673	3,661	4,200			97,418
Randburg ⁷ :	4	3	387	234	8	242	169				8,623
Los Angeles County:											
Cedar:	1		20	3	155	155	29				105
San Gabriel:		1			65	65	16				5,451
Madera County: Fresno River (Dennis):		3									2,290
Mariposa County:											
East Belt ⁴ :	3		302	334		334	70				11,753
Mother Lode ⁵ :	3	(⁶)	226	80	21	101	20				3,553
West Belt ⁴ :	1			16	240	256	39				8,996
Monterey County: Los Burros:	(⁶)	1		4		4	3				8,143

See footnotes at end of table.

TABLE 17.—Mine production of gold, silver, copper, lead, and zinc in 1953, by counties and districts, in terms of recoverable metals —
Continued

County and district	Mines producing †		Lode material (short tons)	Gold (fine ounces)			Silver (lode and placer, ‡ fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
	Lode	Placer		Lode	Total						
					Placer	Total					
Nevada County:											
French Corral.....	1	4	25	40	44	3	9,300				\$1,548
Grass Valley-Nevada City.....	4	3	182,445	69,685	69,735	18,012					2,469,695
Washington (North Bloomfield).....	2	2	169	224	471	62					16,806
You Bet.....		2		23	23	1					
Placer County:											
Cofax.....		(6)									684
Dutch Flat.....		(6)		18	18	4					2,772
Forest Hill.....		3		79	79	0					2,595
Lower Hill.....	1		13	51	59	10					2,072
Michigan Bluff.....		7		185	185	22					6,465
Pumas County:		1		15	15	1					6,526
Genesee.....	1	(6)	1,500	36	39	8					1,372
Granite Basin.....		2		2	2						70
Greenville.....	3	(6)	110	18	30	8					1,058
Johnsville.....		7		77	77	1					1,246
La Porte.....		(6)		77	77	2					2,701
Quincy.....	(6)			19	19	2					667
Rich.....	(6)			20	20	4					703
Sawpit Flat.....	(6)			9	9	1					316
Riverside County:											
Dale.....	2		17		3	1					106
Ironwood (McCoy).....	1		1			1					144
Sacramento County:											
American River (Folsom)⁴.....	2	9	141	65,131	65,185	2,784					2,283,984
Cosumnes River.....		(6)		5	5	2					177
San Bernardino County:											
Belleville (Ord Mt.).....	1	1	1		3						105
Black Hawk.....	1		125	141	141	78					5,006
Clark Mountain.....	3		57								2,595
Turtle Mountain.....	1		520		4	680					10,851
Whipple Mountains (Monumental).....	2		142	11	11	12					8,582
San Diego County: Pine Valley.....		(6)		14	14	15					3,504
San Mateo County: San Mateo (Beach).....		(6)		1	1						35
Shasta County:											
Cottonwood Creek.....		(6)		6	6						210
Dog Creek.....		(6)		1	1						35
Flat Creek.....	1		38								16,043
French Gulch.....	1		1								70
Harrison Gulch.....	1	(6)	20	5	9	2					317

Iro	1	(6)	15	13	5	18	2		632
Shot Gun Creek		(6)			3	3			105
Sierra County:									
Algebony	7	3	17, 171	12, 986	126	13, 112	3, 193		461, 810
Gilshenny		1			12	12			421
Poker Flat (Fort Wine)	1	4	1	1	170	171	10		5, 904
Poverty Hill		(6)			17	17			595
Siskiyou County:									
Cottonwood		(6)			1	1			35
Klamath River	4	3	6, 254	3, 726	79	3, 305	2, 128		135, 101
Salmon River		3			30	30	2		1, 052
Scott River	3	2	7	12	14	26	13	1, 100	1, 065
Trinity County:									
Hayfork		(6)			1	15	4		529
Trinity River	1	2	10	14	1	5, 675	680		190, 184
Tulare County: Camp Wishon	1	12	51	21	5, 655	5, 675	137	1, 500	333
Tuolumne County:									
East Belt ¹									1, 635
Mother Lode ²	5		119	46	17	46	27		1, 511
Yuba County:									
Bear River	7	3	63	26		43	7		140
Browns Valley		(6)			4	4			(9)
Camptownville	1		(10)	(10)		(10)			35
Camptownville		(6)			1	1			105
Smartville		(6)			3	3			105
Strawberry		(6)			3	3			105
Other districts ¹¹	40	32	166, 070	17, 400	49, 751	67, 151	966, 227	589, 500	6, 796, 961
Total	150	123	390, 583	111, 245	123, 346	234, 591	1, 036, 372	764, 000	12, 870, 230

¹ Only those districts are shown separately for which Bureau of Mines is at liberty to publish figures; other producing districts are listed in footnote 11 and their output grouped as "Other districts."
² Excludes itinerant prospectors, "snipers," "high graders," and others who gave no evidence of legal right to property.
³ Source of total silver as follows: 1,029,147 ounces from lode mines and 7,225 ounces from placer mines.
⁴ East Belt district lies in Amador, Calaveras, El Dorado, Calaveras, El Dorado, Mariposa, and Tuolumne Counties.
⁵ Mother Lode district lies in Amador, Calaveras, El Dorado, Mariposa, and Tuolumne Counties.
⁶ From property not classed as a mine.
⁷ West Belt district lies in Calaveras; El Dorado, Madera, and Mariposa Counties.
⁸ American River (Folsom) district lies in El Dorado, Placer and Sacramento Counties.
⁹ Randsburg district lies in Kern and San Bernardino Counties.
¹⁰ Browns Valley district, Yuba County, lode gold and lode silver included with Grass-Valley Nevada City district, Nevada County.
¹¹ Includes following districts: Cosumnes River, Amador County; Butte Creek and Oroville (Palermo), Butte County; Monumental, Del Norte County; American River (Folsom), East Belt and West Belt, El Dorado County; San Joaquin River (Friant), Fresno County; Pecho, Imperial County; Bishop (Pine Creek), Coso (Darwin), Independence (Kuss), Kearsarge (Waucoba), Resting Springs, Slate Range and Ubebebe, Inyo County; Kern River and Radermacher, Kern County; Chowchilla River (Gambetta), Potter Ridge, San Joaquin River (Friant) and West Belt (Daulton), Madera County; Merced River, Merced County; High Grade, Modoc County; Masonic and White Mountains, Mono County; Meadow Lake, Nevada County; American River (Folsom), Auburn, Last Chance, Lincoln and Rocklin, Placer County; Edmanston, Plumas County; Chockawalla and Ergie Mountain, Riverside County; Barstow, Buckeye, Dale, Randsburg, Shadow Mountain and Solo, San Bernardino County; Redding and Shasta, Shasta County; Dog Valley, Pike (Indian Hill) and Sierra County; Yreka, Siskiyou County; Cinnabar and New River, Trinity County; Yuba River, Yuba County.

Iron, Steel, and Iron Ore.—The State's iron-ore output rose 16 percent compared with 1952, and the stepped-up production at the Kaiser Steel Corp. Eagle Mountain mine in the Eagle Mountain district, Riverside County, supplied virtually all of this increase. A heavy-medium plant was being installed at the mine, which would allow the upgrading of iron ore too low in iron content for shipment to blast furnaces. In addition to the yield of hematite-magnetite from the Eagle Mountain mine, which furnished 97 percent of the California iron-ore output in 1953, hematite was shipped from the Iron Age mine and hematite-magnetite from the Vulcan mine, both in San Bernardino County. This material was utilized at California cement plants in preparing low-heat-of-hydration cement and at California and out-of-State steel furnaces. A small shipment of magnetite from Shasta County was used as heavy aggregate. All iron ore produced in California in 1953 was mined from open pits. Shipments of usable iron ore in 1953 averaged 53.6 percent iron compared with 56.2 percent in 1952.

At Fontana the Kaiser Steel Corp. began operation of its third blast furnace in April 1953. This was the major unit of a \$65 million expansion begun 14 months previously, which brought the plant rating to 438,000 tons of pig iron a year. Steel was produced in open hearths and worked in the plant rolling mills. The company also operated a tinplating plant. The flow of ore from the Kaiser Steel Corp. Eagle Mountain mine to the Fontana steel plant was described by Powell.⁶ Columbia-Geneva Steel Division, United States Steel Corp. operated open hearths and rolling mills at Pittsburg and Torrance, and the Bethlehem Pacific Coast Steel Corp. processed steel at South San Francisco. In addition, Columbia-Geneva Steel Division, U. S. Steel Corp. at Pittsburg received a substantial percentage of the corporation Utah steel output in coil form, which was cold-rolled into sheets locally. A tinplating plant also was operated at Pittsburg. Both companies also operated electric furnaces in the Los Angeles area. These plants used a charge made up largely of scrap iron to which pig iron produced outside California was added. Pacific States Steel Co. at Niles and Judson Steel Corp. at Emeryville operated open-hearth furnaces and rolling mills. The former also had electric furnaces in standby status at Niles.

TABLE 18.—Iron ore and other metallic materials consumed and pig iron produced, 1945-48 (average) and 1949-53, in net tons

Year	Iron and manganese iron ores		Sinter ¹	Miscellaneous	Total	Pig iron produced
	Domestic	Foreign				
1945-48 (average).....	341,178	4,743	264,828	61,741	672,490	367,992
1949.....	447,021	756	346,488	95,635	889,900	504,581
1950.....	585,085	67	430,825	116,308	1,132,285	660,463
1951.....	862,977	-----	623,836	121,854	1,608,667	821,695
1952.....	952,606	-----	612,356	172,227	1,737,189	877,121
1953.....	987,471	-----	805,938	150,504	1,943,913	1,095,118

¹ Excludes recycled materials.

⁶ Powell, Kenneth B., *How Eagle Mountain Helps Kaiser Supply Growing Western Steel Needs*: Min. Eng., vol. 5 No. 5, May 1953, pp. 478-483.

Lead.—Reduced lead prices during 1953 resulted in decreases of 22 percent in quantity and 35 percent in value of recoverable lead produced in California compared with 1952. The Anaconda Copper Mining Co. Darwin group of mines in the Coso district, Inyo County, was the only major producer of the metal in the State. The flotation of oxidized lead minerals at the company mill was described by Huttl.⁷ Shipments of lead-bearing mill tailings and dump ore, lead ore from mines in the small-producer class, and miscellaneous ore smelted were sources of the small percentage of the State lead production not accounted for by the output of the major producer. Foreman & Foreman, operator of the Defense mine, Modoc district, Inyo County, was the most consistent shipper of lead ore in the small-operator category.

Anaconda Copper Mining Co. explored and developed the Santa Rosa lead mine, Lee district, Inyo County, and a DMEA exploration project for lead-zinc ore in the South Park district, Inyo County, was in operation during 1953.

Magnesium.—Magnesium was produced at Manteca, San Joaquin County, by Kaiser Magnesium Co. until July 10, 1953, when the plant was deactivated and held in the National Industrial Reserve. Monterey County dolomite and Mariposa County vein quartz were raw materials used in the silicothermic process, in which calcined dolomite is mixed with ferrosilicon and retorted.

Manganese.—Manganese ore and concentrate output increased sharply over the 1952 yield. A total of 5,947 short tons of manganese and manganiferous ore, which comprised 720 short tons of manganese ore and 4,693 tons of battery-grade concentrate containing 35 percent or more manganese and 534 tons of manganiferous ore containing between 10 percent and 35 percent manganese, was shipped to steel furnaces, battery plants, and stockpiles for consumption. This production was contributed by eight mines and was shipped from the following counties, listed in order of output: San Joaquin, Humboldt, Plumas, Trinity, Sonoma, and Lake. TeeKay Mines, Inc., operator of the Ladd mine in the Ladd-Buckeye district, San Joaquin County, and a mill near Tracy, Calif., was the State's principal producer in this group and shipped battery-grade concentrate.

Government purchases of manganese and manganiferous ores for low-grade stockpiles increased sharply over 1952. A total of 42 California mines shipped 3,917 tons of manganese material (1,803 tons of ore and 2,114 tons of concentrate), containing 35 percent or more manganese and 7,797 tons of manganiferous material (7,749 tons of ore and 48 tons of concentrate), containing 15 to 35 percent manganese. The purchase price of this stockpile material was not credited to the State total value, because further beneficiation is necessary to make it usable. Counties that furnished the ore and concentrate are listed in order of output: Imperial, Riverside, San Bernardino, Trinity, San Joaquin, San Luis Obispo, Lake, San Benito, Plumas, Mendocino, and Inyo. The three principal producing counties, which furnished 90 percent of the State total, were in the southeastern part of California, where reserves of ore suitable for stockpiling were relatively large and transportation costs to the Wenden, Ariz., Depot were a minimum.

⁷ Huttl, J. B., *New Oxide Lead Unit for Darwin*: Eng. and Min. Jour., March 1953, pp. 81-83.

L. Mills Beam, operator of the Pioneer mine (Paymaster district, Imperial County), Al Stoval (Big Reef (Van Doren) mine, Cady Mountains, San Bernardino County), and Dan Figueroa & Sons et al. (which worked the Arlington group of mines, including the Blackjack, Ironwood district, Riverside County) were the leading producers.

Because the stockpiled material was to be blended at the low-grade depots and prepared for future beneficiation and eventual consumption, the quantity and value of the annual mine production will not be included in the total mineral production of the United States until upgraded. The Bureau of Mines published data on concentrating manganese ore from Riverside, Humboldt, and Plumas Counties.⁸

Exploration for manganese ore was pursued in the Greenville (Crescent Mills) district, Plumas County, under a DMEA loan.

Mercury.—Mercury production increased 28 percent in quantity and 24 percent in value over 1952, despite a slightly lower average price for the metal in 1953. California continued to predominate in output, contributing 65 percent of the Nation's production (58 percent in 1952). There was activity in cinnabar exploration under DMEA loans in the Mount Diablo district, Contra Costa County; Sulphur district, Lake County; Keene district, Kern County; Idria district, San Benito County; and Almaden district, Santa Clara County.

The three leading producers—New Idria Mining & Chemical Co. (New Idria (including San Carlos) mine, Idria district, San Benito County), Sonoma Quicksilver Mines (Mount Jackson-Great Eastern mine, Guerneville district, Sonoma County), and California Quicksilver Mines, Inc. (Abbott mine, Sulphur district, Lake County)—supplied a large percentage of the State output. Baumeister, Hulbert & Muffly, Culver-Baer mine, and Buckman Laboratories, Inc., Cloverdale mine, both in the Mayacmas district, Sonoma County, followed in output in the order named.

TABLE 19.—Mercury produced in 1953, by counties

County	Producing mines	Ore treated (short tons)	Mercury recovered	
			Flasks (76 pounds)	Value ¹
Del Norte.....	1	10	4	\$772
Fresno.....	1	(²)	(²)	(²)
Lake.....	2	9,763	1,222	235,883
Merced.....	1	15	2	386
Napa.....	3	(³)	4	54
San Benito.....	9	38,073	4,119	795,091
San Luis Obispo.....	3	2,681	227	43,818
Santa Clara.....	2	683	183	35,324
Sonoma.....	4	45,492	3,467	669,235
Stanislaus.....	1	76	4	772
Yolo.....	1	288	28	21,544
Total.....	28	96,881	9,290	1,793,249

¹ Value calculated at average price at New York, \$193.03 per flask.

² Fresno County combined with Yolo County.

³ Dump and placer material.

⁴ Includes 31 flasks from dump materials.

⁸ Engel, A. L., Concentration Tests of Manganese Ores: Bureau of Mines Rept. of Investigations 4985, 1953, 14 pp.

TABLE 20.—Mercury produced, 1944-48 (average) and 1949-53, by methods of recovery

Year	Furnaced ¹		Retorted		Unclas- sified ²	Total		Oper- ating mines
	Ore (short tons)	Flasks (76 pounds)	Ore (short tons)	Flasks (76 pounds)	Flasks (76 pounds)	Flasks (76 pounds)	Value ³	
1944-48 (average) . . .	136, 821	18, 440	1, 440	288	350	19, 077	\$2,043,968	26
1949	39, 846	4, 318	165	90	85	4, 493	357, 014	15
1950	30, 479	3, 008	571	619	223	3, 850	312, 851	14
1951	54, 316	3, 837	1, 440	170	275	4, 282	899, 777	27
1952	82, 431	6, 992	1, 239	202	47	7, 241	1, 441, 683	24
1953	95, 325	8, 874	1, 556	343	73	9, 290	1, 793, 249	28

¹ Includes ore and mercury from dumps not separable.

² Includes mercury recovered from miscellaneous dump material, placer, and cleanup operations.

³ Value calculated at average price at New York.

Molybdenum.—The United States Vanadium Co. was the State's only producer of molybdenum concentrate, a byproduct of tungsten ore milled at the Pine Creek mine, Inyo County. The 1953 shipments were off 34 percent compared with the previous year.

Platinum.—Reflecting the decline in placer mining, less than 200 ounces of crude platinum was recovered as a byproduct from gold dredging in Sacramento and Yuba Counties. This output was slightly under the minor yield of 1952.

Rare-Earth Metals.—The Molybdenum Corp. of America was the State's only producer of rare-earth metal concentrates from bastnaesite (fluocarbonate of the cerium metals) near Mountain Pass, San Bernardino County. This operation was initiated in 1952. The value of these rare-earth concentrates was not determined.

Silver.—Silver production dropped 6 percent in quantity and value compared with 1952. Of the 1953 output, 95 percent was recovered from base-metal and tungsten ores, 3 percent from gold and silver ores, and 2 percent from tailing, slag, and gold placer operations, combined. The Anaconda Copper Mining Co. Darwin group of mines was the only major producer of silver in the State. Noteworthy quantities of silver were recovered from ores of the following properties: Defense mine, Modoc district, Inyo County (lead ore); Brunswick mine and the Empire Star group of mines, both in the Grass Valley-Nevada City district, Nevada County (gold ore); and Pine Creek mine, Bishop district, Inyo County (tungsten ore).

Titanium.—Considerable interest was shown in the occurrences of titanium-iron oxide in ore deposits and placers of the San Gabriel Mountain area and beach deposits in Los Angeles County as a possible source of titanium minerals, but no production of that material was recorded in 1953. In prior years some titanium-iron concentrates recovered from placers and beach deposits were used in manufacturing roofing material.

Tungsten.—Data on tungsten production in California in 1953 are based on mine production and the quantities of concentrates ultimately recovered from the ore at mills have been credited to the mines that produced the ore. For that reason it will be difficult to compare the 1953 output of tungsten concentrates with the 1952 yield credited

to California, because in 1952 the State output probably included some commercial concentrates produced by upgrading low-grade concentrates shipped from other States.

TABLE 21.—A. Tungsten concentrate produced from ore in 1953, by counties

County	Producing mines and prospects	Ore ¹			Concentrate produced (pounds)	Contained WO ₃ ¹ units
		Mined (short tons)	To mills (short tons)	Milled (short tons) ²		
Alpine.....	3	3,059	3,059			
Calaveras.....	1	(3)	(3)			
Fresno.....	5	3,835	2,835	3,247	40,190	1,374
Imperial.....	2	(3)	(3)	(3)		(3)
Inyo.....	53	217,137	212,692	238,333	3,038,023	107,456
Kern.....	26	1,426	1,276	897	13,833	414
Los Angeles.....				482	7,739	242
Madera.....	3	12,682	12,282	12,282	222,980	7,605
Mariposa.....	2	700	100			
Mono.....	9	68,150	68,145	46,380	484,898	11,267
Riverside.....	1	300				
San Bernardino.....	23	57,315	⁴ 57,418	⁴ 57,052	⁴ 361,190	11,448
San Diego.....	5	1,922	279	201	2,997	102
Tulare.....	12	21,725	21,281	19,072	92,528	3,106
Tuolumne.....	1		⁴ 96			
Undistributed.....		2,503	2,503	⁶ 4,020	⁶ 15,215	⁶ 520
Total.....	146	389,754	381,966	381,966	4,279,593	143,534

B. Shipments of tungsten concentrate in 1953 credited to California counties in which ore was mined

County	Pounds	Contained WO ₃ units	Value
Alpine.....	18,768	662	\$41,408
Fresno.....	29,141	999	62,487
Inyo.....	2,576,028	91,319	5,712,003
Kern.....	19,797	607	37,963
Madera.....	222,980	7,605	475,693
Mariposa.....	1,000	32	2,002
Mono.....	810,442	23,179	1,449,846
San Bernardino.....	431,121	13,682	855,809
San Diego.....	4,348	145	9,071
Tulare.....	126,125	4,002	250,325
Tuolumne.....	940	28	1,751
Undistributed ⁷	19,463	652	40,783
Total.....	4,260,153	142,912	8,939,146

¹ Partly estimated.

² Ore actually milled in county.

³ Included with undistributed to avoid disclosure of individual output.

⁴ Includes short ton equivalent of cubic yards of gravel mined and milled.

⁵ Dump ore.

⁶ Includes 2,550 tons of ore, which yielded 12,382 pounds of concentrate containing 420 units of WO₃, milled in Arizona and Nevada.

⁷ Includes Calaveras and Imperial Counties.

Virtually all of the concentrate produced in California was scheelite; however, a small tonnage of scheelite-wolframite concentrate was shipped from San Bernardino County. A large percentage of the low-grade tungsten flotation concentrate produced at mills was shipped to chemical digestion plants to produce synthetic scheelite. The United States Vanadium Co., Pine Creek mine, Bishop district, Inyo County, was by far the largest producer of tungsten concentrate in the State and ranked second in the United States. This company,

by virtue of treating company ore and beneficiating custom tungsten ore and concentrates at its plant, which consisted of flotation units and a chemical digesting section, was the leading shipper of concentrate in the Nation. The Black Rock Mining Corp., Black Rock mine, Yellow Jacket Spring area, Mono County, second in State production, was followed by: The Surcease Mining Co., Atolia group of claims, Randsburg (Atolia) district, San Bernardino County; Strawberry Tungsten Mines Inc., Strawberry mine, Jackass district, Madera County; Round Valley Tungsten Co., Round Valley mine, and Brownstone Mining Co., Brownstone claims, both in the Bishop district, Inyo County. The six leading shippers of tungsten concentrate furnished 88 percent of the State total output; the first 3 alone contributed 80 percent.

Exploration for new tungsten deposits under DMEA assistance loans was pursued in the Bishop district, Inyo County; the Jackass district, Madera County; and the Danby and Randsburg (Atolia) districts, San Bernardino County.

Uranium.—Interest in uranium prospecting was rising during 1953 in California. Uranium mineralization near Rosamond in the Mojave district, Kern County, was explored under a DMEA loan. Work by the Federal Geological Survey included a reconnaissance in the Modoc Plateau area of Modoc and Lassen Counties and examination of the Coon claim, San Bernardino County. The latter property showed significant radioactivity. An interesting project was a radioactivity check of over 6,000 mineral specimens in the collections of the California Division of Mines and the University of California. These activities are described,⁹ as was the Rosamond prospect in Kern County.¹⁰

Zinc.—Zinc output, which decreased 38 percent in quantity and 46 percent in value compared with 1952, was principally the yield from the Anaconda Copper Mining Co. Darwin group of mines in the Coso district, Inyo County, and comprised the metal recovered from zinc concentrate at a zinc smelter and from lead ore and concentrate reduced at a smelter-fuming plant. New Penn Mines, Inc., Penn mine, West Belt district, Calaveras County, the only other producer of zinc concentrate, operated 1 month in 1953. The balance of the State zinc output was a relatively small quantity recovered at lead smelters equipped with fuming plants which treated lead ores and concentrate shipped from small operations. Zinc recovered from smelter slag at the American Smelting & Refining Co. Selby plant, Contra Costa County, during 1953 was largely from ore and concentrate of foreign origin. Only the relatively small quantity of recoverable zinc in California ore and concentrate smelted during the year was credited to State production.

Exploration for zinc was confined to the locations mentioned in the paragraphs on copper and lead, where zinc is an associated metal in these ores.

⁹ Geological Survey, *Geologic Investigations of Radioactive Deposits*: TEI-390, December 1953, pp. 220-221.

¹⁰ Walker, George W., *Rosamond Uranium Prospect*: State of California, Dept. of Natural Resources, Div. of Mines, Special Rept. 37, August 1953, 8 pp.

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Andalusite.—No production of andalusite was recorded in 1953; but some ore mined in the White Mountains, Mono County, several years ago was shipped from a stockpile. This material was for use largely in high-grade porcelain for sparkplugs and chemical ware.

Asbestos.—The widespread occurrence of asbestos in California has stimulated the search for deposits of chrysotile large enough to warrant installation of milling equipment. Areas were explored under DMEA loans in Siskiyou, Shasta, and Trinity Counties. The Voorhees property, West Belt district, Calaveras County, which has a history of chrysotile production, was developed in 1953, as were the St. Thomas claims in southern San Benito County. Tremolite in the Condra Properties claims near Victorville, San Bernardino County, also was developed. The State production consisted of relatively small shipments of chrysotile from the mines of Mt. Shasta Mining Co. near Mount Shasta, Siskiyou County, and Premier Asbestos Co. at Jamestown, Tuolumne County. Hand-sorted tremolite was shipped by Zimdars and Delmue from the Noonday mine, Iowa Hill district, Placer County.

Barite.—Crude barite sold or used by producers declined 17 percent in quantity and 3 percent in value compared with 1952. The mine production increased in 1953; in consequence, larger stocks of barite were on hand. Barium Products, Ltd., shipped barite from the Almanor mine, Plumas County, to its Modesto, Calif., plant for barium chemicals, and some of the byproduct barite recovered as a concentrate from the rare-earth operation near Mountain Pass, San Bernardino County, was utilized for rotary-drilling mud. Barite was mined and stocked at the Leviathan property near Barstow, San Bernardino County. Companies that ground crude barite mined largely in Nevada and Arizona but also in California, principally for use in drilling mud and paint filler, included: Baroid Sales Division, National Lead Co., Merced; The Glidden Co., Chemical & Pigment Div., Oakland; Yuba Milling Co., Emeryville; Oil Base, Inc., Compton; and Macco Corp., Paramount.

Boron Minerals.—California's principal output of boron minerals in 1953 was from Kern County, where Pacific Coast Borax Co. worked its deposits of kernite (rasorite) and tincal at Boron. This company also produced colemanite, the natural calcium borate, in Inyo County. Producers of boron minerals and compounds from brines were: American Potash & Chemical Corp. (borax, boric acid, and anhydrous sodium tetraborate), West End Chemical Co. (borax, and sodium tetraborate), San Bernardino County; and Columbia-Southern Chemical Corp. (borax), Inyo County. Compared with 1952 the yield of boron minerals and compounds rose 23 percent in quantity and 25 percent in value. Although boron compounds had a wide variety of uses, about half of California's total output was consumed by the glass and ceramics industries. Incidentally, the California production in 1953 was the only boron output in the Nation.

Bromine.—Bromine and bromine compounds were produced in 1953 as byproducts by Westvaco Chemical Division, Food Machinery & Chemical Corp., in Alameda County (ethylene dibromide) from salt-works bitterns and by American Potash & Chemical Corp. from

brines of Searles Lake, San Bernardino County (elemental bromine and ammonium, sodium, and potassium bromides). The total production, in terms of contained bromine, decreased 2 percent in quantity and value compared with 1952.

Calcium Chloride.—The State's entire output of calcium chloride was derived from brines in San Bernardino County near Amboy. California Rock Salt Co. and National Chloride Co. of America produced liquid calcium chloride and Hill Bros. Chemical Co. flake calcium chloride. The 1953 yield, in terms of 75-percent CaCl_2 equivalent, decreased 1 percent in quantity but increased 4 percent in value compared with 1952.

Clays.—California clay and shale production decreased 11 percent in quantity but rose 2 percent in value compared with 1952. Clay and shale produced for cement increased 5 percent in quantity and 4 percent in value compared with 1952 but for other purposes declined 19 percent in quantity and rose 2 percent in value. Of the total clays output in 1953, miscellaneous clays, including shale, comprised 1,935,000 tons valued at \$2,566,000; fire clay, 452,700 tons valued at \$1,606,000; kaolin, 29,300 tons valued at \$410,400; and other clays (ball clay, bentonite and fuller's earth), 12,400 tons valued at \$369,800. By uses, producers of heavy clay products consumed 41 percent; cement, 37 percent; lightweight aggregate, 8 percent; firebrick and blocks, 6 percent; rotary-drilling mud, 3 percent; architectural terra cotta, 2 percent; and miscellaneous products including, white wall, art pottery, highgrade tile, paints, refractories, filtering and decolorizing oils, fertilizer, filler, insecticide, and plaster, 3 percent. The principal producers of clay, by types, follow: Kaolin, Southern California

TABLE 22.—Clay (except for cement) production, by counties, and total clays produced, 1952–53

County	1952		1953	
	Short tons	Value	Short tons	Value
Alameda.....	13,810	\$12,650	11,690	\$12,500
Amador.....	165,395	544,002	117,021	324,243
Calaveras.....	7,450	10,222	19,514	41,645
Contra Costa.....	61,888	82,720	64,806	92,265
Humboldt.....	500	500	450	450
Inyo.....	5,386	164,095	2,747	98,819
Kern.....	122,406	831,901	68,324	599,704
Los Angeles.....	566,557	615,462	420,922	428,671
Orange.....	21,871	76,795	47,314	178,981
Placer.....	121,560	252,020	144,225	315,947
Riverside.....	195,692	594,288	225,934	1,063,611
Sacramento.....	167,376	149,282	19,493	33,043
San Benito.....	49	490	88	1,000
San Bernardino.....	23,616	247,492	41,930	353,850
San Diego.....	34,144	25,616	28,515	21,405
San Joaquin.....	(1)	(1)	22,699	19,640
Santa Clara.....	55,511	45,792	17,245	14,751
Stanislaus.....	3,674	12,140	4,928	18,657
Tulare.....	4,048	3,036	5,790	5,790
Ventura.....	185,731	173,196	80,808	88,227
Undistributed ¹	129,985	151,353	189,816	343,785
Total.....	1,886,649	3,993,052	1,534,239	4,057,074
Clay for cement (undistributed).....	856,481	859,214	895,649	895,649
Grand total.....	2,743,130	4,852,266	2,429,888	4,952,723

¹ Fresno, Marin, Mono, Santa Barbara, San Joaquin (1952), Solano (1953), and Sutter Counties included with "Undistributed" to avoid disclosure of individual company operations.

Minerals Co., San Bernardino County; fire clay, Gladding, McBean & Co., Amador, Orange, and Placer Counties; bentonite, National Lead Co., Baroid Sales Division, San Bernardino County; fuller's earth, Excel Minerals Co., Kern County; ball clay, Lester Raggio, Stanislaus County; and miscellaneous clays for other than cement, Gladding, McBean & Co., Amador and Los Angeles Counties.

Western Refractories Co. expanded its brick plant near Ione, Amador County, and added a rotary drier and a grinding unit to the existing plant.

Cement, Portland.—The State finished portland-cement production increased 9 percent in 1953 compared with 1952, but shipments from mills increased 7 percent in quantity and 14 percent in value in the same period. The northern California mills produced 15,125,000 barrels of cement in 1953, an 11-percent increase over 1952, and shipped 15,166,000 barrels valued at \$43,930,000 an increase of 11 percent in quantity and 19 percent in value compared with 1952. The southern California mills produced 17,020,000 barrels, an increase of 7 percent over 1952, and shipped 16,836,000 barrels valued at \$46,942,000, increases of 5 percent in quantity and 10 percent in value compared with 1952. The estimated surplus in local supply of portland cement, based on apparent State consumption and shipments from mills in 1953, was 4,269,000 barrels compared with a surplus of 4,425,000 barrels in 1952.

TABLE 23.—Finished portland cement produced, shipped, and in stock, and estimated consumption, 1944-48 (average) and 1949-53

Year	Active plants	Estimated capacity (thousand barrels)	Production (thousand barrels)	Shipments from mills			Estimated Consumption (thousand barrels)	Stocks at mills, December 31 (thousand barrels)
				Thousand barrels	Value			
					Total	Average per barrel		
1944-48 (average).....	12	28,106	19,507	19,616	\$36,870,000	\$1.88	16,210	966
1949.....	11	29,870	23,218	23,202	57,464,000	2.48	19,944	1,127
1950.....	11	30,870	26,277	26,685	65,259,000	2.45	23,508	818
1951.....	11	32,620	29,918	28,956	77,754,000	2.69	25,192	1,776
1952.....	11	35,120	29,585	29,786	79,458,000	2.67	25,361	1,575
1953.....	11	35,220	32,145	32,002	90,873,000	2.84	27,737	1,708

TABLE 24.—Production, shipments from mills, and stocks at mills of finished portland cement in 1953, by months, in thousand barrels

Month	Mill production	Mill shipments	Shipments to California ¹	Stocks at mills (end of month)
January.....	2,429	2,239	1,943	1,755
February.....	2,355	2,481	2,149	1,630
March.....	2,636	2,774	2,387	1,492
April.....	2,769	2,764	2,384	1,498
May.....	2,851	2,745	2,361	1,604
June.....	2,735	2,656	2,290	1,682
July.....	2,778	2,794	2,400	1,667
August.....	2,783	2,897	2,520	1,553
September.....	2,692	2,939	2,637	1,306
October.....	2,826	2,946	2,586	1,185
November.....	2,765	2,408	2,092	1,543
December.....	2,519	2,360	2,089	1,708

¹ Includes interstate and intrastate shipments.

Of the 11 plants operated in 1953, 5 were in northern California (1 each in Calaveras County, Santa Clara County, Santa Cruz County, San Mateo County, and San Benito County) and 6 in southern California (3 in San Bernardino County and 1 each in Kern County, Riverside County, and Los Angeles County). The estimated annual finished-cement capacity in 1953 of northern California mills was 15,900,000 barrels and of southern California mills 19,320,000 barrels.

Diatomite.—California diatomite yield—a large percentage of the United States output—was principally from Santa Barbara County, where Johns-Manville Products Corp. and Great Lakes Carbon Corp. Dicalite Division worked deposits and operated processing plants in the Lompoc area. Los Angeles County also made an important contribution to the State total output from diatomite produced at the Great Lakes Carbon Corp. Dicalite Division WALTERIA quarry and plant. Basalt Rock Co. was a new producer of diatomite in 1953 from a Napa County deposit. A minor yield was recorded in Inyo County. The 1953 prepared sales (which rose 62 percent over 1952, a year in which output was adversely affected by labor strikes) was used as follows: Filtration, over 64 percent; fillers, 22 percent; insulation, 11 percent; and other uses, including puzzolan and miscellaneous admixtures, nearly 3 percent.

Feldspar.—The 1953 production of crude feldspar was ore from the Gladding, McBean & Co. San Bernardino County mine and a flotation product of the Del Monte Properties Co. Monterey County dune material. It was used principally by the glass and ceramic industries.

Fluorspar.—Although there are deposits of fluorspar in California, no production was reported from State mines. The Holmestake Mining Co. separated fluorite from Arizona lead-zinc ores at its Imperial County mill.

Gem Stones.—Of particular interest to collectors of gems and mineral specimens were deposits in the following localities: San Diego County, Pala district, Himalaya mine—Tourmaline; San Benito County, Idria district—spinel, diopside, black garnet, and idocrase; Dallas mine—benitoite; Clear Creek—jade and dolomite rosettes; San Bernardino County, Baker—turquoise; Lavié Mountains, Cady Mountains, and Afton—jasper and agate; Ludlow—agate; Cahuilla Mountains—rose quartz, tourmaline, and garnet; Boron—petrified palm; Kern County, Castle Butte—jasper and petrified palm.

Gypsum.—Production of crude gypsum and gypsite decreased 3 percent in quantity but increased 5 percent in value compared with 1952. The drop in output was due to less demand by agriculturists for gypsite (the impure gypsum) quarried largely in the lower San Joaquin Valley. Imperial County was the largest contributor to the State total gypsum production by virtue of the United States Gypsum Co. output. Kern County, in second place because of gypsite produced, was followed by Riverside, Kings, San Luis Obispo, Ventura, Merced, Fresno, and San Bernardino Counties. H. M. Holloway, Inc., was the State's principal producer of gypsite from deposits in Kern and Kings Counties. The production of byproduct gypsum at its Alameda County chemical plant by Westvaco Chemical Division, Food Machinery & Chemical Corp., is not included in the State total crude gypsum. Use of calcined gypsum in plaster and plaster board

and as a cement retarder, in addition to the crude material for land plaster, accounted for a large percentage of gypsum consumption.

TABLE 25.—Crude gypsum mined, 1944-48 (average) and 1949-53

Year	Active mines	Short tons	Value	Year	Active mines	Short tons	Value
1944-48 (average)---	9	661, 226	\$1, 486, 727	1951-----	10	1, 092, 885	\$2, 602, 750
1949-----	13	753, 581	1, 852, 452	1952-----	13	1, 236, 430	2, 721, 134
1950-----	11	962, 373	2, 462, 604	1953-----	16	1, 199, 489	2, 855, 983

Iodine.—Deepwater Chemical Co., Ltd., and Great Western Division, Dow Chemical Co., provided California's crude-iodine production in 1953, representing, incidentally, the total output of this commodity in the United States. Iodine was recovered from waste brines of oil wells in the Los Angeles Basin, which lies both in Orange and Los Angeles Counties. The 1953 production was virtually the same as in 1952.

Iron Oxide Pigments.—C. K. Williams & Co. manufactured iron oxide pigments in Alameda County.

Lime.—California lime output from State limestone and dolomite calcined rose 26 percent in quantity and 24 percent in value compared with 1952, owing largely to increased demand by chemical and industrial users who consumed 62 percent of the State output in 1953 and 55 percent in 1952. Refractory use, second in magnitude, increased 19 percent over 1952. Building and agricultural-lime consumption followed in order but decreased 13 and 30 percent, respectively, compared with 1952. Of the total lime produced in 1953, 267,684 tons was in the form of quicklime, and 33,738 tons was hydrated lime. In the previous year the yield was 205,668 tons of quicklime and 33,289 tons of hydrated lime. Limekilns were operated in El Dorado, Monterey, San Bernardino, and Tuolumne Counties.

Lithium Minerals.—American Potash & Chemical Corp. produced crude sodium-lithium phosphate as a byproduct of its dry-lake brine operation at Searles Lake, San Bernardino County.

Magnesium Salts.—Production of magnesium salts from all types of raw materials treated increased substantially over 1952. Westvaco Chemical Division of Food Machinery & Chemical Corp. (in Alameda and San Diego Counties), Kaiser Aluminum & Chemical Corp. (Monterey County), Philadelphia Quartz Co. of California (Alameda County), and Marine Magnesium Products Division, Merck & Co., Inc. (San Mateo County), were producers of magnesium compounds in 1953. Raw sea water, sea-water bitterns, dolomite from Monterey and San Benito Counties, and magnesite from Santa Clara County were the basic materials consumed. Specifically, the partly estimated yield of magnesium salts from sea water and bitterns, in terms of MgO equivalent, increased 11 percent in quantity but decreased 1 percent in value compared with 1952.

Magnesite.—A relatively small tonnage of magnesite mined in the Red Mountain district, Santa Clara County, during 1953 was consumed within the State at magnesium-salts plants.

Mica.—No production of mica was recorded in California in 1953. Mica schist quarried in Imperial County was ground, but no separation of the mica was made. This material is included with the State miscellaneous stone output. Some mica of foreign origin was ground in Los Angeles County.

Marl.—Marlife Co. quarried a caliche-type marl in Fresno County. The material was used largely for soil-aid purposes.

Perlite.—California crude perlite sold or used by producers in 1953 decreased 17 percent in quantity and 12 percent in value from 1952. This yield fell short of the requirements of State plants which expanded crude material. In 1953, 35,300 tons of expanded perlite valued at \$1,602,000, produced at California plants, was sold or used, whereas in 1952, 28,400 tons valued at \$1,203,000 was sold or used by producers. Crude perlite was quarried in Inyo, San Bernardino, and Napa Counties, and United States Mining Corp., which operated a pit in the Fish Springs district, Inyo County, was the State's leading producer. Perlite-expanding plants were operated in Contra Costa, Fresno, Los Angeles, Marin, Riverside, San Bernardino, and San Diego Counties. The principal uses of expanded perlite were: Plaster aggregate, oil-well drilling mud, filter aid, insulation, and concrete aggregate.

Potassium Salts.—American Potash & Chemical Corp. which treated brines at its Searles Lake plant in San Bernardino County, was the principal producer of potassium salts in California in 1953. Some low-grade potash material—a byproduct of cement manufacture used for soil enrichment—was recovered in Santa Cruz County.

Pumice and Pumicite.—California pumice output decreased noticeably in 1953, continuing the decline that began in 1952. The competition with expanded perlite and bloated shales in lightweight aggregates has been the principal cause of this slump. Siskiyou County was the chief source of sawed pumice blocks used as an abrasive. Other uses for pumice included: Insulation, pesticide diluent, filler, and absorbent.

TABLE 26.—Pumice and pumicite ¹ sold or used in 1953, by counties

County	Crude		Prepared		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
Imperial.....			12, 178	\$36, 534	12, 178	\$36, 534
Inyo.....			54, 559	136, 683	54, 559	136, 683
Modoc.....	2, 668	\$4, 821	8, 417	26, 950	11, 085	31, 771
Mono.....			8, 431	117, 202	8, 431	117, 202
Siskiyou.....	315, 048	140, 656	20, 485	56, 950	335, 533	197, 606
Other counties ²	1, 999	3, 501	9, 320	124, 613	11, 319	128, 114
Total.....	319, 715	148, 978	113, 390	408, 932	433, 105	647, 910

¹ Includes volcanic cinders.

² Amador, Calaveras, Kern, Lassen, Madera, San Bernardino Counties.

Pyrites.—The Mountain Copper Co., Ltd., produced pyrites in 1953 from the Hornet mine, Shasta County. The ore was shipped principally to Contra Costa County sulfuric acid plants. Some of the pyrite cinder from these plants is utilized as the source of iron oxide in portland cement.

TABLE 27.—Pumice and pumicite¹ sold or used in 1944-48 (average) and 1949-53

Year	Short tons	Value	Year	Short tons	Value
1944-48 (average).....	112,360	\$723,971	1951.....	264,411	\$1,288,569
1949.....	149,878	799,602	1952.....	129,780	793,716
1950.....	157,497	970,826	1953.....	433,105	647,910

¹ Includes volcanic cinders in 1953, 352,291 short tons valued at \$196,411.

Salt (Sodium Chloride).—Owing largely to continued subnormal harvests at salt beds in the San Francisco Bay tidelands, California salt production dropped 2 percent in quantity below 1952; however, the value rose 28 percent. Alameda County led in output of salt, contributing 839,200 tons valued at \$5,211,000. San Bernardino County, in second place was followed by San Diego County. Kern County, in fourth position, produced 8,200 tons valued at \$47,500, and Monterey County was in fifth place, with 8,000 tons valued at \$24,000. Orange County ranked sixth. The production for San Bernardino, San Diego, and Orange Counties together was 268,000 tons valued at \$980,700. Leslie Salt Co., Alameda County, and California Rock Salt Co., San Bernardino County, were the State's leading producers.

Distribution of the salt sold or used by California producers (which comprised 926,400 tons of evaporated salt valued at \$5,630,000 and 196,900 tons of rock salt valued at \$633,100) follows: California 44 percent, other States 54 percent, and exports to United States Territories and foreign countries 2 percent. In utilization, the chemical and related industries, largely chlorine, bleaches, and chlorates, consumed 51 percent of the State total production; water treatment, 10 percent; refrigeration, 7 percent; food processing, including meat packing, 7 percent; miscellaneous uses, including home, dairies, livestock, highway conditioning, and metallurgical, 6 percent; and curing hides and leather, 3 percent. Salt shipped for resale and export amounted to 16 percent of the State output, and the ultimate utilization is unknown.

During 1953 Leslie Salt Co. acquired acreage in Napa County for expansion of its solar-evaporation facilities, now centered in Alameda County.

TABLE 28.—Salt sold or used by producers, 1944-48 (average) and 1949-53

Year	Short tons	Percent of United States total	Value	Year	Short tons	Percent of United States total	Value
1944-48 (average) ..	763,738	5	\$3,531,915	1951.....	1,275,574	6	\$5,261,780
1949.....	964,807	6	4,110,271	1952.....	1,148,693	6	4,880,392
1950.....	868,496	5	3,816,655	1953.....	1,123,365	5	6,263,059

Sand and Gravel.—The total production of sand and gravel from commercial and noncommercial operations increased 10 percent in quantity and 22 percent in value compared with 1952. A large percentage of the sand and gravel output was used in buildings, road-construction projects, and dams. Due to its widespread occurrence

TABLE 29.—Sand and gravel sold or used by producers, 1944-48 (average) and 1949-53

Year	Sand		Gravel		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1944-48 (average).....	12,078,133	\$3,922,339	15,566,395	\$12,012,921	27,644,528	\$20,935,260
1949.....	14,912,709	12,643,953	21,367,107	17,554,971	36,279,816	30,198,924
1950.....	17,812,379	15,136,857	24,081,660	20,410,701	41,894,039	35,547,558
1951.....	19,009,895	16,640,752	27,917,557	24,639,083	46,927,452	41,279,835
1952.....	20,434,017	18,060,627	32,617,243	25,572,498	53,051,260	43,633,125
1953.....	22,129,931	21,232,885	36,299,597	31,991,318	58,429,528	53,224,203

TABLE 30.—Sand and gravel sold or used by producers, 1952-53, by commercial and Government-and-contractor operations and by uses

	1952			1953		
	Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per ton
COMMERCIAL OPERATIONS						
Sand:						
Glass.....	315,614	\$1,226,622	\$3.89			
Molding.....	61,209	208,140	3.40	33,700	\$84,686	\$2.51
Building.....	12,195,416	10,443,281	.86	12,676,258	11,362,921	.90
Paving.....	5,269,028	4,389,199	.83	6,383,638	5,578,210	.87
Blast.....	121,070	372,611	3.08	126,945	400,888	3.16
Engine.....	71,392	77,280	1.08	84,407	92,385	1.09
Filter.....	18,277	53,762	2.94			
Railroad ballast.....	1,440	792	.55			
Other ¹	104,148	105,469	1.01	842,196	2,742,163	3.26
Total commercial sand.....	18,157,594	16,877,156	.93	20,147,144	20,261,253	1.01
Gravel:						
Building.....	13,994,654	13,379,052	.96	13,255,772	13,698,631	1.03
Paving.....	8,601,253	8,463,624	.98	9,328,175	9,501,357	1.02
Railroad ballast.....	181,257	121,851	.67	268,768	194,877	.73
Other.....	522,628	378,321	.72	849,831	946,303	1.11
Total commercial gravel.....	23,299,802	22,342,848	.96	23,702,546	24,341,168	1.03
Total commercial sand and gravel.....	41,457,396	39,220,004	.95	43,849,690	44,602,421	1.02
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand:						
Building.....	235,601	89,910	.38	326,775	225,379	.69
Paving.....	2,040,822	1,093,561	.54	1,656,012	746,253	.45
Total Government-and-contractor sand.....	2,276,423	1,183,471	.52	1,982,787	971,632	.49
Gravel:						
Building.....	328,234	96,266	.29	5,452,315	3,105,707	.57
Paving.....	8,989,207	3,133,384	.35	7,144,736	4,544,443	.64
Total Government-and-contractor gravel.....	9,317,441	3,229,650	.35	12,597,051	7,650,150	.61
Total Government-and-contractor sand and gravel.....	11,593,864	4,413,121	.38	14,579,838	8,621,782	.59
COMMERCIAL AND GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand.....	20,434,017	18,060,627	.88	22,129,931	21,232,885	.96
Gravel.....	32,617,243	25,572,498	.78	36,299,597	31,991,318	.88
Grand total.....	53,051,260	43,633,125	.82	58,429,528	53,224,203	.91

¹ Included with "Other" to avoid disclosure of individual company operations.

the greater outputs of sand and gravel were from areas of maximum construction activity. The most noteworthy rise in output was in Placer County, where large tonnages of gravel were prepared for dikes and other appurtenances to the Folsom Dam under construction in Sacramento County. The principal locales of special-purpose industrial sand production were in Monterey, Riverside, and Los Angeles Counties; lesser tonnages were contributed by Contra Costa, Fresno, San Diego, San Luis Obispo, and Yuba Counties.

TABLE 31.—Production of sand and gravel, commercial and noncommercial, by counties in 1953

County	Commercial and non-commercial, short tons	Total value	County	Commercial and non-commercial, short tons	Total value
Alameda	5,588,583	\$6,029,133	Napa	5,709	\$3,058
Alpine	500	125	Orange	3,003,406	2,629,786
Amador	35,762	10,765	Placer	1,029,943	532,043
Butte	341,140	478,224	Plumas	71,484	47,623
Calaveras	36,881	68,139	Riverside	803,469	1,168,394
Colusa	207,488	111,341	Sacramento	6,451,061	4,704,063
Contra Costa	84,242	55,771	San Benito	65,640	18,150
Del Norte	144,193	146,601	San Bernardino	2,168,881	2,173,938
El Dorado	93,437	74,312	San Diego	3,100,522	4,287,389
Fresno	927,764	698,451	San Joaquin	1,664,436	1,552,198
Glenn	298,768	196,147	San Luis Obispo	264,415	188,620
Humboldt	791,955	755,299	Santa Barbara	371,280	522,922
Imperial	508,066	370,049	Santa Clara	1,038,679	729,125
Inyo	126,579	88,569	Santa Cruz	648,371	620,038
Kern	555,714	628,928	Shasta	259,259	260,355
Kings	136,000	43,575	Stanislaus	539,607	475,118
Lake	111,323	71,548	Tehama	71,138	75,623
Lassen	146,887	84,422	Trinity	35,747	43,656
Los Angeles	19,665,578	14,969,723	Ventura	910,238	1,146,794
Madera	85,559	64,274	Yolo	1,203,039	1,022,846
Mariposa	52,903	50,028	Yuba	208,773	241,220
Mendocino	189,956	264,076	Other counties ¹	2,003,516	1,950,049
Merced	950,504	877,347			
Modoc	340,693	110,676			
Monterey	1,090,440	2,583,672	Total	58,429,528	53,224,203

¹ Includes Marin, Mono, Nevada, San Mateo, Siskiyou, Solano, Sonoma, Sutter, Tulare and Tuolumne Counties, combined to avoid disclosure of individual company operations.

Silica (Quartz).—Silica in the form of vein quartz was produced in Mariposa and Kern Counties, as quartzite in San Bernardino County, and as sand in Monterey County. Its principal uses were in refractory brick, ferrosilicon, ceramics, and cement. The output was considerably below that in 1952 because the use of ferrosilicon was curtailed owing to cessation of magnesium production in California after midyear. Kaiser Aluminum & Chemical Corp., Minerals Materials Co., Del Monte Properties Co., and Riverside Cement Co. were the main producers.

Slate.—California slate production increased slightly both in quantity and value over 1952. The output was relatively small, and Pacific Minerals Co., Ltd., and Kelsey Slate Co., both in El Dorado County, were the producers. The chief uses of the slate were for roofing granules, filler, and flagging.

Sodium Compounds.—Natural sodium carbonate was produced from dry-lake brines by American Potash & Chemical Corp. near Trona (soda ash) and West End Chemical Co. at West End (soda ash), both in San Bernardino County, and by Columbia-Southern Chemical Corp. near Bartlett, Inyo County (soda ash and trona). American

Potash & Chemical Corp. also produced natural sodium sulfate as salt cake near Trona, San Bernardino County.

Stone.—Production of stone, including all types, increased 1 percent in quantity and 4 percent in value compared with 1952. A high percentage of the stone used was crushed or broken, but there were outputs of dimensional stone in Madera, Placer, San Bernardino, and San Diego Counties (granite), Monterey and Sonoma Counties (sandstone), and Los Angeles and El Dorado Counties (miscellaneous stone). Crushed marble from Tuolumne County was in demand for terrazzo. It should be noted that volcanic cinders output is tabulated with pumice and pumicite in 1953, whereas this commodity was included with miscellaneous stone in prior years.

TABLE 32.—Stone sold or used by producers, commercial and noncommercial, 1949–53, by kinds

Year	Granite		Basalt and related rocks (traprock)		Marble	
	Short tons	Value	Short tons	Value	Short tons	Value
1949.....	1,756,280	\$1,617,996	1,393,150	\$1,607,735	3,930	\$78,580
1950.....	1,834,060	1,690,722	1,293,030	1,371,622	4,410	80,212
1951.....	1,910,307	2,088,967	1,652,314	1,921,527	8,435	171,083
1952.....	1,903,866	1,979,756	1,996,836	2,524,972	7,168	137,664
1953.....	3,565,847	3,214,767	2,664,009	2,800,346	(1)	(1)

Year	Limestone		Sandstone		Other stone ²		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1949.....	789,130	\$2,413,666	1,614,840	\$1,632,594	5,816,370	\$5,243,477	11,373,700	\$12,594,048
1950.....	1,061,040	2,819,555	1,698,020	1,777,982	5,874,070	6,258,539	11,764,630	13,998,432
1951.....	1,158,999	3,443,408	1,508,495	1,549,001	6,298,794	5,540,538	12,537,344	14,714,524
1952.....	1,727,224	4,148,150	1,029,084	1,290,141	7,806,607	7,731,349	14,374,930	17,697,085
1953.....	1,991,949	4,930,005	2,093,219	2,835,693	4,199,156	4,698,341	14,514,180	18,479,152

¹ Bureau of Mines not at liberty to publish.

² Includes light colored volcanics, schist, serpentine, river boulders, and such other stone as cannot properly be classed in any main group.

TABLE 33.—Production of stone,¹ commercial and noncommercial, by counties, in 1953

County	Short tons	Value	County	Short tons	Value
Alameda.....	1,178,707	\$1,181,338	San Bernardino.....	545,792	\$1,646,577
Butte.....	248,023	210,359	San Diego.....	341,719	616,434
Contra Costa.....	945,603	1,236,269	San Mateo.....	808,372	995,012
Del Norte.....	18,900	20,250	Santa Clara.....	1,179,216	749,856
El Dorado.....	214,383	607,448	Santa Cruz.....	55,490	218,274
Fresno.....	500,660	412,893	Shasta.....	48,367	69,971
Humboldt.....	26,476	72,798	Siskiyou.....	15,975	14,575
Imperial.....	27,518	35,481	Solano.....	214,818	285,275
Lassen.....	16,000	16,000	Sonoma.....	762,301	751,049
Los Angeles.....	3,244,050	2,819,252	Tehama.....	9,441	17,133
Marin.....	652,803	1,024,583	Trinity.....	17,350	23,380
Monterey.....	340,333	997,305	Tuolumne.....	59,969	207,944
Orange.....	37,335	57,158	Ventura.....	516,446	827,483
Riverside.....	90,025	106,998	Undistributed.....	50,560	48,730
Sacramento.....	341,764	466,341	Other counties ²	735,488	1,145,720
San Benito.....	1,270,296	1,597,266	Total.....	14,514,180	18,479,152

¹ Excludes limestone for lime and cement.

² Includes Kern, Madera, Mariposa, Merced, Mono, Napa, Placer, Plumas, San Joaquin, San Luis Obispo, Santa Barbara, Tulare, and Yolo, combined to avoid disclosure of individual company operations.

TABLE 34.—Stone, commercial and noncommercial, sold or used, 1952–53, by uses

Use	1952		1953	
	Quantity	Value	Quantity	Value
Dimension stone:				
Rough construction and rubble.....short tons..	39, 916	\$163, 800	11, 431	\$44, 645
Rough architectural and dressed stone.....cubic feet..	40, 075	174, 262	9, 492	92, 808
Approximate equivalent in short tons.....	3, 259	-----	776	-----
Monuments and mausoleums.....cubic feet..	35, 266	254, 777	29, 571	148, 823
Approximate equivalent in short tons.....	2, 892	-----	2, 400	-----
Flagging.....cubic feet..	7, 529	11, 000	3, 133	4, 617
Approximate equivalent in short tons.....	640	-----	246	-----
Total dimension stone (quantities approximate, in short tons).....	46, 707	603, 839	14, 853	290, 893
Crushed and broken stone:				
Riprap.....short tons..	994, 892	1, 470, 061	872, 172	1, 539, 269
Metallurgical.....do.....	86, 481	251, 912	63, 021	185, 092
Concrete and road metal.....do.....	9, 984, 529	10, 361, 036	10, 434, 506	10, 771, 937
Railroad ballast.....do.....	526, 654	404, 843	704, 729	697, 948
Agricultural.....do.....	279	1, 719	1, 095	3, 488
Chemical.....do.....	506, 661	1, 210, 942	614, 076	1, 896, 794
Miscellaneous ¹.....do.....	2, 228, 727	3, 392, 733	1, 809, 728	3, 093, 731
Total crushed and broken stone.....do.....	14, 328, 223	17, 093, 246	14, 499, 327	18, 188, 259
Grand total (quantities approximate, in short tons).....	14, 374, 930	17, 697, 085	14, 514, 180	18, 479, 152

¹ Includes whitening or whitening substitute, filler, mineral food, poultry grit, stucco, roofing granules, filter beds, terrazzo, and miscellaneous uses.

Strontium Minerals.—Pan Chemical Co. produced a small tonnage of celestite in the Fish Mountain district, San Diego County.

Sulfur.—Sulfur-ore output in 1953 was the largest ever attained in the State. Other than a relatively small tonnage of sulfur ore mined in Inyo County for soil conditioning, the 1953 California production was from the Anaconda Copper Mining Co. Leviathan open-pit mine in Alpine County. The ore, which contained an average of 25 percent sulfur, was shipped to Yerington, Nev., for sulfuric acid manufacture. There was some development during 1953 at a sulfur deposit near Bartlett Springs, Lake County. Brimstone was recovered as a byproduct in the liquid purification of gas by oil companies in Los Angeles County. Hydrogen sulfide having a total sulfur content of 59,175 tons was obtained at oil refineries in the refining process in Los Angeles and Contra Costa Counties. The American Smelting & Refining Co. recovered liquid sulfur dioxide as a byproduct of the smelting of sulfide ores at Selby, Contra Costa County, and sulfur paste and sludge from spent acid were shipped to chemical plants from oil refineries in Contra Costa County.

Talc, Pyrophyllite, and Soapstone.—Production of crude talc, pyrophyllite, and soapstone increased 5 percent in quantity over 1952, but no direct comparison can be made in value, as the 1953 figure is "mine value," and the 1952 value pertains to ground material. Of the total crude California material mined in 1953, 56,750 tons valued at \$679,674 was produced in San Bernardino County (talc and pyrophyllite), 48,006 tons valued at \$382,171 in Inyo County (talc), and the remainder (21,686 tons valued at \$70,855) in Los Angeles County (soapstone), El Dorado County (soapstone), Mono County (pyrophyllite), and Riverside County (pyrophyllite). Grinding mills were

operated in Alameda County (soapstone), San Francisco County (talc and soapstone), Inyo County (talc and pyrophyllite), and Los Angeles County (talc, pyrophyllite, and soapstone). Ground talc was used principally in ceramics, paint, rubber, toilet preparations, and battery cases, with lesser quantities used in paper, insecticides, rice polishing, textiles, and plastic. Pyrophyllite was utilized largely in insecticides, paper, and stucco; and soapstone, in insecticides and asphalt filler.

Vermiculite.—Although no crude vermiculite was produced in California, exfoliating plants were operated by California Zonolite Co. in Los Angeles and Sacramento, principally on Montana crude material. The properties of expanded vermiculite are such that it had application in the construction and chemical fields for industrial insulation.

Volcanic Cinders.—Volcanic cinders, which differ from pumice both in composition and appearance, were produced largely in Siskiyou County, where the yield was 312,900 tons valued at \$136,200. Output also was recorded in Inyo, Modoc, and Lassen Counties. This material was used principally as railroad ballast, in road surfacing (including seal-coating), and as concrete aggregate. The Southern Pacific Co. operation in Siskiyou County and Redlite Aggregates, Inyo County, were the State's leading producers in 1953.

Wollastonite.—No wollastonite was produced in California during 1953. Test shipments were made from Riverside County in 1952.

MINERAL FUELS

Carbon Dioxide (Natural).—Carbon dioxide gas, used largely for "dry ice," was withdrawn from the Salton Sea field in Imperial County and the Hopland field, Mendocino County. The production of this gas was virtually the same as in 1952.

Coal.—Approximately 2,400 tons of lignite was mined in Amador County near Ione as a raw material in the preparation of extracted products, principally montan wax. Because of its nonfuel use, the value is not included in the State total.

Peat.—Peat, dug in Orange, Modoc, and Contra Costa Counties, was utilized by agriculturists for soil improvement.

Petroleum and Natural Gas.—The production of petroleum in 1953 from 15 California counties rose 2 percent in quantity and 13 percent in value compared with 1952. The total crude-oil capacity of the 50 petroleum refineries in the State was 1,242,900 barrels daily at the close of the year compared with 1,226,300 barrels a day as of January 1, 1953, an increase of 1 percent.

Marketed production of natural gas from 23 counties in the State increased 3 percent in quantity and 21 percent in value over 1952. In 1953 the yield of natural gasoline and cycle products from natural gas treated at California plants in 8 counties was up 5 percent in quantity and 32 percent in value, and the output of liquid-petroleum products from the same source increased 1 percent in quantity and 32 percent in value over the previous year.

The production of petroleum, natural gas, and natural-gas products is discussed in more detail in commodity chapters on these subjects in volume II, Minerals Yearbook.

TABLE 35.—Natural gas, natural-gas liquids, and petroleum produced by counties, in 1953¹

County	Marketed natural gas		Natural-gas liquids				Petroleum	
			Natural gasoline and cycle products		LP-gases		Thousand 42-gallon barrels	Value (thousand dollars)
	Million cubic feet	Value (thousand dollars)	Thousand gallons	Value (thousand dollars)	Thousand gallons	Value (thousand dollars)		
Butte.....	3,401	693						
Contra Costa.....	810	(²)						
Fresno.....	42,080	8,929	58,254	5,940	54,306	3,284	35,737	97,915
Glenn.....	682	138						
Humboldt.....	1,768	(²)					(³)	(³)
Kern.....	94,345	18,222	237,678	22,261	119,700	7,213	93,618	217,160
Kings.....	28,746	6,037	(²)	(²)	(²)	(²)	2,994	9,337
Los Angeles.....	93,302	16,310	267,834	25,485	45,528	2,175	97,383	254,784
Madera.....	2,831	601						
Monterey.....	1,041	(²)						
Orange.....	32,702	5,559	129,780	12,818	49,644	2,604	11,324	13,713
Sacramento.....	61,504	15,745					37,548	93,176
San Benito.....	70	(²)						
San Bernardino.....	17	(²)					31	(³)
San Joaquin.....	4,397	985					22	(³)
San Luis Obispo.....	1,288	(²)	(²)	(²)	(²)	(²)	3,265	10,019
Santa Barbara.....	23,155	3,589	42,126	3,858	22,050	1,025	35,390	81,201
Santa Clara.....							(³)	(³)
Solano.....	40,712	10,442						
Sonoma.....	4	(²)						
Stutter.....	706	(²)					1	(²)
Tulare.....	4,872	1,066						
Ventura.....	89,380	14,653	141,246	12,170	60,228	3,148	1	(³)
Yolo.....	3,533	624					47,771	131,623
Undistributed.....		1,077	33,432	3,159	46,116	2,512		132
Total.....	531,346	104,675	910,350	85,691	397,572	21,961	365,085	909,060

¹ Production from those petroleum and natural-gas fields that lie in more than 1 county was prorated among the involved counties.

² Included with "Undistributed."

³ Less than 500 barrels.

SECONDARY METALS

Iron and Steel Scrap.—Ferrous scrap consumption at California steel and iron furnaces was up 4 percent over 1952 due to the increased use at steel furnaces. Consumption at iron furnaces and miscellaneous operations declined in 1953.

Nonferrous Metals Scrap.—Secondary lead, zinc, brass, white metals, type metals, antimonial lead, and other alloys, produced chiefly in the San Francisco and Los Angeles areas, were offered on the markets in competition with primary metals.

In 1953 California foundries reported consumption of 19,200 short tons of brass and bronze ingot made chiefly from copper-base scrap. This is compared with 16,200 tons consumed in 1952 and 20,200 tons in 1951. Leaded red brass ingot—the largest single item used—amounted to 13,300 tons in 1953, 11,500 tons in 1952, and 13,500 tons in 1951.

TABLE 36.—Consumption of ferrous scrap and pig iron, 1944-48 (average) and 1949-53

Year	Total scrap used (short tons)	Pig iron used (short tons)	Year	Total scrap used (short tons)	Pig iron used (short tons)
1944-48 (average).....	1,730,796	571,541	1951.....	2,638,565	1,271,574
1949.....	1,822,065	673,616	1952.....	2,470,169	1,288,561
1950.....	2,217,674	937,740	1953.....	2,574,840	1,233,898

TABLE 37.—Consumption of ferrous scrap and pig iron, 1952-53, by types of furnaces and miscellaneous uses, in short tons

Ferrous scrap and pig iron charged to—	1952	1953	Ferrous scrap and pig iron charged to—	1952	1953
Steel furnaces: ¹			Miscellaneous uses: ²		
Scrap.....	2,031,695	2,182,341	Scrap.....	52,003	48,284
Pig iron.....	1,099,156	1,072,992	Total scrap.....	2,470,169	2,574,840
Total.....	3,130,851	3,255,333	Total pig iron.....	1,288,561	1,233,898
Iron furnaces: ³			Grand total.....	3,758,730	3,808,738
Scrap.....	386,471	344,215			
Pig iron.....	189,405	160,906			
Total.....	575,876	505,121			

¹ Includes open-heat and electric furnaces.

² Includes cupola, air, and blast furnaces, also direct castings.

³ Includes reolling, copper precipitation, nonferrous, and chemical uses.

REVIEW BY COUNTIES AND DISTRICTS

ALAMEDA

Mineral production was a relatively small but significant portion of the Alameda County economy, which was based primarily on industrial activities. Salt was obtained from sea-water ponds and plants on the southern San Francisco Bay tidal flats by American Salt Co. and Oliver Bros. Salt Co. at Mount Eden and Leslie Salt Co. and Morton Salt Co. at Newark. The Westvaco Chemical Division, Food Machinery & Chemical Corp., produced bromine and bromine compounds from salt-works bitterns and refractory magnesia and caustic calcined magnesia from salt-works bitterns and dolomite at its Newark plant. Byproduct gypsum was recovered from the latter chemical process. At Emeryville, Yuba Milling Co. ground barite produced from the company quarry in Nevada; Pabco Products, Inc., operated an asphalt plant rated at 2,500 barrels daily crude oil throughput capacity; and C. K. Williams & Co. processed iron oxide pigments. Non-metallic minerals were ground by Industrial Minerals & Chemical Co. and Philadelphia Quartz Co. at Berkeley. The Palo Alto Mining Corp. mined chromite ore from the Mendenhall No. 1 and Newman No. 1 mines in the Cedar Mountains district and shipped the ore to the company mill near Coyote, Santa Clara County. Concentrate produced was shipped to the Grants Pass, Oreg., Depot. Miscellaneous clays, dug in the county, were the raw material used by the California Pottery Co., Interlocking Rooftile Co., and Kraftile Co. at Niles and M. & S. Tile Co. at Decoto. The San Leandro Rock

Co. (San Leandro quarry) produced sandstone; Gallagher & Burk, Inc. (Leona quarry), basalt; Niles Quarry Co., Niles, miscellaneous stone; and Peter Kiewit & Sons, chert for road base, near Richmond. The Henry J. Kaiser Co. (Radium and Niles plants) crushed miscellaneous stone and prepared sand and gravel, as did the Pacific Coast Aggregates, Inc. (Centerville 106 and Elliot 104 plants). Other producers of sand and gravel were California Rock & Gravel Co., Livermore; Rhodes & Jamieson, Ltd., Centerville; and Bell Sand & Gravel, Irvington. The material prepared was used principally in base rock and aggregate.

TABLE 38.—Mineral production in California in 1953, by counties

County	Value	Minerals produced, in order of value
Alameda	\$13,997,116	Sand and gravel, salt, magnesium compounds, stone, bromine, chromite, clays.
Alpine	(1)	Sulfur ore, tungsten concentrate, sand and gravel.
Amador	449,639	Clays, gold, sand and gravel, silver, pumice.
Butte	1,442,486	Natural gas, sand and gravel, stone, chromite, gold, silver.
Calaveras ²	8,090,472	Cement, sand and gravel, clays, tungsten concentrate, gold, copper, zinc, silver, lead, pumice.
Colusa	111,341	Sand and gravel.
Contra Costa	1,625,021	Stone, natural gas, clays, sand and gravel, peat.
Del Norte	477,811	Chromite, sand and gravel, stone, mercury, gold, silver.
El Dorado	1,992,069	Lime, stone, gold, slate, sand and gravel, chromite, copper, soapstone, lead, silver, zinc.
Fresno	117,476,574	Petroleum, natural-gas liquids, natural gas, sand and gravel, stone, chromite, tungsten concentrate, marl, clays, gold, gypsum, mercury, silver.
Glenn	336,864	Sand and gravel, natural gas, chromite.
Humboldt	1,203,429	Sand and gravel, natural gas, stone, manganese ore, clays, petroleum, gold.
Imperial ²	2,018,508	Gypsum, sand and gravel, carbon dioxide, pumice, stone, tungsten concentrate, gold, silver.
Inyo ²	11,817,954	Tungsten concentrate, lead, zinc, silver, sodium carbonate, talc, molybdenum concentrate, clays, perlite, sand and gravel, copper, pumice, volcanic cinders, gold, boron minerals, sulfur ore, diatomite.
Kern	284,126,105	Petroleum, natural-gas liquids, natural gas, boron minerals, cement, sand and gravel, clays, gypsum and gypsite, gold, salt, tungsten concentrate, pumice, silver, silica (quartz), lead, stone.
Kings	20,029,478	Petroleum, natural gas, natural-gas liquids, gypsite, sand and gravel.
Lake ²	318,191	Mercury, sand and gravel, manganese ore, chromite.
Lassen	103,356	Sand and gravel, stone, volcanic cinders.
Los Angeles	321,805,478	Petroleum, natural-gas liquids, natural gas, sand and gravel, stone, cement, recovered sulfur, diatomite, iodine, clays, soapstone, gold, silver.
Madera	1,296,913	Natural gas, tungsten concentrate, pumice, sand and gravel, copper, stone, gold, silver.
Marin	1,041,683	Stone, clays, sand and gravel.
Mariposa	223,006	Silica (quartz), sand and gravel, gold, tungsten concentrate, stone, silver.
Mendocino ²	267,726	Sand and gravel, carbon dioxide.
Merced	956,066	Sand and gravel, stone, gypsite, mercury, gold.
Modoc	146,002	Sand and gravel, pumice, volcanic cinders, peat, gold, silver.
Mono	1,640,749	Tungsten concentrate, pumice, clays, pyrophyllite, gold, sand and gravel, silver, zinc, lead.
Monterey	22,363,688	Petroleum, lime, sand and gravel, magnesium compounds, stone, natural gas, feldspar, ground sand, silica (quartz), salt, gold, silver.
Napa	648,026	Stone, chromite, perlite, mercury, diatomite, sand and gravel.
Nevada	2,509,121	Gold, sand and gravel, silver, copper.
Orange	117,641,971	Petroleum, natural-gas liquids, natural gas, sand and gravel, iodine, clays, stone, peat, salt.
Placer	953,927	Sand and gravel, clays, stone, gold, chromite, asbestos, silver.
Plumas ²	89,439	Sand and gravel, barite, manganese ore, gold, stone, manganese ore, silver.
Riverside ²	23,940,668	Iron ore, cement, sand and gravel, clays, gypsum, stone, gold, lead, copper, silver, phrophyllite.

See footnotes at end of table.

TABLE 38.—Mineral production in California in 1953, by counties—Continued

County	Value	Minerals produced, in order of value
Sacramento.....	\$23, 241, 371	Natural gas, sand and gravel, gold, stone, clays, platinum, silver.
San Benito ¹	4, 935, 506	Cement, stone, mercury, petroleum, sand and gravel, natural gas, clays.
San Bernardino ¹	59, 704, 292	Cement, sodium carbonate, boron minerals, potassium salts, sodium sulfate, sand and gravel, stone, rare-earth metals concentrate, tungsten concentrate, talc and pyrophyllite, salt, calcium-magnesium chloride, iron ore, clays, lime, lithium salts, bromine, petroleum, silica (quartzite), gold, copper, barite, perlite, pumice, feldspar, silver, natural gas, lead, zinc, gypsum.
San Diego.....	5, 377, 292	Sand and gravel, stone, salt, magnesium compounds, clays, tungsten concentrate, strontium ore, gold, silver.
San Joaquin ¹	2, 829, 307	Sand and gravel, natural gas, stone, manganese ore, clays.
San Luis Obispo ¹	12, 734, 672	Petroleum, natural-gas liquids, chromite, natural gas, sand and gravel, stone, gypsite, mercury.
San Mateo.....	7, 941, 473	Cement, stone, magnesium compounds, sand and gravel, gold.
Santa Barbara.....	97, 004, 337	Petroleum, diatomite, natural-gas liquids, natural gas, sand and gravel, clays, stone, chromite.
Santa Clara.....	23, 535, 780	Cement, stone, sand and gravel, chromite, mercury, clays, magnesite, petroleum.
Santa Cruz.....	6, 378, 618	Cement, sand and gravel, stone, potassium salts.
Shasta.....	911, 585	Pyrites, sand and gravel, stone, copper, gold, chromite, iron ore, silver.
Sierra.....	760, 584	Gold, silver, copper.
Siskiyou.....	1, 061, 288	Chromite, sand and gravel, volcanic cinders, gold, pumice, stone, silver, asbestos, lead.
Solano.....	10, 922, 549	Natural gas, stone, clays, sand and gravel.
Sonoma.....	2, 232, 930	Sand and gravel, stone, mercury, petroleum, manganiferous ore, natural gas, chromite.
Stanislaus.....	494, 547	Sand and gravel, clays, mercury.
Sutter.....	209, 124	Natural gas, clays, sand and gravel.
Tehama.....	190, 702	Chromite, sand and gravel, stone.
Trinity ¹	298, 600	Gold, sand and gravel, stone, chromite, manganiferous ore, manganese ore, silver.
Tulare.....	1, 834, 073	Natural gas, sand and gravel, tungsten concentrate, stone, clays, petroleum, lead, silver, zinc.
Tuolumne ²	972, 399	Lime, stone, sand and gravel, gold, tungsten concentrate, asbestos, silver.
Ventura.....	163, 698, 504	Petroleum, natural-gas liquids, natural gas, sand and gravel, stone, clays, gypsum.
Yolo.....	1, 653, 858	Sand and gravel, natural gas, stone, mercury.
Yuba.....	1, 957, 386	Gold, sand and gravel, platinum, silver.
Undistributed.....	953, 633	Gem stones, stone, tungsten concentrate.
Total.....	1, 392, 975, 000	

¹ Included with "Undistributed" to avoid disclosure of mine output.

² 1953 mine production of chromite from Calaveras and Tuolumne counties not included. Concentrate was unsold and in stock.

³ Excludes value of manganese and manganiferous ores sold and blended at Government low-grade stockpiles for future beneficiation.

ALPINE

Hope Valley District.—Tungsten ore was shipped by Don Burgner (Alpine mine), W. W. Whitney (Empire mine), and Carson Tungsten Co. (Valpine mine) to custom mills.

Monitor (Mogul) District.—Anaconda Copper Mining Co. produced 151,500 long tons of 25-percent sulfur ore from the Leviathan open-pit mine. The material was to be consumed in the sulfuric acid plant of the company Yerington, Nev., acid-leaching copper project.

AMADOR

Cosumnes River District.—C. J. Lorentz operated a dragline and floating washing plant at the Lorentz mine and recovered gold and silver from the gravel. Sand was produced for a State highway project by contractors.

East Belt District.—The O. W. L. Mining Co. worked the Peterson mine and produced 20 ounces of gold and 4 ounces of silver from 400 tons of ore amalgamated. Garibaldi Bros. recovered 59 ounces of gold and 9 ounces of silver from 9,000 cubic yards of gravel at the Garibaldi mine, using a dragline and nonfloating washing plant.

Mokelumne River District.—Glenn Modrell operated a dragline dredge on the C. R. Brown property, recovering gold and silver from gravel washed.

Mother Load District.—The American International Mining & Milling Co. operated the Italian mine. Concentrates produced, containing gold and silver, were shipped to a smelter. The Central Eureka Mining Co. produced 5,382 tons of gold ore from the Old Eureka mine until closing in October. Gold and silver were recovered by amalgamation and cyanidation.

West Belt (Ione) District.—Gladding, McBean & Co., Pacific Clay Products, and Western Refractories Co. operated open pits for high-grade fire clay. This production accounted for 25 percent of California's total fire clay in 1953. Gladding, McBean & Co. produced a small quantity of pumice, used for cleaning compounds, from the Howard lease. Copper Hill Venture continued exploration for copper-zinc ore at the Copper Hill mine northwest of Plymouth under the DMEA program. American Lignite Products Co. operated a lignite strip mine near Ione and processed the coal near Buena Vista, extracting principally montan wax.

BUTTE

Natural gas was produced in the Chico, Durham, Wild Goose, and Willows fields in 1953.

Butte Creek District.—Thurman & Wright recovered gold and silver in a cleanup of the company dragline dredge No. 3, which terminated operations in 1952. Butte Creek Rock Co. produced sand and gravel near Chico.

Magalia District.—Helmke, Thomas & Janssen shipped chromite ore for refractory-brick use to an ore buyer and consigned ore to the company mill for upgrading. The chromite concentrate produced was shipped to the Grants Pass, Oreg., Depot.

Oroville District.—The Morris Ravine Mining Co. prospected the Morris Ravine drift mine for gold, and James D. Simpson washed gravel at the Big Dipper mine, using a nonfloating plant. Gold and silver were recovered. Sand and gravel were produced by Marler Rock Co. near Oroville, and Henry J. Kaiser Co. crushed cobbles at its Adelaide plant.

Other Districts.—H. J. Beachler hydraulicked the Bull Dog claim in the Forbestown district, recovering gold and silver. Tom Street and L. L. Pendleton prospected for gold on the Golden Rocket lode claim in the Limpkin district, and in the Yankee Hill district Mildred Holmgren recovered gold from the Rim Rock mine by placering. V. K. McNichols shipped a small tonnage of chromite ore to the Grants Pass, Oreg., Depot from the Majestic mine in the Merrimac district.

CALAVERAS

Calaveras Cement Co. operated its 3,250,000-barrel-a-year-capacity cement plant at Kentucky House. Limestone and shale, raw materials for cement, were quarried at the company No. 4 pit in the East Belt district. Sand and gravel were produced by Neilson Gravel Co. near San Andreas.

East Belt District.—Godfrey Dapp recovered gold and silver by amalgamation from ore mined on the Garland Ranch.

Mother Lode District.—The Gold Bar Mining Co. produced gold and silver from gravel at the Altaville drift mine. Nicholas Huss and the K. & S. Co. worked gravel on the Calaveras Cement Co. property for gold and silver, using a dragline and floating washing plant. Lucky Four Co. recovered 4 ounces of gold from 60 cubic yards of gravel washed at the Pellaton drift mine. George and John Miller shipped old tailing containing gold and silver to a smelter from the Carson Hill mine.

Salt Spring District.—North American Tungsten Mines, Inc., shipped tungsten ore from the Garnet Hill mine near West Point. The ore was concentrated at the Church mill in El Dorado County.

West Belt District.—H. D. Warren produced pumice for aggregate from the Warren property near Burson. California Pottery Co. and Pacific Clay Products shipped fire clay (2,400 and 17,100 tons, respectively) from pits near Valley Springs. R. A. Ford and Joe Paltor recovered gold and silver by amalgamating ore from the Gold Knoll lode mine. New Penn Mines, Inc., operated the Penn mine until January 15, 1953. Copper concentrate containing recoverable gold, silver, and lead and zinc concentrate containing gold, silver, copper, and lead, produced from 3,049 tons of ore treated at the company 200-ton-a-day flotation mill, were shipped to smelters. Jig concentrate yielded some free gold. Copper precipitate recovered from mine water was shipped to a smelter. The company explored for new copper-zinc ore bodies later in the year under the DMEA program. J. V. Dowdel and C. K. Garibaldi produced some gold from the Deep Blue Lead (McCarty property) by placering. Mountain Gold Dredging Co. recovered gold and silver from 58,700 cubic yards of gravel by dragline dredging at the Gilman property; the same equipment was used to produce gold and silver from 14,300 cubic yards of gravel at the adjacent McCarty property. W. C. Jackson operated a nonfloating dredge on the San Juan Creek claim and recovered gold and silver. Chromite from the Pardee Reservoir dump was beneficiated, but the chromite concentrate produced was not marketable.

COLUSA

At Colusa, sand and gravel were produced by Cortina Sand, Gravel & Silt Co., using portable equipment, and gravel was prepared by Paul Entremont.

CONTRA COSTA

Petroleum refining in northern California was centered in Contra Costa County. Plants of Standard Oil Co. of California, Shell Oil Co., Tide Water Associated Oil Co., and Union Oil Co. of California at Richmond, Martinez, Avon, and Oleum, respectively, had an

aggregate daily crude-oil throughput capacity of 397,800 barrels at the end of the year, an increase of 25,000 barrels over January 1, 1953. Several major refineries produced hydrogen sulfide as a by-product of the liquid purification of gases. Natural gas was withdrawn from the Rio Vista field, which also lies in Solano and Sacramento Counties. American Smelting & Refining Co. operated the Selby lead smelter and gold-silver refinery at Selby. The smelter treated gold bullion, ores, concentrates, and secondary nonferrous metals from domestic mines and plants, largely in the western United States, but production was based principally on South and Central American, Asian, and Australian ores and concentrates. Sulfur dioxide was also recovered as a byproduct of smelting sulfide ores. Columbia-Geneva Steel Division, United States Steel Corp., operated one of California's principal steel plants at Pittsburg and produced rolled structural shapes and tinplate. General Chemical Division, Allied Chemical & Dye Corp., at Nichols and Stauffer Chemical Co. at Stege manufactured sulfuric acid from Shasta County pyrites. Mountain Copper Co., Ltd., produced copper salts at Mococo, largely from scrap copper. Port Costa brickworks at Port Costa and United Material & Richmond Brick Co., Ltd.; at Richmond quarried shale for brick manufacture. Peat was dug on Bethel Island by Pacific Natural Products Co. for soil aid. Industrial sand was prepared by Silica Sand Co. and at the Morris sand pit portable plant near Antioch. Sandstone was produced at the Blake Bros. Co. San Pablo quarry, Point Richmond, for aggregate, riprap, and railroad ballast and by Serra Bros. at Martinez for aggregate. Basalt was quarried by Henry J. Kaiser at Antioch and Upton and from the Tunnel Rock Quarry at Orinda.

Mount Diablo District.—Mount Diablo Mines (Jonas & Johnson) explored the Mount Diablo mercury mine under a DMEA contract.

DEL NORTE

Sand and gravel were produced at the Marlin Tryon portable plant at Fort Dick. Gravel was prepared by Crescent City Rock Co. and Peters Rock Co. in Crescent City and at the Simpson Logging Co. portable plant near Klamath. Rowdy Creek Crusher Co. produced crushed basalt for aggregate at Smith River. Sandstone, gravel, and sand were produced in the county by the California Division of Highways and contractors for State highway projects.

Clear Creek District.—C. H. McClendon shipped chromite ore to the Grants Pass, Oreg., Depot from the Bar-Rick, Buckskin, and Fourth of July mines.

Gasquet District.—The following operators shipped chromite to the Grants Pass, Oreg., Depot: Pioneer Mining Co., concentrate from the Coon Creek claims and the Broken Shovel mine; Ashland Mining Co. and Tulare Bros., 13 long tons of concentrate averaging 46 percent Cr_2O_3 and 548 long tons of concentrate averaging 48 percent Cr_2O_3 , respectively, from the Holiday (High Dome) mine; Ashland Mining Co., a small lot of concentrate from the Big Dipper claim; and Nealy Logging Co., operating the Sunrise mine, 114 long tons of ore averaging 44 percent Cr_2O_3 and 6 long tons of concentrate containing 45 percent Cr_2O_3 .

Gordon Mountain District.—Jim Graham shipped 13 long tons of chromite ore and 7 long tons of concentrate averaging 43 percent Cr_2O_3 to the Grants Pass, Oreg., Depot from the Sensation No. 1 mine.

High Plateau District.—Roy A. Brown operated the Simbro (Webb) mercury mine late in 1953 and installed additional plant equipment. Four flasks of mercury was shipped to a buyer. Eugene R. Brown shipped chromite ore and concentrate from the High Plateau mine to the Grants Pass, Oreg., Depot. Ernest Tarbell shipped 5 long tons of chromite ore averaging 41 percent Cr_2O_3 from the Blue Bird, High Point, and Skyline claims, and James L. Perry shipped chromite ore from the Judy group of claims.

Low Divide District.—Tom Cronin (Hollywood claims) and Arnold Bodger and Harold T. Funk (Old Doe mine) shipped chromite ore to the Grants Pass, Oreg., Depot.

Monumental District.—D. E. Raymond recovered gold and silver from the Patrick Creek mine by placering.

Patrick Creek District.—Pete Janzen shipped a small lot of chromite ore from the Chrome Hill No. 1 claim, and Carl Verstagn & Melvin Eaton shipped chromite ore from the Elk Camp mine to the Grants Pass, Oreg., Depot.

Smith River (French Hill) District.—George Schicora and Stanley Planchon produced chromite concentrate from the Eagles Nest mine. The following shipped chromite ore to the Grants Pass, Oreg., Depot: J & W Mining Co., French Hill (Tyson) mine; Ted Webb, Higgins Copper; Tyson Mining Co., Mountain View mine; and Robert & Lorraine Reuss, Paday No. 8 claim.

EL DORADO

East Belt District.—Hazel Creek Mining Corp. Hazel Creek mine was the largest producer of gold and silver in the county by virtue of ore amalgamated and concentrate smelted. The concentrate also contained recoverable lead and zinc. Ivan H. Campion, operating a nonfloating washing plant on the Irish Slide-Payne-Christian group of placer claims, recovered 6 ounces of gold and 1 ounce of silver from 80 cubic yards of gravel. T. C. Nutt quarry and Ralph C. Young prepared dimension building stone from rhyolite tuff. Contractors of the California Division of Highways crushed granite for road metal, and contractors crushed quartzite and schist for United States Department of the Interior, Bureau of Reclamation projects.

Mother Lode District.—William J. Lange and L. W. Loomis recovered gold and silver from the French Creek mill tailings. Volo Mining Co. amalgamated ore from the French Creek lease and the Shaw mine and recovered gold and silver. This company also shipped copper concentrate containing gold and silver produced from the Noonday mine copper ore. Diamond Springs Lime Corp. prepared quicklime and hydrated lime at the company Diamond Springs plant, that was operated on limestone, some of which was produced at the company quarry. In addition, some crushed limestone was shipped for aggregate. Kelsey Slate Co. produced slate for flagging at Kelsey, and Pacific Minerals Co., Ltd., ground slate from the company underground mine at Chili Bar. Sand and gravel were produced by El Dorado Rock & Sand Co. at Placerville.

West Belt (Rattlesnake) District.—Chromite was shipped to the Grants Pass, Oreg., Depot from the Pilliken mine by Allied Mining Co. (ore and gravity concentrate) and Lawrence Skicklig (ore). Lunium Co. (Jack A. Hoppe) produced a small tonnage of chromite concentrate from the Little Bald Mountain mine ore at the company Placer County gravity mill. El Dorado Chrome Co. worked the Cornelius chromite deposits near Latrobe by open-pit methods. Ore was milled at the Church gravity plant in the Mother Lode district, and concentrate was shipped to the Grants Pass, Oreg., Depot. Hughes Vertin Lime Co. prepared quicklime for the building and chemical industries east of Rattlesnake Bridge, using limestone from the nearby company quarry and the California Rock & Gravel Co. quarry at Cool. The latter company also produced limestone for miscellaneous uses, principally chemical. El Dorado Limestone Co. mined low-magnesium limestone, largely chemical and metallurgical grades, by underground methods, west of Shingle Springs. Pacific Minerals Co., Ltd., shipped soapstone to grinding plants in the San Francisco Bay area from its property near Brandon. C. B. Clark recovered a minor quantity of gold and silver by amalgamating ore from his pocket mine at Pine Mountain.

FRESNO

Petroleum, natural gas, and natural-gas liquids prepared from wet gas continued to be the county's principle source of mineral production in 1953. A large percentage of the petroleum and natural-gas yield was from the Coalinga field and the Kettleman field, which also lies in Kings County. The following fields and areas also contributed to the county's total petroleum and natural-gas output: Burrell, Guijarral Hills, Helm, Jacalitos, Pleasant Valley, Raisin City, Riverdale, San Joaquin, Camden, and Cantua Creek. Natural-gasoline and LP-gas plants were operated at Coalinga by Standard Oil Co. of California and Los Nietos Co. and at Burrell by General Petroleum Corp.

Valley View Gypsum Mines produced agricultural gypsum from an open pit near Firebaugh. At Fresno miscellaneous clays for brick manufacture were produced by Craycroft Brick Co., and Perlite Products Co. expanded crude perlite. Herndon Rock Products at Herndon crushed river boulders and prepared sand and gravel for aggregates and base rock. Sharp & Fellows Construction Co. crushed basalt for railroad ballast at the Piedra quarry, and Clovis Quarries, Inc., quarried granite for monuments near Clovis. Sand and gravel were also produced by: Southern California Edison Co. at the Vermillion Valley Dam; Gene Richards, Inc., Fresno; and Thompson Materials & Construction Co. near Avenal. Gravel was prepared by the Atchison, Topeka & Santa Fe Railway Co. at Oakhurst and at the L. D. Folsom, Inc., portable plant near Coalinga.

Garnet Dike Mines shipped tungsten concentrate derived from ore produced at the Garnet Dike mine and Mud Lake No. 7 mine, in the North Fork of the Kings River and Upper Dinkey Creek areas, respectively. Edgar A. McMurtry shipped tungsten concentrate produced from ore at the Jack Pot mine near Tollhouse. Stephen Kirkpatrick operated a custom mill on tungsten ore near Dunlap and shipped tungsten concentrate.

Coalinga District.—J. R. Holman, the third largest producer of chromite in the State, operated the Mistake open-pit mine and gravity mill. A total of 1,976 long tons of concentrate and ore, containing 89,858 units of Cr_2O_3 , was shipped to the Grants Pass, Oreg., Depot.

Kings River District.—Sand and gravel and a small quantity of byproduct gold were produced by the Central Sand & Gravel Co. at Sanger.

New Idria District.—Archer Enterprises operated the Archer mine and shipped mercury.

San Joaquin River (Friant) District.—Pacific Coast Aggregates Co. recovered some gold and silver as byproducts of its sand-and-gravel and crushed-river-boulder production at the Rockfield No. 124 plant. Anderson Rock & Supply Co. produced sand and gravel. At Friant California Industrial Minerals Co. prepared pumice, mined in Madera County, for use as pesticide diluent.

GLENN

Sand and gravel were prepared by Orland Sand & Gravel Co. at Orland. Gravel was produced by: Madsen & Paul and W. J. Rabbit near Willows, the Southern Pacific Co. at Wyo, and the California Division of Highways at various locations in the county. Natural gas was withdrawn from the Afton and Ord Bend fields.

Stonyford District.—F. M. Maestretti and Anderson Bros. & Guy Pye worked the Chrome King No. 1 mine and shipped chromite concentrate and ore to the Grants Pass, Oreg., Depot.

HUMBOLDT

Hindley Clay Products produced miscellaneous clays, principally for heavy clay products, from the company pit near Eureka. Tom Hull quarried granite for riprap at Blue Lake, and contractors crushed felsite and sandstone, quarried in the county, for highway projects. Sand and gravel were produced by the Mad River Sand & Gravel Co. and the Eureka Sand & Gravel Co. near Arcata and at the McWhorter & Dougherty Worwich plants near Fortuna. The California Division of Highways and its contractors prepared sand and gravel at various locations in the county. Natural gas was withdrawn from the Eureka field near Petrolia. In 1953 petroleum was produced commercially for the first time in Humboldt County.

Fort Seward District.—Glenn E. Adkisson shipped manganese ore to Utah steel furnaces from the Fort Seward mine.

Hoopa District.—Providence-Tuolumne Gold Mines explored the Copper Bluff property for copper-zinc ore under the DMEA program.

IMPERIAL

Carbon dioxide gas was withdrawn from the Salton Sea field by Cardox Western, Inc., for dry-ice manufacture. Superlite Products Corp. prepared 12,178 tons of pumice for use in aggregate. Western Non-Metallics ground mica schist from the Micatale property near Ogilby for use in preparing roofing material. D. L. Blumtack shipped a small quantity of tungsten float ore from the Chocolate Mountains

near Glamis to a custom mill. The Imperial irrigation district crushed granite at the Hanlon and Mount Signal quarries for riprap. Contractors for the California Division of Highways produced sand and some gravel at several locations in the county for highway construction.

Fish Creek Mountain District.—United States Gypsum Co., largest producer of gypsum in the State, operated the Fish Creek Mountain gypsum quarry and its mill and board plant at Plaster City.

Palo Verde District.—Manganese ore was shipped to the Government low-grade stockpile at Wenden, Ariz., by Walter D. Scott, Black Beauty No. 2 mine; M. E. Harter & Kenneth O. Prouty, Lobo mine; George Ringwald, Lucky Boy group of claims; Roy Williams, Lugo and Tadpole claims; Charles L. Mills, Mary Ellen No. 1 mine; and Masciteli & Walters, Virginia Dare mine.

Paymaster District.—L. Mills Beam, the largest producer of manganese ore in the county, shipped 4,629 long tons of ore to the Wenden, Ariz., stockpile from the Pioneer mine.

Picacho District.—George E. Danley recovered gold from El Apache mine ore by amalgamation. Hazel D. Bratcher, operating the L. P. (Bell) (Mayflower) mine, recovered gold and silver by amalgamation, constructed 7 miles of road, and added a 5-ton-a-day ball mill to the plant.

INYO

Crownite Corp. prepared 18,900 tons of pumice from the Crownite property near Little Lake, and Bishop Building Materials produced 683 tons of pumicite from the Van Loon mine near Bishop. Redlite Aggregates shipped volcanic cinders from its property near Little Lake. Bentonite was shipped from the Silicates Corp. pit near Death Valley Junction and from the Multi Mines Inc. property near Tecopo. Sierra Talc & Clay Co. produced fuller's earth from its pits near Olancha. Boron, soda ash, and trona were recovered by Columbia-Southern Chemical Corp. from dry-lake brines near Bartlett, for use principally in the glass industry. Colemanite was produced by Pacific Coast Borax Co. from its mine near Death Valley Junction and by the United States Borax Co. from an underground mine near Shoshone. Inyo County was the leading producer of tungsten ore and concentrate in California, contributing 64 percent of the State yield. Sand and gravel were produced at various locations in the county by contractors for State highway construction. Huntley Industrial Minerals ground talc, pyrophyllite, and soapstone from its Nevada and California mines at Laws. The Blue Star mill, formerly operated on talc by the company near Big Pine, was destroyed by fire.

Bishop District.—The leading tungsten producer in the State was the United States Vanadium Co. Pine Creek mine. Company ore and custom ore and low-grade concentrate from several Western States were treated in the Pine Creek gravity-flotation mill and digestion plant. The principal products were tungsten concentrate and artificial scheelite. Some byproduct copper concentrate, containing gold and silver, and molybdenum concentrate were also recovered from Pine

Creek-mine ore. Round Valley Tungsten Co., operating the Round Valley mine, was the second largest tungsten producer in the county and fifth in the State. The ore was shipped to custom mills. Brownstone Mining Co. shipped 4,500 tons of tungsten ore, which averaged 0.54 percent WO_3 , to a custom mill from the Brownstone mine. Other shippers of tungsten ore and concentrate in the district were: John Schober, Buzzard mine; Ray Harvey, Elsie Girl mine; Brooks & Hogle, Garnet claims; Paul Priebe, Garnet No. 2 mine; C. H. Hall, Hanging Valley and Tungstar mines; Lester Brown, L & L mine; Hedgecock & Riley, E. K. Lovelace, K. Moore, and Hah's Development Co., Tungsten City mine; E. K. Lovelace, Little Sister mine; Lee Early, Moonlite mine; C. E. Lindner, Oomph mine; Inyo Star Mining Corp., Pickup (Chipmunk) claims; Harry David & George Lasley, Rossi mine; Roger Ray & Kenneth Moore, Shamrock and Western Tungsten mines; Tungsten Hill Mine, Tungsten Hill mine; Ray & L. B. McMurray, Valley mine; and A. H. Peterson, White Lorni mine. P. M. Gardener operated the Shepard Lane Milling Co. custom mill on tungsten ore, largely from the Bishop district. Northfield Mines, Inc., explored the Adamson mine above Pine Creek for tungsten ore under the DMEA program.

Cerro Gordo (Keeler) District.—Sierra Talc & Clay Co. ground company produced and purchased talc at its Keeler grinding mill. William & Bernice Bonham shipped talc from the Alberta and White Mountain mines to a grinding plant.

Chloride Cliff District.—P. L. Harris shipped 10 tons of gold ore containing 26 ounces of gold and 10 ounces of silver to a smelter from the Black Iron mine.

Coso (Darwin) District.—Sierra Talc & Clay Co. worked the Frisco and Talc City talc mines and George W. Koest the Alliance talc mine. Anaconda Copper Mining Co., largest producer of lead, zinc, and silver in the State in 1953, mined lead and lead-zinc ores from the Darwin group of mines and shipped lead ore and lead concentrate to a lead smelter-fuming plant and zinc concentrate to a smelter. Substantial quantities of recoverable gold, silver, and copper, and some cadmium were contained in the ore and concentrates smelted. L. D. Foreman shipped tailing containing gold, silver, lead, and zinc from the Lane mine of the Darwin group to a smelter, and Sidney O. Gibbs shipped 28 tons of lead-zinc ore containing 450 ounces of silver, 11,141 pounds of lead, and 4,192 pounds of zinc from the Lucky Jim dump of the same group to a smelter-fuming plant. N. W. Curson shipped a small tonnage of lead ore containing silver from the Christmas Gift mine to a smelter. Miller & Warnken operated the St. Charles mine and mill and shipped tungsten concentrate. Joe McCully & L. Crow mined lead ore from the Empress and Camp Bird mines and produced lead-zinc concentrates that contained some silver, copper, and zinc. Joe McCully also shipped tungsten concentrate from the Wonder mine. Finley & Vignich, G. F. Lund, and L. & W. Tungsten Mine shipped tungsten concentrate produced from the Darwin (Silver Reef) mine ore.

Eureka Valley (Deep Wells) District.—Sierra Talc & Clay Co. worked the Eureka talc mine, Huntley Industrial Minerals the White Eagle talc mine, and G. P. Rodgers the Gray Eagle talc mine. A. A. Goehring shipped tungsten concentrate from the Kilroy claim near

Oasis. A. L. Stewart operated the Samson group of claims near Big Pine and shipped tungsten ore and concentrate.

Fish Springs District.—United States Mining Corp., the largest crude perlite producer in California, operated the Fish Springs open-pit mine. The perlite was expanded at several State plants.

Independence (Russ) District.—Reward Mining & Milling Corp. mined lead ore from the Reward (Brown Monster) mine and shipped lead concentrate, containing gold, silver, copper, and zinc, to a California smelter-fuming plant.

Kearsarge (Waucoba) District.—Rooth & Carr Construction Co. installed a 50-ton-a-day gravity concentrating mill at the Bunker Hill mine in anticipated production of ore, which contains values in lead, zinc, gold, and silver.

Last Chance District.—Roy E. Ketching shipped sulfur ore from dumps at the Crater group of claims for soil-aid purposes.

Lee District.—Albert Glenn and Ambrose Aquerreberry operated the Silver Reid (Lee) mine and shipped 77 tons of lead-zinc ore containing 2 ounces of gold, 5,790 ounces of silver, 499 pounds of copper, 13,519 pounds of lead, and 29,613 pounds of zinc to a Utah smelter-fuming plant. Anaconda Copper Mining Co. continued exploration work at the Santa Rosa mine, which has a past production of lead ore.

Le Moigne (Le Moyne) District.—W. V. Skinner shipped from the Le Moyne (Le Moigne) mine 345 tons of lead-zinc ore containing 8 ounces of gold, 986 ounces of silver, 186 pounds of copper, 181,641 pounds of lead, and 47,193 pounds of zinc to a California smelter-fuming plant.

Modoc District.—Foreman & Foreman explored the Defense mine under the DMEA program and shipped lead ore, containing appreciable silver, and some gold, copper, and zinc. McFarland & Hurlinger shipped lead ore, containing silver, copper, and zinc, from the Minnetta mine. Sidney O. Gibbs shipped 3 tons of lead-zinc ore containing 107 ounces of silver, 12 pounds of copper, 1,356 pounds of lead, 633 pounds of zinc, and a trace of gold from the Modoc-mine dump. All three operators shipped their ore to a smelter-fuming plant.

Resting Springs (Shoshone) District.—Louise Grantham & Associates operated the Warm Spring No. 5 and Big Talc mines; Multi Mines, Inc., the Shoshone Talc mine; Kennedy Mineral Co., Inc., the Eclipse mine; and Sierra Talc & Clay Co., the Tecopa and Panamint Talc mines. R. L. Scott made a small shipment of gold ore containing silver to a custom mill from the Ship Creek mine. Charles B. Foster shipped 17 long tons of manganese ore to the Wenden, Ariz., Depot from the Lucky Black Jr. mine.

Sherman District.—Roy Argo shipped a small tonnage of manganese carbonate ore from the Lily group of claims to the Wenden, Ariz., Depot.

South Park District.—Clair Bros. recovered gold and silver by amalgamating gold ore from the Margaret mine and gold ore and old tailings from the Radcliff mine. Harry E. Briggs worked the Red Cloud mine and recovered gold and silver from the ore by amalgamation. He also explored the mine for lead-zinc ore under the DMEA program.

Ubehebe District.—Lippincott Lead Mines operated the Lippincott (Lead King) mine and shipped lead ore containing silver to the company smelter near Bonnie Clair, Nev., which operates primarily on secondary material. The lead bullion produced was consumed in manufacturing storage batteries at an affiliated Santa Ana, Calif., plant.

Wildrose District.—Panamint Tungsten Mines shipped tungsten ore from the Greene mine near Skidoo to a custom mill.

KERN

Petroleum, natural gas, and natural-gas liquids from wet gas were the principal mineral commodities produced. Among the California counties Kern County ranked first in output of natural gas and liquefied-petroleum gases and second in the yield of both petroleum and natural gasoline. This production was from fields that comprise a large portion of the western half of the county. Plants for the production of natural-gas liquids were operated by the following companies (field locations are in parentheses): Bankline Oil Co. (Maricopa); Belridge Oil Co. (Belridge); Honolulu Oil Co. (Cymric and Taft); Ohio Oil Co. (South Coles); Shell Oil Co. (Ten Section); Standard Oil Co. of California (Taft, Mountain View, Elk Hills, Greeley, and Lost Hills); Superior Oil Corp. (Rio Bravo); Union Oil Co. of California (Belgian Anticline); and Western Gulf Oil Co. (Paloma). A total of 9 petroleum refineries—8 in the Bakersfield area and 1 at Maricopa—had a total-crude oil throughput capacity of 74,900 barrels daily at the close of 1953—an increase of 1,000 barrels over January 1, 1953.

Kaolin was shipped by American Minerals Co. from the company pit 8 miles west of Cantil. Excel Minerals Co. produced 7,200 tons of fuller's earth (diatomaceous clay) near McKittrick. Miscellaneous clays for use in rotary-drilling muds were produced by McKittrick Mud Co. near McKittrick and by Mojave Corp. and Kernco Materials Co. from Muroc Lake silt deposits. Agricultural gypsum was quarried by: C. L. Fannin, H. M. Holloway, Inc., and Roberts Farms Gypsum Mines, near Lost Hills; D. F. Halsey and Mojave Desert Agricultural Gypsite, near Cantil; and Purity Gypsum Mines, near Bakersfield. H. M. Holloway, Inc., was the largest producer of agricultural gypsum in the county, with 173,200 tons. Calsilco Corp. prepared pumice from Calsilco open-pit mines 33 miles northeast of Mojave. Long Beach Salt Co. recovered 8,200 tons of salt by solar evaporation from a drylake deposit at Saltdale. Pacific Coast Borax Co. produced tincal (borax) and Kernite (rasorite), a sodium borate, from its mines at Boron.

Agua Caliente (Keene) District.—Walabu Mining Co. explored the Walabu (Cuddeback) mine near Keene for cinnabar under a DMEA contract.

Clear Creek District.—C. L. Seager & W. Hilton developed the Tungsten V mine near Havilah. Wm. Traill and Tap, Inc., shipped scheelite and hübnerite concentrates from the Little Wonder mine.

Greenhorn Mountain District.—R. O. Griffith amalgamated 10 tons of development ore from the Escanaba mine and recovered 15 ounces of gold and 7 ounces of silver.

Indian Wells (Inyokern) District.—Tungsten concentrate was shipped by J. F. Wright, from the Gray Hill and Blue Rock mines; Hatton & Carlson, from the Hi Peak and Snow White No. 1 mines; and Jack Cowan, from the Squaw claim. R. W. Griffin developed the Golden Star tungsten claim.

Kern River District.—The C. & H. Materials Co. and the Hartman Concrete Materials Co. produced some byproduct gold and silver from the respective companies' sand and gravel plants. Griffith Co. and Kern Rock Co. produced sand and gravel for aggregates.

Kernville District.—Abaca Mining Co. explored the Big Oscar mine for antimony ore under the DMEA program.

Keyes District.—Tungsten concentrate was shipped to buyers by J. H. Christenson, from the El Rey and King mines; Tap, Inc., from the Pappy mine; Seawards, Leibel, Masten & Beatty, from the Unip mine; and Earl Milsap, Tom L. Akins & Elsie Brown, from the Big Bear mine.

Mojave District.—Burton Bros., Inc., operated the 150-ton-a-day Tropic cyanide mill on ore from the company-lessee-operated Tropic (Kid Shaft) and Cactus Queen mines and custom ore, which included a shipment by George Ritchie of 35 tons of gold ore containing 13 ounces of gold and 206 ounces of silver from the Whitmore mine. Margaret Wegmann shipped 7 tons of silver ore containing gold from the Wegmann group to a smelter. N. W. Sweetser produced silica (quartz) for use in mosaics from an underground operation near Rosamond.

Rademacher District.—Lloyd Llewellyn shipped gold ore to a custom-cyanide mill from the Dan Pier mine.

Randsburg District.—The Butte Lode Mining Co. treated gold ore and old tailings from the Butte Lode mine and custom gold ore by cyanidation and amalgamation. Gold and silver were recovered. The company also concentrated tungsten ores on a custom basis. Rolland C. Cole operated the Betty G. group of placer claims and recovered gold, silver, and scheelite by dry placering methods. W. E. Wilkinson shipped 15 tons of gold ore containing 6 ounces of gold and 1 ounce of silver to a custom mill from the Florence group of claims. Harris Hall Quick shipped gold ore from the Minnesota mine to a custom mill. E. B. Atkinson et al., operating as the King Solomon Lease, treated 275 tons of Yellow Aster mine ore by amalgamation at the King Solomon mill. Gold and silver were recovered. Tungsten concentrate was shipped to buyers by: L. C. Bills, from the Ada R. claim; Bert Johnson and Green & Thorpe, from the Billie Burke mine; and Charles Stryker, from the Pearl Wedge mine.

Tehachapi District.—Monolith Portland Cement Co. quarried limestone, clay, and silica material for portland-cement manufacture at the Monolith plant.

KINGS

Petroleum, natural gas and natural-gas-liquids production was the largest contribution to the county's total mineral yield. The Kettleman field, which extends into Fresno County, and the Pyramid Hills field were sources of petroleum and natural gas. Natural gas was withdrawn from the Trico gas field, which also lies in Tulare and Kern Counties. Near Avenal P. S. Magruder operated the Huffman and

Western S. plants and produced natural gasoline and LP-gases. The Caminol Co. petroleum refinery at Hanford had a 5,000-barrel daily crude throughput capacity in 1953. H. M. Holloway, Inc., produced 71,800 tons of agricultural gypsum and McPhaill Gypsum Co. 87,800 tons of similar material. The open-pit operations are near Avenal in the Kettleman Plain area. Gravel was also prepared in the county by the California Division of Highways for road construction.

LAKE

F. M. Frazell and Lange Bros. Sand & Gravel Co. produced sand and gravel near Kelseyville. Lange Bros. Sand & Gravel Co. also shipped manganese ore from the Grand View mine near Lakeport to both Government high- and low-grade stockpiles.

Clear Lake District.—James I. Scott made a small shipment of chromite ore to the Grants Pass, Oreg., Depot from the Ellis Ranch.

Mayacmas District.—W. A. Fritz and Paul Davis recovered a minor quantity of mercury from cinnabar furnaced at the Helen mine. James I. Scott shipped a small tonnage of chromite ore from the Mirabel and Flander claims to the Grants Pass, Oreg., Depot.

Sulfur District.—California Quicksilver Mines, Inc., third largest producer of mercury in California in 1953, operated the Abbott mine and a 40-ton Saracco rotary kiln and two "D" retorts. The company continued development work under the DMEA program.

LASSEN

Grayson Concrete & Materials produced sand and gravel at Susanville. The California Division of Highways and contractors quarried volcanic cinders and produced sand and gravel from county deposits for highway use, and the Lassen County Road Department crushed basalt for road construction.

LOS ANGELES

Los Angeles County was the largest producer and consumer of minerals in California in 1953, as well as the locale of several important nonmetallic-mineral preparation plants. Petroleum, natural gas, and natural-gas liquids from wet gas provided the major portion of the mineral production. The county was the largest producer of petroleum and natural-gas liquids in the State and ranked second in the output of natural gas. Most of this yield was from the Los Angeles Basin, which extends into Orange County, and the Newhall and Castaic areas. Plants for the production of natural-gas liquids were operated by the following companies (field locations are in parentheses): Bankline Oil Co. (Santa Fe); Cowan Oil & Refining Co. (Rosecrans); General Petroleum Corp. (Santa Fe Springs and Wilmington); Inglewood Gasoline Co. (Inglewood); Lomita Gasoline Co. (Lomita); Shell Oil Co. (Brea, Dominguez, and Long Beach); Signal Oil & Gas Co. (Signal Hill); Standard Oil Co. of California (Inglewood, Santa Fe, Seal Beach, and Torrance); Sunray Oil Co. (Newhall); Union Oil Co. of California (Santa Fe Springs-Bell, Del Valle, Playa del Rey, Dominguez, Rosecrans and Sansinena); Wilmington Gasoline Co. (Wilmington); The Texas Co. (Santa Fe Springs and Signal Hill).

A total of 25 petroleum refineries in the county (8 at Long Beach, 7 at Wilmington, 2 each at Torrance, Vernon, and Santa Fe Springs, and 1 each at Paramount, Newhall, El Segundo, and Norwalk) had a total crude-oil throughput capacity of 739,700 barrels daily at the close of 1953—an increase of 12,700 barrels over January 1, 1953. Deepwater Chemical Co., Ltd., and the Dow Chemical Co. recovered iodine, the only production of this commodity in the United States in 1953, from brines of certain oil wells in the Los Angeles Basin. Hydrogen sulfide was recovered as a byproduct from liquid purification of gas in the Richfield Oil Corp. Watson refinery, Shell Oil Co. Wilmington and Dominguez refineries, Standard Oil Co. of California El Segundo refinery, and Wilshire Oil Co., Inc. Norwalk refinery. Brimstone was recovered at the Union Oil Co. Los Angeles refinery, Wilshire Oil Co., Inc., Norwalk refinery, and Hancock Chemical Co. Long Beach plant, which operated on refinery gases from General Petroleum Corp.

At Sun Valley, Sun Valley Tungsten Co. operated a custom tungsten mill on tungsten ore, produced outside of the county. Blue Diamond Corp. manufactured cement from purchased clinker at its Los Angeles plant. Gladding, McBean & Co. produced and used miscellaneous clays from company pits at Pico and Santa Monica. Other producers of miscellaneous clays were: Angulo Tile Co., San Vallee Kilns, Reseda; Atkinson Brick Co., Compton; Atlas Sewer Pipe Co., Whittier; J. C. Booth and Pacific Brick Co., Santa Monica; Builders Brick Co. and Higgins Brick & Tile Co., Moneta; Castaic Brick Co., Castaic; Davidson Brick Co. and Lynn Brick Co., Los Angeles; Pacific Clay Products, Los Nietos; and Valley Brick & Supply Co., Van Nuys. Great Lakes Carbon Corp. (Dicalite Division) prepared diatomite from company pits at WALTERIA for use in filters, insulation, and fillers. Kaiser Gypsum Co. manufactured plaster board at Long Beach using crude gypsum imported from company mines in Lower California, and Pabco Products, Inc. calcined gypsum quarried in Nevada and manufactured plaster board at South Gate.

Expanded perlite, used principally for plaster aggregates, was prepared from crude material (produced outside the county) by: McClure & Erickson Corp., Panacalite Pacific Inc., U. S. Perlite Manufacturing Co., and Peerless Perlite Co., at Los Angeles; Paramount Perlite Co., Inc., Paramount; Redco, Inc., North Hollywood; Perlite Popped Products, Norwalk; and Sun Perl Corp., Sun Valley. More than 70 percent of the State expanded-perlite production in 1953 was from Los Angeles County. Leon Katz shipped soapstone to a grinding plant from the Katz mine near Acton.

Thirty percent of the miscellaneous stone produced in California in 1953 was from Los Angeles County. It was used principally for riprap and aggregates. County operations follow: Connolly-Pacific Co. Pebble Beach quarry, and Graham Bros., Inc., Empire quarry, both on Catalina Island; Consolidated Rock Products Co. Hewitt quarry, and Granite Materials Co., North Hollywood; H. A. Jones et al., Saugus; Manning Bros. Rock & Sand Co., Irwindale; Pacific Rock & Gravel Co., Monrovia; and Don Poteet, Bouquet Canyon quarry, Newhall (used for wall rock and flagstone). Los Angeles County supplied 61 percent of the State production of granite (including disintegrated), which was used locally, principally in aggregate.

Production was reported by: W. T. Bonfield and California Materials Co., Sun Valley; Consolidated Rock Products Co., Largo and Sierra plants; Hanawalts, Pomona; Livingston Rock & Gravel Co., Palos Verde; and Los Angeles Decomposed Granite Co., Montebello. Sand and gravel were prepared, principally for use as aggregate in building and paving, and the county output was 34 percent of the State total sand and gravel yield in 1953. Operators who produced sand and gravel included: Arrow Rock Co., Monrovia and Rosco plants; Blue Diamond Corp., Monrovia and Sun Valley plants; California Materials Co., Sun Valley; Century Rock Products and Chandler Sand & Gravel, El Monte; City Rock Co., Sunland; Consolidated Rock Products Co. Hewitt, Irwindale, Largo, Rosco, and Sierra plants; Graham Bros. Inc., Pacific Rock & Gravel Co., Sierra Rock Products Co., Sparks & Mundo Engineering Co., and Owl Rock Products Co., Monrovia; Granite Materials Co., North Hollywood; Hanawalts, Pomona; the Lindauer Corp., La Habra; Livingston Rock & Gravel Co., Azusa; Manning Bros. Rock & Sand Co., Irwindale; Miller Bros. Trucking Co., Redondo and Torrance plants; Osborn Co., Pasadena; Walter D. Ransom, El Segundo; Edw. Sidebottom & Son, Inc., Lomita; Gordon Transfer Co., Los Angeles; MacArthur & Son, Palmdale; and the California Division of Highways and its contractors, at various locations.

Cedar District.—Wm. M. Reid operated the High-Grade No. 2 mine and a 12-ton-a-day gravity concentration mill; 3 ounces of gold was recovered from 20 tons of ore amalgamated.

San Gabriel District.—Azusa Rock & Sand Co. prepared sand and gravel and crushed some granite at its Azusa plant; San Gabriel Valley Placers recovered gold and silver as byproducts from the aggregate-plant tailings.

MADERA

Natural gas was withdrawn from the Gill Ranch and Moffat Ranch fields, west of Madera. The United States Department of the Interior, Bureau of Reclamation, crushed Madera County granite for county projects.

Chowchilla River District.—Howell Bros. operated a suction dredge equipped with a 12-inch pump on the Wesley Ranch and recovered gold and silver. San Joaquin Valley Pipe Co. produced sand for aggregate near Chowchilla, and Raymond Granite Quarries produced dimension granite, principally for monuments, near Raymond.

Fresno River District.—Building sand was produced by Valley Feed & Fuel Co. at Madera. The following recovered gold and silver, using suction dredges: C. H. Brous, near Coarsegold; D. J. Yearout, 21 ounces of gold and 6 ounces of silver from 4,000 cubic yards of stream gravel on the Heiskell property; C. H. Griffin, Heiskell property; and D. J. & R. C. Jordan, the Parker Ranch.

Jackass District.—Strawberry Tungsten Mines, Inc., operated the Strawberry mine 33 miles northeast of Bass Lake. High-grade tungsten concentrate was shipped to GSA and low-grade concentrate to a custom mill for upgrading. Exploring for new ore bodies was continued under the DMEA program. The mine was the fourth largest tungsten producer in the State.

Potter Ridge District.—M. Gordan made a test shipment of gold ore to a smelter from the Quartz Mountain mine.

San Joaquin River (Friant) District.—California Industrial Minerals Co. mined 5,245 tons of pumicite from the Taylor's open-pit mine near Friant. Elmer Erickson produced pumice from an open-pit property, also near Friant, for use as aggregate. Merl E. Richard recovered gold from gravel near Friant, using suction equipment. Thompson Materials Construction Co. produced sand and gravel by suction dredge north of Kerman.

West Belt (Daulton) District.—H. J. Buchenau treated copper ore from the Jesse Belle mine at his 75-ton-a-day mill. Flotation copper concentrate containing gold and silver was shipped to smelters in Arizona, Utah, and Washington, and gold and silver were recovered from jig concentrates by amalgamation.

MARIN

Sandstone for aggregate was crushed at the Basalt Rock Co., Inc., McNear quarry and the Hutchison Co. Greenbrae quarry at San Rafael. Perolite Products Co. expanded perlite for plaster aggregate at Sausalito. McNear Brick Co. quarried shale to be expanded for use in lightweight aggregate, and L. P. McNear Brick Co. utilized weathered shale for brick manufacture at McNear. The Marin County Road Department crushed county basalt for riprap.

MARIPOSA

East Belt District.—Horse Shoe Mine milled 205 tons of Horse Shoe mine ore and recovered 286 ounces of gold and 61 ounces of silver by amalgamating flotation concentrate. Chas. M. Schroeder recovered gold and silver from the Schroeder claims ore by amalgamation. Williams Bros. installed a 5-stamp mill and treated 25 tons of Williams Bros. mine ore which yielded 11 ounces of gold and 5 ounces of silver. F. S. Harrod shipped tungsten ore to a custom mill from the June Bee mine near Ahwahnee. Incline Mining Co. developed its tungsten properties near El Portal. The National Park Service produced granite as dimension stone in Yosemite National Park.

Mother Lode District.—On Mariposa Creek sand and gravel were produced by Mariposa Sand & Gravel Co., and William J. Saye prepared gravel, using a portable plant. Gold and silver were recovered from gold ore by amalgamation at several small properties, including: A. J. mine (LeRoy Richardson); Black Cat claims (Etta Bernard and Abbie Copus); Combination mine (Jess & Harold Brown), 10 tons of ore containing 4 ounces of gold and 1 ounce of silver; Louisiana mine (E. W. Ferguson); Mariposa mine (Frank Gallagher); and the Specimen claims (Joe Cordoza).

West Belt District.—The Adobe Mining Co. recovered 238 ounces of gold and 33 ounces of silver on the Waltz property from 60,000 cubic yards of gravel washed by suction dredge equipped with a 10-inch pump. Nuroc Corp. recovered gold and silver from a mill cleanup at the Mount Gaines mine. Kaiser Aluminum & Chemical Corp. mined vein quartz from the White Rock quarry near Le Grand for the manufacture of ferrosilicon and fayalite until June, when the operation was discontinued.

MENDOCINO

Herbert & David Filben made small shipments of manganese ore from the Memorial (Foster Mountain) mine 16 miles east of Willits and the Rattlesnake mine on Cow Mountain east of Ukiah to the Wenden, Ariz., Depot. Sand and gravel were produced by Ford Gravel Co. and Ukiah Gravel & Cement Co. at Ukiah. The California Division of Highways and contractors prepared noncommercial sand and gravel at various locations in the county. Cal Dri Ice Corp. produced dry ice from natural carbon dioxide at Hopland.

MERCED

Agricultural Minerals & Fertilizer Co. produced agricultural gypsum from the Ortigalita Creek deposit near Los Banos. Volpa Bros. crushed river boulders from the Le Grand pit for concrete aggregate. Sand and gravel were prepared by: Los Banos Gravel Co., Los Banos; Valley Aggregates Inc., Cressey; River Rock, Inc., using portable plants, Atwater and Merced; Turlock Rock Co., Ballico; and Le Grand Sand & Gravel Co., near Le Grand. Sand was produced by Cressey Sand & Gravel Co., Cressey. Baroid Sales Division, National Lead Co., ground barite from Nevada mines at its Merced plant, principally for drilling mud.

Central San Benito District.—Louis Sciochetti prospected the Crystal Quartz mercury claim near Mercy Hot Springs.

MODOC

Modoc Peat Moss Co. dug peat from beds at Likely. Pumice was prepared for use in lightweight aggregate by Boorman Pumice Products from the Boorman property near Tionesta and by Glass Mountain Brick Co. and Glass Mountain Pumice Producers east of Tulelake. U. S. Pumice Supply Co. processed pumice produced from Siskiyou County properties at its Tulelake plant in Modoc County. The California Division of Highways quarried volcanic cinders from county deposits for road surfacing and seal coats, and its contractors prepared sand and gravel at several sites.

High Grade District.—Moonlight Mines Oregon, Ltd., explored the Moonlight mine and shipped gold ore, containing silver, to a California smelter.

MONO

Pumice for use in lightweight aggregate was prepared by Cowan & McGraw and the Insulating Aggregates Co. near Laws. U. S. Pumice Supply Co. prepared pumice for abrasive use at the Lee Vining property. Huntly Industrial Minerals Co. mined kaolin from the company pit near Casa Diablo, largely for stucco and as filler in paint and rubber. Some kaolin was shipped to an Oregon aluminum-silicon alloys plant to determine its potential use in that field. Black Rock Mining Corp., second largest producer of tungsten concentrate in the State, operated the Black Rock tungsten mine and mill near Benton Station. Tungsten concentrate was consigned to GSA and consumers, and some ore was shipped to a custom mill. The company explored for new ore bodies under the DMEA program. Scharf,

Scharf & Schwerin operated the Nicoll (Mountain View) tungsten claims, and Blue Ridge Midway Gold Mines, Inc., worked the Hilton Creek tungsten mine on Hilton Creek near Bishop. Mono County mines were the source of 16 percent of the State output of tungsten concentrate. Contractors of the California Division of Highways crushed granite and produced sand and gravel for highways.

Masonic District.—Page Blakemore shipped gold bullion produced from high-grade gold ore at the Lakeview claim. Valley View Mines Co. recovered gold and silver from ore mined at the Serita group of mines by cyanidation.

White Mountain District.—Fowler Mining Co. operated the Alexander (Green Monster) mine and shipped lead-zinc ore containing silver and some copper, and lead-zinc concentrates, containing silver and some copper, derived from silver ore, to a smelter-fuming plant. Huntley Industrial Minerals, Inc., shipped pyrophyllite to its Laws grinding plant from the Pacific Pyrophyllite open-pit mine.

MONTEREY

Kaiser Aluminum & Chemical Co. quarried dolomite at the Natividad quarry $6\frac{1}{2}$ miles northeast of Salinas. Some dolomite was used for metallurgical fluxes, but most of the output was calcined at the Natividad plant to produce quicklime for refractory and chemical use. Refractory magnesia, caustic-calcined magnesia, and magnesium hydroxide were prepared at the company Moss Landing plant from sea water and calcined dolomite, and periclase produced was consumed in the company refractory chrome-brick plant. Del Monte Properties Co. produced sand products for a variety of purposes from dune material in Del Monte Forest. Feldspar and silica were recovered from the natural sand mixture by flotation, and a portion of each product was ground for ceramic uses. The company quarried decomposed granite at Pebble Beach for aggregates. Dune sand was also utilized by Owens Illinois Glass Co., which produced glass sand at Pacific Grove, and by Monterey Sand Co. at Seaside and Pacific Coast Aggregates, Inc., at its Lapis and Pratteco plants for industrial and construction purposes. In Carmel Valley sand and gravel were produced by M. J. Murphy, Inc., and sandstone for flagging and architectural uses at the Carmel stone quarry. The California Division of Highways and contractors prepared sand and gravel at several sites for highways in the county. Monterey Bay Salt Works recovered 8,000 tons of salt by solar evaporation from ponds near Moss Landing. Petroleum and natural gas were produced at the San Ardo field in the southern part of the county west of Coalinga.

Los Burros District.—E. A. Brewer, S. A. Gray and D. Page developed the Lucky Mo claim by an opencut and shipped 5 tons of ore containing 4 ounces of gold, 3 ounces of silver and a trace of copper, to a California smelter.

NAPA

At Napa, Basalt Rock Co., Inc., crushed basalt from the Pedrotti quarry for riprap and aggregate. The company also prepared diatomite from the company quarry near Napa by kiln firing and crushing for use in puzzolanic cement and at Napa Junction bloated bentonitic

shale from Solano County for aggregate. Napa Perlite Co. and Perlite Aggregates, Inc. (Alvo quarry), quarried crude perlite near St. Helena. The latter company expanded perlite at St. Helena. Sand and gravel were produced by the Bensen Gravel Plant at Pope Valley.

Knoxville District.—Ray Adams recovered 5 flasks of mercury from 5 tons of dump ore at the Knoxville mine. Lunium Co. (Jack A. Hoppe) operated the White Angel mine and shipped chromite ore and concentrate produced from the ore at the company mill in Placer County, to the Grants Pass, Oreg., Depot.

Mayacmas District.—James I. Scott shipped chromite ore to the Grants Pass, Oreg., Depot from the Chrome Dome claim. A. Garcia et al. retorted cinnebar from the James Creek placer deposit and the Oat Hill dump and shipped mercury to a buyer.

NEVADA

Contractors for the State division of highways produced gravel for road construction from several county deposits.

French Corral District.—L. M. White washed 250 cubic yards of gravel tailings at the Atomic claim and recovered 4 ounces of gold. James L. Johns et al. operated a dragline and a nonfloating washing plant to recover 12 ounces of gold and 1 ounce of silver from 550 cubic yards of gravel on the Boodt claims. L. L. Johnson sluiced 500 cubic yards of gravel at the China Tunnel mine and recovered 3 ounces of gold.

Grass Valley-Nevada City District.—Empire Star Mines Co. Ltd., the third largest producer of gold and the leading lode-gold mine in California in 1953, operated the Empire Star group of mines and 500-ton-a-day mill. Gold and silver were recovered from company gold ore and some custom gold ore and concentrate by amalgamation and cyanidation. Idaho Maryland Mines Corp., fourth in production of gold and the second largest lode-gold mine in the State, worked the Brunswick mine and the 600-ton-a-day Idaho Maryland mill. Gold and silver were recovered from the gold ore by amalgamation, and concentrates shipped to a smelter yielded gold, silver, and some copper. Interest was shown in scheelite mineralization encountered in the company Union Hill mine, formerly worked for gold. Willow Valley Mines, Inc., treated 1,000 tons of gold ore from the St. Louis Tunnel claim at its 100-ton-a-day mill. Gold and silver were recovered by amalgamation, and flotation concentrate shipped to a custom-cyanide plant yielded gold and silver. Placer gold from the district was largely from small sporadic operations. Bob Winkle produced gravel near Grass Valley for road construction.

Meadow Lake District.—Al Ansel and R. J. Dougherty shipped gold ore, containing gold, silver, and a trace of copper, to a smelter from the Lucky Joe mine. The mine was worked by opencuts.

Washington (North Bloomfield) District.—The Crescent Pacific Mining Co. terminated operations at its Eastman (Middle Yuba) placer mine, which also extends into Sierra County, late in 1953. Some gold and silver were recovered. Aubrey Cripps worked 150 cubic yards of gravel at the Waukshau (Blue Lead) mine, using tractor, grizzly, and sluice box, and recovered 5 ounces of gold. The Red

Ledge Mines amalgamated 89 tons of gold ore at its 3-stamp mill and recovered gold and silver. L. R. Tatom et al. treated 80 tons of ore at a 4-stamp mill from the Sadie D. and Birdie L. mines and recovered gold and silver.

You Bet District.—M. W. & A. Dredging Co. recovered gold and silver incidental to developing placer claims at Quaker Hill for dredging.

ORANGE

The value of petroleum, natural gas, and natural-gas liquids from wet gas was the largest single contribution to county mineral production in 1953. This production was from the Los Angeles Basin, which extends into Los Angeles County. Natural-gas-liquids plants were operated by the following companies (field locations in parentheses): Brea Canyon Oil Co. (Brea Olinda); Fullerton Oil Co. (Huntington Beach); Richfield Oil Co. (Brea); Signal Oil Co. (Huntington Beach); Standard Oil Co. of California (Huntington Beach and Murphy Coyote); Union Oil Co. of California (Richfield and Brea Olinda-Stearns); West Coast Refining Co. (Richfield). The county's 2 petroleum refineries at Huntington Beach had a total crude-oil throughput of 6,800 barrels daily in 1953.

La Bolsa Tile Co. at Corona and Pacific Clay Products at Irvine produced miscellaneous clays. Gladding, McBean & Co. produced flint and plastic fire clay from the Capistrano pit at San Juan Capistrano and flint fire clay from the Claymont pit near Corona. Kaolin was mined near El Toro by I. P. Arnold and W. A. Schoeppe. W. A. Schoeppe also shipped ganister (a natural mixture of kaolin and quartz sand), and I. P. Arnold produced sandstone for use in refractory-furnace lining. Western Salt Co. recovered salt by solar evaporation at Newport Beach. Great Western Division, Dow Chemical Co. produced iodine from oil-well brines at Seal Beach. The Consolidated Rock Products Co. plant, Orange, was the largest producer of sand and gravel in the county. Other producers of sand and gravel included: R. J. Noble Co., Anaheim; Sully-Miller Construction Co., El Modeno; Graham Bros., Inc., Trabuco Creek and San Juan Capistrano; and Orange County Rock Products, California Rock Co., and A. E. Fowler & Sons, all of Orange. Sand was produced at the Burris sand pit and by McClellan & Sons, Anaheim; Foster Sand & Gravel Co., Orange; and V. J. Frye, Newport Beach. D. D. Lawhead & Sons quarried decomposed granite from the Emery pit at Buena Park for aggregate.

PLACER

American River District.—Contractors for the United States Army Corps of Engineers prepared a large tonnage of gravel for use in building dikes and other appurtenances to the Folsom Dam under construction in Sacramento County.

Auburn District.—Joe Chevreaux produced sand and gravel from a deposit on the Bear River, and Rock Creek Aggregates operated a sand and gravel plant and incidentally recovered some gold and silver in the washing operation. Lunium Co. beneficiated chromite ore, principally from Napa County, at the converted Mary Len mill near Penryn. Concentrate was shipped to the Grants Pass, Oreg., Depot.

Foresthill District.—Carl Doherty recovered gold and silver from ore amalgamated at the Marigold Quartz mine. W. E. Wilson hydraulicked the Paragon mine and recovered gold and silver. H. R. Beresford (Adam-pit tailings) and Geo. Bell (Ohio) recovered placer gold by small-scale hand methods. Small tonnages of chromite ore were shipped to the Grants Pass, Oreg., Depot by John Mehl & Ray A. Graetz from the Twin Shafts mine and Ashland Mining Co. from the Foresthill mine.

Iowa Hill District.—Zimdars & Delmue shipped 4 tons of handsorted white tremolite asbestos with fibers 1 inch to 10 inches long from the Noon Day asbestos mine. C. L. Matthews, operating the Sunset Chrome mine, shipped 12 long tons of chromite ore averaging 52 percent Cr_2O_3 to the Grants Pass, Oreg., Depot. Gold and silver were recovered from gravel at the following drift operations: C. A. M. Leasing Co. and C. & H. Leasing Co., Occidental mine; Mel Henderson, Penn Valley mine; and Lester Capurro and Alvin J. Watts, Strawberry mine; and O. F. Goodwin & A. W. Simpson, Virtle mine. W. E. Thompson worked the Twenty One placer mine, using mechanical equipment, and recovered gold and silver.

Last Chance District.—W. B. Pendleton sluiced gravel at the American Hill mine and recovered gold and silver.

Lincoln District.—At Lincoln, Gladding, McBean & Co. quarried plastic fire clay from the Lincoln and Atkinson pits for use at company plants, and Lincoln Clay Products Co., Inc., shipped plastic fire clay. Donald G. Carter recovered gold and silver from gravel on the Crescent Ranch, using mechanical equipment.

Michigan Bluff District.—L. L. Anderson sluiced 200 cubic yards of gravel at the Oro mine and recovered 14 ounces of gold and 1 ounce of silver.

Rocklin District.—At Rocklin, Union Granite Co. produced granite as dimension stone for monuments and as broken stone for riprap.

PLUMAS

Western Pacific Railroad Co. quarried granite for riprap at Tobin. Contractors for the California Division of Highways produced sand and gravel from county deposits for road construction.

Genesee District.—O. R. Allen worked the Walker mine tailing and recovered 36 ounces of gold and 8 ounces of silver.

Greenville (Crescent Mills) District.—Kenneth McIntyre shipped concentrate containing gold and silver to a smelter from the Arcadia mine. J. W. & S. D. Hoefler worked the Dag-Ian (L & L) mine and recovered gold and silver by amalgamating the ore. Myles Timmins produced some gold during test operations on gravel at the Wolf Creek lease. H. W. Clark recovered gold and silver from gravel at Lights Creek claims incidental to research on platinum separation. George Osmeyer produced 14 ounces of gold and 1 ounce of silver from 1,500 cubic yards of gravel at the O & O claims during test operations of a dragline dredge. Barium Products, Ltd., shipped barite ore from the Almanor mine to the company grinding plant at Modesto, Stanislaus County. F. A. Smith shipped manganese ore to steel furnaces from the Arlington mine. Terhel Farms, Inc., consigned manganese ore to both Government high- and low-grade stockpiles from the

Mount Hough group of claims. Lakeview Manganese Mines continued exploration for new manganese ore bodies at the Iron Dyke-Lakeview-Trail claims under the DMEA program.

RIVERSIDE

Riverside Cement Co. operated the Crestmore portland-cement plant on limestone from the Crestmore underground mine and the Jensen quarry. Near Elsinore plastic fire clay was produced by Alberhill Coal & Clay Co. and Elsinore Clay Co.; flint clay was dug at the Sloan pit by Gladding, McBean & Co. The last company also produced plastic fire clay at the Harrington pit near Corona, as did the Los Angeles Brick & Clay Products Co. and Pacific Clay Products Co. (Lower Douglas, Murphy, and South pits) near Alberhill. Miscellaneous clays were also produced by Gladding, McBean & Co. at the Sloan pit and by Los Angeles Brick & Clay Products Co. and Elsinore Clay Co. Plasterboard was manufactured by United States Gypsum Co. at its Midland plant from gypsum quarried nearby. Near Crestmore, More-Lite Co. expanded crude perlite from its deposits on the California-Nevada State line, for use in plaster aggregate. E. T. Herman & Geo. Keller made a sample shipment of pyrophyllite to a grinding plant from a property near Desert Center. Granite was quarried for riprap by the Atcheson, Topeka & Santa Fe Railway Co. at Box Springs and J. B. Stringfellow at Riverside. Haven Granite Corp., West Riverside, crushed granite for poultry grit. Colored sand and flint sand for glass were produced by Owens Illinois Glass Co. at Corona. Sand and gravel were prepared by Massey Rock & Sand Co., Indio; Valley Rock & Sand Corp., San Jacinto; Palm Springs Builders Supply, Whitewater; San Geronio Rock Products, Banning; and Desert Rock Co., Palm Springs.

Chuckawalla District.—Roy M. Berg & Hugh H. Leiferman shipped 3 tons of lead ore containing gold and silver to an Arizona ore market. Sweeney Tungsten Co., Ltd., shipped tailing containing gold and silver from the Pinto Basin mill to a custom-cyanide mill.

Dale District.—Earl Geiger recovered a small quantity of gold by amalgamating ore from the Duplex and Golden Rod mines.

Eagle Mountain District.—Kaiser Steel Corp. shipped 1,642,000 long tons of magnetite-hematite ore, averaging 53.46 percent Fe, from the Eagle Mountain mine to the company blast furnaces at Fontana. Basin Mining & Milling Co. shipped lead concentrate, containing some gold, silver, copper, and zinc, recovered during mill tests of tailings from the Black Eagle mill.

Ironwood (McCoy) District.—Ben Tyrrell shipped 1 ton of direct smelting ore containing 0.1 ounce of gold, 1 ounce of silver, and 541 pounds of copper from the Copper Queen claim, a new discovery in 1953. The following operators shipped oxide manganese ore to the Government low-grade stockpile at Wenden, Ariz.: A. B. Miner (ore and concentrate); A. T. Sweet & E. A. Brown and Dan Figueroa & Sons, from the Arlington claims; James F. George, Bertha claims; Ike W. Kusisto, Black Ace mine; California Limestone Products, Langdon mine; and Dan Figueroa & Sons, Black Jack and Manganese Canyon mines. Dan Figueroa & Sons was the principal shipper of manganese ore in the District.

SACRAMENTO

Cannon & Co. produced plastic fire clay and miscellaneous clays at Michigan Bar. Harrison Fait and the Sacramento Brick Co. produced miscellaneous clays for common brick at Sacramento. Asta Construction Co. produced sand near Rio Vista. This operation extended into Solano County. Natural-gas yield—fourth highest in the State—was from the Freeport, Thornton, River Island, and Rio Vista fields. The last field extends into Solano and Contra Costa Counties.

American River District.—The Natomas Co. fleet of 6 bucketline dredges, operating in the Folsom area, was the largest producer of gold in the State. Silver and crude platinum were recovered incidental to the gold operation. One dredge capsized and sank November 22, 1953. The company annual report to shareholders showed a 3-percent increase in gross production and a 5-percent increase in costs. Evanis Mining Co. explored the Evanis mine and recovered gold and silver from ore mined. The property was abandoned in December 1953. J. D. Fippin & A. R. Vincent mined and amalgamated 60 tons of ore from the Little White Rock mine on Carson Creek and recovered 39 ounces of gold and 7 ounces of silver. Sand and gravel were produced by: Pacific Coast Aggregates, Inc., Fair Oaks plants Nos. 108 and 111, and McGillivray Construction Co. The following sand and gravel operations near Sacramento yielded byproduct gold and silver: Brighton Sand & Gravel Co., A. Teichert & Sons, Inc., Del Paso Rock Products Co., Fair Oaks Gravel Co., and Haggin Gravel Co. Western Refractories Co. mined fire clay near Folsom.

SAN BENITO

Ideal Cement Co. operated the San Juan Bautista portland-cement plant formerly owned by Pacific Portland Cement Co. The company quarried cement rock and shale for raw materials. San Benito Bentonite Co. produced a small quantity of bentonite at its pit near Tres Pinos. Granite Rock Co., the largest producer of granite in the State, crushed the material at the Logan quarry for aggregate, railroad ballast, and miscellaneous uses. Westvaco Chemical Division, Food Machinery & Chemical Corp., quarried dolomite from the Hollister quarry principally for the production of magnesia at the company Alameda County plant. The California Division of Highways produced gravel from county deposits. Jack Simas developed the St. Thomas claims near Coalinga for cross- and slip-fiber chrysotile asbestos during 1953. The relatively small petroleum production was from the Ciervo, Lomerias, Vallecito, and Bitterwater areas. Natural gas was withdrawn from the Hollister field.

Idria District.—New Idria Mining & Chemical Co., the largest producer of mercury in the United States in 1953, worked the New Idria (including the San Carlos) mine and treated company and custom ore in four 100-ton-a-day Gould rotary furnaces. A new cinnabar ore body was discovered under the DMEA exploration program. Eugene J. Jacques shipped mercury ore from the Esperanza mine to a plant for furnacing.

Panoche District.—Louis Sciocchetti shipped mercury ore from the Juniper mine to a custom plant for treatment. Other shippers of

mercury ore to a custom plant included: Juan Quinonez (El Rey mine); Raymond J. Lucas (Lucky Strike mine); and Paul Gonzalez (Wonder claims).

Stayton District.—Ed. Mathews & Arthur Pierce shipped a small tonnage of manganese ore from the Pacheco mine to the Wenden, Ariz., low-grade stockpile.

SAN BERNARDINO

Kaiser Steel Corp. operated its blast furnaces and steel mill at Fontana throughout 1953 on ferrous scrap and iron ore from the Eagle Mountain mine in Riverside County. American Potash & Chemical Corp. recovered soda ash and salt cake, potassium chloride, dilithium-sodium phosphate, borax, boric acid, sodium tetraborate, bromine, and sodium and potassium bromides from dry-lake brines treated at the Trona plant. West End Chemical Co. quarried limestone in Searles Valley for the carbon dioxide and hydrated lime used in the West End plant process for recovery of borax, sodium tetraborate, and soda ash from dry-lake brines. Near Bristol Lake calcium chloride was recovered at Saltus by California Rock Salt Co. from well brines and by Hill Bros. Chemical Co. and National Chloride Co. of America from dry-lake brines. California Rock Salt Co. also produced rock salt from the dry-lake bed deposits at Saltus. Pacific Salt & Chemical Co. produced rock salt from Searles Lake bed deposits, and Don's Salt Service recovered salt by solar evaporation from dry lake beds near Twenty-nine Palms. California Portland Cement Co. operated its Colton plant using company-quarried limestone. This company also prepared quicklime and hydrated lime for the building industry. Riverside Cement Co. operated the Oro Grande portland-cement plant on limestone from the Klondike quarry. The company also quarried shale and sandstone for cement and marketed some limestone for miscellaneous uses. Southwestern Portland Cement Co. quarried sandstone and limestone from the Black Mountain quarry for cement manufacture at its Victorville plant. Limestone was also quarried near Victorville by Victorville Lime Rock Co., principally for whittings, and by White Lime Rock Co. near Big Bear City for roofing granules. Dolomite was mined for roofing granules by California Dolomite Co., Inc., near Adelanto. California Perlite Corp. quarried crude perlite near Ludlow, and Nu-Lite Insulated Homes, Inc., operated a perlite-expanding plant at Fontana on crude perlite obtained from the company mine in Clark County, Nev. Neal Garrett developed the Pisgah pumice property near Newberry and used some of the material for road construction. Williams Bros. prepared 1,364 tons of pumice from its property near Hinkley for use in aggregate. Gladding, McBean & Co. mined kaolin from the Hart pit near Ivanpah, and Marter Mining Co. produced kaolin from the company pit at Victorville. Southern California Minerals Co. dug kaolin from its pit near Ivanpah. The Inerto Co. prepared hectorite, a bentonite clay, from dump material treated at the company property near Hector, and National Lead Co., Baroid Sales Division, mined bentonite from the underground mine near Daggett. Pomona Brick Co. quarried miscellaneous clays from the company pit near Chino. Gladding, McBean & Co. mined potash

feldspar from the White Butte (Beck Spar) mine near Kramer Junction. The crude material was ground and used in manufacturing refractory brick. Quartzite was produced at the Mineral Materials Co. Atlas open-pit operation near Oro Grande, principally for refractory brick. Agricultural Minerals Mines Corp. mined agricultural gypsum from a property near Bristol Lake. Near Victorville W. H. Johnson & Co. produced granite as dimension stone for construction use. Sharp & Fellows Contracting Co. crushed miscellaneous stone for railroad ballast at Newberry. Commercial producers of sand and gravel follow: Service Rock Co., Colton; Consolidated Rock Products Co., Claremont; Holliday Rock Co., Colton and Upland plants; Tri-City Rock Co., Redlands; Fourth Street Rock Crusher, Geo. Herz & Co., and Edwin E. Hill, San Bernardino; Fontana Gravel Co., Fontana. Contractors for Government agencies prepared sand and gravel at highway projects in the county. Sierra Talc & Clay Co. shipped talc to company grinding plants from the Ibex mine 12 miles southwest of Tecopa, the Sheep Creek mine 20 miles northwest of Baker and the Silver Lake No. 1, Silver Lake Addenda, and Gould Tunnel properties 10 miles northeast of Baker. Western Talc Co. mined talc at the Western mine 7 miles southeast of Tecopa and shipped it to the company grinding plant at Dunn for primary crushing and then to the company Los Angeles plant for final grinding. Southern California Minerals Co. produced talc from the following deposits: Superior claims $2\frac{1}{2}$ miles north of Yucca Grove, Acme mines $8\frac{1}{2}$ miles southeast of Tecopa, Excelsior mine 25 miles northwest of Valley Wells, and Calmasil mine 1 mile north of Yucca Grove. Material was shipped to the company grinding plant in Los Angeles. Barton, Arrow, & Alden shipped talc to a custom mill from the Annex No. 1 mine 18 miles north of Baker, and Desert Talc & Clay Co. produced talc from the Yucca Grove mine $1\frac{1}{2}$ miles northwest of Paso Alto. Minerals Materials Co. consigned pyrophyllite to a custom grinding plant from the Victorite deposit 12 miles northeast of Victorville. Al Stoval shipped oxide manganese jig concentrates from the Big Reef mine near Poes Station to the Wenden, Ariz., Depot. R. D. Styer & J. S. Davenport operated the Styer-Davenport mine near Ludlow and shipped a small tonnage of manganese ore to the Wenden, Ariz., Depot. Harry F. Heather shipped 39 tons of tungsten ore to custom mills from the Bright Outlook mine northeast of Kelso. T. F. Curtis developed the Columbia claims near Baker for scheelite and wolframite. Walter H. Zindell milled 20 tons of tungsten ore from the Section 9 mine near Cadiz and shipped concentrate containing 36 units of WO_3 . Near Adelanto Just Associates shipped tungsten ore from the Shadow Mountain mine to a custom mill, Page, Corio, & Palmer shipped tungsten concentrate produced from 100 tons of the Princess Pat mine tailings, and Adelanto Mining Co. consigned tungsten ore to a custom mill from the Mary Ann mine. Hidden Hills Co. explored the Birthday Star mine in the Danby district for tungsten ore under the DMEA program. The relatively small natural-gas and petroleum production was from the Chino-Soquel area.

Barstow District.—Pacific Coast Mill & Mining Co. shipped flotation copper concentrate, containing gold, silver, and some lead, which was derived from the Hoffman Estate (Bagdad-Chase mine) tailing to a smelter. Oil Base, Inc., mined and stockpiled barite at the Levia-

than mine. Jaylite Mining & Milling Co. treated ores from various tungsten mines on a custom basis and shipped tungsten concentrate. Brubaker-Mann Co. and the Rainbow Rock Co. quarried and crushed stone for roofing granules.

Belleville (Ord Mountain) District.—E. Bahe recovered 3 ounces of placer gold from the Camp Rock (Royal) mine during the course of assessment work. L. L. Scott made a test shipment of ore containing gold and silver from the Grandview claims to a custom mill. Erwin J. Dear developed the Golden Dear claims and stockpiled ore containing gold and silver.

Black Hawk District.—Frank Czerwonka shipped 125 tons of gold ore containing 157 ounces of gold and 94 ounces of silver to a custom mill from the Rambler-Hilltop mine.

Buckeye District.—Gold ore containing copper and silver was shipped to smelters by Donald F. Love from the Bagdad-Chase mine and Arthur I. Hoe & George W. Golden from the Valley View (John Sutter) mine.

Calico District.—The Union Mining Co. explored and developed the Waterloo (Zenda) and Union mines formerly operated for gold and silver.

Clark Mountain District.—Joe Ostrenger shipped lead ore containing zinc, silver, copper, and gold to a California smelter-fuming plant from the Clark Mountain mine. Mike Lytle shipped 4 tons of ore containing 7 ounces of silver, 840 pounds of lead, and 1,239 pounds of zinc to a Utah lead smelter from the State Line mine. Umberci Mines, Inc., worked the Umberci (Carbonate King) mine and shipped lead-zinc ore containing silver to a California smelter-fuming plant. Molybdenum Corp. of America operated the Mountain Pass mine and separated rare-earth-metal concentrates from the barite-carbonate rock at its 150-ton-a-day flotation mill.

Dale District.—Iron Age Mines Co., operating the Iron Age mine, shipped 9,337 long tons of hematite-magnetite ore to steel furnaces in the eastern United States. H. M. Chambliss & G. M. Russell recovered gold and silver from ore amalgamated at the Ivanhoe mine and also shipped gold concentrate containing silver and some copper to a smelter.

Goldstone District.—Tungsten concentrate was shipped by: Raymond Jones operating the Tungsten King and Moonlight claims; Martin & Martin, the Fairview mine; Baird & Martin, the Blue Jay mine; and W. T. Ritson, the M. Gail mine.

Ivanpah District.—J. R. Bembry made test mill runs of tungsten ore from the Standard No. 1 (Riley) mine. Claremont Mining Co. continued to develop the Sagamore mine, the ore of which contains lead, zinc, silver, copper, and tungsten.

Lane Mountain District.—C. B. Aitcheson, lessee, shipped tungsten ore and concentrate from the Starbright mine.

Lytle Creek District.—R. B. Lytle worked on development at the Blew Jordam zinc mine in 1953.

Providence (Arrow) District.—The Stephan Mining Co. began rehabilitating the Queen group of claims worked previously for gold and silver. Minerals Materials Co. shipped 46,392 long tons of magnetite ore to blast furnaces and a cement plant from the Vulcan mine.

Randsburg District.—West American Tungsten Corp. recovered

scheelite and byproduct gold and silver from the Cole group of tungsten placer claims, using a dry-land dredge. Tungsten concentrates were shipped. Gold ore containing silver was shipped to custom mills by R. McDonald from the Fremont mine and by R. E. Ralston from the Pioneer mine. Surcease Mining Co., third largest producer of tungsten concentrate in California in 1953, operated the Atolia group of mines and treated 50,144 tons of ore at the Atolia mill; 199 tons of concentrate containing 12,621 units of WO_3 was shipped. Exploration for new tungsten ore bodies was pursued under the DMEA program. Henry Plekas shipped tungsten ore to a custom mill from the Green Top mine and V. T. Bowald made a small shipment of tungsten concentrate from the Tanana mine.

Solo District.—Joe Ostrenger shipped tailing containing gold, silver, copper, and zinc from the Margaret mill to a smelter-fuming plant. Dick Bright shipped gold ore containing silver to a custom-cyanide mill from the Telegraph mine.

Turtle Mountain District.—The Turtle Mountain Mining Co., operating the Horn claims, produced 520 tons of copper ore, containing 3 ounces of gold, 166 ounces of silver, and 37,869 pounds of copper, which was shipped to smelters.

Whipple Mountain District.—Joe M. B. Parry operated the Copper Basin claims and shipped 103 tons of oxide ore containing 1 ounce of gold, 12 ounces of silver, and 9,787 pounds of copper to smelters. Harryman & Stewart shipped 39 tons of gold ore containing 10 ounces of gold and 1,500 pounds of copper to a smelter from the Islander claims. D. R. Harryman (operating the Manganese King mine), Lelan Noblitt (the Barnett and Monarch mines), Roe T. Brock and Tom Noblitt (the Monarch mine), and Carl Noblitt (the Hilltop mine) shipped manganese ore to the Wenden, Ariz., low-grade stockpile.

SAN DIEGO

Shale was quarried by Union Brick Co. and La Jolla Canyon Clay Products for the manufacture of clay products. Westvaco Chemical Division, Food Machinery & Chemical Corp., recovered magnesium chloride for oxychloride cement at the Chula Vista plant from sea-water bitterns. Harborlite Corp. expanded perlite for plaster aggregate at the company plant near Chula Vista. Western Salt Co. produced salt from sea-water ponds at Chula Vista by solar evaporation. Tungsten ore was shipped to custom mills by L. B. Spaulding from the Crown Point and Metal Mountain mines near Live Oak Spring and Paul Henderson from the P-K mine near Jacumba. Nelson & Sloan operated a basalt quarry near Otay and crushed the material for aggregates. Dimension granite for construction use was produced by: California Cut Stone & Granite Co., at Vista; Clemens Granite Co., at Suncrest; and Excondido Quarries, Inc., and Valley Granite Co., at Excondido. Contractors crushed dacite quarried in the county for State highway projects. The county led the State in the production of granite as dimension stone. Canyon Rock Co. quarried miscellaneous stone for aggregate and riprap at San Diego. Sand and gravel were produced for the construction industry by the following operators: H. G. Fenton Materials Co., Mission Valley, Murray Canyon, and Otay No. 1 plant; Caudell & Johnson, Mission

Valley and Poway Valley plants; H. W. Rohl Co., Inc., and Crystal Silica Co., Oceanside; Daley Corp. and Denton's Sand & Gravel Co., Mission Valley; Escondido Sand & Gravel Co., Escondido; Canyon Rock Co., San Diego; Monarch Materials Co., Santee; Nelson & Sloan, Otay; and Mrs. Henry Gray, J. Kelly Ranch near Carlsbad. Sand was produced by Woodward Sand Co., Mission Valley; American Sand Co., San Diego; Charles & Victor Arnell, Lakeside; C. R. Guthridge sand plant, Del Mar; and Wiley Bros., near Vista. A small quantity of gravel was produced by Carl Niemann at Del Mar. Sand and gravel were produced at several localities in the county by the California Division of Highways and contractors. Pan Chemical Co. produced 50 tons of crude celestite from the Fish Creek Mountain mine 26 miles north of Plaster City. The material was ground and sold to a chemical company.

SAN FRANCISCO

No mineral production was recorded in the county, but the Commercial Minerals Co. ground soapstone and talc in the company custom grinding plant at San Francisco.

SAN JOAQUIN

Kaiser Magnesium Co. operated the Manteca magnesium plant until July 10, 1953, and produced 5,646 tons of metal. The raw material treated was calcined dolomite produced at Natividad, Monterey County. Heavy clay products were manufactured by Stockton Brick & Tile Co. and Stockton Building Materials Co. from miscellaneous clays. Gravel was produced by Tracy Rock & Gravel Co. at Tracy, and sand and gravel were prepared at the Pacific Coast Aggregates, Inc., Kerlinger No. 114 plant, near Lyoth; by Claude C. Woods Co., Clements; Putnam Sand & Gravel Co., Riverbank; and Beck Dredging Co., near Tracy. Natural gas was produced at the Galt, Lodi, McDonald Island, Tracy, Thornton, Vernalis, and Roberts Island fields. The Thornton field extends into Sacramento County.

Ladd-Buckeye District.—Teekay Mines, Inc., operated the Laddmine and a concentrating mill near Tracy. Battery-grade manganese concentrate was shipped to a battery plant, and 198 long tons of oxide manganese ore was consigned to the Government low-grade stockpile at Wenden, Ariz.

SAN LUIS OBISPO

Castro Mining Co., California's leading chromite producer both in quantity and value, operated the Castro open-pit mine and a leased mill throughout 1953. The company shipped 5,733 long tons of concentrate averaging 39.2 percent Cr_2O_3 to the Grants Pass, Oreg., Depot. The H-J Chrome Co., operating the Sweetwater and Norcross mines, produced chromite concentrate and was the fourth largest producer of chromite, in quantity and value, in the State. Pierce Bros. milled ore from the Hard Face claims and the London mine, the combined production of which ranked fifth in quantity and value among State chromite producers. The Hard Face claims supplied ore for 88 long tons of concentrate averaging 41.5 percent Cr_2O_3 , and 1,520 long tons of concentrate averaging 41.6 percent Cr_2O_3 was derived from the London mine ore. H. J. Steven also operated the London mine and shipped ore to the Grants Pass Oreg., Depot. Other pro-

ducers of chromite in the San Luis Obispo and Morro Bay area included: Biaggini & Pierce, Pick & Shovel claims; the San Luis Mining Co., which shipped 443 long tons of concentrate averaging 44.9 percent Cr_2O_3 from the Seeley-Miller property; and Ruda & Negranti, Sweetwater mine. Shandon Gypsum Co. near Shandon and Superior Gypsum Co. at Carriso Plain produced agricultural gypsum in 1953. Sand and gravel were prepared by Walter P. Roselip at Atascadero and Guitore Molding Sand Co., using a portable plant, at Oceano. The California Division of Highways and contractors produced sand and gravel noncommercially at several deposits. Henry C. Dalessi produced limestone from the Lime Mountain quarry near San Luis Obispo for use in sugar refining. R. W. Sylvester & F. J. Vollmer worked the Sylvestra and Irish Hills mines in the Santa Lucia Range and shipped oxide manganese ore to Government stockpiles. Petroleum, natural gas, and natural-gas liquids from wet gas were important production items in the county. Petroleum and natural gas were produced at the Morales, Russell Ranch, and Taylor Canyon fields, and the Arroya Grande field yielded petroleum. Richfield Oil Co. prepared natural gasoline and LP-gases at the Russell Ranch field, which also lies in Santa Barbara County.

Adelaide District.—Woodrow Osborn and William Stephenson operated the La Libertad mine and shipped mercury.

Rinconada District.—George P. Bell produced mercury at the Rinconada mine 11 miles southeast of Santa Margarita.

SAN MATEO

Bethlehem Steel Co. operated open-hearth furnaces and rolling mills at its South San Francisco plant. Ideal Cement Co. manufactured portland cement at the Redwood City plant, using a natural-shell and clay mixture dredged from San Francisco Bay. Kaiser Gypsum Co. manufactured plasterboard from crude gypsum imported from Lower California. Marine Magnesium Products Division, Merck & Co., Inc., produced U. S. P. magnesia, magnesium carbonate, and magnesium hydroxide from raw sea water and calcined dolomite. A. W. Payne recovered gold from 20 cubic yards of beach sand washed near Pescadero. Limestone for aggregate was produced by Skyline Quarries near Belmont and at the California Aggregates Co. Rockaway quarry, Rockaway Beach. Miscellaneous stone for aggregate was crushed at the Pacific Coast Aggregates Co. Brisbane No. 130 plant and the Peter Sorenson Woodside quarry. Sand was prepared by Rockaway Quarry, Inc., at Rockaway Beach and at the Pacific Coast Aggregates Inc. Junipera Serra No. 132 plant near Daly City.

SANTA BARBARA

Near Casamalia the Airox Co. quarried and expanded a diatomaceous shale containing bituminous material, which was used for light-weight aggregate. McNeil Building Materials manufactured clay products from shale mined near Santa Barbara. At Lompoc Great Lakes Carbon Corp. and Johns-Manville Products Corp. prepared diatomite produced from the respective company mines, which was sold principally for use in filters and insulation material. Harry L. Roberts shipped a small tonnage of chromite ore to the Grants Pass,

Oreg., Depot from the Cachuma mine on Figueroa Mountain. Southern Pacific Milling Co. produced sand and gravel at Santa Barbara, as did Buell Flat Rock Co. at Solvang and the Valley Sand & Gravel Co. on the Santa Ynez River near Buellton. Sandstone quarried in the county was crushed for highway construction. The value of mineral fuels output was a large percentage of the county total mineral yield in 1953. Petroleum and natural gas were produced principally from three areas—the Santa Maria Valley, the Cuyana Valley, and the coastal area near Santa Barbara. Plants for the production of natural-gas liquids were operated by the following companies (field locations are in parentheses): Rice Ranch Oil Co. (Orcutt); Richfield Oil Corp. (South Cuyana); Shell Oil Co. (Capitan and Santa Maria); Signal Oil & Gas Co. (Elwood); Union Oil Co. of Calif. (Orcutt and Santa Maria). At Santa Maria petroleum refineries of Douglas Oil Co. of Calif. (formerly Five C Refining Co.), Sunray Oil Co., and Western Asphalt & Refining Co. had a combined daily crude-oil throughput capacity of 10,000 barrels at the close of 1953 compared with 9,300 barrels as of January 1, 1953.

SANTA CLARA

Permanente Cement Co. operated the largest portland-cement plant in the State near Permanente. The company quarried limestone, sandstone, and a portion of its clay requirements for the cement raw materials. Miscellaneous clays were quarried at San Jose for heavy clay products manufactured by, Gladding Bros. Mfg. Co., the Remillard-Dandini Co., and San Jose Brick & Tile Co. James McPeters shipped magnesite ore from the Western mine at Red Mountain to a chemical plant in the San Francisco Bay area. P. J. Gambetti dredged shells from lower San Francisco Bay for use as calcium carbonate in poultry feed prepared by the Bay Shell Co. at Alviso. Limestone was produced by Bahr & Ledoyen, Inc., from the Page Mill quarry near Los Altos and Santa Clara County at Saratoga for aggregate. Mirassou Bros. (operating the Lone Hill, Inc., quarry near Los Gatos), Sondgroth Bros. (the Neary quarry at Los Altos), and A. F. Voss (a quarry near Cupertino) crushed miscellaneous stone for base rock and aggregate. J. C. Bateman operated three portable gravel plants in the vicinity of San Jose. Sand and gravel were prepared by: Leo F. Piazza Paving Co. and A. J. Raisch Paving Co. (portable plant) at San Jose; Western Gravel Corp. at Campbell; Western Tile & Supply Co., Gilroy; and Los Gatos Sand & Gravel Co., Los Gatos. Morrison-Knudsen Co., Inc., and Frederickson & Watson Construction Co. produced gravel for highway projects in the county. A small quantity of petroleum was produced at the Moody Gulch field near the Santa Cruz County border.

Coyote District.—Palo Alto Mining Co. operated the O'Connell No. 1 chromite mine near Coyote. The ore was concentrated at the company mill, also near Coyote, and concentrate was shipped to the Grants Pass, Oreg., Depot. Chas. H. & Olga O. Kruse consigned chromite ore from the Kruse mine near Coyote to a custom-concentrating mill.

New Almaden District.—A. S. Burrell, W. R. MacKinnon, David Parr, and James Tobar worked sections of the Guadalupe mine

intermittently during 1953, and each shipped mercury to buyers. Cordero Mining Co. explored the New Almaden mine under a DMEA contract but discontinued the project early in 1953. A small quantity of mercury was recovered from dump ore on the New Almaden property by lessees.

SANTA CRUZ

The Santa Cruz Portland Cement Co. manufactured portland cement at the Davenport plant, using limestone from the San Vicente quarry. The company also quarried shale for raw material. By-product potash, which has a market in agricultural areas, was recovered in the plant as precipitated flue dust. Pacific Limestone Products Co. produced limestone near Santa Cruz, principally for poultry grit. At Olympia Henry J. Kaiser Co. and Pacific Coast Aggregates Co. operated sand plants. Hansen, Silvey, & Sinnott prepared gravel at Felton, and V. W. Maddock & Poley Milsap operated a similar plant near Soquel. Santa Cruz Aggregates Co. produced sand and gravel at Felton. The Santa Cruz County Road Department quarried granite in the county for concrete and roadstone.

SHASTA

A small shipment of magnetite ore was made from the Shasta and California mine 12 miles north of Redding on Shasta Lake by Carrico & Gautier, for use in heavy aggregates. Fredrickson & Watson Construction Co. operated a portable gravel plant at Anderson. The California Division of Highways and contractors prepared sand and gravel at several localities, and Shasta County crushed basalt for riprap used in road construction.

Bully Hill District.—The Glidden Co. continued exploration for copper and zinc ores under a DMEA contract at the Bully Hill and Rising Star mines.

Flat Creek District.—Mountain Copper Co., Ltd., operated the Hornet mine for iron pyrites, used principally for sulfuric acid manufacture at plants in the San Francisco Bay area. In addition, copper precipitate was recovered from mine water.

LaMoine District.—The Ashland Mining Co. shipped chromite ore from the Brown mine and Costa Ranch to its Ashland, Ore., mill. A total of 51 long tons of concentrate was derived from the ore milled. W. A. Orsini shipped 7 long tons of chromite ore from the Forest Queen claims.

Redding District.—Near Redding, Oaks Sand, Gravel & Cement Products Co. prepared sand and gravel, recovering some byproduct gold and silver, and J. H. Hein Co. produced sand and gravel. Mrs. Walda Giles & Associates, operating the Hummingbird claims in the Buckeye area, prepared the mine and mill for production of gold and silver.

Other Districts.—Relatively small quantities of gold and silver were recovered by amalgamation at the following lode properties: Yankee Gulch mine (J. H. Branyen), French Gulch district; Midas mine (H. D. Bradburg), Harrison Gulch district; Forscher Ranch (E. A. Forscher), Igo district; and Whiskey Hill mine (J. E. Leonard), Shasta district. Itinerant miners marketed gold produced from various deposits in the county by placer methods.

SIERRA

Alleghany District.—The Original Sixteen to One Mine, Inc., fifth ranking producer of gold and the third largest lode-gold mine in California in 1953, operated the Original Sixteen to One mine throughout the year. Gold and some silver were recovered by amalgamating the ore and from gold concentrate shipped to a California smelter. Dickey Exploration Co. worked the Orient mine and recovered gold and silver by amalgamation. Concentrate and crude ore shipped to a California smelter and concentrate cyanided at a custom mill also yielded gold and silver. Harold E. Hawn amalgamated ore at the Hawn (Kate Hardy) mine and produced a substantial quantity of gold and silver. Gold and silver also were recovered from concentrate cyanided and smelted at custom plants. Other producers of lode gold and silver, principally by amalgamation, included: Yellow Jacket Consolidated Gold Mines, Ltd., Red Star mine; Giles Bros., Gold Crown mine; J. B. Madoche, Seven Spot claims; and J. C. Orr, American Hill mine. The Mugwump Mining Co. Inc., rehabilitated several gold properties, including the Exchange, Gold Bug, Live Yankee, and Young America claims. Donald Read produced 9 ounces of gold and 1 ounce of silver from 1,000 cubic yards of gravel washed at the Gold Channel drift mine.

Dog Valley District.—James Napier developed the Beacon Light claims 5 miles northwest of Verdi, Nev., by an opencut and shipped copper ore containing silver to a smelter.

Downieville District.—Best Mines, Inc., sixth largest producer of gold in the State in 1953, operated the Brush Creek mine and 100-ton-a-day flotation mill throughout 1953. Gold and silver were recovered by amalgamation, and concentrate containing gold and silver was cyanided at a custom mill. Mary Ann McCalister washed gravel at the Craycroft mine, using mechanical equipment, and recovered gold and silver. Fred Linsea worked the Magnolia drift mine and recovered 7 ounces of gold and 1 ounce of silver from about 140 cubic yards of gravel.

Gibsonville District.—Fred T. Clarke produced a small quantity of gold from the Woodacre mine by placer methods.

Pike (Indian Hill) District.—F. Gilman Low, operating the Sierra Alaska (Alaska) mine, recovered gold and silver by amalgamating ore. Joseph Gabel Brown produced gold and silver from the Depot Hill (Joubert) mine by hydraulicking and sluicing.

Poker Flat (Indian Hill) District.—Sierra Mining & Development Co. produced gold and silver from gravel at the Oriole (Pioneer) (Wildrose) mine by hydraulicking. Glenn C. Allender (Blue Lake claims), L. F. Johnson (St. Elmo mine), and William Anderson (Two Bills mine) recovered placer gold and silver by hand methods.

Sierra City District.—R. C. Hanford worked the Colombo mine and shipped gold ore containing silver to a custom cyanide mill.

SISKIYOU

Volcanic cinders were quarried by: Clement Construction Co. and the Siskiyou County Road Department at various locations for county road construction; Southern Pacific Railroad Co. and the McCloud River Lines near Bray and Hambone, respectively, for

railroad ballast; and Shastalite Cinder Block Co. 6 miles northeast of Weed, for cinder block. Pumice was produced for abrasives by U. S. Pumice Supply Co. Glass Mountain property near Tulelake. The company operated a pumice preparation plant nearby in Modoc County. Producers of pumice for aggregate were: John Madsen, from the Skoria Stove Brick property near Klamath Falls; Dan A. Williams, Mount Hoffman property near Tennant; and Gordenker Pumice Co., Thompson mine near Tionesta. M. N. Thompson & J. S. Jensen prepared sand and gravel at the Upton pit near Mount Shasta. Sandstone from county quarries was crushed for road projects, and sand and gravel were produced by contractors for State highways. The Mount Shasta Mining Co. consigned hand-cobbed chrysotile asbestos ore from the Mount Eddy prospect 5 miles southwest of Weed to a processor. The Siskiyou County Road Department crushed basalt quarried in the county for aggregate.

Gazelle District.—L. J. Conley shipped chromite ore and concentrate to the Grants Pass, Oreg., Depot from the Black Bear mine. Chromite ore was shipped to Grants Pass by C. B. Sappington (Cameron-Sappington mine), J. T. Eastlick (Masterson mine), Roy L. Sharples (Opportunity claims), and Henry L. Shuster & Ross Johnson (Section 31 claims).

Klamath River District.—The Siskon Corp. treated 6,200 tons of ore from the Siskon mine, a new operation on Dillon Creek, in the company recently completed 100-ton-a-day countercurrent-cyanide mill. The ore treated yielded 3,693 ounces of gold and 2,108 ounces of silver. Robert Claye, Jr., recovered gold and silver from ore at the Golden Rule mine on Hungry Creek by amalgamation. James M. & Grace O. Fitzhugh developed gold ore at the Gearhart mine on Indian Creek. Ashland Mining Co. produced 17 long tons of chromite concentrate at its Ashland, Oreg., mill from ore mined at the Lewis property. Other producers of chromite were: Elmer T. Weeks (Mountain View mine), Pell Mining Co. (Riverview mine), Scott Bar Milling Co. (Seiad Valley deposits), and J. L. Leak (Roadside mine).

Preston Peak District.—Ruth Robertson, second largest producer of chromite in California in 1953, operated the Cyclone Gap mine and shipped 2,906 long tons of chromite ore averaging 48.7 percent Cr_2O_3 to the Grants Pass, Oreg., Depot.

Salmon River District.—Gold and silver were recovered at several placer properties operated sporadically during the year. W. R. George shipped a small tonnage of chromite ore to the Grants Pass, Oreg., Depot, from the Dry Gulch claim at Sawyers Bar.

Scott River District.—Cherry Hill Development Co. prospected the Cherry Hill mine for gold ore. Frank H. Cory shipped a small tonnage of lead ore, which contained some silver, to a smelter from the Green Dragon No. 1 mine. G. A. Reichman worked the Turk (Independence) claims in the Quartz Valley area by open pit and amalgamated 5 tons of ore, which yielded 12 ounces of gold and 3 ounces of silver. Alexis R. B. Bouvier recovered gold from gravel washed at the Pollard drift mine. D. W. Hatcher (Black Jack mine) and L. R. Hatcher (West Side and Brockway claims), in the Moffet Creek area, and J. A. Richter (Gazelle Mountain mine), at Callahan, shipped chromite ore to the Grants Pass, Oreg., Depot. Keystone

Asbestos Corp. explored the Keystone claims near Callahan for chrysotile asbestos under a DMEA contract.

Yreka District.—Rough Mountain Mining Co. worked the Rough Mountain mine near Yreka and shipped chromite ore to the Grants Pass Oreg., Depot. R. M. Conley recovered gold and silver from gravel at the Conley property by hand methods.

SOLANO

A bentonitic shale quarried by Basalt Rock Co., Inc., at the Chabot Acres property, was expanded for use in lightweight aggregate at the company Napa County plant. Asta Construction Co. prepared sand at Rio Vista. This property extends into Sacramento County. Basalt was quarried and crushed for aggregate by Cordelia Quarries near Thomasson and at the Parish Bros. Goodyear quarry north of Benicia. Fredrickson Bros. produced a small quantity of crushed stone at Winters for aggregate. Natural gas, the principal item of mineral production in the county, was withdrawn from the Cache Slough, Kirby Hill, Maine Prairie, Miller, Suisun Bay, Winters and Rio Vista fields. The Rio Vista field also lies in Sacramento and Contra Costa Counties, and the Winters field extends into Yolo County.

SONOMA

James I. Scott shipped a small tonnage of chromite ore to the Grants Pass, Oreg., Depot from the Morse Ranch near Windsor. Talbert Rock Quarry, working the Stony Rock quarry near Cotati and Hein Bros. Basalt Rock Co. at Petaluma produced crushed basalt for aggregate. Construction Supply Co. at Santa Rosa and Thomas A. Graham at Occidental produced shale for aggregate and fill rock, respectively. Sand and gravel were produced by Basalt Rock Co. near Healdsburg and by Marshall Maxwell near Santa Rosa. Arthur B. Siri and Eton & Smith prepared gravel at several locations for highways. A small production of natural gas and petroleum was recorded in the Petaluma area.

Geyserville District.—Consolidated Manganese Corp. shipped a carlot of manganese ore from the Boyer mine to Utah steel furnaces.

Guerneville District.—Sonoma Quicksilver Mines, Inc., operated the Mount Jackson (includes Great Eastern) mine and treated mercury ore in one 80- and one 40-ton-a-day Gould rotary furnace. The company was the second largest producer of mercury in California in 1953.

Mayacmas District.—Buckman Laboratories, Inc., developed the Buckman mine (formerly the Dewey-Buckman) and operated the Cloverdale open-pit mine. Mercury was produced from ore treated at the Buckman mine 80-ton-a-day Gould rotary furnace. Baumeister, Hulbert & Muffly treated 1,670 tons of the Culver-Baer mine mercury ore in a 15-ton-a-day rotary furnace and recovered 221 flasks of mercury.

STANISLAUS

Barium Products, Ltd., manufactured barium chemicals at Modesto, treating barite from its Plumas County, Calif., and Nevada properties. Harry Chase and Lester Raggio produced fire clay from pits

near Knights Ferry. The latter also marketed a small tonnage of ball clay. Sand and gravel were produced by: Standard Rock Co. at Oakdale; Santa Fe Rock & Sand Co., operating a portable plant at Waterford; Chas. D. Warner & Son, Inc., at Hickman; American Sand & Gravel Co. near Empire; Frank B. Marks, Jr., at Newman; Modesto Sand & Gravel Co. at Modesto; and Hughson Gravel Plant at Hughson. Contractors for Government agencies produced sand and gravel at several deposits in the county.

Phoenix District.—Irvin Del Ponte worked the Adobe mine 21 miles west of Patterson and recovered 4 flasks of mercury from 76 tons of ore treated in a 14-ton-a-day rotary furnace.

SUTTER

Miscellaneous clays were quarried from the Nicolaus pit at Nicolaus by Gladding, McBean & Co. Lester Rice & Sons and Rice Bros., Inc., produced gravel at Yuba City. Natural gas was withdrawn from the Marysville Buttes field.

TEHAMA

Sand and gravel were prepared at portable plants operated by Allen, Hulseman & Paulsen and Frederickson & Watson at Red Bluff. The California Division of Highways produced sand and gravel at several locations, and contractors quarried and crushed miscellaneous stone for the United States Department of the Interior, Bureau of Reclamation projects in the county.

Beegum District.—Tedoc Mining Co. worked the Blue Sky, Lucky Star, North Fork, and Seagraves claims and shipped chromite ore to the Grants Pass, Oreg., Depot. Other producers of chromite included: The Red Mountain Mining Co. (McArthur mine); Jess Lattin & Joseph Cerny (Cadillac mine and Little Goat claims), and Mark Hausman (Star claims).

Kleinsorge District.—Elder Creek Mining Co., Inc., operated the Elder Creek mine and shipped chromite ore. Conconully Mining Co. milled ore from the Grau-mine dump and the State School lease and shipped chromite concentrate to the Grants Pass, Oreg., Depot.

TRINITY

The Keystone Asbestos Corp. developed the Trinity group of chrysotile asbestos claims in the Tamarack Lake area, which lies in both Trinity and Shasta Counties, under a DMEA contract. Sand and gravel were produced by the Trinity Sand & Gravel Co. at Douglas City and by the California Division of Highways and contractors at several sites.

Cinnabar District.—Clayton L. Kalbaugh hydraulicked the Thursday No. 1 mine and recovered gold and silver from the gravel.

Forest Glen District.—K. P. F. & F. Mining Co. shipped 284 long tons of oxide manganese ore to a Government low-grade stockpile from the Blue Jay mine.

Fort Seward District.—Ted Webb & Don Johnson operated the Stockton and Manganese Queen mines and consigned manganese ore to a Government low-grade stockpile. Glenn E. Adkisson also

operated the Stockton mine and shipped manganese ore to Utah steel furnaces.

Hayfork District.—George W. Patton (Big Hunk and Little Nellie claims) and Lowell Norgaar (Black Bear and Dry Ridge claims) shipped chromite ore to the Grants Pass, Oreg., Depot. T. C. Kelly recovered gold and silver from ore amalgamated at the Kelly mine.

Island Mountain District.—The Northwestern Pacific Railroad Co. quarried miscellaneous stone at Island Mountain for riprap.

New River District.—Robert M. Gatewood recovered gold from gravel at the Herman Dailey Ranch by hand methods. The Hazel Creek Mining Co. explored for gold ore at the Holy Terror claims during 3 months of 1953.

Trinity River District.—Fairview Placers, eighth largest producer of gold in California in 1953, operated a bucketline dredge equipped with 75 10½-cubic-foot buckets, near Minersville. Hydraulic operations that produced gold and silver included: The Bennett Mining Co., at Big Bar; Betty's Placer (Teddy Sartori), at Minersville; Brown's Creek Placer (C. O. Arbuckle), near Weaverville; Buckeye Placer (Leo Unger), on Buckeye Creek; Rex mine (Perry T. Bennett), at Weaverville; and Guthrie Consolidated mine (Earl & Ellen Larkin), on Canyon Creek. Small lode mines that produced gold and silver by amalgamation were: F. A. Marcellus (Blue Eagle mine), in Garden Gulch; and M. L. Benoist (Chloride & Globe open-pit mine, which yielded 19 ounces of gold and 5 ounces of silver from 50 tons of ore milled), on Little East Fork Creek. G. W. Cordes and F. C. Meckel developed gold ore at the Ralston mine on Canyon Creek. Gold and silver were produced from the following placer mines by sluicing: Big Flat mine (E. J. Hostetter) near Helena and Clipper mine (C. N. Bullard) on Canyon Creek. Floyd Munson & Eric Schoonmacher operated the Mumbo claim near Carrville and shipped chromite ore to the Grants Pass, Oreg., Depot.

TULARE

S. P. Brick & Tile Co. manufactured clay products from miscellaneous clays produced near Exeter. Tulare County Tungsten Mines, operating the Big Jim mine near Exeter, milled company and custom ore and was the largest shipper of tungsten concentrate in the County. Other productive tungsten operations included: Clifford Ash (Sherman Peak mine) and S. D. Crostenburg (Brush Creek No. 1 claim) near Kernville; Wheeler Mining Co., (Wheeler mine) and Claude Rouch (Consolidated (Harrel Hill) mine) near Orosi; Fred Bowers (Christmas mine near Indian Valley); and T. A. Hazelton (Crystal Queen mine), Good Hope Mining Co. (Pioneer mine) and the Buckeye Mining Co. (Buckeye mine) near Three Rivers; and Hilltop Mining Co. (Hilltop mine) near Lemon Cove. Pacific Coast Aggregates, Inc., produced sand and gravel and crushed stone for aggregate at the Lemon Cove No. 133, Lindsay No. 123, and Terminus Beach No. 134 plants. Gravel was prepared by contractors at highway projects in the county. Natural gas was withdrawn from the Trico field, which extends into Kern and Kings Counties, and a small quantity of petroleum was produced in the Deer Creek area. The United States

Department of Interior, Bureau of Reclamation quarried granite for riprap at county projects.

Camp Wishon (Powell) District.—The Bell Mining Co. shipped 2 tons of lead ore containing 137 ounces of silver, 1,534 pounds of lead, and 100 pounds of zinc, to a smelter-fuming plant from the Tule Copper-Cedar Hill claims.

TUOLUMNE

United States Lime Products Corp. produced hydrated lime and quicklime, principally for use in chemical industries, at the Sonora plant from limestone quarried nearby. Limestone was also shipped to glass manufacturers and mineral-food processors. Sonora Marble Aggregates Co. quarried and crushed marble of various colors for use in terrazzo and prepared some limestone for dimension stone. Tuolumne Tungsten Co. shipped 96 tons of dump ore, averaging 0.3 percent WO_3 , from the Montezuma mine 1 mile northeast of Snow Lake to a custom mill. Sand and gravel were produced by Beerman & Jones at Jamestown, and by contractors for road construction at county sites. The Tuolumne Road Department crushed county basalt for aggregate, and granite and sandstone for road metal.

East Belt District.—George & John Miller shipped gold tailing, containing gold and silver, from the Columbus mill to a smelter. Small operations that produced some gold and silver by amalgamating ore included: Gust Nystrom, Hopeful mine; G. C. Joyce, Lady Washington mine; Mel Coeur, Lucky Strike mine; and Evan Tilley, Tiger mine. Harry Gibson explored for gold ore at the Hidden Fortune pocket mine during part of 1953.

Mother Lode District.—Premier Asbestos Co. shipped a carlot of low-grade chrysotile-asbestos ore from the Premier mine near Jamestown to a milling plant for testing. Gold and silver were recovered at the following sporadic lode operations by amalgamation: G. L. Condra, Atlas mine; W. K. Shearer, Heslep mine; Andy Vincasovich, Josephine mine; Ross Harry, Lazar mine; and R. Kartz, Omega and Tarantula mines. Placer gold and silver were obtained from small sluicing operations, which included: H. R. Hollingsworth, Bedrock claims; Frank Tomasivaj, Farlington Ranch; and Ira Hartman, Lucky claims. Chromite from the district was beneficiated but the chromite concentrate produced was not of marketable grade.

VENTURA

Petroleum and natural gas were the principal minerals produced in the county in 1953. The yield of mineral fuels was from an area that traverses the central portion of the county from the eastern border westward to the Pacific Ocean. Natural-gasoline plants were operated in the Ventura field by General Petroleum Co., Shell Oil Co., and Tidewater Associated Oil Co.; at Rincon-Padre by Colina Gasoline Co.; at San Miguelito by Continental Oil Co.; at Grimes Canyon by Union Oil Co. of California; and at Shiells Canyon by The Texas Co. Petroleum refineries of Edington-Oxnard Asphalt Co. and Oxnard Oil & Refinery Co. at Oxnard and those of Superior Asphalt

Co. and Seaside Oil Co. at Ventura had a combined daily crude oil throughput capacity of 9,000 barrels at the close of 1953 compared with 9,500 barrels on January 1, 1953.

Near Ventura, Rocklite Products Co. expanded shale for lightweight aggregate from the company pit, and miscellaneous clays were produced for use in rotary-drilling muds by Shell Oil Co. and Tidewater Associated Oil Co. Monolith Portland Cement Co. quarried 24,490 tons of crude gypsum at the Quatal Canyon property in Cuyama Valley. Western Lime Products Co. quarried shells from the Tapo Alto deposit near Santa Susana for use as calcium carbonate in fertilizer, mineral food, and poultry grit. Saticoy Rock Co., Inc., produced sandstone for base rock and aggregate and prepared sand and gravel at Saticoy. Other producers of sand and gravel were Montalvo Rock Co. at Montalvo and Southern Pacific Milling Co. at Santa Paula. Contractors for the California Division of Highways crushed limestone and prepared gravel for highway use at several sites.

Piru District.—Helber Enterprises hydraulicked a small yardage of gravel at the Live Oak mine on Piru Creek. The project was abandoned after an unsuccessful attempt to separate ilmenite and gold from black-sand concentrate.

YOLO

Pacific Coast Aggregates, Inc., crushed stone and produced sand and gravel at the Yolo No. 131 plant. Sand and gravel were also produced by Madison Sand & Gravel Co. on the Stephens and Harger leases at Madison and by W. C. Railing at Woodland. A. Teichert & Son prepared noncommercial gravel for road projects in the county, and Schwarzgruber & Sons produced gravel at Woodland. Natural gas was withdrawn from the Dunnigan Hills, Fairfield Knolls, Pleasant Creek, Sycamore Slough, and Winters fields. The Winter field extends into Solano County.

YUBA

Browns Valley District.—The Empire Star Mines Co., Ltd., operated the Browns Valley group of mines through the Dannebrog shaft. Gold and silver were recovered at the company Grass Valley mill by cyaniding concentrate produced from the ore.

Yuba River District.—Yuba Consolidated Gold Fields, the second largest producer of gold in California in 1953, operated 1 dredge equipped with 71 6-cubic-foot buckets and 6 dredges, respectively, with 135, 126, 122, 100, and 87 18-cubic-foot buckets, in the Yuba River Basin. Gold, silver, and crude platinum were recovered. Rice Bros., Inc., and Yuba River Sand Co. produced sand and gravel at Marysville. The California Division of Highways and contractors produced gravel noncommercially for highways.

The Mineral Industry of Colorado

By A. J. Martin¹ and F. J. Kelly²



MINERAL production in Colorado, excluding uranium, increased in total dollar value in 1953 for the eighth consecutive year, despite a 38-percent decrease from 1952 in the combined value of the gold, silver, copper, lead, and zinc. These five metals as a group along with coal, had dominated mineral production in the State until molybdenum rose to first place in annual value among the metals in 1942 and petroleum surpassed coal in 1947. Both molybdenum and petroleum made impressive gains in production and value in 1953; in fact, petroleum established a new record high, as several new oil fields in the Denver-Julesburg Basin became important producers. Coal production was nearly the same as in 1952 but was 28 percent under the average for the 5 years 1947-51. Fluorspar, with an output 83 percent above that in 1952, reported the largest percentage increase among the principal nonmetallic minerals.

Since 1949 uranium has become one of the most important minerals produced in the State; and activity in uranium exploration, development, mining, and milling continued unabated throughout 1953. The Atomic Energy Commission extended the expiration date of the guaranteed minimum price schedule for uranium ores of the Colorado Plateau area to cover the period through March 31, 1962, and also extended the period during which a bonus will be paid for initial and certain other production of uranium ores from domestic mines to cover the period through February 28, 1957. Under existing regulations of the Commission, figures on the production of uranium are not available, and therefore the value of the uranium output is not included in the total value of the State mineral production shown in table 1 of this chapter. Also, because of the close connection between uranium and vanadium production, figures for vanadium are not published separately, for security reasons.

The increase over 1952 in production of molybdenum was 56 percent and in shipments 37 percent. The Climax mine in Lake County, the State's only producer during the year, operated at a greatly expanded rate, and the mill treated an average of more than 21,000 tons of ore per working day.

The heavy decline in the overall production of gold, silver, copper, lead, and zinc can be attributed to several factors. The downward trend in the prices of lead and zinc that commenced in the second quarter of 1952 continued into 1953, when the average yearly price of lead was the lowest since 1946 and that of zinc since 1945. The low metal prices, with the cost of labor and materials still high, led

¹ Assistant chief for mineral statistics, Region IV, Bureau of Mines, Denver, Colo.
² Commodity-industry analyst, Region IV, Bureau of Mines, Denver, Colo.

to the closing of a number of mines in addition to those that had shut down in 1952. Although the average price of copper was the highest since 1872, the quantity of this metal produced in Colorado in 1953 was not large. Economic conditions continued to be unfavorable for straight gold or gold-silver mining, as wages and the cost of supplies and equipment have risen greatly since World War II, and there has been no change in the Government-fixed price of gold since 1934 or in that of silver since 1947.

The production of tungsten, mostly recovered as a byproduct from Climax molybdenum ore in Lake County and from tungsten ore in Boulder County, increased 31 percent over 1952. The price for domestic concentrate was sustained at \$63 per short-ton unit under the terms of the Government Domestic Tungsten Program, although the price in imported concentrate dropped to \$32.40 per unit.

Other metallic minerals produced included beryl, columbite-tantalite, bog iron ore, and tin (recovered as a byproduct from molybdenum ore).

The American Smelting & Refining Co. continued to operate its Arkansas Valley custom lead bullion-copper matte smelter at Leadville on ores and concentrates from Colorado and domestic and foreign concentrates, residues from zinc smelters, and other material. The company also operated its Globe smelter in Denver, which treated flue dust, dross, and other byproduct material shipped to it from other company smelters for the recovery of cadmium, indium, and thallium.

The new \$30-million seamless tube mill added to the steelworks of the Colorado Fuel & Iron Corp. at Pueblo was completed and placed in operation in September 1953. The plant as a whole is a large consumer of limestone, coal, and other raw materials mined in Colorado. The iron ore is obtained from company mines in Utah and Wyoming.

Among the principal nonmetallic minerals, fluospar made the largest percentage gain in production over 1952. The increase, amounting to 83 percent, resulted from greatly expanded output in Jackson and Chaffee Counties and a moderate increase in Boulder County. The production of feldspar, mostly from Chaffee County, increased 14 percent.

Sustained or expanded activity in residential, office-building, and highway construction led to increased output of cement, clays, gypsum, perlite, and sand and gravel. Combined shipments of crushed limestone to sugar factories and the steel mill at Pueblo also increased, but the total output of stone (except limestone for cement) decreased owing mainly to the decline in the quantity of crushed sandstone and granite used by Government agencies for constructing dams. Pumice output (all used for concrete aggregate) also decreased. Other non-metallic minerals produced included lepidolite, mica, peat, pyrite, and quartzite.

Many ores contain valuable minor constituents, such as arsenic, bismuth, cadmium, cobalt, nickel, platinum-group metals, selenium, tellurium, and some minor metals, such as gallium and germanium. These quantities sometimes are not known and sometimes, though known by analyses, are not accounted for metallurgically in early processing stages, or credited to the mine of origin. These minor constituents are recovered at plants, frequently treating mixtures of materials from

TABLE 1.—Mineral production in Colorado, 1952-53 ¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Beryllium concentrate.....gross weight..	54	\$24, 588	75	\$39, 215
Clays.....	568, 730	1, 087, 154	777, 969	1, 429, 780
Coal.....	3, 623, 015	19, 215, 657	3, 574, 850	19, 197, 732
Copper (recoverable content of ores, etc.).....	3, 606	1, 745, 304	2, 941	1, 688, 134
Feldspar.....long tons.....	38, 268	224, 385	43, 508	267, 642
Fluorspar.....	29, 185	1, 505, 968	53, 276	2, 872, 360
Gold (recoverable content of ores, etc.).....troy ounces.....	124, 594	4, 360, 790	119, 218	4, 172, 630
Gypsum.....	(?)	(?)	62, 936	233, 043
Iron ore (usable).....long tons, gross weight.....			900	3, 825
Lead (recoverable content of ores, etc.).....	30, 066	9, 681, 252	21, 754	5, 699, 548
Manganiferous ore (5 to 35 percent Mn) gross weight.....	76	(?)		
Mica (scrap).....	(?)	(?)	1, 599	19, 455
Molybdenum (content of ore and concentrate) pounds.....	24, 557, 149	(?)	33, 851, 083	(?)
Natural gas.....million cubic feet.....	34, 260	1, 884, 000	28, 509	1, 654, 000
Peat.....	2, 312	20, 230	6, 067	(?)
Petroleum (crude).....thousand 42-gallon barrels.....	30, 381	77, 470, 000	36, 402	98, 650, 000
Pumice and pumicite.....	(?)	(?)	47, 919	99, 700
Sand and gravel.....	8, 461, 039	6, 268, 367	12, 438, 600	8, 609, 151
Silver (recoverable content of ores, etc.).....troy ounces.....	2, 813, 643	2, 546, 489	2, 200, 317	1, 991, 398
Stone (except limestone for cement and lime).....	1, 708, 872	2, 566, 401	4, 883, 646	1, 741, 926
Tin (content of ore and concentrate).....long tons.....	13	33, 723	(?)	(?)
Tungsten concentrate.....60-percent WO ₃ basis.....	625	2, 354, 664	817	2, 902, 490
Zinc (recoverable content of ores, etc.).....	53, 203	17, 663, 396	37, 809	8, 696, 070
Undistributed: Carbon dioxide (1952-53), cement, columbium-tantalum concentrate, gem stones, lithium minerals (1953), natural-gas liquids, perlite, pyrites, stone (crushed basalt, 1953), vanadium, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2). Excludes value of clays for cement.....		\$ 38, 936, 141		51, 617, 866
Total Colorado.....		187, 589, 000		211, 586, 000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

² Value included with "Undistributed."

³ Final figure. Supersedes preliminary figure given in Petroleum and Petroleum Products chapter, vol. II.

⁴ Excludes certain stone, value for which is included with "Undistributed."

⁵ Revised figure.

TABLE 2.—Average prices of certain mineral commodities in Colorado, 1952-53 ¹

Commodity	1952	1953
Beryl.....short ton..	\$451. 63	\$522. 867
Clay:		
Fire.....do.....	2. 621	2. 647
Other.....do.....	1. 273	1. 362
Coal.....do.....	5. 304	5. 369
Copper ² (recoverable content of ores).....pound.....	. 242	. 287
Feldspar.....long ton.....	5. 864	6. 152
Fluorspar.....short ton.....	51. 601	53. 915
Gold ³ (recoverable content of ores).....troy ounce.....	35. 000	35. 000
Lead ³ (recoverable content of ores).....pound.....	. 161	. 131
Petroleum ⁴.....42-gallon barrel.....	2. 550	2. 710
Sand and gravel (commercial).....short ton.....	1. 010	1. 004
Silver ⁵ (recoverable content of ores).....troy ounce.....	. 905	. 905
Stone:		
Dimension.....short ton.....	10. 840	14. 417
Crushed and miscellaneous.....do.....	1. 429	1. 643
Tungsten short-ton unit, contained in 60-percent WO ₃ concentrate.....	62. 756	59. 190
Zinc ³ (recoverable content of ores).....pound.....	. 166	. 115

¹ Prices are based on average value f. o. b. mines or mills reported by the producers, except as otherwise noted.

² Yearly average weighted price of all grades of primary metal sold by producers.

³ Price under authority of Gold Reserve Act of January 31, 1934.

⁴ Value at wells.

⁵ Treasury buying price for newly mined silver July 1, 1946 to date—\$.9050505 (\$.905 used in 1947 for calculating purposes).

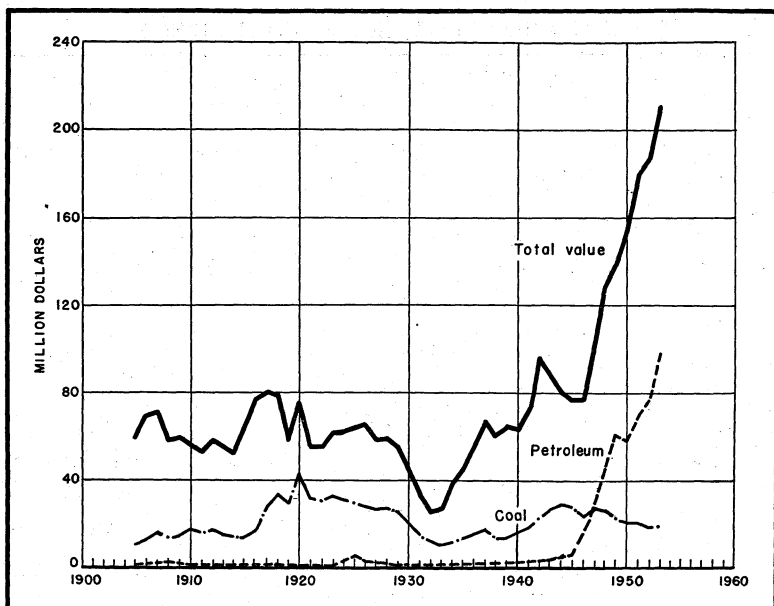


FIGURE 1.—Total value of all minerals produced in Colorado, excluding uranium from 1941-53, and value of coal and petroleum, 1905-53.

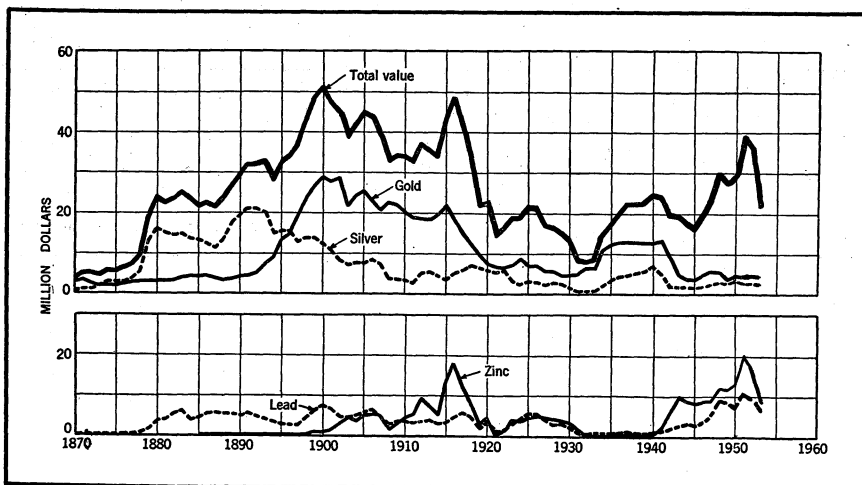


FIGURE 2.—Value of mine production of gold, silver, lead, and zinc and total value of gold, silver, copper, lead, and zinc in Colorado, 1870-1953. The value of copper has been less than \$2,000,000 annually, except in a few years.

many sources, including residues from the refining of metals such as copper, lead, and others and in other ways. It is not possible in many such instances to distribute the mineral products by States of origin, and in some instances it is even difficult to obtain an accurate separation as to domestic and foreign sources. Another mineral product of value, the production of which usually can not be separated as to source, is byproduct sulfuric acid.

DEFENSE MINERALS EXPLORATION PROJECTS

The Government, through the Defense Minerals Exploration Administration (DMEA), continued to aid in financing exploration in search of strategic and critical minerals. The list of minerals eligible for aid and the percentage of Government participation for some of the minerals were revised in 1953 under Amendment 2 to DMEA Order 1, effective May 15, and Amendment 3, effective November 3. Details of projects undertaken in Colorado from the beginning in 1951 through 1952 are given in Minerals Yearbook, 1952, volume III, Colorado chapter. Table 3 of this chapter gives details for 1953.

TABLE 3.—DMEA contracts in Colorado in 1953 and total value of contracts from January 1951 through December 31, 1953

Name of commodity and contractor	Property	County	Date of contract	Participation	
				Government	Private
<i>Beryl</i>					
Ben Waltz & Kenneth R. Hewitt.	Switzer lode-mining claim. U. S. Survey 6149.	Jefferson	May 25, 1953	\$5,760	\$640
<i>Copper-lead</i>					
Mariposa Mining Co., Inc.	30 patented mining claims.	San Miguel	July 24, 1953	10,600	10,600
<i>Copper-lead-zinc</i>					
Shenandoah-Dives Mining Co.	Silver Lake Group, letter "G" vein.	San Juan	June 26, 1953	105,950	105,950
<i>Lead-uranium</i>					
Intercounty Corp.	German mine	Gilpin	Mar. 24, 1953	17,100	1,900
<i>Lead-zinc</i>					
S. E. and W. E. Bursleson	Antoro mine	Saguache	Feb. 24, 1953	13,300	13,300
Robert F. Blum	The unpatented Jean lode-mining claim.	Clear Creek	July 10, 1953	1,400	1,400
Myron L. Jones, L. M. Jones, Paul R. Jones, & E. M. Lill.	2 patented and 2 unpatented mining claims.	Dolores	Feb. 24, 1953	4,130	4,130
Silver Bay mines	Black Hawk & Occidental.	San Juan	Apr. 12, 1953	14,550	14,550
Mike Vinson & Fred Harris.	The Chataqua Lode, U. S. Survey No. 82 & 3 unpatented mining claims.	Summit	Apr. 15, 1953	18,800	18,800
<i>Thorium-rare-earth-columbium-tantalum</i>					
Rare Earth Mining Co.	14 unpatented lode-mining claims.	Gunnison	Oct. 29, 1953	32,070	3,568
<i>Tungsten</i>					
Paul H. Bennett		Boulder	July 21, 1953	6,150	2,050
Galtie Boy Mines, Inc.	8 patented lode-mining claims.	San Juan	Oct. 2, 1953	9,000	3,000
George Jump	Good Friday mine	Boulder	Oct. 14, 1953	13,635	4,545
U. S. Tungsten, Inc.	Little Ema, U. S. Survey No. 7749; Hubernite, Hubernite No. 2 & No. 3 claims.	Gunnison	July 10, 1953	7,331	2,444
Stanley Larson & Robert C. Plummer.	Vasco claims, Nederland mining district.	Boulder	Feb. 17, 1953	15,250	1,750

¹ Amended contract.

TABLE 3.—DMEA contracts in Colorado in 1953 and total value of contracts from January 1951 through December 31, 1953—Continued

Name of commodity and contractor	Property	County	Date of contract	Participation	
				Government	Private
<i>Uranium</i>					
Gamblin & Knowles.....	Lee Mack claim & Blue Bell claim.	San Miguel.	Oct. 21, 1953	\$1,160	\$129
Gold Bar Mines, Inc.....	Elizabeth M. Lode, Martin E., Daisy Freeze, Orton & Bell claims.	Clear Creek.	Feb. 4, 1953	6,984	776
Woodrow E. Gripe.....	2 lode mining claims.....	San Miguel.	July 13, 1953	9,225	1,025
Mack Mining Co.....	12 unpatented mining claims.	.....do.....	May 27, 1953	10,332	1,148
Clarence Louis Neilson.....	4 mining claims.....	.....do.....	Oct. 30, 1953	11,363	1,263
Fred Schwartzwalder.....	Ralston Creek mine.....	Jefferson	Sept. 2, 1953	20,700	2,300
J. R. Simplot Co.....	45 mining claims.....	Montrose	Sept. 8, 1953	50,870	5,652
Do.....	Peanut mining claims.....	.....do.....	Dec. 21, 1953	88,777	9,864
W. L. Weaver.....	End of Trail No. 2.....	Garfield.....	Feb. 12, 1953	1,800	200
Total, 1953.....				456,237	200,984
Total of contracts through Dec. 31, 1952.....				1,138,073	711,899
Grand total through 1953.....				1,594,310	912,883

REVIEW BY MINERAL COMMODITIES

METALS

Beryl.—The Colorado production of beryl in 1953 came from scattered pegmatite deposits, most of which also yielded feldspar or feldspar and mica and some columbium-tantalum ore. Beryl output increased 39 percent over 1952. The Beryl Ores Co. near Arvada bought beryl and byproducts of beryl mining and operated plant for grinding beryl and preparing and blending it for the ceramic trade. The company also prepared small lots of beryllium compounds on order. The Government, through the General Services Administration Purchase Depot at Custer, S. Dak., bought some Colorado beryl under the mica-purchasing program for stockpiling. The Government purchased additional beryl for shipment elsewhere. To be purchased by the depot at Custer, ore had to contain not less than 8 percent beryllium oxide, be clean crystal, and cobbed free of waste. The prices paid were \$40 a unit for ore containing 8.0 to 8.9 percent BeO; \$45 for 9.0 to 9.9 percent; and \$50 for 10 percent. In 1953 production of beryl was reported in Clear Creek, Fremont, Gunnison, Jefferson, and Larimer Counties.

Cadmium, Indium, and Thallium.—These metals were recovered at the Globe smelter of the American Smelting & Refining Co. in Denver from flue dust, dross, and other byproduct material shipped to it from other company smelters.

Columbium and Tantalum.—Columbium-tantalum ore in lots ranging from 57 to 1,072 pounds was shipped in 1953 from pegmatite deposits in Jefferson County. Part of the ore was sold to the Beryl Ores Co. near Arvada, and part was shipped to a Government purchasing depot at Custer, S. Dak., operated by the General Services

Administration. The prices paid under the Government guaranteed purchase program include a 100-percent incentive bonus to producers. Lots of less than 2,000 pounds containing 50 percent combined Cu_2O and Ta_2O_5 were purchased at a flat rate of \$1.70 per pound of ore or concentrate (equivalent to \$3.40 per pound of contained pentoxide). Additional details of the Government purchase program and a review of domestic production, consumption, uses, and other data are published in volume I of this series.

Copper.—The copper produced in Colorado in 1953, totaling 2,941 tons compared with 3,606 tons in 1952, was derived mostly from complex ores of gold, silver, copper, lead, and zinc. Only 172 tons of straight copper ore was shipped in 1953. Complex ores from San Miguel and Ouray Counties yielded 75 percent of the State copper and other ores 25 percent. The Idarado Mining Co., which made a copper concentrate from complex gold-silver-copper-lead-zinc ore mined in San Miguel County, continued to be the only substantial producer of copper in the State.

Gold (and Ores of Gold, Silver, Copper, Lead, and Zinc).—Economic conditions continued to be unfavorable for straight gold or gold-silver mining, as wages and the cost of supplies and equipment have risen greatly since World War II, and there has been no change in the Government-fixed price of gold since 1934 and of silver since 1947. Gold production in Colorado in 1953 totaled 119,200 fine ounces compared with 124,600 ounces in 1952. The Cripple Creek district, producing straight gold ore, contributed 43 percent of the State total gold in 1953. Other formerly important gold-producing districts in Boulder, Clear Creek, Gilpin, La Plata, Park, and Rio Grande Counties remained idle or had only scattered small-scale operations. The Upper San Miguel and Iron Springs districts in San Miguel County, producing complex ore carrying commercial quantities each of gold, silver, copper, lead, and zinc, supplied 34 percent of the total gold, and the Leadville district, also producing mostly complex ore, with lead and zinc predominating, contributed 8 percent. The remaining 15 percent came mostly from complex and base-metal ores from Eagle, Ouray, San Juan, and Mineral Counties. Placer gold produced totaled only 1,600 ounces, of which 1,500 ounces was recovered as a byproduct at sand and gravel plants in Adams and Jefferson Counties.

The leading gold-producing properties, in order of rank, were: Treasury Tunnel-Black Bear group (Idarado) in San Miguel County, Ajax group (Golden Cycle Corp.) at Cripple Creek, Smuggler Union (Telluride Mines) at Telluride, Cresson mine at Cripple Creek, and Resurrection at Leadville. These 5 properties produced 67 percent of the total gold.

Gold and silver occur to some extent in virtually all lead, zinc, and copper ores mined in Colorado and were important accessory products at most mines. The total value of the gold, silver, copper, lead, and zinc decreased from \$35,997,000 in 1952 to \$22,247,800 in 1953. The lower prices for lead and zinc in 1953 explained part of the decreased value, but production of all five metals also decreased. Details of the State output of ore and of each of the metals, by months and by counties, are given in tables 4, 5, 6, and 7.

TABLE 4.—Mine production of gold, silver, copper, lead, and zinc, 1944-48 (average), 1949-53, and total, 1858-1953, in terms of recoverable metals ¹

Year	Mines producing		Material sold or treated ² (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1944-48 (average)	237	28	1,470,856	137,617	\$4,746,588	2,456,885	\$2,006,498
1949	255	27	1,262,355	102,618	3,591,630	2,894,886	2,620,018
1950	202	30	1,372,744	130,390	4,563,650	3,492,278	3,160,688
1951	196	21	1,578,466	116,503	4,077,605	2,787,882	2,523,174
1952	171	20	1,548,815	124,594	4,360,790	2,813,643	2,546,489
1953	118	19	1,204,517	119,218	4,172,630	2,200,317	1,991,398
1858-1953			(³)	39,974,347	892,979,109	750,184,348	585,451,685

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1944-48 (average)	1,747	\$630,508	19,123	\$4,772,548	39,157	\$9,509,462	\$21,665,604
1949	2,403	946,782	26,853	8,485,548	47,703	11,830,344	27,474,322
1950	3,141	1,306,656	27,007	7,291,890	45,776	13,000,384	29,323,268
1951	3,212	1,554,608	30,336	10,496,256	55,714	20,279,896	38,931,539
1952	3,606	1,745,304	30,066	9,681,252	53,203	17,663,396	35,997,231
1953	2,941	1,688,134	21,754	5,699,548	37,809	8,696,070	22,247,780
1858-1953	270,462	75,427,185	2,641,737	294,951,999	1,663,312	296,120,392	2,144,930,370

¹ Includes recoverable metal content of gravel washed (placer operations), ore milled, old tailings or slimes re-treated, and ore, old slag, or tailings shipped to smelters during the calendar year indicated.

² Does not include gravel washed.

³ Figure not available.

TABLE 5.—Mine production of gold, silver, copper, lead, and zinc in 1953, by months, in terms of recoverable metals ¹

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January	10,277	188,324	242	2,265	4,347
February	9,329	182,835	257	2,223	4,177
March	10,417	175,060	242	2,138	3,907
April	9,222	201,324	309	1,974	4,162
May	10,532	205,106	279	1,918	3,608
June	10,370	138,152	97	1,550	3,300
July	9,946	181,247	277	1,640	3,339
August	10,180	222,365	243	1,995	2,977
September	9,467	181,910	229	1,593	1,344
October	9,149	174,887	237	1,420	1,300
November	10,111	146,416	247	1,434	2,439
December	10,218	202,691	282	1,604	2,909
Total	119,218	2,200,317	2,941	21,754	37,809

¹ Mine production comprises ore, gravel, or other mineral material sold or treated and metal recovered as natural gold or as bullion from cyanidation or amalgamation and the estimated recoverable metals (or gross metal as indicated) contained in concentrates, ores, tailings, and other mineral materials shipped directly to smelters or sold to ore buyers within the year.

TABLE 6.—Gold and silver produced at placer mines, 1944-48 (average) and 1949-53, in fine ounces, in terms of recoverable metals

Year	Small-scale hand methods ¹		Hydraulic		Gravel mechanically handled				Total	
					Nonfloating washing plants ²		Bucketline and dragline dredges			
	Gold	Silver	Gold	Silver	Gold	Silver	Gold	Silver	Gold	Silver
1944-48 (average).....	130	28	15	4	660	115	11,042	2,142	11,847	2,289
1949.....	137	33	-----	-----	775	116	12,231	2,652	13,143	2,801
1950.....	83	21	-----	-----	1,246	196	18,084	3,522	19,413	3,739
1951.....	30	7	-----	-----	(³)	(³)	³ 13,563	³ 2,288	13,593	2,295
1952.....	28	7	-----	-----	(³)	(³)	³ 2,152	³ 338	2,180	345
1953.....	37	11	-----	-----	1,046	159	546	75	1,629	245

¹ Includes all operations in which hand labor is principal factor in delivering gravel to sluices, long toms, dip boxes, pans, rockers, dry washers, etc.

² Includes all placer operations using power excavator and washing plant, both on dry land; when washing plant is movable, outfit is termed "dry-land dredge."

³ Production by nonfloating washing plants included with that by bucketline dredges; Bureau of Mines not at liberty to publish separately.

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in 1953, by counties, in terms of recoverable metals

County	Mines producing		Material sold or treated (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
Adams.....	-----	5	-----	1,218	\$42,630	175	\$158
Boulder.....	7	1	1,312	131	4,585	24,332	22,022
Chaffee.....	2	-----	249	284	9,940	664	601
Clear Creek.....	16	1	16,454	2,306	80,710	51,853	46,930
Custer.....	3	-----	123	3	105	337	305
Dolores.....	1	-----	40,199	95	3,325	103,908	94,042
Eagle.....	1	-----	203,960	3,750	131,250	581,100	525,925
Gilpin.....	6	4	514	153	5,530	975	882
Gunnison.....	3	-----	423	124	4,340	884	800
Hinsdale.....	2	-----	9	1	35	64	58
Jefferson.....	1	4	170	319	11,165	132	119
Lake.....	10	1	98,507	9,345	327,075	196,263	177,628
La Plata.....	1	-----	3	202	7,070	163	148
Mineral.....	2	-----	37,372	1,257	43,995	173,966	157,448
Ouray.....	4	-----	53,054	3,224	112,840	91,975	83,242
Park.....	2	3	2,086	1,470	51,450	7,659	6,932
Pitkin.....	3	-----	264	1	35	4,392	3,975
Saguache.....	2	-----	899	136	4,760	4,666	4,223
San Juan.....	12	-----	55,943	2,696	94,360	122,462	110,834
San Miguel.....	6	-----	501,815	40,416	1,414,560	776,486	702,759
Summit.....	15	-----	14,063	523	18,305	47,826	43,285
Teller.....	19	-----	177,098	51,559	1,804,565	10,035	9,082
Total: 1953.....	118	19	1,204,517	119,218	4,172,630	2,200,317	1,991,398
1952.....	171	20	1,548,815	124,594	4,360,790	2,813,643	2,546,489

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in 1953, by counties, in terms of recoverable metals—Continued

County	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
Adams.....							\$42,788
Boulder.....	8	\$4,592	100	\$26,200			57,399
Chaffee.....	1	574	11	2,882	16	\$3,680	17,677
Clear Creek.....	24	13,776	440	115,280	93	21,390	278,086
Custer.....			10	2,620	6	1,380	4,410
Dolores.....	18	10,332	1,871	490,202	2,634	605,820	1,203,721
Eagle.....	440	252,560	2,500	655,000	16,850	3,875,500	5,440,235
Gilpin.....	1	574	2	524			7,510
Gunnison.....			10	2,620			7,760
Hinsdale.....			1	262	1	230	585
Jefferson.....	3	1,722					13,006
Lake.....	59	33,866	3,072	804,864	3,945	907,350	2,250,783
La Plata.....							7,218
Mimral.....	12	6,888	1,696	444,352	858	197,340	850,023
Ouray.....	254	145,796	1,360	356,320	864	198,720	896,918
Park.....	13	7,462	33	8,646	275	63,250	137,740
Pitkin.....			9	2,358	2	460	6,823
Saguache.....	6	3,444	36	9,432			21,859
San Juan.....	136	78,064	1,479	387,498	632	145,360	816,116
San Miguel.....	1,950	1,119,300	7,924	2,076,088	10,433	2,399,590	7,712,297
Summit.....	16	9,184	1,200	314,400	1,200	276,000	661,174
Teller.....							1,813,647
Total: 1953.....	2,941	1,688,134	21,754	5,699,548	37,809	8,696,070	22,247,780
1952.....	3,606	1,745,304	30,066	9,681,252	53,203	17,663,396	35,997,231

The total tonnage of ores and cleanup material yielding gold, silver, copper, lead, and zinc mined or shipped from dumps in Colorado in 1953 decreased 22 percent from 1952 and was the lowest since 1933. With the continued high cost of labor and materials, the prices of all five metals except copper (a minor constituent in most of the ores) remained too low to provide the incentive needed for operating many of the equipped mines or for exploring and developing new properties. Available new capital was directed almost wholly to development of mines yielding uranium, tungsten, or other metals bought by the Government at incentive prices guaranteed over a period of years. The total number of lode and placer mines, prospects, and dumps that contributed to the output of gold, silver, copper, lead, and zinc decreased from 191 in 1952 to 137 in 1953, the smallest number recorded during the 50 years (1904-53) for which figures are available. The average number per year for the 50-year period was 641. The average value of the output per mine, however, was \$162,393 in 1953 (including mines, prospects, dumps, and placers) compared with \$39,977 in the preceding 50 years, reflecting the trend toward mechanization and larger scale operations.

The bulk of the straight gold ore produced in 1953 came from the Cripple Creek district and was treated in the 1,000-ton Carlton flotation-cyanidation mill of the Golden Cycle Corp. The lead-zinc and complex gold-silver-copper-lead-zinc ores came largely from the Battle Mountain (Gilman) and Leadville districts and the San Juan region. In the Leadville district the Resurrection Mining Co., principal producer since 1942, suspended company mining operations as of July 3, 1953, but ran the mill the latter part of the year on

ore produced by lessees; in the Animas district, San Juan region, the Shenandoah-Dives Mining Co., principal operator for more than 20 years, was closed in March. The base-metal and complex ores were treated in flotation mills, some of which used jigs in the ball-mill-classifier circuit to recover coarse gold for amalgamation. A total of 26 mills was in operation in the State all or part of the year; the daily capacity of 2 of the mills was under 50 tons, 18 ranged from 50 to 300 tons, and 6 from 600 to 1,200 tons.

The principal market for Colorado lead, copper-lead, and siliceous gold-silver concentrates and direct-smelting ores was the Arkansas Valley smelter of the American Smelting & Refining Co. at Leadville. A market for custom lead-zinc milling ore was provided throughout the year by the Resurrection Mining Co. mill at Leadville and from January to March 15 by the Shenandoah-Dives Mining Co. mill at Silverton. Several scattered small mills treated custom ore on the basis of a fixed charge per ton. Custom mills and smelters in the Salt Lake Valley, Utah, purchased lead-zinc milling ores and lead concentrates from some Colorado areas. Copper concentrates and ore were sold to smelters at Garfield, Utah, and El Paso, Tex. Zinc concentrates were shipped to smelters at Amarillo and Corpus Christi, Tex.; Depue, Ill.; Palmerton, Pa.; and Great Falls, Mont.

The tonnage of ore treated and the yield in metals by class or type of ore and by method of recovery are given in tables 8 to 10.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1953, by classes of ore or other source materials, in terms of recoverable metals

Source	Number of mines ¹	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode ore:							
Dry gold.....	35	182,034	53,521	14,254	3,240	11,813	-----
Dry gold-silver.....	13	48,616	1,845	68,887	209,030	807,550	310,490
Dry silver.....	9	22,619	3,177	479,152	838,700	163,557	4,000
Total.....	57	253,269	58,543	562,293	1,050,970	982,920	314,490
Copper.....	2	172	15	118	6,200	-----	-----
Lead.....	33	24,542	1,785	126,985	97,700	3,504,190	37,800
Lead-zinc ²	28	734,900	55,016	1,316,856	4,656,930	33,845,990	41,015,710
Zinc.....	2	187,106	2,092	184,173	70,000	5,004,200	34,250,000
Total.....	65	946,720	58,908	1,628,132	4,830,830	42,354,380	75,303,510
Other "lode" material:							
Assay sweeps.....		(3)	73	-----	-----	-----	-----
Cleanings (gold).....		4	11	7	-----	-----	-----
Mill cleanings (gold).....		(3)	1	-----	-----	-----	-----
Mill cleanings (lead).....		8	19	382	200	1,700	-----
Old slag (lead).....		4,516	34	9,258	-----	169,000	-----
Total.....		4,528	138	9,647	200	170,700	-----
Total "lode" material.....	118	1,204,517	117,589	2,200,072	5,882,000	43,508,000	75,618,000
Gravel (placer operations).....	19	-----	1,629	245	-----	-----	-----
Total, all sources.....	137	1,204,517	119,218	2,200,317	5,882,000	43,508,000	75,618,000

¹ Detail will not add to totals because some mines produce more than 1 class of ore.

² Includes copper-lead-zinc ore, for which the Bureau of Mines is not at liberty to publish separate figures.

³ Less than 1 ton.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1953, by methods of recovery and types of material processed, in terms of recoverable metals

Type of material processed and method of recovery	Material treated (short tons)	Recoverable metals				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode:						
Amalgamation:						
Ore.....	(¹)	20,631	8,715	-----	-----	-----
Mill cleanings (gold).....	(²)	1	-----	-----	-----	-----
Total.....	(¹)	20,632	8,715	-----	-----	-----
Cyanidation:						
Ore.....	177,098	51,122	9,692	-----	-----	-----
Assay-office cleanings.....	(²)	73	-----	-----	-----	-----
Total.....		51,195	9,692	-----	-----	-----
Total recoverable in bullion.....		71,827	18,407	-----	-----	-----
Concentration, and smelting of concentrates ³						
.....	998,801	42,040	1,677,110	5,031,790	41,943,640	75,618,000
Direct smelting:						
Ore.....	24,090	3,658	494,908	850,010	1,393,660	-----
Cleanings (gold).....	4	11	7	-----	-----	-----
Mill cleanings (lead).....	8	19	382	200	1,700	-----
Old slag (lead).....	4,516	34	9,258	-----	169,000	-----
Total.....	28,618	3,722	504,555	850,210	1,564,360	-----
Placer.....	(⁴)	1,629	245	-----	-----	-----
Grand total.....	1,204,517	119,218	2,200,317	5,882,000	43,508,000	75,618,000

¹ Not available; part of the material amalgamated was a hutch product from jigs in ball-mill-classifier circuits used in some flotation mills.

² Less than 1 ton.

³ Ore only; no old tailings, etc., processed by this method in Colorado in 1953.

⁴ Not available.

⁵ Excluding placer gravel.

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1953, by classes of concentrate and crude material, in terms of recoverable metals

Class of material	Concentrate shipped to smelters ¹ and recoverable metal					
	Short tons	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Copper.....	6,879	6,834	127,613	2,820,800	300,000	127,800
Lead and lead-copper.....	37,697	31,656	1,408,440	1,551,425	40,142,980	24,650
Zinc.....	80,546	2,684	136,845	657,705	1,482,780	75,449,850
Other ²	549	866	4,212	1,860	17,880	15,700
Total: 1953.....	125,671	42,040	1,677,110	5,031,790	41,943,640	75,618,000
1952.....	177,657	54,162	2,550,667	6,818,852	57,963,775	106,392,255
	Crude material shipped to smelters					
Dry gold, dry gold-silver ore.....	46	295	503	900	600	-----
Dry silver ore.....	20,170	3,116	452,709	836,100	110,900	-----
Copper ore.....	2	12	38	200	-----	-----
Lead:						
Crude ore.....	3,876	246	41,665	12,810	1,282,160	-----
Mill cleanings and old slag.....	4,524	53	9,640	200	170,700	-----
Total: 1953.....	28,618	3,722	504,555	850,210	1,564,360	-----
1952.....	22,691	1,817	245,220	393,148	2,168,225	13,745

¹ Excludes concentrates treated only by amalgamation or cyanidation.

² Dry gold, 266 tons; dry silver, 10 tons; dry iron (from lead-zinc ore), 273 tons.

TABLE 11.—Mine production of gold, silver, copper, lead, and zinc in 1958, by counties and districts, in terms of recoverable metals

County and district	Mines producing		Material sold or treated (short tons)	Gold (fine ounces)			Silver (fine ounces)			Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
	Lode	Placer		Lode	Placer	Total	Lode	Placer	Total				
Adams County.....	5											\$42,788	
Boulder County 1.....	7	1	1,312	1,218	1,218	175	175	175	2,160,000	2,200,000		57,399	
Chaffee County.....				26	131	3	24,329	3	24,332	2,000	22,000	32,000	17,500
Chalk Creek.....	1		247	279	279	662	662	662				177	
Granite.....	1		2	5	5	2	2	2					
Clear Creek County:													
Argentine.....	2		7,034	464	464		18,348		28,700	596,700		119,251	
Empire.....	1		52	6	6		16,103		1,400	155,300		57,623	
Griffith.....	2		1,249	16	16		16,609		16,000	155,200		80,044	
Idaho Springs.....	6	1	5,064	33	1,639	5	9,311	5	16,000	74,000	800	4,072	
Montana.....	2		580	28	1,568		6,909		1,100	30,200		16,154	
Trail Creek or Freeland (Lamartine).....	3		2,475	153	153		6,337		36,000	3,742,000	12,000	4,410	
Custer County: Hardscrabble.....	3		40,199	95	95		103,908		880,000	3,000,000	5,268,000	1,203,721	
Dolores County: Pioneer.....	1		203,960	3,750	3,750		581,100		2,000	8,800	33,700,000	5,440,255	
Eagle County: Red Cliff.....	1												
Gilpin County:													
Southern.....	4	4	466	125	148		945	6	951	3,800		7,112	
Northern.....	2		48	10	10		24		24	200		398	
Gunnison County:													
Gold Brick.....	1		400	124	124		345		345	1,700		4,875	
Rock Creek.....	2		23				539		539	18,300		2,885	
Hinsdale County:													
Galena.....	1		8									544	
Lake.....	1		1				57		57	2,000	2,000	41	
Jefferson County.....	1	4	170	3	316		80	52	6,000			13,006	
Lake County:													
California (Leadville).....	9	1	98,502	9,321	9,328		196,239	1	196,240	118,000	6,143,200	2,250,082	
Twin Lakes.....	1		5	17	17		23		23	800		7,218	
La Plata County: California.....	1		202	3	202		163		163	24,000	1,715,000	850,033	
Mineral County: Creede.....	2		37,372	1,257	1,257		173,966		173,966	508,000	2,720,000	806,918	
Ouray County: Red Mountain and Sneffels.....	2		53,054	3,224	3,224		91,975		91,975				
Park County:													
Alma Placers-Fairplay.....	1			2	2			1	1			71	
Beaver Creek.....	1			1	1			1	1			26	
Buckskin.....	1		2,080	1,454	1,457		7,603	1	7,604	26,000	550,000	137,285	
Consolidated Montgomery.....	1		6	10	10		53		53			398	
Pitkin County:													
Ashcroft.....	1						109		109	1,700	4,000	6,506	
Roaring Fork.....	2		261				4,283		4,283				
Saguache County:													
Crystal Hill.....	1		615	130	130		80		80			4,622	
Kerber Creek.....	1		284	6	6		4,586		4,586	72,000		17,287	

For footnotes, see end of table.

TABLE 11.—Mine production of gold, silver, copper, lead, and zinc in 1953, by counties and districts, in terms of recoverable metals—Continued

County and district	Mines producing		Material sold or treated (short tons)	Gold (fine ounces)			Silver (fine ounces)			Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
	Lode	Placer		Lode	Placer	Total	Lode	Placer	Total				
San Juan County:													
Animas.....	9	-----	51,757	2,225	-----	2,225	99,619	-----	99,619	248,500	2,424,000	1,081,600	\$881,283
Eureka.....	3	-----	4,186	471	-----	471	22,843	-----	22,843	23,500	534,000	182,400	134,833
San Miguel County: Iron Springs and Upper San Miguel ¹	6	-----	501,815	40,416	-----	40,416	776,486	-----	776,486	3,900,000	15,848,000	20,866,000	7,712,297
Summit County:													
Breckenridge.....	4	-----	11,689	504	-----	504	34,623	-----	34,623	29,200	2,112,600	2,400,000	610,107
Montezuma and Ten Mile ²	11	-----	2,374	19	-----	19	13,203	-----	13,203	2,800	287,400	-----	51,067
Teller County: Cripple Creek.....	19	-----	177,098	51,559	-----	51,559	10,035	-----	10,035	-----	-----	-----	1,813,647
Total Colorado.....	118	19	1,204,517	117,589	1,629	119,218	2,200,072	245	2,200,317	5,882,000	43,508,000	75,618,000	22,247,780

¹ Includes Central, Gold Hill, Grand Island, Magnolia, and Ward districts. Bureau of Mines not at liberty to show production figures separately by districts.

² Includes amounts recovered from lead-silver-gold-copper concentrates produced as byproduct of beneficiation of fluorspar at 2 plants.

³ Bureau of Mines not at liberty to show production figures separately by districts.

Iron Ore.—During the latter half of 1953 bog iron ore was shipped from the Robinson mine near Old Ophir, San Miguel County, to buyers outside the State. Ore for the steel mill of the Colorado Fuel & Iron Corp. at Pueblo was obtained from mines in Utah and Wyoming.

Lead.—With the average yearly price of lead at its lowest since 1946 (and that of zinc since 1945), the Colorado production of recoverable lead in 1953 decreased to 21,800 short tons from 30,100 tons in 1952. The lead price at the beginning of 1953 was 14.75 cents a pound, the low for the year was 12 cents quoted from April 20–28, and the quotation at the year end was 13.5 cents. A number of the mines, including two of the larger producers, shut down during the year.

Lead-zinc and copper-lead-zinc ores, all containing gold and silver along with the base metals, yielded 78 percent of the State total lead; zinc ore, 12 percent; lead ore, 8; and gold and silver ores and cleanup material, 2 percent. San Miguel County contributed 36 percent of the total lead, Lake 14 percent, Eagle 11, Dolores 9, Mineral 8, San Juan 7, Ouray and Summit each 6, and 10 other counties together 3 percent. The larger lead-producing mines, in order of output, were the Treasury Tunnel-Black Bear group (Idarado) in San Miguel County, Resurrection group at Leadville, Smuggler Union (Telluride Mines) at Telluride, Eagle (Empire Zinc) in Eagle County, and Rico Argentine group at Rico in Dolores County.

Manganese Ore.—Small tonnages of manganese ore were shipped from Lake, La Plata, and Routt Counties to the Government Purchase Depot at Deming, N. Mex.

Molybdenum.—The Climax mine of the Climax Molybdenum Co. on Fremont Pass in Lake County, which produced all the Colorado output of molybdenum in 1953, was by far the largest mine in the State, both in tonnage of ore mined and in value of metals recovered. Because of the importance of molybdenum in the manufacture of armament for national defense, the Government has entered into contracts with Climax under which facilities have been expanded to provide for the production of molybdenum for the National Strategic Stockpile, in addition to that produced for established markets. From a rated capacity of 15,000 tons daily in 1950, the mill capacity was increased to 25,000 tons by the end of 1953. The tailings from the mill were re-treated in a separate plant for recovery of byproducts, including tungsten concentrate, pyrite, and tin concentrate; the capacity of the byproduct plant was 20,000 tons daily. The Climax production of molybdenum, by years, from 1949 to 1953, and other details affecting Colorado operations abstracted from the company annual report are given later in this chapter under Lake County.

Silver.—The output of silver in Colorado in 1953 was 2,200,300 fine ounces—a decrease of 613,300 ounces (22 percent) from 1952 and the lowest since 1933. The decrease was due to the drop in tonnage of lead and zinc and complex copper-lead-zinc-gold-silver ores mined; these ores and minor quantities of lead-bearing cleanup material yielded 74 percent of the State total silver in 1953. The remaining 26 percent was contained in dry gold and silver ores, except for a small quantity recovered as a byproduct from placer gold. San Miguel County led in silver production and was followed by Eagle, Lake, Mineral, San Juan, and Dolores Counties, all of which produced

over 100,000 ounces. The leading silver-producing properties were the Treasury Tunnel-Black Bear (Idarado) in San Miguel County, Eagle (Empire Zinc) at Gilman in Eagle County, Resurrection group at Leadville, Emperius at Creede, Smuggler Union (Telluride Mines) at Telluride, and Rico Argentine at Rico. Except for a relatively small quantity contained in gold bullion shipped to the mint, the silver produced in Colorado was marketed along with lead, copper, gold, and zinc as one of the valuable constituents of concentrates or ore sold to smelters.

Tin.—The Climax Molybdenum Co. plant at Climax, on Fremont Pass near the boundary line of Lake and Summit Counties, continued to recover a small tonnage of tin concentrate as a byproduct from molybdenum ore.

Tungsten.—Production of tungsten from mines in Boulder County rose sharply in 1953, while that recovered as a byproduct from molybdenum ore in Lake County declined moderately. Small lots of tungsten ore were shipped from mines in Larimer, Ouray, San Juan, and Summit Counties, and some tungsten concentrate was recovered as a byproduct at the Silver Bell mill in San Miguel County. The State total shipments of tungsten concentrate increased 30 percent over 1952. Ore was reported shipped from 65 mines, prospects, and dumps, of which 59 were in Boulder County and 6 in other counties. The Cold Spring in Boulder County was the largest producing tungsten mine. The expanded activity in 1953 stemmed mainly from the incentive afforded by the Domestic Tungsten Program of the Government, which provides a market for standard-grade tungsten concentrate at \$63 per short-ton unit and which was extended in 1953 to July 1, 1958, with a limit of 3,000,000 units, by an act of Congress. Also, the Government program of financial assistance in exploration was continued; data on exploration projects are given in table 3.

TABLE 12.—Shipments of tungsten concentrates, 1944-48 (average), 1949-53, and total 1900-53, in short tons of 60-percent WO_3

Year	Short tons	Value
1944-48 (average).....	204	\$278, 024
1949.....	222	(1)
1950.....	196	302, 248
1951.....	336	1, 092, 780
1952.....	625	2, 354, 664
1953.....	817	2, 902, 490
1900-53.....	27, 030	² 30, 558, 400

¹ Bureau of Mines not at liberty to publish.

² Value estimated for some years.

Uranium.—The boom in uranium prospecting, exploration, development, mining, and milling continued unabated throughout 1953. Probably the most important action affecting the long-range production of uranium taken during the year was extension by the Atomic Energy Commission of the expiration date of its guaranteed minimum price schedule for uranium ores on the Colorado Plateau from March 31, 1958, to March 31, 1962. Another favorable action, taken at the same time (September 23, 1953), was to extend the period during

which initial production of uranium ore from new domestic mines will be eligible for bonus payments from February 28, 1954 to February 28, 1957. The minimum prices and bonus payments in 1953 were the same as those published in the chapter on Uranium, Radium, and Thorium in Minerals Yearbook, 1951.

The accomplishments of the uranium industry in Colorado and adjoining States in 1953 were reviewed³ by the manager of the Grand Junction Operations Office of the Atomic Energy Commission; the following data are abstracted from this review.

Total exploratory and development drilling by the AEC, Federal Geological Survey, and private concerns exceeded 2,700,000 feet. The ore-reserve picture was improved substantially by the year's operations. Overall ore production followed the trend it has held since 1949 whereby the total tonnage of ore delivered to processing mills and Government buying stations has doubled every 18 months. The capacity of ore-processing mills in operation, as of the end of 1953, was materially larger than the comparable 1952 figures.

A study of drilling figures for 1950 and 1953 provides a good insight into the increase in private activity. In 1950 a total drilling footage of 633,000 feet was achieved, of which 270,000 feet (43 percent) was privately financed by a relatively few larger companies. Of the approximate amount of 2,700,000 feet drilled in 1953, about 1,500,000 (55 percent) was privately financed, and it is estimated that 75 to 100 firms or individuals were involved.

The number of producing mines has likewise been rapidly increasing. It is estimated that at the end of 1953 approximately 550 operators were shipping ores to processing mills and Government ore-buying stations, an increase of 20 percent or more over 1 year ago.

Access roads constructed by the Bureau of Public Roads on the basis of AEC recommendations total more than 715 miles in the 4-State area of Colorado, Arizona, Utah, and New Mexico, at a cost exceeding \$4,500,000.

In 1952 8 full-scale ore-processing plants were in operation. In 1953 a contract was executed for constructing a new mill at Shiprock, N. Mex., and construction of that plant was scheduled to begin on February 1, 1954. The Durango and Naturita plants of the Vanadium Corp. of America underwent considerable expansion in 1953. Also, capacity was increased at the Uravan plant of the United States Vanadium Co. and the Climax Uranium plant in Grand Junction.

Besides the four Colorado uranium-treatment plants mentioned above, a plant of the United States Vanadium Co. at Rifle operated in 1953. Complete data on the number of active uranium mines in Colorado are not available; the annual report of the Commissioner of Mines, State of Colorado, lists 167 producing mines and 13 developing properties. Most of the mines were in the Uravan mineral belt in Mesa, Montrose, and San Miguel Counties. Vanadium associated with uranium in the ore enhanced the value of the mine output. The ore was marketed through authorized purchasing agents of the Atomic Energy Commission and delivered to central mills for treatment.

Under regulations of the AEC, figures showing the production of uranium cannot be published; therefore, the value of uranium output

³ Wimpfen, Sheldon P., The Present and Future of Domestic Uranium Production: Address before meeting of Colorado Min. Assoc., Denver, Colo., Jan. 29, 1954.

is not included in the total value of the Colorado mineral production shown in table 1 of this chapter.

Data on the results of Government exploration and geological studies are available in publications of the AEC and Federal Geological Survey. Volume I of Minerals Yearbook, 1953, chapter on Uranium, Radium, and Thorium, contains a general review of the uranium industry in Colorado and other States, with references to literature published.

The exploration projects financed jointly by the Government and private capital under DMEA are listed above in table 3.

Vanadium.—Mines in Montrose, San Miguel, Mesa, and Garfield Counties contributed the bulk of the vanadium output in Colorado in 1953. Nearly all the ore mined in this area carried both vanadium and uranium. For security reasons, because of the close connection in production between the two metals, figures on production of vanadium have not been published since 1947.

Much of the ore produced was marketed as uranium ore, settlement being made for the vanadium and uranium content on the basis of the guaranteed minimum prices set by AEC. The ore was treated in the central mills of the United States Vanadium Co. at Rifle and Uravan, the Vanadium Corp. of America at Naturita and Durango, and the Climax Uranium Co. at Grand Junction.

Zinc.—Production of zinc in Colorado in 1953 was 37,809 short tons, the lowest since 1946, compared with 53,203 tons in 1952. The average price of zinc in 1953 was the lowest since 1945; the price dropped from the 13-cent quotation on January 2, 1953, to a low of 10 cents a pound on September 11 and remained at that level through December. Two of the larger producers of zinc and a number of small ones closed during the year. Only 33 mines, prospects, and dumps contributed to the output of recoverable zinc in 1953 compared with 74 in 1952 and 100 in 1951.

Zinc, lead-zinc-silver, and complex copper-lead-zinc-gold-silver ores yielded over 99 percent of the State total zinc in 1953. Eagle County ore comprised 45 percent of the total; San Miguel County, 28 percent; Lake, 10; Dolores, 7; Mineral, Ouray, and San Juan together, 6; Summit, 3; and 6 other counties together, 1 percent. The leading zinc-producing mines, in order of rank, were: Eagle mine at Gilman, Treasury Tunnel-Black Bear (Idarado) in San Miguel County; Resurrection at Leadville; Smuggler Union (Telluride Mines); Rico Argentine at Rico; and Wellington at Breckenridge.

NONMETALS

Cement.—The Ideal Cement Co. continued to operate 2 cement plants at Portland, Fremont County, and 1 at Boettcher near Fort Collins, Larimer County. Limestone and clay were obtained from local quarries and pits.

Clays.—The total output of clays in Colorado increased 37 percent in 1953 over 1952. Fire-clay production increased 21 percent to

365,200 tons, and miscellaneous clays used in the manufacture of brick, tile, cement, and other products rose 44 percent to 411,400 tons. Small tonnages of bentonite were shipped by two producers in Bent County. Jefferson County contributed 40 percent of the fire clay, Pueblo 16, Douglas and Denver each 15, and Arapahoe, El Paso, and Fremont together 14 percent. Among the large producers of fire clay were the Robinson Brick & Tile Co., operating in Denver, Douglas, El Paso, and Jefferson Counties; George W. Parfet Estate, Inc., Jefferson County; Pueblo Clay Products Co., Pueblo County; H. M. Rubey Clay Co., Jefferson County; S. A. Whisenhunt, Douglas County; and George W. Lindsay, Jefferson County. The larger producers of other clays included Montgomery Bros. and the Lakewood Brick & Tile Co., Jefferson County; Colorado Brick Co., Boulder County; and Summit Pressed Brick & Tile Co., Pueblo County. Clay was produced for use in manufacturing cement at Portland, Fremont County, and Boettcher, Larimer County.

Production was reported in 1953 by 41 companies and individuals, including several that operated more than one mine. Fifteen of the producers sold their output as raw clay; the others used all or part of their clay in their own plants.

The price of the raw clay mainly depended on the type, quantity, and geographic location. The average mine value reported to the Bureau of Mines for fire clay in 1953 was \$2.65 a ton and for other clays (excluding clay used for cement) \$1.36 compared with \$2.62 and \$1.27, respectively, in 1952.

Feldspar.—The output of feldspar increased 14 percent over 1952. Chaffee County was the largest producing county and was followed by Jefferson, Teller, Fremont, Clear Creek, and El Paso. The M&S, Inc., Homestake mine in the Ute Trail district, Chaffee County, worked by open-pit methods, was the largest individual producing property. Grinding mills were operated by the International Minerals & Chemical Corp., at Denver and the Western Feldspar Milling Co., at Salida. Most of the feldspar produced was shipped to glass manufacturers outside the State.

Fluorspar.—Fluorspar output in 1953 increased in all 3 of the producing counties and recorded a gain of 83 percent over 1952 in the State total. This unusually large gain resulted from expanded production at the Ozark-Mahoning mine at Northgate in Jackson County and a full year's operation of the new mill and sharp increases in production of the Reynolds Mining Corp. Poncha mine in Chaffee County and the Burlington (General Chemical) group in Boulder County. Output from the Ozark-Mahoning group in Boulder County increased slightly. Acid-grade fluorspar mills were operated in Colorado by the General Chemical Division, Allied Chemical & Dye Corp., at Valmont near Boulder, Boulder County; the Ozark-Mahoning Co. at Northgate, Jackson County, and Jamestown, Boulder County; and the Reynolds Mining Corp. at Poncha Springs, Chaffee County. The fluorspar produced was shipped to consumers outside the State.

TABLE 13.—Shipments of fluorspar, 1944-48 (average), 1949-53, and total 1905-53

Year	Short tons	Value
1944-48 (average).....	42,007	\$1,129,149
1949.....	22,324	763,296
1950.....	18,489	654,089
1951.....	20,661	820,322
1952.....	29,185	1,505,968
1953.....	53,276	2,872,360
1905-53.....	677,739	17,993,538

Gem Stones.—The principal gem stone mined in Colorado in 1953 was turquoise from the Villa Grove Turquoise Lode in Saguache County. Some amazonstone and smoky quartz were produced near Lake George, Park County. Other stones that have been picked up by specimen collectors in the past include petrified wood, amethystine quartz, tourmaline (usually nongem quality), garnet, and jasper.

Gypsum.—The bulk of the Colorado output of gypsum in 1953 was produced by the Ideal Cement Co. in Fremont County and the United States Gypsum Co. and E. W. Munroe in Larimer County. Production increased over 1952.

Mica.—Several mines in El Paso, Fremont, Jefferson, and Teller Counties produced scrap mica in 1953. The International Minerals & Chemical Corp. operated a mica-grinding plant at Pueblo and provided a market for the mica.

Perlite.—Colorado's only producer of perlite in 1952 and 1953 was the mine at Rosita, Custer County, which was operated before 1953 by the Alexite Engineering Division of the Alexander Film Co. and was sold early in 1953 to the Great Lakes Carbon Corp. Production increased substantially over 1952. The crude perlite was shipped to the company crushing, sizing, and drying plant at Florence, Fremont County.

Pumice and Pumicite.—Colorado's output of pumice (all used for concrete aggregate) came from Costilla and Routt Counties; the quantity produced was 47,919 tons, a moderate decrease from 1952.

Pyrites.—Pyrite concentrate was produced as a byproduct from molybdenum ore in Lake County and zinc-lead ore in Dolores County.

Sand and Gravel.—The output of sand and gravel reported by commercial and noncommercial producers in Colorado in 1953 totaled 12,439,000 tons compared with 8,461,000 tons in 1952. Part of the increase over 1952 was due to the fact that reports were received for the first time from a number of the producers, some of which operated portable equipment and had not been canvassed previously. However, sustained or expanded activity in residential, office-building, and other types of construction accounted for a substantial part of the gain. Production was reported from 54 of the State's 63 counties. Adams County, with an output of 1,148,839 tons, was the largest producer; other leading counties were Arapahoe, Denver, Pueblo, Otero, Larimer, Jefferson, Moffat, Grand, and Weld.

About three-fourths of the total in 1953 was noncommercial material used by State, county, and Federal highway and municipal

street departments. Of the 3,013,870 tons of commercial sand and gravel produced, 99 percent was washed. The leading producing companies included the Hall Sand & Gravel, Inc., Arapahoe County; Cooley Gravel Co., Adams County; Brannan Sand & Gravel Co., Adams, Denver, and Jefferson Counties; Fountain Sand & Gravel Co., Pueblo County; Rio Grande Co., Jefferson County; White Water Sand & Gravel Co., Mesa County; and C. L. Hubner Co., Jefferson County.

Stone.—The production of stone in Colorado (except limestone for cement) decreased from 1,709,000 tons in 1952 to 884,000 tons in 1953. The decrease was largely in crushed sandstone and granite. In 1952 a large tonnage of crushed sandstone was produced in Larimer County under a Government contract for construction of Carter Lake reservoir, but none was reported for 1953. No crushed granite for construction of dams by Government agencies was reported shipped from Jefferson County in 1953, whereas nearly 250,000 tons was shipped in 1952. Combined shipments of crushed limestone to sugar factories and the steel mill at Pueblo increased in 1953 and comprised 70 percent of the State total limestone and dolomite shipped. The output of dimension stone, mostly sandstone from Boulder County, was about 18,000 tons in each of the 2 years.

The leading producers of limestone (except limestone for cement) were the Colorado Fuel & Iron Corp. in Chaffee and Fremont Counties; Golden Cycle Corp., El Paso County; Frank H. Norberg Co., Fremont, Garfield, and Larimer Counties; and Colorado Limestone Co., Fremont County.

Quartzite was shipped from Fremont and Lake Counties by the Standard Fire Brick Co. at Pueblo.

MINERAL FUELS

Coal.—Coal production was nearly the same as in 1952 but was 28 percent under the average for the 5 years 1947-51. Natural gas and petroleum products have supplanted coal for a number of uses in recent years. The large coal-producing counties in 1953, in order of rank, were Las Animas, Weld, Routt, Gunnison, Fremont, and Huerfano, all of which produced more than 135,000 tons.

The quantity of natural gas marketed decreased, but that of natural gasoline and liquefied petroleum gases increased.

Detailed statistics on production of mineral fuels and a summarized review covering oil and natural-gas production and well drilling may be found in volume II of this series.

Peat.—Peat continued to be mined near Caribou and Nederland in Boulder County.

Petroleum.—Production of crude petroleum in Colorado increased to a new record high in 1953. The increase over 1952 was due mainly to expanded activity in new fields, but the Rangely field in Rio Blanco County continued to be much the largest producer. Figures for 1953 show a total output of 36,402,000 barrels valued at \$98,650,000, compared with 30,381,000 barrels valued at \$77,470,000 in 1952.

TABLE 14.—Production of coal, 1952–53, by counties

(Exclusive of mines producing less than 1,000 tons)

County	1952			1953		
	Production (net tons)	Value		Production (net tons)	Value	
		Total	Average per ton		Total	Average per ton
Boulder.....	79,989	\$453,538	\$5.67	49,821	\$289,958	\$5.82
Delta.....	63,936	347,812	5.44	57,645	326,271	5.66
El Paso.....	72,036	325,603	4.52	55,927	237,690	4.25
Fremont.....	201,641	903,352	4.48	175,307	757,326	4.32
Garfield.....	42,412	228,601	5.39	35,877	168,263	4.69
Gunnison.....	339,498	1,892,362	5.58	297,860	1,644,187	5.52
Huerfano.....	246,149	1,627,045	6.61	135,719	849,601	6.26
Jackson.....	2,415	13,379	5.54	2,833	15,893	5.61
Jefferson.....	1,593	8,092	5.08			
La Plata.....	37,853	153,683	4.06	43,800	182,646	4.17
Las Animas.....	857,589	5,603,400	6.53	1,172,771	7,842,003	6.69
Mesa.....	95,038	469,484	4.94	80,410	396,421	4.93
Moffat.....	90,532	476,198	5.26	89,940	484,777	5.39
Montrose.....	3,083	16,463	5.34	3,205	17,339	5.41
Pitkin.....	7,328	35,174	4.80	35,928	174,969	4.87
Rio Blanco.....	40,174	223,367	5.56	22,960	116,178	5.06
Routt.....	686,970	3,325,395	4.84	614,500	2,709,945	4.41
Weid.....	754,779	3,112,709	4.13	700,347	2,983,478	4.26
Total.....	3,623,015	19,215,657	5.30	3,574,850	19,196,945	5.37

TABLE 15.—Production of crude petroleum, 1952–53, by fields, in thousand barrels

Field	1952	1953	Field	1952	1953
Iles.....	378	334	Wilson Creek.....	2,851	2,854
Little Beaver.....	(1)	2,529	Yenter.....	962	1,503
Merino.....	391	411	Other fields ²	2,521	4,460
Mount Hope.....	578	1,125	Total.....	30,381	36,402
Powder Wash.....	257	286			
Rangely.....	22,443	22,900			

¹ Included with "Other fields."² Includes crude oil consumed on leases and net change in stocks held on leases for entire State.REVIEW BY COUNTIES⁴

ADAMS

The gravel bars of Clear Creek in Adams County northwest of Denver were an important source of commercial sand and gravel and also yielded placer gold recovered as a byproduct at some of the gravel washing and screening plants. The plants at which byproduct placer gold was recovered included the stationary plants of the Brannan Sand & Gravel Co., F. S. Rizzuto, and Superior Sand & Gravel Co., where sluices were operated by Kerklung & Slensker; and the floating plant (fed by a "walking" dragline on the bank of the pond) of the Cooley Gravel Co. The Cooley plant was the largest producer of sand and gravel in the county.

ARAPAHOE

The Robinson Brick & Tile Co. operated clay pits in Arapahoe County that supplied raw material for the company plant in Denver. Sand and gravel washing and screening plants were operated at Englewood and Sullivan.

⁴ The review is confined generally to minerals other than fuels and the noncommercial sand and gravel and crushed stone used on Federal, State, county, and municipal projects.

TABLE 16.—Value of mineral production in Colorado in 1952-53, by counties,¹ and principal minerals² produced in 1953, excluding uranium

County	1952	1953	Principal minerals in order of value ³
Adams	\$1, 114, 555	\$1, 154, 542	Sand and gravel, gold.
Alamosa		71, 030	Sand and gravel.
Arapahoe	291, 176	864, 190	Sand and gravel, clays.
Archuleta		102, 747	Sand and gravel, coal.
Baca		43, 769	Sand and gravel.
Bent		7, 230	Clays.
Boulder	2, 369, 944	3, 122, 338	Tungsten, fluorspar, stone, coal, sand and gravel.
Chaffee	1, 269, 768	1, 763, 672	Stone, fluorspar, feldspar, sand and gravel, gold.
Cheyenne		23, 771	Sand and gravel.
Clear Creek	244, 811	319, 156	Lead, gold, silver, sand and gravel, zinc.
Costilla	(⁴)	115, 378	Sand and gravel, pumice.
Custer	(⁴)	272, 578	Perlite, sand and gravel.
Delta	353, 270	402, 314	Coal, sand and gravel, clays.
Denver	707, 356	670, 597	Sand and gravel, clays.
Dolores	1, 787, 258	1, 337, 454	Zinc, lead, sand and gravel, silver, copper.
Douglas	120, 819	295, 242	Sand and gravel, clays, stone.
Eagle	10, 383, 527	5, 467, 787	Zinc, lead, silver, copper, gold.
Elbert		72, 165	Sand and gravel.
El Paso	560, 404	651, 184	Coal, sand and gravel, stone, clays.
Garfield	264, 280	224, 297	Coal, stone.
Gilpin	50, 139	7, 510	Gold, silver, copper, lead.
Grand		416, 442	Sand and gravel, stone.
Gunnison	⁴ 2, 754, 266	1, 689, 010	Coal, sand and gravel, lepidolite.
Hinsdale	327, 032	4, 985	Sand and gravel, lead, zinc.
Huerfano	1, 627, 045	755, 141	Coal, sand and gravel.
Jefferson	1, 085, 776	1, 133, 224	Sand and gravel, clays, feldspar, beryl, gold.
Kiowa	⁴ 8, 126		
Kit Carson		1, 430	Sand and gravel.
La Plata	161, 281	429, 137	Coal, sand and gravel.
Las Animas	⁴ 5, 601, 956	6, 483, 171	Coal, sand and gravel, clays.
Lincoln	⁴ 5, 220	26, 676	Sand and gravel.
Logan	⁴ 2, 000	47, 465	Do.
Mesa	563, 602	651, 398	Coal, sand and gravel.
Mineral	1, 037, 257	861, 643	Lead, zinc, silver, gold.
Moffat	479, 209	905, 838	Coal, sand and gravel.
Montezuma		2, 293	Coal.
Montrose	16, 463	322, 874	Sand and gravel, coal.
Morgan	⁴ 2, 809	17, 466	Sand and gravel.
Otero		237, 610	Do.
Ouray	959, 187	929, 907	Lead, zinc, copper, gold, silver.
Park	169, 530	193, 255	Zinc, sand and gravel, gold.
Phillips		18, 114	Sand and gravel.
Pitkin	42, 516	200, 148	Coal, silver, lead.
Provers		66, 697	Sand and gravel.
Pueblo	573, 311	848, 012	Sand and gravel, clays.
Rio Blanco	243, 936	224, 021	Coal, sand and gravel.
Rio Grande		133, 240	Sand and gravel.
Routt	⁴ 3, 320, 813	3, 415, 973	Coal, sand and gravel, pumice.
Saguache	178, 611	89, 484	Sand and gravel, lead, gold, silver, turquoise.
San Juan	2, 839, 970	840, 937	Lead, zinc, silver, gold, copper.
San Miguel	8, 953, 357	7, 837, 813	Zinc, lead, gold, copper, silver.
Sedgwick	⁴ 1, 930	12, 800	Sand and gravel.
Summit	504, 469	702, 158	Lead, zinc, silver, sand and gravel, gold.
Teller	1, 738, 176	1, 845, 962	Gold, feldspar, sand and gravel.
Washington		22, 042	Sand and gravel.
Weld	⁴ 3, 128, 605	3, 972, 901	Coal, sand and gravel.
Yuma	⁴ 3, 403	10, 650	Sand and gravel.
Undistributed ⁵	⁴ 52, 387, 897	58, 943, 132	
Subtotal	108, 235, 000	111, 282, 000	
Petroleum and natural gas	⁴ 79, 354, 000	100, 304, 000	
Total	⁴ 187, 589, 000	211, 586, 000	

¹ County figures exclude petroleum, natural gas, natural-gas liquids, uranium, vanadium, and in 1952 some undistributed stone and sand and gravel.

² Other than petroleum, natural gas, natural-gas liquids, uranium, and vanadium.

³ Value included with "Undistributed;" Bureau of Mines not at liberty to publish.

⁴ Revised figure.

⁵ Includes value for gem stones, natural-gas liquids, vanadium, mineral production, and principal minerals produced in 1953 from the following counties: Conejos (1952), Fremont (cement, coal, stone, gypsum, clays), Jackson (fluorspar, sand and gravel, coal), Lake (molybdenum, tungsten, zinc, lead, gold), Larimer (cement, sand and gravel, gypsum, clays, stone), and counties whose value cannot be revealed for particular years (indicated by footnote 3).

TABLE 17.—Production of clays, 1952-53, by counties, in short tons

County	1952		1953	
	Short tons	Value	Short tons	Value
Boulder	33,000	\$33,000	36,958	\$36,958
Delta	5,458	5,458	390	390
Douglas	(1)	(1)	54,172	137,052
El Paso	(1)	(1)	8,726	32,892
Fremont ²	106,243	114,429	192,390	213,894
Jefferson	153,512	340,605	197,454	421,756
Larimer	(1)	(1)	² 92,223	² 95,975
Mesa	(1)	(1)	2,579	2,579
Pueblo	81,716	226,281	86,240	235,723
Other counties	² 188,765	² 367,264	⁴ 106,837	⁴ 250,034
Total	568,694	1,087,037	777,969	1,429,753

¹ Included with "Other counties."

² Including clay used in cement manufacture.

³ Includes Arapahoe, Denver, and counties indicated by footnote 1.

⁴ Includes Arapahoe, Bent, Denver, and Las Animas Counties.

BENT

Some fire clay and bentonite were produced by the Colo-Tex Mining & Engineering Co. at Las Animas.

BOULDER

Metal mining in Boulder County in 1953 was confined principally to tungsten. Under the incentive afforded by the Government Domestic Tungsten Program (which provides a market for standard-grade tungsten concentrate at \$63 per short-ton unit), the number of producing mines, prospects, and dumps increased from 28 in 1952 to 59 in 1953, and the output of tungsten concentrate (60-percent WO₃ equivalent) rose from 111 tons to 314 tons. The search for ore reserves was aided by the Government program of financial assistance in exploration administered by DMEA. Projects begun before 1953 are listed in Minerals Yearbook, 1952, volume III, Colorado chapter, and projects begun in 1953 are listed in table 3 of this chapter.

The production of marketable concentrate centered at two mills, both of which treated custom and company ores. The largest producer was the Hetzer (formerly Wolf tongue) mill at Nederland, operated for a few weeks early in the year by the Vanadium Corp. of America and the remainder of the year by Hetzer Mines, Inc. This mill received ore from 56 mines, prospects, and dumps. The largest shipper to the mill was the Cold Spring Tungsten, Inc., which operated the Cold Spring mine from June through December. Other substantial ore shippers included the Quaker, Lone Pine, and Eureka mines. The second mill was that of Boulder Tungsten Mines, Inc., which treated company ore from the Katie mine and custom ore from 36 mines, prospects, and dumps in Boulder County (some of which also shipped ore to the Hetzer mill) and 3 from other counties. Substantial custom shippers to this mill included the Good Friday-April Fool group, Roosevelt claim, Rambler-Tungsten, and various Hetzer mines operated by Cobb & Weldon. A considerable tonnage of low-grade ore produced by Cobb & Weldon was treated in the Lakewood mill. Johnson & Prime operated the Hoosier mine and treated

stope fills in the Hoosier mill, and James Pastore ran dump ore in his mill near Nederland.

Data on the geology and ore deposits of Boulder County were published.⁵

The output of silver decreased from 280,151 ounces in 1952 to 24,332 ounces in 1953 as a result of the shutdown of the Caribou mine near Nederland from about March 15 to September 24. In 1952 this mine ranked third in the State in silver production. Before the shutdown the mine was operated by the Consolidated Caribou Silver Mines, Inc., which underwent a reorganization and resumed operations on September 25 under the name of Nederland Mines, Inc. The Caribou ore, concentrated in the company 100-ton mill, yielded a rich silver-lead-gold concentrate containing also a little copper. Small lots of gold ore were shipped from the Cash mine at Gold Hill, the Rusty Dime and another property at Magnolia, and Comstock at Ward. Lead-silver-gold-copper concentrate was recovered as a by-product from fluorspar mined in the Central (Jamestown) district. Some placer gold was recovered as a byproduct in laundries at a sand and gravel plant on the George Sawhill ranch near Boulder.

Fluorspar production increased 20 percent over 1952. The flotation mill of the Ozark-Mahoning Co. at Jamestown operated throughout the year, treating crude fluorspar from company mines; the largest producers were the Emmett-Afterthought, Argo, and Blue Jay, opened by vertical shafts 1,100, 350, and 400 feet deep, respectively; the mining was done under contract by Harry M. Williamson & Son. Mining at the Spartan No. 5, opened by a 230-foot vertical shaft, was done by E. P. Swerdfeger. The General Chemical Division, Allied Chemical & Dye Corp., continued to operate its Burlington mine at Jamestown and flotation mill at Valmont.

Producers of dimension or building stone (all in the Lyons area) included the Summers Stone quarry, Ohline quarry, Colorado Stone Co. (Red Stone quarry), Stockton quarry, and Brodie Bros. sandstone quarry. The Golden Transfer Co. supplied crushed sandstone for the Longmont city reservoir and a Bureau of Reclamation canal.

The Colorado Brick Co. mined clay from an open pit for use in its Longmont plant. There were several sand and gravel producers in the county. Peat was produced near Nederland and Caribou. The county continued to be an important producer of coal, but the output decreased heavily from 1952.

CHAFFEE

The metal production from Chaffee County in 1953 was contained in 247 tons of lead-zinc-silver-gold ore shipped from the Mary Murphy mine in the Chalk Creek district, leased by S. E. and W. E. Burleson, and 2 tons of high-grade ore from the John Walkinshaw claim, near Granite, worked by Ed Bradbury.

Production of fluorspar, feldspar, and limestone increased sharply over 1952. The Poncha Springs fluorspar mine of the Reynolds Mining Corp. operated throughout 1953. The crude fluorspar was mined from both open-cut and underground workings and concen-

⁵ Lovering, T. S., and Tweto, Ogden, *Geology and Ore Deposits of the Boulder County Tungsten District*: Geol. Survey Prof. Paper 245, 1953, 199 pp.

trated in the company mill. Some fluorspar was shipped from the Browns Canyon mine of the General Chemical Division, Allied Chemical & Dye Corp., to the company mill in Boulder County.

The M&S, Inc., Homestake feldspar mine in the Ute Trail district, worked by open-pit methods, operated continuously; the feldspar produced was milled in the Western Feldspar Milling Co. fine-grinding dry-process plant at Salida and shipped to glass manufacturers outside the State.

Shipments of crushed limestone from the Monarch quarry of the Colorado Fuel & Iron Corp. increased. Monumental stone was produced from the Crystal Stone quarry by the Colorado Granite Co., which cut and polished the stone in its plant at Salida. The Calcium Co. mined calcium carbonate for the production of poultry grits in its Salida plant.

CLEAR CREEK

Although metal mining in Clear Creek County in 1953 was again confined to small-scale operations, the output of gold, silver, and lead increased considerably over 1952. The most consistent producers were the Dixie gold mine of LeRoy Giles & Co. near Idaho Springs and the Grizzly Gulch lead-silver mine of the Lupton Mining Co. in the Argentine district; the ore produced was treated in the respective company mills.

The Montana Mining Development Co. operated its mill in the Trail Creek District part of the year on ore from the Gum Tree and Lamartine dumps and Great Western mine. At Silver Plume the Mendota-Frostberg mine operated a few months; the ore produced, containing zinc, lead, and silver as the principal minerals but also yielding a little gold and copper, was milled in the Silver Spruce mill at Idaho Springs. The Smuggler group, producing lead-silver ore, was operated part of the year.

Other producers, nearly all shipping gold-silver or gold-silver-lead ore, included the Forge Hill, Freighter's Friend, Lake, Mono Diamond Joe, and Stanley mines near Idaho Springs; the Blue Ridge dump and the Nabob mine in the Dumont-Lawson area; the Headlight claim near Empire; and the Blue Bell (ore cleaned up from surface bins) in the Argentine district. The Silver Spruce mill at Idaho Springs continued to treat custom ores. Placer gold was produced from the Spanish Bar placer near Idaho Springs. Some beryl and feldspar were shipped from the Joe Grover mine on Beaver Creek.

COSTILLA

The Colorado Aggregates Co., Inc., continued to mine pumice from an open pit for use in manufacturing building blocks.

CUSTER

Lead-zinc-silver ore was shipped from the Defender mine, operated from January 1 through March, and small lots of lead and lead-silver ore were shipped from the High Kicker-Wild Girl and Little Annie properties, all in the Hardscrabble district.

The Great Lakes Carbon Corp., Perlite Division, acquired the Rosita perlite quarry from the Alexander Film Co., as of February 16,

1953, and operated the quarry at an increased production rate over 1952. The perlite rock was crushed, dried, and sized before shipment to expanding plants.

DELTA

Coal continued to be the chief mineral product of Delta County, but clay, uranium ore, and sand and gravel were also produced in 1953.

DENVER

Manufacturers of brick and tile, concrete and cinder blocks, concrete and clay sewer pipe, and other construction materials in Denver provided a market for several nonmetallic minerals mined in Denver and other counties. The Consolidated Feldspar Dept., International Minerals & Chemical Corp., continued to operate its feldspar grinding plant; the feed comprised crude feldspar mined from company-quarries or purchased from other producers in various counties. The Globe byproducts smelter of the American Smelting & Refining Co. recovered cadmium, indium, and thallium from flue dust, dross, and other material shipped to it from other company smelters. The General Chemical Division, Allied Chemical & Dye Corp., purchased pyrite concentrate produced in Colorado for use in its plant. Expanded perlite was produced by Persolite Products, Inc., at its Denver plant. A substantial quantity of clay and a large tonnage of sand and gravel were produced within the limits of the city and county.

DOLORES

The Rico Argentine Mining Co. operated its group of lead-zinc-silver mines and 150-ton flotation mill at Rico throughout 1953 at nearly as high a crude-ore tonnage rate as in 1952, despite the further decline in prices of lead and zinc, which, with continued high cost of labor and materials, accentuated the economic problem of maintaining production and carrying on necessary development ahead of mining. Besides lead-silver and zinc concentrates (the main products of the mill), some pyrite was recovered and shipped in 1953. The mine has been in production steadily since 1939, except during parts of 1949 and 1950, when the prices of lead and zinc were at a low level and operations were confined to development.

DOUGLAS

Clay was produced by the Robinson Brick & Tile Co. and Helmer Bros. near Littleton and by S. A. Whisenhunt near Castle Rock. Other output included a large tonnage of sand and gravel shipped by various operators.

EAGLE

Eagle County again ranked first among Colorado counties in zinc production and second in total value of gold, silver, copper, lead, and zinc. The large Eagle mine of the New Jersey Zinc Co. at Gilman operated continuously in 1953, except during a strike that lasted from September 1 to November 2. Articles on the history of the mine, geology and ore occurrence, mining operations, the underground mill, and the plant and service department at Gilman and the roasting

and sintering facilities at Canon City were published.⁶ The information that follows was obtained from the articles.

The most important ore bodies are replacement deposits in the carbonate rocks. They consist of long, relatively narrow mantos of zinc ore in the upper portion of the Leadville limestone and funnel-shaped chimneys of copper-silver ore that cut across the strata of the Leadville and Chaffee formations. The principal minerals in the copper-silver bearing chimneys are chalcopyrite, tetrahedrite, freibergite, and occasionally galena in a gangue of pyrite. The most abundant minerals found in the manto ore bodies are sphalerite (marmatite variety) and galena in a gangue of pyrite and manganese-siderite. The average marmatite contains approximately 54 percent zinc and 11 percent iron, and some of it may carry fractional percentages of lead and copper, which occur as microscopic inclusions of galena and chalcopyrite.

The mine was producing about 1,000 tons of zinc ore (containing also lead and silver) and 150 tons of copper-silver ore per day at the time the articles were being written in 1953; it was operated on a 3-shift basis 5 days per week and employed approximately 340 men. Copper-silver ore was loaded directly into railroad cars for shipment to smelters, and the zinc ore was milled at Gilman. The mill, one of the few underground beneficiation plants in the world, usually treats 1,000 tons per day of lead-zinc ore. The lead concentrates produced were shipped to outside smelters and the zinc concentrates to company plants, which included the roasting and sintering plant at Canon City and smelters in Illinois and Pennsylvania.

EL PASO

Coal continued to be the mineral of chief value produced in El Paso County, but the combined value of the sand and gravel, limestone, and clay exceeded that of coal in 1953. The bulk of the limestone came from the Golden Cycle Corp. quarry. Clay was produced near Colorado Springs by the Standard Fire Brick Co. and Nixon Bros. and at the Calhan pits of the Robinson Brick & Tile Co. Some feldspar and mica were produced at the Cocreham quarry. There were a number of producers of sand and gravel.

FREMONT

Limestone, clays, and gypsum were produced in Fremont County for making cement in the two plants of the Ideal Cement Co. at Portland, and dolomite was quarried for use in the Colorado Fuel & Iron Corp. steel plant at Pueblo. Refractory ganister was quarried and shipped for furnace or converter lining. Limestone was quarried, crushed, and sized for shipment to sugar plants. Travertine and marble quarries were operated. The important quarry operators included Nat Senatore (gypsum quarry), Colorado Fuel & Iron Corp. (Canon dolomite quarry), Colorado Limestone Co. (Howard), Ideal Cement Co. (Portland), Frank H. Norberg Co. (Taylor Gulch), Dale Hoover (Pine View), Standard Fire Brick Co. (Penrose quarry), Colonna & Co., and Ray B. Sturbaum (Canon City).

⁶ Mining Engineering, New Jersey Zinc; The Eagle Mine: Vol. 5, No. 12, December 1953, pp. 1222-1227.

The larger producers of clays included the Colorado Fire Clay Co., Pueblo Clay Products Co., G. E. Goodale, Laclede Christy Co. of Colo., and Standard Fire Brick Co. Feldspar, beryl, and mica were produced at several quarries near Texas Creek and Canon City. Fremont County continued to be one of the larger producers of coal.

GARFIELD

The United States Vanadium Co. operated its mill near Rifle continuously on vanadium-uranium ores received from producers in Garfield and Montrose Counties. Frank H. Norberg Co. continued to ship crushed limestone from the Glenwood Springs quarry to sugar factories, smelters, and highway departments. Coal production in the county was less than in 1952. The Bureau of Mines continued to operate the experimental oil-shale mine and plant at Rifle, authorized by Congress to conduct an experimental program to develop the technology for obtaining oil from oil-shale. Data on blasting research at the mine were published.⁷

GILPIN

The Calhoun mine of the Realty Co., under exploration and development for uranium in 1953, produced several hundred tons of gold-silver-copper ore, which was milled at the Silver Spruce mill at Idaho Springs. The Queens Mineral Ranch property, also under exploration and development for uranium ore (pitchblende) by the Bowles-Bennett Account (a partnership), produced 5 tons of direct-smelting gold-silver-lead ore. The United Mining & Leasing Corp. continued work on a lead-zinc exploration project at the Gilpin-Eureka-Essex group under a DMEA contract until October, when the project was closed owing to the low prices of lead and zinc. The company shipped a test lot of gold-silver-lead ore from the Gilpin-Eureka-Essex group during the year and carried on uranium development at the Carroll mine. The Mackey and We Got Em mines produced some gold-silver ore, and the Lone Star produced a few tons of silver ore. Small lots of placer gold were recovered by hand methods at four places on North Clear Creek.

GUNNISON

The total value of the metals recovered from ores of gold, silver, copper, lead, and zinc in Gunnison County in 1953 amounted to only \$7,760 (lowest since 1932), compared with \$848,287 in 1952. The drop in output in 1953 was due largely to the idleness of the Callahan Zinc-Lead Co. Akron-Erie group at White Pine, principal producer of metals in the county from 1943 until it shut down on November 3, 1952, because of the low prices of lead and zinc.

Three mines reported production in 1953. At the Carter mine near Ohio the Kanarado Mining & Development Co. ran 400 tons of ore through its 100-ton flotation mill (equipped also with a mineral jig); the yield, in recovered metals, was 124 ounces of gold, 345 ounces of silver, and 1,700 pounds of lead. The Little Darling Mines

⁷ Wright, Fred D., Burgh, Ernest E., and Brown, Brinton C., Blasting Research at the Bureau of Mines Oil-Shale Mine: Bureau of Mines Rept. of Investigations 4956, 1953, 23 pp.

in the Rock Creek district shipped 13 tons of ore containing 10,400 pounds of lead, 357 ounces of silver, 53 pounds of copper, and 3,850 pounds of zinc; the zinc was not recovered, as the ore was shipped to the Leadville lead smelter. The B. D. & P. Mining Co. shipped 10 tons of lead-silver ore from the Undine mine No. 1, also in the Rock Creek district.

The American Smelting & Refining Co. continued developing the Keystone zinc-lead-silver property at Crested Butte and built a 200-ton selective flotation mill at the mine. It was reported that regular mining and milling operations would be delayed until economic conditions for lead and zinc mining improved.

The Brown Derby pegmatite mine in the Quartz Creek district near Ohio, operated by the Adolph Poston Mining Co., produced lepidolite and beryl in 1953. Tantalum-columbium minerals also occur in the deposit, but none was sold during the year, as the ore must be milled to recover the tantalum and columbium.

A report on an investigation of the New Anniversary-Bucky pegmatite by the Bureau of Mines was published.⁸ The county continued to be an important producer of coal, although the output was less than in 1952.

HINSDALE

A truckload of lead-zinc-silver ore was shipped from the Czar claim on North Henson Creek, and 1 ton of gold-silver ore was shipped from the Black Crook-Ilma-Hiwassée group on Hotchkiss Mountain. The Ute & Ulay group, a substantial producer of metals in 1952 until it was shut down on December 7, had no output in 1953.

JACKSON

The Ozark-Mahoning Co. operated its Northgate underground flourspar mine and mill continuously 6 days a week in 1953 and in addition operated the open-cut for 20 weeks. The mill product is acid-grade flourspar, the output of which was much larger than in 1952.

JEFFERSON

The output of clays in Jefferson County increased 29 percent in 1953 over 1952. The largest producers included the George W. Parfet Estate, Inc., Rockwell open pit, H. M. Rubey Clay Co., Rubey open pit, George W. Lindsay mine (underground and open pit), Denver Sewer Pipe & Clay Co. Strainland and Johnson underground fireclay mines, Denver Fire Clay Co. North Golden and South Golden underground fire-clay mines, Golden Fire Brick Co. open-pit and underground fire-clay mines, and Robinson Brick & Tile Co. open-pit fire-clay mine. The bulk of the clay was used by the producer or sold to local clay-products companies. No shipments of crushed stone for construction of dams by Government agencies were reported from the county in 1953; in 1952 large shipments were made. However, the output of sand and gravel reported more than doubled that in 1952.

⁸ Wilson, S. R., and Young, W. A., Investigation of the New Anniversary-Bucky Pegmatite, Gunnison County, Colo.: Bureau of Mines Rept. of Investigations 4939, 1953, 7 pp.

Beryl, columbite-tantalite, and feldspar were produced at the Biggar mine near Morrison; beryl was produced at the Tall Timber Mining Co. mine near Indian Hills; and columbite-tantalite was shipped from Our Mine No. 2. A test run on ore from the old Malachite copper mine near Starbuck was made in the Lamartine mill in Clear Creek County; the yield was 19 tons of copper concentrate, containing silver and a little gold and lead along with the copper. Several sand and gravel plants on Clear Creek recovered placer gold as a byproduct.

LAKE

Molybdenum has been the dominant metal mined in Lake County since 1929, when the value of the molybdenum produced first exceeded the combined value of the gold, silver, copper, lead, and zinc. The molybdenum output comes from the Climax mine of the Climax Molybdenum Co. on Fremont Pass 13 miles north of Leadville. The company began mine development and construction of a 400-ton mill at the mine in 1917 and shipped the first concentrate in 1918; it has since been a steady annual producer except from 1920-23. Development and milling capacity have been expanded at frequent intervals, and at the end of 1953 the daily capacity for ore extraction and milling exceeded 25,000 tons. The following data are abstracted from the company annual report to stockholders for the calendar year 1953.

The company's production of molybdenum during the past five years was as follows:

Year	Pounds of molybdenum contained in concentrate
1949.....	10, 752, 817
1950.....	11, 903, 043
1951.....	22, 538, 739
1952.....	23, 874, 408
1953.....	37, 306, 341

Production from the Storke Level commenced in February but did not reach full stride until April. Since then, approximately half the mine tonnage has been drawn from this level.

The mill treated 6,604,857 tons of ore during 1953, an average of over 21,000 tons per working day as compared with a rated capacity of 20,000 tons.

Sales during the year amounted to over 33,000,000 pounds of molybdenum contained in all forms. Prices of molybdenum products remained unchanged throughout the year.

All governmental allocations of or restrictions on the sale or use of molybdenum products either for domestic consumption or for export have been removed, except licenses for security purposes to prevent this strategic material from passing beyond the Iron Curtain. Consequently some increase in the nonmilitary use of the metal per ton of steel produced may be expected as alloys restricted during the Korean war return to industrial design. Furthermore, as a consequence of our expanded capacity, supplies will be available to support an almost certainly increasing European demand.

In byproduct production, the tungsten values contained in that portion of the ore body now being mined on the Storke Level have been much lower than anticipated. With about half the byproduct plant feed during 1953 coming from this source, production of tungsten fell to 413,000 pounds contained in concentrate from 524,000 pounds in 1952 despite the higher total tonnage treated.

Our expansion programs became fully operative on January 1, 1954 when the 5,000-ton per day mill unit to treat low grade ores commenced regular production. Your company now has broken and prepared ore reserves of over 22,000,000 tons, all of which have been paid for out of earnings. Rated mill capacity was 15,000 tons per day in 1950. It is now 25,000 tons per day although production currently exceeds this capacity from 1,000 to 3,000 tons per day. Byproduct capacity, fully utilized, amounts to 20,000 tons of mine output per day. The Climax mine is

now the largest underground mine in North America and the second largest in the world. Capacity operation is assured by Government contract until sometime during 1956. A 5,000-ton-per-day production from low grade ores is assured by Government contract until mid-1962.

Production of gold, silver, copper, lead, and zinc in Lake County decreased heavily in both quantity and value in 1953. The shutdown on July 3 of operations by the Resurrection Mining Co. on the Resurrection group of mines, a large, steady producer since 1942, left the Leadville district without a major producer of any of the five metals during the last half of 1953. However, a section of the Resurrection property (the Resurrection No. 2) was kept in production by lessees under the direction of Robert L. Jones, and the Resurrection Mining Co. operated a unit of its 600-ton mill on company lease ore and custom ores from Lake and other counties. The company also carried on an exploration program at the Helena mine in Iowa Gulch, beginning in July.

The Arkansas Valley smelter of the American Smelting & Refining Co. purchases lead, lead-copper-gold-silver, and gold and silver ores and concentrates from various Colorado mining districts and concentrates, residues from zinc smelters, and other material from outside the State. Receipts of purchased material in 1953 totaled 65,758 compared with 74,626 tons in 1952. The company also carried on a development campaign in the Ibex-Sunday area from January to November. Lessees (Garibaldi Lease) shipped a substantial tonnage of lead-zinc-gold-silver ore from the area.

Other small producers included the Dolly B, Fortune mine, Hayden shaft group (under exploration by the Cadwell Mining Co.), Bi-Metallic-Free Coinage, Antioch pit (ore treated in a small gravity concentration-amalgamation mill), and several dumps in the Leadville district and a small tonnage of mill clean-up material from the old Denver and Million Dollar Baby properties near Twin Lakes.

The pyrite and tin produced were recovered as byproducts from Climax molybdenum ore. Some low-grade manganese ore was shipped to the Government stockpile at Deming, N. Mex. Quartzite was shipped to the Standard Fire Brick Co. at Pueblo. Data on the geology and ore deposits of the west slope of the Mosquito Range were published.⁹

LA PLATA

The Zodomok Mines, Inc., shipped 2.81 tons of ore containing 202 ounces of gold and 163 ounces of silver from the Bessie G mine 18 miles northwest of Durango; the net return from the Leadville smelter was \$7,003. The company built a road to the mine and worked on constructing a 30-ton mill, consisting mainly of a crusher, rolls, Humphrey-spiral units, and amalgamation boxes and barrels.

The county output of coal increased over 1952.

The Vanadium Corp. of America continued to operate its uranium-vanadium mill at Durango on ores received from Colorado and adjoining States.

LARIMER

The Ideal Cement Co. continued to operate its Boettcher cement plant and La Porte limestone quarry. Gypsum was produced by the

⁹ Behre, Charles H., Jr. Geology and Ore Deposits of the West Slope of the Mosquito Range: Geol. Survey Prof. Paper 235, 1953.

United States Gypsum Co. at its Loveland quarry and by E. W. Munroe at the Goodwin quarry. Limestone was quarried at the Frank H. Norberg Co. Rex quarry for use in a sugar refinery. Other rock quarried included granite at the Rocky Mountain quarry (shaped and used for monuments) and sandstone at the Berthoud quarries of the Colorado Stone Co. (shaped or used in irregular form for building veneer and flagstone) and various other quarries. The Fort Collins Brick & Tile Co. dug brick clay from an open pit for use in its plant. Beryl was produced at the Tailwind claim at Estes Park, the Green Mountain Lode northeast of Fort Collins, and the Hide Away and Emerald Gem claims. Cherokee Mines shipped some uranium ore from the Black Hawk No. 1 mine in the Prairie Divide district. A small tonnage of tungsten ore was shipped from the Buckhorn Mining Co. mine northwest of Fort Collins.

LAS ANIMAS

The large Allen coal mine of the Colorado Fuel & Iron Corp. west of Trinidad was one of the principal suppliers of coal to the company steelworks at Pueblo. Sand and gravel and some clay and alabaster were also produced in the county.

MESA

Uranium mining in Mesa County centered in the Calamity Mesa-Outlaw Mesa-Gateway area about 60 miles southwest of Grand Junction. The producers included the Climax Uranium and United States Vanadium mines, most of which were worked under contract by independent operators, and various mines owned by other companies and individuals. The number of men employed by each of the 30 producing mines that supplied figures ranged from 2 to 8. Of the 20 mines that reported on the depth of mining, 18 had inclines ranging from 40 to 385 feet long and averaging 160 feet, and 2 had vertical shafts 40 and 335 feet deep. The Climax Uranium Co. mill at Grand Junction continued to operate; the bulk of the ore treated came from Mesa County mines. The Atomic Energy Commission maintained an operations office at Grand Junction covering all the Colorado Plateau activities.

Several coal mines were operated in the county, and shale used in the manufacture of brick was produced by the Grand Junction Brick Co., using a tractor with a rotary scraper on surface deposits.

MINERAL

The bulk of the Mineral County output of gold, silver, copper, lead, and zinc in 1953, as in the past 13 years, came from the group of mines at Creede (including the Amethyst, Commodore-Wedge, New York-Volunteer-Del Monte-Aspen, and Equinox properties) operated by the Emperius Mining Co. Most of the ore output was treated in the company 120-ton zinc-lead flotation mill, but several cars monthly of high-grade silver-lead ore were shipped direct to the Leadville smelter. Mine development in 1953 included 1,200 feet of raises and 2,200 feet of drifts. The workings are reached through a 9,000-foot tunnel. One bank of flotation cells was added to the mill during the year. The other producer at Creede was the Outlet Mining Co.,

operating the Phoenix-Palo Alto group; the company drove 1,261 feet of drifts in 1953 and shipped to the Leadville smelter 2,438 tons of crude ore containing 22,047 ounces of silver, 895,695 pounds of lead, and 113 ounces of gold.

MOFFAT

This county continued to be an important producer of coal and sand and gravel.

MONTROSE

Intense activity in uranium mining and exploration prevailed throughout 1953, and mills of the United States Vanadium Co. at Uravan and the Vanadium Corp. of America at Naturita operated steadily. The Naturita mill was expanded during the year, and work was continued at the Uravan mill on placing in operation the new process for handling high-lime uranium ores.¹⁰ A report¹¹ by the AEC, covering uranium-ore production in general, stated that:

mine operators, who a few years ago were mining ore mostly from the rims of canyons or through inclined shafts a short distance back from the rims, are now mining through vertical shafts, some of which will be as deep as 600 feet, as the more easily accessible deposits are depleted and deeper deposits are discovered and developed.

The mines of the United States Vanadium Co. and Vanadium Corp. of America, many of which were worked by independent mining contractors, produced a large total tonnage of ore. Other important producers included the La Salle Mining Co., J. R. Simplot Co., Bunker & Co., and Virgin Mining Co. properties. The number of men employed at the 50 individual mines for which data are available ranged from 2 to 23 and averaged between 5 and 6. There were other producing mines for which employment figures were not reported.

OURAY

The King Lease on the Camp Bird mine, principal producer of metals in Ouray County since the mine was reopened by Joseph King in 1926, operated continuously and at an increased production rate in 1953 despite the decline in prices of lead and zinc that necessitated curtailment in some phases of the mining program. Even though the company reduced mining and milling costs per ton of ore by \$1.06 compared with those in 1952, it was unable to make a profit owing to the low lead and zinc prices. The yield from 52,686 tons of ore milled in 1953 was 2,980 tons of lead-copper concentrate containing 2,984 ounces of gold, 79,334 ounces of silver, 545,370 pounds of copper, 2,647,926 pounds of lead, and 256,814 pounds of zinc; and 1,829 tons of zinc concentrate containing 359 ounces of gold, 9,611 ounces of silver, 55,798 pounds of copper, 113,988 pounds of lead, and 1,893,222 pounds of zinc. Additional equipment installed raised the daily capacity of the mill from 140 to 175 tons.

Shipments of ore from the Red Mountain district consisted of lead-silver ore from the Lost Day-Patsy group and lead-zinc-silver ore from the Magnet mine. The 1,000-ton mill of the Idarado Mining

¹⁰ Colorado Mining Association, 1954 Mining Yearbook: Pp. 37, 43.

¹¹ Atomic Energy Commission, Fifteenth Semiannual Report: January 1954, part 1.

Co. on Red Mountain treated ore mined in San Miguel County. The Allray Co. carried on rehabilitation work at the Altoona mine in the Sneffels district during September and October and shipped some ore for testing to establish values.

Two small shipments of tungsten ore were made from the Dunsmore group.

PARK

The Buckskin Joe Mines, Ltd., owner and operator of the Phillips group of mines in Buckskin Gulch near Alma since April 1941, continued in 1953 to ship ore to the Resurrection mill at Leadville. This mine has been the only steady annual shipper of ore in Park County for several years; shipments in 1953 totaled 2,080 tons of ore containing 1,598 ounces of gold, 8,531 ounces of silver, 52,078 pounds of copper, 72,396 pounds of lead, and 739,284 pounds of zinc. The Alma Syndicate shipped a truckload of gold-silver ore from the Otis Shaft. Several small lots of placer gold were recovered by individuals in the vicinity of Alma and Fairplay.

PITKIN

Small tonnages of crude lead-silver ore were shipped from the Nelson Bros. prospect and the Wichita-Egg Nest group, and cleanup material containing lead, silver, and zinc was shipped from another property at Aspen to the Resurrection mill at Leadville.

PUEBLO

The new 30-million-dollar seamless tube mill added to the steelworks of the Colorado Fuel & Iron Corp. at Pueblo was completed and placed in operation in September 1953. The plant as a whole is now one of the larger producers of steel in the United States and has 8,000 to 10,000 employees. The company operates a number of coal mines and limestone quarries in Colorado. Iron ore is obtained from company mines in Wyoming and Utah.

The output of clays increased over 1952. The principal clay producers included Pueblo Clay Products Co. underground and open-pit fire-clay mines and the Colorado Fire Clay Co. underground mine at Stone City, the Standard Fire Brick Co. Rock Creek underground fire-clay mines, and the Summit Pressed Brick & Tile Co. shale clay pit. The International Minerals & Chemical Corp. operated a mica-grinding plant at Pueblo.

RIO BLANCO

The bulk of the Colorado output of crude petroleum continued to come from Rio Blanco County. The Rangely field in the northwestern part of the county was by far the largest producing field in the State, and the Wilson Creek field in the north central part ranked second. A summarized State review of petroleum production and well drilling may be found in Minerals Yearbook, 1953, volume II.

The county is also a substantial producer of coal, but output in 1953 decreased materially. Several uranium mines were operating in the vicinity of Meeker.

ROUTT

The output of coal, the principal mineral product of Routt County, decreased in 1953. Pumice was produced from an open pit on a leased section of school land near McCoy and was crushed and screened for shipment to manufacturers of building blocks in Denver.

SAGUACHE

Wm. J. Costello operated the Rawley mine at Bonanza on a small scale throughout 1953; ore shipped totaled 284 tons containing 4,589 ounces of silver, 75,136 pounds of lead, 55,530 pounds of zinc, 13,068 pounds of copper, and 6 ounces of gold. The zinc was not recovered, as the ore was shipped to a lead smelter. La Garita Mines operated the Crystal Hill-Esperanza gold mine and flotation-amalgamation mill 18 miles west of Center during the first few months of 1953. The products of the mill were retort gold, amalgam, and gold concentrate. The Bear Creek Mining Co. carried on a diamond core-drilling project in the Bonanza district.

The Villa Grove Turquoise Co. produced turquoise from an open pit on its property near Villa Grove. The turquoise was sorted according to grade, color, and size and sold in the rough to jewelry manufacturers.

SAN JUAN

The shutdown on March 14, 1953, of the Shenandoah-Dives Mining Co. mining operations on the Mayflower-Silver Lake group of mines and the closing of the company 700-ton mill near Silverton reduced overall production of metals in San Juan County to the lowest level in value since 1922. From 1928 to March 14, 1953, the company mined and milled 4,217,177 tons of gold-silver-lead-copper-zinc ore on company account and in addition milled 190,573 tons of custom ore mined by other operators. The company continued exploration work at the mine under a DMEA contract. During the 2½ months' operation in 1953 the mill treated 32,577 tons of company ore and 5,300 tons of custom ore. The producers of custom ore, in order of tonnage, were the Pride of the West-Green Mountain, Osceola, Lead Carbonate, May Day, Henrietta, Thelma, Little Nation, and Hercules mines.

Additional ore from the Pride of the West-Green Mountain, Lead Carbonate, and Hercules mines was milled in the Pride of the West mill, which was purchased and reconditioned by J. Cameron Grant and operated several months in 1953. The mill also treated a substantial tonnage of ore from the Surprise (U. S. Metals Corp.) and Great Eastern mines. The Venture Leasing Co. completed construction of a 50-ton lead-zinc flotation mill on property leased from the United States Smelting, Refining & Mining Co. in Mastodon Gulch 2 miles west of Animas Forks. The mill operated from June to September, and both lead and zinc concentrates were shipped.

Owing to the low prices of lead and zinc during 1953, none of the San Juan County mines was in full production throughout the year, and exploration under some of the DMEA contracts was not as extensive as had been planned. Contracts were in force at the Lead Carbonate, Black Hawk & Occidental, Treasure Mountain, Silver Queen, and two U. S. Metals Corp. properties.

Tungsten ore was shipped from the Ruby and Galtie Boy mines near Silverton. Vanadium-uranium ore was produced at the Graysill mine of the Vanadium Corp. of America.

SAN MIGUEL

San Miguel County's production of gold, silver, copper, lead, and zinc was well maintained in 1953 despite the low prices of lead and zinc that caused heavy decreases in some other counties. Nearly all the ore mined was complex, carrying all five metals in commercial quantity.

The Idarado Mining Co. increased the tonnage of ore mined from its Treasury Tunnel-Black Bear-Ajax group for the eighth consecutive year since mining was renewed in 1945 on the lower levels opened by the 12,000-foot Treasury Tunnel 1,100 feet below the old Black Bear workings. The portal of the Treasury Tunnel and the company 800-ton mill are on the Ouray County side of the divide between the San Miguel River and Uncompahgre River drainages, but the mining in 1953 was all in San Miguel County. The mine and mill operated continuously, except for an interruption in June, while surface installations between the mill and the Treasury Tunnel portal were being rebuilt after having been destroyed by fire on June 7. The mill products were zinc concentrate, lead concentrate, and copper concentrate (all enriched by gold and silver), and gold-silver bullion (obtained by amalgamating a jig hutch product). The company continued extensive development of its properties at greater depth through tunnels opening on the Telluride side of the mountain; 9,209 feet of drifts and 3,503 feet of raises were driven on the property during the year.

In addition to its original Idarado operations, the Idarado Mining Co. in May 1953 purchased the stock of Telluride Mines, Inc., and subsequently directed that company operations on the Smuggler Union-Montana-Tomboy group of mines and 900-ton flotation mill. The tonnage of ore mined from this group in 1953 was also larger than in 1952. The mill products were copper, lead, and zinc concentrates all containing gold and silver as well as base metals and gold-silver bullion. Development continued on the deeper levels of the group of mines, opened by the recently driven 12,000-foot mill-level tunnel and 1,200-foot raise to the mine workings above.

At Ophir the Silver Bell Mines Co. operated its washing-sorting plant and 175-ton flotation mill on ore from the Silver Bell and Carbonero mines from January through July and from the Carbonero only from August through December. Most of the mill output was bulk lead-silver-gold-copper concentrate; but some zinc concentrate was also made, and tungsten (wolframite) concentrate was recovered as a byproduct. The Mariposa Mining Co. sank 100 feet of shaft and drove 200 feet of drifts at the Butterfly mine, which has extensive old workings on 4 levels. The ore produced was milled in a leased 20-ton mill at Placerville and yielded mostly silver-lead concentrate containing also some copper, zinc, and gold. The mine was shut down in November. A small lot of gold-silver ore was shipped from the Royal group southeast of Telluride.

Bog iron ore totaling 900 tons was shipped from the Iron Springs placer at Old Ophir to buyers outside the State.

In the western part of the county uranium mining and exploration were actively carried on throughout the year. Mine operators employing 5 to 35 men were the Dulaney Mining Co. (Ike No. 1, Pinto, Radium and other mines), Jack C. Turner (Georgeta mine), Ortmayer Mining Co. (King incline and shaft and Frenchy incline No. 2), Barkley & Co. (Block 6 Club Mesa), Black & Jones (Shack & Cottonwood), and United States Vanadium Co. (Full Moon No. 1-Dorothy May and Longridge mines). There were a number of other uranium operating mines and prospects.

SUMMIT

Owing solely to increased output of ore from the Wellington mine at Breckenridge, the production of metals in Summit County increased sharply in 1953 over 1952. The Wellington has been operated steadily since 1947 by W. L. Davenport, and shipments in 1953—all to custom mills outside the county—totaled 11,298 tons of crude ore, containing 3,154,018 pounds of zinc, 2,290,532 pounds of lead, 38,227 ounces of silver, 600 ounces of gold, and 49,018 pounds of copper. Other small shippers of ore in the Breckenridge district were the Cordillera Corp. (Ling group), G. F. Galloway, Jr. (Monte Christo), and Gaymon & Webb (Pittsburg Placer, under development for lode mining).

At Montezuma Elvin E. Oelrich worked the Sts. John group from March 1 to December 20 on a small scale, trucking the ore to the 50-ton Plymouth mill. This mill was operated by Vera & John M. Jeffrey, who also produced and milled 345 tons of ore from the Silver King mine. The Sally Barber Mining Co. worked the Chautauqua mine from June through December; the output was 860 tons of lead-silver ore, which was treated in the mill near the mine. The mill also treated 148 tons of zinc-lead-silver ore mined by S. P. True from the Paymaster group. Small tonnages of direct-smelting ore were shipped from the Coley Extension, Manerva, National Treasury, Pennsylvania, Vindicator, and another property.

Near Kokomo in the Ten Mile district the Ivanhoe Trust did clean-out and repair work in the Queen of the West 1,400-foot tunnel and completed constructing a 50-ton gravity- and flotation-concentration mill. A test run of ore was made, and the property was shut down at the end of April.

Some tungsten ore was shipped from Dillon by Jackson, Fresh & Diter.

TELLER

Production of gold in the Cripple Creek district increased from 48,527 ounces in 1952 to 51,559 in 1953. The 1,000-ton Carlton custom flotation-cyanidation mill of the Golden Cycle Corp. treated the entire district output of ore. The mill operated continuously, though not at capacity, as many of the equipped mines remained idle owing to the unfavorable economic conditions for gold mining. Dump ore constituted 69 percent of the mill feed in 1953. The treatment process includes bulk flotation concentration; roasting the gold-pyrite concentrate in a fluosolids reactor, where the sulfur in the

pyrite provides fuel for roasting; cyanidation of the calcines from the reactor and dust collectors, with zinc-dust precipitation of the gold; and cyanidation of the flotation tailings in a low-grade circuit, using carbon precipitation.

The Ajax mine of the Golden Cycle Corp., opened by a vertical shaft 3,100 feet deep, was again the largest producer of gold in the Cripple Creek district. Much of the ore shipped was exceptionally rich. The Cresson Consolidated Gold Mining & Milling Co. group, with a 2,650-foot vertical shaft, was the second largest gold producer, the Mary McKinney dump ranked third, the United Gold Mines group (Portland, Rose Nicol, and Deadwood mines and the Vindicator and Hull City dumps) ranked fourth, and the Free Coinage group (Deadwood Leasing Co.) ranked fifth. Other producers included the Acme (Milliken Gold Mines), El Paso (John Roebush & Co.), Gold King (Cripple Creek Mining & Milling Co.), Grace Greenwood (LeClair), Moose, Proper (Stratton Estate, Globe Hill Mining Co.), Strong (Front Range Mines, Inc.), and Tenderfoot (Markley Mining and Exploration Co.) mines and a number of dumps.

WELD

Weld County continued to be one of the leading coal and sand and gravel producers.

The Mineral Industry of Connecticut

By Richard H. Mote¹ and Alvin Kaufman²



MINES, pits, and quarries of Connecticut yielded mineral commodities valued at \$7,917,000 in 1953, the highest since 1924 and an 11-percent increase over 1952. The gain resulted primarily from higher unit prices for stone and sand and gravel, as well as increased statistical coverage in the clay industry. Stone, most of which was crushed, continued to be the principal mineral product and composed 53 percent of the total value of State mineral output; sand and gravel, with 30 percent of the value, ranked second. Other mineral commodities produced in Connecticut in 1953 included feldspar, mica, peat, lime, and quartz.

TABLE 1.—Mineral production of Connecticut, 1952-53¹

Product	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Beryllium concentrate.....			33	\$14,321
Clays.....	157,500	\$157,500	438,200	448,260
Feldspar..... long tons..	10,929	87,432	9,829	63,049
Mica.....	11	7,073	(?)	(?)
Peat.....	10,300	(?)	7,475	30,450
Sand and gravel.....	2,581,247	1,033,214	3,025,840	2,347,750
Stone.....	2,837,045	4,101,060	3,226,568	4,235,327
Undistributed: Basalt (dimension), Columbium tantalum ores (1953), lime, mica (1953), peat (1952), quartz, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2).....		838,418		778,303
Total.....		7,125,000		7,917,000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

² Included with "Undistributed."

³ Incomplete total, portion excluded is included with "Undistributed."

REVIEW BY MINERAL COMMODITIES

METALS

There was no mine output of metals in Connecticut in 1953. Deposits containing iron, copper, tungsten, bismuth, lead, silver, and other metals are numerous in the State, but most of them have not proved to be economic.

¹ Chief, Mineral Industry Division, Region VIII, Bureau of Mines, Pittsburgh, Pa.

² Commodity-industry analyst, Region VIII, Bureau of Mines, Pittsburgh, Pa.

NONMETALS

Clays.—Most of Connecticut's clay resources, which consist entirely of miscellaneous clays, occur in the Connecticut River Valley. Reported production was substantially higher in 1953 than in 1952 because of improved reporting practice. There were 7 clay pits operated by 6 companies active in 1953. Of these, 4 were in Hartford County, 1 in Middlesex County, and 2 in New Haven County.

Feldspar.—Output of feldspar declined 10 percent as compared with 1952. The average price dropped from \$8.00 per ton in 1952 to \$6.41 in 1953. Production was reported by the Worth-Spar Co. and Eureka Mining & Milling Co. from mines in the pegmatite area northeast of Middletown, Middlesex County.

TABLE 2.—Crude feldspar sold or used by producers, 1944-48 (average) and 1949-53

Year	Long tons	Value	
		Total	Average per ton
1944-48 (average).....	13,434	85,501	\$6.36
1949.....	12,659	95,044	7.50
1950.....	13,580	101,851	7.50
1951.....	13,811	107,083	7.75
1952.....	10,929	87,432	8.00
1953.....	9,829	63,049	6.41

Lime.—Output of lime in 1953 consisted of quicklime and hydrated lime for a wide variety of uses. New England Lime Co., Litchfield County, continued to be the sole producer.

Mica.—Connecticut mica output more than tripled in 1953 compared with 1952 as a result of the Defense Materials Procurement Administration's long-range purchasing program. The present Government program was initiated in March 1952 and is to continue until June 20, 1955, or until the total domestic block, film, and hand-cobbed mica accepted by the Government reaches the equivalent of 25,000 short tons of hand-cobbed mica (90 pounds of full-trimmed block or film mica equals 1 ton of hand-cobbed mica). Connecticut production was sent to the Franklin, N. H., General Services Administration depot, which began operation August 20, 1952, for inspection and sale. Major producers were Branchville Mining Co. and the Worth-Spar Co. Branchville Mining Co. operated a mica mine in granite pegmatites at Redding, Fairfield County. The Worth-Spar Co. recovered mica as a byproduct of its feldspar operation near Cobalt, Middlesex County.

Sand and Gravel.—Production of sand and gravel increased 17 percent in 1953, compared with the previous year. Output was reported from all counties except Tolland and Windham. The counties producing the largest quantities were Hartford, New Haven, and Fairfield. Sand and gravel, recovered by the 36 commercial operators active during the year, was sold for building, paving, railroad ballast, engine, and filter purposes.

Silica (Quartz).—The Lantern-Hill Silica Co. operated mines at Lantern Hill and Long Hill near North Stonington, New London

County, for the production of quartz. The output was utilized for glass and foundry sands.

Stone.—The major mineral industry in Connecticut in 1953 was the quarrying of stone, most of which was produced in New Haven and Hartford Counties. There were 11 basalt, 6 granite, and 4 limestone quarries active in the State during the year. Production consisted mainly of crushed stone for railroad ballast, building, and paving purposes.

TABLE 3.—Stone sold or used by producers, 1952–53, by uses

Use	1952		1953	
	Quantity	Value	Quantity	Value
Dimension stone:				
Building stone:				
Rough construction.....short tons..	1 2, 316	1 \$7, 177	2 2, 287	2 \$8, 831
Cut stone, slabs, and mill blocks.....cubic feet..	3 11, 460	3 36, 626	3 26, 266	3 78, 927
Approximate equivalent in short tons.....	3 951		2, 180	
Rubble.....short tons..	1, 348	13, 928	(²)	(²)
Monumental stone.....cubic feet..	3 10, 563	3 83, 415	3 10, 680	3 84, 380
Approximate equivalent in short tons.....	3 877		3 886	
Curbing and flagging.....cubic feet..	(⁴)	(⁴)	(⁴)	(⁴)
Approximate equivalent in short tons.....	(⁴)		(⁴)	
Undistributed.....short tons..	405	38, 155	1, 423	35, 033
Total dimension stone (quantities approximate in short tons).....	1 5, 897	1 179, 301	2 6, 776	2 207, 171
Crushed and broken stone:				
Riprap.....short tons..	1 23, 631	1 29, 537	3 33, 918	3 40, 414
Crushed stone.....do....	2, 682, 843	3, 476, 223	2, 635, 053	3, 532, 045
Furnace flux (limestone).....do....	(⁴)	(⁴)	(⁴)	(⁴)
Agricultural (limestone).....do....	64, 146	245, 772	(⁴)	(⁴)
Other uses.....do....	(⁴)	(⁴)	(⁴)	(⁴)
Undistributed.....do....	59, 986	168, 665	150, 821	455, 697
Total crushed and broken stone.....do....	1 2, 830, 606	1 3, 920, 197	2, 819, 792	4, 028, 156
Grand total (quantities approximate in short tons).....	2, 837, 045	4, 101, 060	2 2, 826, 568	2 4, 235, 327

¹ To avoid disclosing confidential information certain totals are incomplete, but the portion excluded is included in the grand total.

² Incomplete total.

³ Incomplete. The portion not included is combined with "Undistributed."

⁴ Included with "Undistributed."

MINERAL FUELS

Peat.—Peat production in 1953 decreased 27 percent from 1952 despite an increased number of producers. This commodity was recovered from bogs in Hartford, Middlesex, and Tolland Counties by Shaler Humus Co., Manchester; J. Werden Clark, Old Saybrook; and Bonair Peat Co., Manchester. Shaler Humus Co. had been the only producer in 1952. The Federal Geological Survey estimated original reserves at 2 million short tons.³

Peat produced in 1953 was sold for soil-improvement purposes.

REVIEW BY COUNTIES

FAIRFIELD

Sand and gravel, mica, and stone were the major mineral commodities produced in Fairfield County. Bernard J. Dolan Co.

³ Geological Survey, Coal Resources in the United States; Progress Report: Circ. 293, Oct. 1, 1953, p. 38.

(Bethel), John Lomazzo & Sons (Weston), Grasso Construction Co. (Bridgeport), Holbeck & Co. (Greenwich), and L. DeLucas Sons (Cos Cob) produced sand and gravel for structural, paving, and railroad-ballast purposes. Agricultural stone, flux, concrete aggregate, road material, and a small quantity of rough construction limestone were produced by The Connecticut Agstone Co., Danbury. Mica continued to be recovered by Branchville Mining Co. from its open-cut and underground mine at Redding.

TABLE 4.—Value of mineral production in Connecticut, 1952-53, by counties, and principal minerals produced in 1953

County	1952		1953		Principal minerals in order of value
	Value	Value	Rank	Percent of total	
Fairfield.....	\$244, 894	\$523, 642	5	7	Sand and gravel, stone.
Hartford.....	2, 758, 462	2, 823, 628	1	36	Stone, sand and gravel, clays.
Litchfield.....	1, 262, 923	1, 223, 524	3	15	Stone, lime, sand and gravel.
Middlesex.....	113, 697	324, 991	6	4	Clays, feldspar.
New Haven.....	2, 341, 468	2, 408, 184	2	30	Stone, sand and gravel, clays.
New London.....	(¹)	599, 427	4	8	Quartz, sand and gravel, stone.
Tolland and Windham.....	403, 253	13, 787	7	(²)	Stone, peat.
Total.....	7, 125, 000	7, 917, 000	-----	100	Stone, sand and gravel, clays.

¹ Included with Tolland and Windham Counties.

² Less than 1 percent.

HARTFORD

Hartford County retained its position as the leading mineral-producing county in Connecticut in 1953. The county ranked first in output of sand and gravel and second in production of clay. Crushed basalt for concrete aggregate and road bases—the major product in terms of value—was produced by Edward Balf Co., Hartford; New Haven Trap Rock Co., Inc., Plainville; Material Service, Inc., Windsor Locks; Arborio & Sons, Farmington; Angelo Tomasso, Inc., Plainville; and Sherman Sand & Stone Co., New Britain. Sand and gravel for structural, paving, and filter purposes were produced at 13 commercial plants in 1953; the largest were those of Dunning Sand & Gravel Co., Farmington; Russak Bros., Inc., Plainville; Farmington Sand & Gravel Co., West Hartford, and Manchester Sand & Gravel Co., Manchester. Clay for brick manufacture was recovered from the surface mines of Donnelly Brick Co., Kensington; Eastern Brick Co., South Windsor and Berlin; and E. W. Mack & Sons, Windsor. Raw and shredded peat humus for soil-improvement purposes was recovered near East Hartford by Shaler Humus Co.

LITCHFIELD

Mineral output from Litchfield County included limestone, basalt, burnt lime, and sand and gravel. The county continued to rank third in Connecticut in total value of mineral production. New England Lime Co. produced hydrated lime and quicklime at its Canaan plant. This company also produced crushed limestone, as did United States Gypsum Co., Falls Village, and The Conklin Limestone Co., Inc., Canaan. Basalt was quarried and crushed by Wood-

bury Trap Rock Co., Inc., Torrington. Sand and gravel were produced by State Line Sand & Gravel Co., Canaan; and by Benvenuti & Favali Construction Co., John C. Ifland Lumber Co., and Oneglia & Gervasini, Inc., Torrington.

MIDDLESEX

Clay, feldspar, mica, peat, and sand and gravel were produced in Middlesex County in 1953. Feldspar was recovered from The Worth-Spar Co. mine near Cobalt and from the Hale mine of Eureka Mining & Milling Co. at Portland. The Worth-Spar Co. mine also yielded byproduct mica. The Middletown open pit of Michael Kane Brick Co. yielded clay for use in producing brick by the soft-mud process. Sebastian Ortise and Middletown Sand Service operated sand and gravel pits at Middletown. Cultivated peat humus was produced by J. Werden Clark from an 80-acre bog near Old Saybrook. Output was sold for soil-improvement and packaging purposes.

NEW HAVEN

New Haven County, which ranked second among the mineral-producing counties in Connecticut in 1953, supplied 31 percent of the State's total value of mineral output. Major mineral products were basalt and granite. The principal producers of crushed basalt were New Haven Trap Rock Co., North Branford and Middlefield; York Hill Trap Rock Quarry Co., Meriden; C. W. Blakeslee & Sons, Inc., Hamden and New Haven; A. N. Farnham, Inc., New Haven; and Foxon Trap Rock Co., Inc. Dimension granite was quarried by Ansonia Granite Quarries, Seymour; the Stony Creek Granite Quarry, Inc., Milford, produced both dimension and crushed granite.

A. N. Farnham, Inc., was the largest sand and gravel producer in the county. Other companies producing these commodities were The Iron Ledge Co., Bridgeport; D. J. Carten Sand & Gravel Co., Stratford; and Elm City Construction Co., Hamden. J. L. Stiles & Son Brick Co. and North Haven Brick Co., both of North Haven, mined clay for use in manufacturing brick.

NEW LONDON

The major mineral commodity of New London County in 1953 was crushed silica rock mined by Lantern Hill Silica Co. from the Lantern Hill and Long Hill quartz deposits near North Stonington. Sand and gravel were obtained from pits near New London by Southern New England Contractors Supply Co., Inc.; John J. Doyle Sand & Gravel Co., Inc.; and New London Sand & Gravel Co. Dimension granite for use as memorials and dressed stone was quarried by Millstone Granite Quarry, Inc., Millstone Point; Golden Pink Granite Quarry, Inc., New London; and E. Locarno & Sons, Niantic. The Millstone Point Quarry also yielded some riprap.

TOLLAND

Bonair Peat Co. produced shredded peat humus for soil-improvement purposes from a 19-acre deposit in the Ellington-Tolland area.

WINDHAM

The only mineral producer in Windham County was R. B. Marriott & Sons, Oneco, which quarried granite for use as rubble, curbing, flagging, and miscellaneous uses.

The Mineral Industry of Delaware

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Delaware Geological Survey.

By Richard H. Mote¹ and Alvin Kaufman²



THE VALUE of Delaware mineral output decreased 3 percent in 1953 compared with 1952, primarily as a result of a decline in stone production. Sand and gravel remained the major products, supplying 61 percent of the total value of State output. Other commodities produced included stone and clay. Seven mining establishments were active in the State in 1953 compared with eight in 1952.

TABLE 1.—Mineral production in Delaware, 1952-53¹

Mineral	1952		1953	
	Short tons	Value	Short tons	Value
Sand and gravel.....	515,399	\$382,484	520,817	\$399,685
Stone.....	94,911	251,759	80,364	215,382
Undistributed: Nonmetallic minerals.....		42,805		43,930
Total.....		677,000		659,000

¹ Production as measured by mine shipments, sales or marketable production (including consumption by producers).

METALS

There was no mine output of metals in Delaware in 1953. Bog-type deposits of limonite ore had been utilized by local iron furnaces before 1890. Since that time, however, the discovery of higher grade deposits has made exploitation of the Delaware deposits uneconomic.

NONMETALS

Clays.—Clays for use in manufacturing brick was mined by two companies in New Castle County. Production increased slightly in 1953 as compared with 1952, despite a drop in the number of producers from 3 to 2.

Sand and Gravel.—Production of sand and gravel, chiefly for building, paving, and railroad-ballast purposes, continued to be the major mineral industry in Delaware. Output increased slightly in 1953. Of the 4 active pits, 2 were in New Castle County and 2 in Sussex County.

Stone.—The quarry of Petrillo Bros., Inc., New Castle County, yielded gabbro, a basaltic-type rock. This commodity was used for concrete aggregate, road material, and railroad ballast.

¹ Chief, Mineral Industry Division, Region VIII, Bureau of Mines, Pittsburgh, Pa.
² Commodity-industry analyst, Region VIII, Bureau of Mines, Pittsburgh, Pa.

REVIEW BY COUNTIES**NEW CASTLE**

Sand and gravel, stone, and clay were produced in New Castle County. Petrillo Bros., Inc., Minguadale, and Thomas D. Whittington, Bear, produced sand and gravel for building and paving. The Shellpot quarry of Petrillo Bros., Inc., north of Wilmington yielded gabbro, which was crushed for sale as Brandywine blue granite. Delaware Brick Co. operated a pug mill and brickmaking machine near New Castle. Clay was obtained from the company pit near the plant. Brick was also manufactured by Oberly Brick Co., Wilmington, from clay purchased locally.

SUSSEX

Henry G. Graves & Sons produced paving sand from a portable plant near Lewes. The fixed plant of Lewes Sand Co., Lewes, yielded unwashed engine sand. The county sand output was derived from the dune deposits on Cape Henlopen.

The Mineral Industry of Florida

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of Florida.

By J. R. Thoenen¹ and James L. Calver²



IN 1953 minerals produced in Florida were phosphate rock, stone, sand and gravel, clays, ilmenite, zircon, rutile, peat, natural gas, in the order of published production value, and cement, petroleum, abrasive garnet, and lime, the values of which cannot be published separately.

A new record of production was established in 1953 which exceeded that in 1952, the previous record year, by 11 percent. New alltime highs were attained in the cement and phosphate-rock industries.

TABLE 1.—Mineral production in Florida, 1952-53¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays.....	197, 711	\$2, 071, 185	257, 911	\$2, 952, 359
Natural gas..... million cubic feet..	15	1, 000	34	2, 000
Peat.....	23, 729	154, 164	27, 678	185, 524
Petroleum (crude)..... thousand 42-gallon barrels..	591	(²)	543	(²)
Phosphate rock ⁴ long tons..	9, 205, 138	54, 085, 524	9, 331, 002	56, 524, 701
Sand and gravel.....	4, 154, 613	3, 848, 077	3, 731, 432	3, 199, 368
Stone (except limestone for cement and lime).....	7, 836, 634	9, 577, 541	9, 428, 959	11, 309, 421
Titanium concentrate:				
Ilmenite.....	(²)	(²)	151, 109	2, 322, 451
Rutile.....	(²)	(²)	6, 475	702, 791
Zirconium concentrate.....	(²)	(²)	21, 234	793, 685
Undistributed: Cement, abrasive garnet, lime, stone (dimension limestone, 1953), and minerals whose value must be concealed for particular years (indi- cated in appropriate column by footnote reference 2). Excludes value of clays used for cement.....		\$13, 140, 989		14, 343, 637
Total Florida.....		\$82, 878, 000		92, 336, 000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

² Value included with "Undistributed."

³ Final figure. Supersedes preliminary figure given in commodity chapter.

⁴ Marketable production.

⁵ Revised figure.

¹ Chief, Mineral Industry Division, Region VII, Bureau of Mines, Knoxville, Tenn.

² Geologist, Florida Geological Survey, Tallahassee, Fla.

TABLE 2.—Average unit value of mineral commodities in Florida, 1949-53¹

Commodity	1949	1950	1951	1952	1953
Cement, portland..... 376-pound bbl	\$2. 65	\$2. 65	\$2. 80	\$2. 76	\$2. 87
Clays:					
Fuller's earth..... short ton	17. 60	16. 70	16. 78	17. 37	18. 84
Kaolin..... do	23. 07	23. 74	23. 60	24. 55	23. 92
Miscellaneous..... do	. 55	. 75	1. 00	1. 00	1. 00
Garnet..... do			38. 07	46. 44	46. 49
Ilmenite..... do	17. 35	15. 56	14. 81	16. 35	15. 37
Lime..... do	12. 95	12. 55	12. 56	12. 93	12. 57
Limestone:					
Crushed..... do	1. 13	1. 30	1. 17	1. 22	1. 20
Dimension..... do				9. 74	9. 00
Marl..... do	. 40				
Natural gas..... thousand cubic feet	. 04	. 05	. 07	. 07	. 06
Peat..... short ton	5. 85	6. 57	6. 27	6. 50	6. 70
Petroleum..... 42-gallon bbl	(?)	(?)	(?)	(?)	(?)
Phosphate rock..... long ton	5. 55	5. 61	5. 92	5. 88	6. 07
Rutile..... short ton	44. 22	50. 00	50. 17	103. 77	108. 54
Sand..... do	. 78	. 91	. 84	. 75	. 82
Gravel..... do	. 97	1. 20	1. 25	1. 34	1. 27
Zircon..... do	44. 75	47. 04	43. 63	38. 57	37. 38

¹ For greater detail on prices by grades and markets, see volume I, Minerals Yearbook, 1953.
² Data not available.

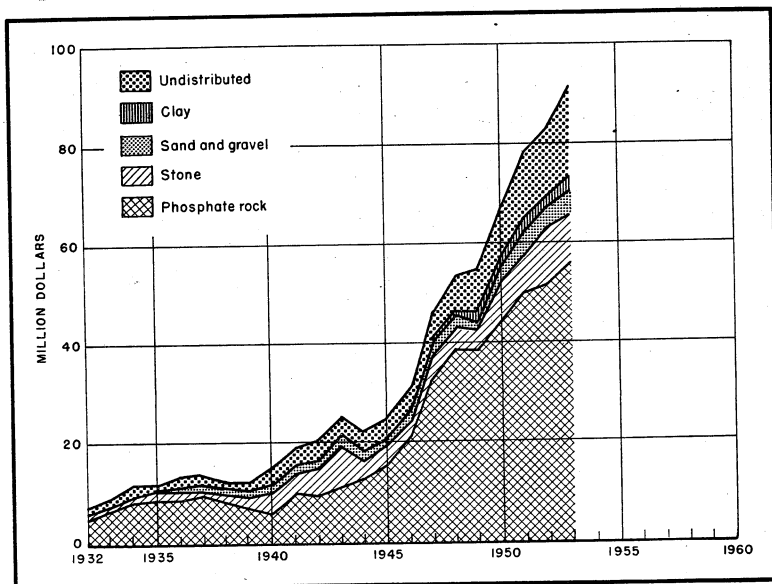


FIGURE 1.—Value of mineral production in Florida, 1932-53.

REVIEW BY MINERAL COMMODITIES

METALS

There are no known primary metalliferous deposits in the State. Titanium (Ilmenite and Rutile Concentrates).—Production of titanium minerals came from stabilized dunes in Brevard, Indian River, Clay, and Duval Counties. Mining has been conducted for the most part by suction dredges, although draglines have also been in use. The "heavy" sand content of the deposits averages less than 5 percent

and consists of minerals other than ilmenite and rutile. Concentration was by gravity "spirals" and mineral separation by electrical and magnetic methods.

The E. I. du Pont de Nemours Co., Inc., continued operation of its Trail Ridge mine in Clay County and toward the end of the year announced plans to erect a similar plant to be known as the Highland plant near Lawtey, 10 miles north of the Trail Ridge plant. The new plant was expected to go into production early in 1955 and produce 100,000 tons of concentrate annually.

The Florida Ore Processing Co. continued to mine beach and dune sands for concentration in its separation plant near Melbourne, Brevard County.

The Rutile Mining Co. and the Titanium Division of National Lead Co. continued mining near Jacksonville.

W. A. White, president, Titanium Corp. of Florida, announced operation of a pilot plant near Sebastian, but no production was reported for 1953.

Several large companies noted increased interest in prospecting and exploration for new deposits on both the east and west coasts.

Ilmenite was mined in Brevard, Indian River, Clay, and Duval Counties. The value per ton of ilmenite concentrate shipped decreased 6 percent; and the total value of shipments decreased approximately 4 percent, although mine production increased 2 percent. As in previous years, ilmenite produced in Clay County consisted of a mixture of ilmenite, rutile, and leucoxene.

Rutile was mined in Brevard, Indian River, and Duval Counties. The value per ton increased a little less than 5 percent, but mine production was down 4 percent and total value down a little less than 2 percent.

Uranium.—The Atomic Energy Commission, with the cooperation of the phosphate-rock industry, contracted with the Federal Geological Survey to explore for uranium by core drilling in the land-pebble field. Cores were taken from both the phosphate matrix and the so-called "leached zone" overlying it. This leached zone was believed to offer interesting possibilities for the recovery of uranium, phosphate, and alumina. For investigation of this possibility the AEC contracted with the International Minerals & Chemical Corp. to erect and operate a pilot plant to study various methods by which uranium, phosphate, and alumina could be economically recovered. Research indicated that uranium as well as phosphate and alumina could be recovered from this leached zone.³

Zirconium (Zircon Concentrate).—Zircon concentrate was separated by all producers of titanium minerals from the heavy sand concentrate. Mine production declined 9 percent and value per ton 3 percent.

NONMETALS

Cement.—The cement industry expanded to another all-time high, with shipments increasing 66 percent above those in 1952, the previous record year. This increase was due to the fact that the new Bunnell plant of Lehigh Portland Cement Co. approached capacity output during the year after initial production in 1952.

³ Mining World, May 1953.

Portland cement was manufactured in Flagler and Hillsborough Counties. The reported value per barrel increased 4 percent above 1952, and the total value of shipments increased 73 percent.

Clays.—The clay-mining industry reached an all-time high in production and value, advancing 43 percent in total value and 30 percent in tonnage over those reported for 1951, the previous peak year.

Fuller's earth was mined by two companies during the year; both operated in Gadsden County. The total sold or used increased 45 percent over that reported in 1952, and the total value increased 58 percent. The value per ton increased 8 percent.

Two operators in Putnam County mined kaolin. Production remained about the same as in the previous year, but the total value reported declined 2 percent, reflecting a 3-percent decline in unit value a ton.

Miscellaneous clays for heavy clay products and brick came from one producer in Gadsden County, who operated at about half 1952 production rate. Clay used in cement manufacture increased with the increased cement production.

Fluorspar.—Fluorspar has not been found as a primary mineral in Florida. However, investigations underway suggest the possibility that the State's vast phosphate-bearing minerals may become the source of a significant synthetic fluorspar production.⁴

Of parallel interest is the announcement that Chemecon Corp. of Mulberry was allowed an 85-percent tax writeoff on an investment of \$109,700 for the purpose of manufacturing synthetic cryolite.⁵

Garnet.—The production of garnet was confined to a single operator as a byproduct recovered in the mining and concentration of titanium minerals. Production was slightly below 1952.

Lime.—Lime production was slightly lower in both tonnage and value than in the peak year 1952 but remained above that of the previous peak in 1951.

Limestone.—The limestone industry, excluding limestone used in manufacturing cement or lime, enjoyed its greatest year in the State's history.

Stone quarried for sale or use by producers exceeded that in 1951—the previous peak year— by 17 percent in tonnage and 20 percent in value. The increase over 1952 was 20 percent in tonnage and 18 percent in value. The unit value a short ton for crushed limestone declined 2 cents a ton to an average of \$1.20 as compared with 1952 value.

Forty-four quarries reported the production of crushed limestone, and three reported production of dimension stone. In addition, the National Park Service reported production of crushed limestone without designating the county source.

New production was reported from Jackson and Sarasota Counties by single producers in each county. In all, 15 counties reported crushed-stone production compared with 13 in 1952, and 3 counties reported dimension-stone production compared with 2 in 1952.

⁴ Chemical Engineering, The Cementator: November 1953, p. 107.

⁵ Oil, Paint and Drug Reporter, Apr. 26, 1954, p. 3.

TABLE 3.—Crushed limestone sold or used by producers, 1944-48 (average) and 1949-53 (exclusive of limestone used for cement and lime)

Year	Short tons	Value	Year	Short tons	Value
1944-48 (average).....	3, 173, 594	\$3, 668, 433	1951.....	8, 032, 966	\$9, 419, 682
1949.....	4, 215, 090	4, 748, 253	1952.....	7, 836, 124	9, 577, 541
1950.....	5, 313, 400	6, 885, 394	1953.....	9, 428, 959	11, 309, 421

Monazite.—Monazite was recovered from sand-dredging operations for titanium minerals in Duval County. Production data were classified.

Phosphate Rock.—The phosphate-rock-mining industry expanded to another alltime high record in 1953, although it dropped from 65 percent to 61 in its relation to the total State mineral production. Marketable production of phosphate rock increased a little more than 1 percent above that in 1952; however, total material sold or used by producers increased 4 percent in tonnage and 8 percent in total value over 1952. Unit value advanced 3 percent.

The new triple phosphate plant of the International Minerals & Chemical Corp. near Bartow went into production and extraction of uranium from the rock is planned for later undertaking.

The Independent Chemical Co. applied to the City Commission of Bartow to permit mining its phosphate deposit, which lies within the city's limits.

Virginia-Carolina Chemical Corp. was planning a new phosphate plant and a new drying and shipping center.⁶

Other companies were reported to have substantially expanded operating equipment.

Gases containing fluorine, which are liberated in the production of superphosphate, have long been regarded as an undesirable byproduct by the fertilizer industry. They were being considered as a potential source of silicofluorides for use as laundering agents and in the manufacture of gasoline and foam rubber.⁷

Research at the International Minerals & Chemical Corp. pilot plant previously mentioned reportedly indicated that the alumina byproduct recovered in addition to phosphate and uranium could be concentrated to equal or better the alumina content of high-grade bauxites, without certain penalizing impurities. The Florida alumina has been tested successfully by several aluminum manufacturers.⁸

The Coronet Phosphate Co. holdings in Hillsborough and Polk Counties were acquired by the Smith-Douglass Co. of Norfolk, Va., and operated as the Coronet Division of that company.

Land-pebble rock was mined by 7 companies in Hillsborough and Polk Counties, hard rock by 1 operator in Citrus County, and soft rock by 5 companies in Citrus, Columbia, Gilchrist, and Marion Counties.

⁶ Mining World, March 1953, p. 91.

⁷ Oil, Paint and Drug Reporter, Sept 14, 1953, p. 45.

⁸ Mining World, May 1953, p. 87.

TABLE 4.—Phosphate rock sold or used by producers, 1944-48 (average) and 1949-53

Year	Hard rock		Soft rock †		Land pebble		Total	
	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value
1944-48 (average)	62,880	\$462,811	77,365	\$312,131	5,063,319	\$23,525,806	5,203,564	\$24,300,748
1949	23,804	173,211	77,088	344,787	6,715,097	37,339,985	6,815,989	37,857,983
1950	71,319	538,601	81,542	408,595	7,933,009	44,430,646	8,085,870	45,377,842
1951	75,615	582,247	92,183	495,243	8,329,033	49,185,072	8,496,831	50,262,562
1952	81,086	625,175	75,853	433,203	8,624,186	50,483,421	8,781,125	51,541,799
1953	81,725	643,993	75,910	470,062	9,009,220	54,498,217	9,166,855	55,612,272

† Includes material from waste-pond operations.

Table 5 has been prepared to show the marketable production of phosphate rock for comparison with sales and use, as shown in table 4.

TABLE 5.—Marketable production of phosphate rock, 1949-53

Year	Hard rock		Soft rock		Land pebble		Total	
	Long tons	Value	Long tons	Value	Long tons	Value	Long tons	Value
1949	32,176	\$231,024	73,086	\$321,388	6,590,145	\$36,681,481	6,695,407	\$37,233,893
1950	70,500	532,275	80,095	398,797	8,446,632	47,446,909	8,597,227	48,377,981
1951	81,600	628,320	90,359	486,424	8,059,881	47,497,248	8,211,820	48,611,992
1952	85,900	662,289	83,001	491,775	9,056,237	52,931,460	9,205,138	54,085,524
1953	68,200	537,416	76,781	474,248	9,186,021	55,513,037	9,331,002	56,524,701

Sand and Gravel.—For the second year since the peak of 1951, the sand and gravel industry declined in both tonnage produced and total value. As in previous years, commercial sand composed the major portion of production (90 percent in 1953). Commercial gravel supplied 9 percent of the output, and sand produced by the Bureau of Forestry amounted to less than 1 percent.

Twelve counties reported commercial sand production compared with 13 in 1952. However, Duval and Marion Counties, which showed production in 1952, did not report any in 1953, whereas Volusia County did report in 1953 and not in 1952.

Gravel production came from the same four counties as in 1952 but declined appreciably both in tonnage and value. This reduction was due in part to improvement in statistical detail when it was found that some stone and oystershell output had been reported as sand and gravel in previous years.

Table 6 shows sand and gravel sold or used by producers.

Staurolite recovered from the mining of ilmenite, rutile, and zircon was used by the Bunnell plant of the Lehigh Portland Cement Co. as a source of alumina in manufacturing cement. Consumption for cement use in 1953 was roughly 19,000 short tons. A small amount was distributed to other experimental markets.

TABLE 6.—Sand and gravel sold or used by producers, 1944-48 (average) and 1949-53

Year	Sand		Gravel		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1944-48 (average).....	(1)	(1)	(1)	(1)	1,712,756	\$1,577,723
1949.....	1,532,931	\$1,190,753	710,967	\$688,980	2,243,898	1,879,733
1950.....	1,850,448	1,687,713	943,417	1,118,718	2,793,865	2,806,431
1951.....	2,986,862	2,512,282	1,431,711	1,788,400	4,418,573	4,300,682
1952.....	(2)	(2)	(2)	(2)	4,154,613	3,848,077
1953.....	3,386,329	2,760,410	345,103	438,958	3,731,432	3,199,368

¹ Data not available.

² Figure withheld to avoid disclosure of individual company operations.

MINERAL FUELS

Natural Gas.—Natural gas produced and marketed doubled in volume and value above 1952.

Peat.—Peat produced for agricultural purposes increased 17 percent in tonnage and 20 percent in value as compared with 1952. No peat was produced for use as fuel.

Petroleum.—The marketed production of petroleum decreased 9 percent below 1952.

Up to 1954 the Sunniland field had been the only producing field in the State, but a wildcat well drilled to a depth of 11,347 feet in Dade County, 40 miles southeast of the Sunniland field, may become the first producing hole in a new field.⁹ However, the well had not been officially completed at the end of the year.

REVIEW BY COUNTIES

ALACHUA

A new quarry was opened by S. M. Wall to produce crushed limestone. Williston Shell Rock Co. continued to operate its Buda and Haile quarries, and The Newberry Corp. also continued operation.

Total limestone sold or used by producers was 266,300 short tons valued at \$297,500, a reduction of 46 percent in tonnage and 45 percent in value; however, the average unit value a ton increased 2 cents from \$1.10 in 1952 to \$1.12 in 1953.

TABLE 7.—Crushed limestone sold or used by producers in Alachua County, 1951-53

Year:	Short tons	Value
1951.....	586,362	\$597,995
1952.....	490,332	538,211
1953.....	266,297	297,518

BAY

The Brewton Engineering Co. reported the sale or use of 14,520 short tons of building sand valued at \$8,250, or 57 cents a ton.

⁹ Oil and Gas Journal, New Florida Strike: Oct. 12, 1953, p. 107.

BREVARD

The Florida Ore Processing Co. continued to operate its Palm Bay concentrating plant and recovered garnet, ilmenite, rutile, and zircon concentrates from ore obtained in Brevard and Indian River Counties, with little change in the rate of production from 1952.

BROWARD

Six producers reported production of crushed limestone, and one produced dimension limestone. Producers were S. P. Snyder & Son, Inc., Deerfield Rock Corp., and Broward County Highway Department, all at Fort Lauderdale; C. Meekins, Hollywood; Hallandale Rock Corp., Hallandale; and Maule Industries, Inc., Miami Beach. The total output was 143 percent larger in tonnage and 157 percent in value than in 1952, and the unit value increased an average of 6 cents a ton.

TABLE 8.—Crushed limestone sold or used by producers in Broward County, 1949-53

Year	Short tons	Value	Year	Short tons	Value
1949.....	391,340	\$299,123	1952.....	779,255	\$786,794
1950.....	735,394	659,633	1953.....	1,893,827	2,024,771
1951.....	979,737	833,936			

Less than 10 tons of dimension limestone was produced.

CITRUS

Mineral products aggregating \$1 million were mined in Citrus County during the year. Connell & Shultz quarried and crushed limestone from its Citrus Gardens quarry, and J. S. Nangle continued to operate the Nangle quarry for crushed dolomite. Kibler-Camp Phosphate Enterprises operated its Sec. 12 mine and opened a new (Sec. 17) mine for hard rock. Five producers reported mining soft phosphate rock: Soil Builders, Inc. (Mincoll mine), The Kellogg Co. (Kellogg mine), Knight & Bevis (Seacoll mine), Superior Phosphate Co. (Dunnellon mine), and the Seaboard Phosphate Co. (Manko mine).

CLAY

Operation of Trail Ridge mine (dredge pond) by E. I. du Pont de Nemours Co., Inc., for the production of a mixed product containing ilmenite, rutile, and leucoxene was continued. The mineral zircon was also recovered in considerable tonnage.

E. I. du Pont de Nemours Co. announced plans for developing a new dredge operation for ilmenite near Lawtey.

COLLIER

Production of natural gas and crude petroleum continued from the Sunniland field. Production of natural gas more than doubled that of 1952, but crude petroleum declined nearly 50,000 barrels.

COLUMBIA

Loncala Phosphate Rock Co. continued to operate its Fort White mine for production of soft rock.

DADE

The city of Miami recovered roughly 22,000 short tons of lime as a byproduct in its water-purification operations.

Eight operators reported production of crushed limestone as follows: Maule Industries (Maule-Ojus, Red Road, and Tropical quarries), Murphy & Mills (M & M quarry), Naranja Rock Co. (Naranja quarry), Troup Quarries, Inc., (Troup quarry), Oolite Rock Co. (Oolite quarry), T. J. James Construction Co. (James quarry), Peffer Construction Co. (Peffer quarry), and E. A. Pynchon (Pynchon quarry).

Four companies continued production of sand and gravel, namely, Maule Industries (Ojus and Red Road pits), Hialeah Crushed Stone Co. (formerly reported as Murphy & Mills Corp.), Des Rochers Sand Co., and Florida Silica Sand Co.

The total value of mineral production from the county was \$5,272,-000, a 14-percent reduction below 1952. Table 9 shows the mineral aggregates sold or used by producers.

TABLE 9.—Mineral aggregates sold or used by producers in Dade County, 1949-53

Year	Crushed limestone ¹		Sand		Gravel		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1949.....	2,383,260	\$2,250,435	613,123	\$629,328	600,000	\$600,000	3,596,383	\$3,479,763
1950.....	2,513,490	2,922,624	859,439	991,765	654,030	954,813	4,026,959	4,869,202
1951.....	3,347,326	3,914,231	1,342,668	1,454,029	1,295,794	1,646,431	5,985,788	7,014,741
1952.....	3,579,192	3,793,305	728,502	757,468	973,072	1,347,308	5,280,766	5,898,081
1953.....	4,038,367	3,805,333	955,468	1,096,059	105,596	143,812	5,099,431	5,045,204

¹ Exclusive of limestone used for the manufacture of cement and lime.

DUVAL

Both the Rutile Mining Co. and the National Lead Co., Titanium Division, continued dredging operations near Jacksonville to recover ilmenite, rutile, and zircon. Total production increased roughly 16 percent above 1952.

ESCAMBIA

Rufus Campbell and Ward Gravel Co. continued to produce sand and gravel. The total produced was 289,000 short tons valued at \$262,000, an increase of 63 percent in tonnage and 66 percent in value above 1952.

FLAGLER

The Lehigh Portland Cement Co. continued to operate its Bunnell plant, which first began production in the latter part of 1952. As noted elsewhere, this plant utilized staurolite an iron-aluminum silicate containing, when pure, 56 percent alumina and 16 percent iron oxide. The staurolite was used as a source of both alumina and iron in the manufacture of cement.

GADSDEN

The Floridin Co. continued to operate several mines to supply its Jamieson and Quincy plants with fuller's earth, and the Attapulcus Mineral & Chemical Corp. continued to operate the Willocoochee Nos. 6 and 8 mines for fuller's earth. The total production exceeded that reported in 1952 by 45 percent in tonnage and 58 percent in value.

The Apalachee Correctional Institute continued to operate the Chattahoochee mine for brick and tile clay, but production was only half that in 1952.

The Florida Gravel Co. continued operation but at a reduced scale compared with 1952.

GILCHRIST

The Loncala Phosphate Co. continued to operate its Mona mine for soft phosphate rock.

HERNANDO

The Camp Concrete Rock Co. (Gay quarry) and Wm. P. McDonald Corp. (Conrock quarry) continued to produce crushed limestone, and the Brookville Rock Co. reopened the Conroc quarry. Total production increased 35 percent in tonnage and 31 percent in value over 1952.

HILLSBOROUGH

The General Portland Cement Co. continued to operate its Tampa mill. Shipments increased 23 percent in quantity and 26 percent in value over 1952.

Land-pebble phosphate rock was mined by the American Cyanamid Co. (Sydney mine) and the American Agricultural Chemical Co. (Boyette mine).

JACKSON

The Marjax Co. reopened the Marjax quarry and quarried a small tonnage of crushed limestone.

LAFAYETTE

The Williston Shell Rock Co. continued to operate its Mayo quarry but at greatly reduced rate below 1952.

LAKE

The Central Sand Co. continued to operate its sand pit but at a slightly reduced rate compared with 1952.

LEVY

Five operators reported production of crushed limestone during 1953. Connell & Schultz (Williston quarry), Levy County Lime Rock Corp., United Limerock Corp., and Dixie Lime Products Corp. (Lebanon quarry) continued operation, and V. E. Whitehurst & Sons reported production from the Raleigh quarry.

Table 10 shows crushed limestone sold or crushed by producers.

TABLE 10.—Crushed limestone sold or used by producers in Levy County, 1948-53, in short tons

Year	Short tons	Value	Year	Short tons	Value
1948.....	124, 619	\$188, 897	1951.....	387, 353	\$539, 772
1949.....	165, 330	299, 133	1952.....	400, 543	684, 073
1950.....	(1)	(1)	1953.....	320, 415	651, 311

¹ Figure withheld to avoid disclosure of individual company operations.

MANATEE

The Manatee Dolomite Co. (Manatee quarry) and the Southern Dolomite Co. (Southern quarry) continued to produce crushed stone. Total crushed-stone production increased 206 percent in tonnage and 209 percent in value over 1952.

Aiclaries Travertine Co. quarried 875 tons of dimension stone compared with 108 tons quarried in 1952.

F. A. Edwards continued to produce sand from the Bradenton mine but at a rate 14 percent less in tonnage and 33 percent less in value than in 1952.

MARION

Production of lime by Dixie Lime Products Co. decreased 11 percent in quantity and 7 percent in value.

The Cummer Lime & Manufacturing Co. (Cummer quarry), Dixie Lime Products Co. (No. 3 and Reddick quarries), and the Ocala Lime Rock Corp. (Kendrick No. 7 quarry) continued to crush limestone for building and paving use.

Table 11 shows crushed limestone sold or used by producers.

TABLE 11.—Crushed limestone sold or used by producers in Marion County, 1948-53, in short tons

Year	Short tons	Value	Year	Short tons	Value
1948.....	403, 137	\$413, 583	1951.....	1, 033, 506	\$1, 207, 439
1949.....	245, 642	315, 165	1952.....	748, 760	1, 010, 099
1950.....	453, 300	546, 952	1953.....	530, 843	722, 369

Pedrick & Bernard reported production of soft phosphate rock for the first time from the Morriston mine.

MONROE

Alonzo Cothron reported production of crushed limestone 200 percent above 1952 in both tonnage and value. The Cutler Cut Rock Co. quarried dimension stone for the second year at the same rate as in 1952.

PALM BEACH

The Belle Glade Rock Co. continued to produce crushed limestone and the Palm Beach County Highway Department continued production of noncommercial limestone. Burnup & Sims continued mining sand and gravel.

The total mineral production for the county decreased 29 percent in tonnage and 27 percent in value as compared to 1952.

PINELLAS

The Largo Washed Sand Co. reported a 14-percent increase in production of sand but only a 4-percent increase in total value.

POLK

Land-pebble phosphate rock was mined and processed by The American Agricultural Chemical Corp. (South Pierce mine and Pierce mill); American Cyanamid Co. (Saddle Creek mine and Brewster mill); Coronet Phosphate Co., a Division of Smith Douglass Co. (Tenoroc mine and mill); Davison Chemical Co., Division of W. R. Grace & Co. (Pauway and Bonny Lake mines and Ridgewood mill); The International Minerals & Chemical Corp. (Achan, Noralyn, and Peace Valley mines and Noralyn-Mulberry mill); Swift & Co. (Varn and Watson mines and Agricola mill); and the Virginia-Carolina Chemical Corp. (Clear Springs and Homine mines and Phosmico and Nichols mills).

Five companies continued to produce building and paving sand: The Davenport Sand Co., Inc., Lake Wales Concrete Sand Co., Lake Wales Independent Sand Co., Standard Sand & Silica Co., and Oak Ridge Sand Co.

TABLE 12.—Sand sold or used by producers in Polk County, 1951-53, in short tons

Year:	Short tons	Value
1951.....	698, 101	\$451, 527
1952.....	1, 010, 744	703, 744
1953.....	1, 185, 952	843, 124

PUTNAM

Edgar Plastic Kaolin Co. and United Clay Mines Corp. supplied the kaolin production which was virtually the same as in 1952, although the average unit value declined slightly.

Sand was produced either as a main product or as a byproduct by the following five operators: The All-Florida Sand Co., the Diamond Interlachen Co., the Keuka Sand Co., the Keystone Sand Co., and the United Clay Mines Corp.

TABLE 13.—Sand sold or used by producers in Putnam County, 1948-53, in short tons

Year	Short tons	Value	Year	Short tons	Value
1948.....	283, 115	\$173, 169	1951.....	422, 268	\$249, 362
1949.....	261, 110	183, 909	1952.....	595, 473	362, 323
1950.....	389, 705	234, 788	1953.....	654, 534	407, 070

SARASOTA

Florida Dolomite Co. reported resumption of production of crushed limestone from its Dolomite quarry.

ST. LUCIE

The Florida East Coast Railway again produced a small quantity of sand for railroad ballast.

SUWANNEE

The Suwannee Limerock Co. continued to quarry and crush limestone for building and paving purposes. Tonnage produced was 440 percent above 1952 and value 360 percent above.

VOLUSIA

The Hauser Construction Co. (Deland pit) and Owens Bros. Construction Co. (Owens pit) combined produced 5,720 short tons of sand valued at \$4,400. The Volusia County Highway Department reported production of 12,000 tons of crushed limestone for road metal valued at \$9,600.

The Mineral Industry of Georgia

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of Georgia.

By James L. Vallely¹ and Garland Peyton²



MINERAL PRODUCTION in Georgia in 1953 was valued at \$51,395,000, practically the same as in 1952. Production of clays, lime, mica, slate, peat, and talc increased both in tonnage and value; stone and cement decreased slightly in tonnage but increased in value. Asbestos, barite, bauxite, coal, iron ore, sand and gravel, and ground sand and sandstone decreased both in tonnage and value from 1952. The principal minerals of the State, in the order of their production value, were clays, stone, cement, sand and gravel, and iron ore.

Mineral production was reported from 55 of Georgia's 161 counties, 20 of which contributed \$47,983,000 or 93 percent of the total production. Rated on the value of production, Wilkinson, Twiggs, and Washington, in that order, all producing clays, were the principal mineral-producing counties, followed in order by Pickens, De Kalb, Houston, Polk, Bartow, Richmond, Decatur, Warren, Gilmer, Henry, and Elbert, each with mineral production valued above a million dollars.

TABLE 1.—Mineral production in Georgia, 1952-53¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays.....	2,562,182	\$23,137,507	2,651,153	\$23,455,315
Coal.....	32,100	160,500	14,100	70,500
Gold (recoverable content of ores, etc.) troy ounces.....		2	2	70
Iron ore (usable)..... long tons, gross weight.....	319,959	1,439,251	259,964	1,100,725
Lime (open-market).....	7,854	87,587	9,345	95,484
Mica (sheet)..... pounds.....	13,010	18,852	14,063	73,806
Peat.....	2,150	38,000	2,305	(²)
Sand and gravel.....	2,133,970	2,029,367	2,051,058	1,900,987
Sand and sandstone (ground).....	1,765	17,650	(²)	(²)
Stone (except limestone for cement and lime).....	³ 7,132,082	³ 17,166,108	7,112,024	17,756,302
Talc and soapstone.....	⁴ 56,491	⁴ 663,144	⁵ 57,891	⁵ 202,619
Undistributed: Asbestos, barite, bauxite, beryllium concentrate cement, mica (scrap and flake), slate, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2). Excludes value of clays used for cement.....		6,701,729		6,739,022
Total Georgia.....		³ 51,450,000		51,395,000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

² Value included with "Undistributed."

³ Revised figure.

⁴ Sold or used by producers. Quantity and value of ground material included.

⁵ Mine production of crude material.

¹ Mining engineer, Mineral Industry Division, Region VII, Bureau of Mines, Knoxville, Tenn.

² State geologist, Georgia Geological Survey, Atlanta, Ga.

Under the Defense Minerals Exploration Administration (DMEA) program to aid in the exploration of strategic minerals, 8 properties in 5 counties were explored—1 for beryl in Pickens County, 1 for manganese in Bartow County, and 6 for mica—1 each in Lamar and Pickens Counties and 2 each in Monroe and Upson Counties. DMEA advanced \$17,056 as its share of the total cost (\$19,439) of these projects in 1953. In 1952 DMEA paid \$20,241 of the \$25,645 spent in the program for exploration on 3 properties, 1 each for beryl, mica, and manganese.

TABLE 2.—Average unit values of mineral commodities produced in Georgia, 1949-53¹

Commodity	1949	1950	1951	1952	1953
Asbestos..... short ton	\$100.00	\$100.00	\$100.00	\$100.00	\$100.00
Barite..... do	9.26	10.70	11.34	11.75	12.82
Beryl..... do	.....	.....	.....	596.00	.....
Cement..... 376-pound barrel	2.33	2.35	2.53	2.54	2.65
Clays:					
Fuller's earth..... short ton	17.53	17.57	18.00	18.11	18.73
Kaolin (china, paper, etc.)..... do	14.66	15.21	15.35	² 15.40	15.89
Kaolin (refractory)..... do	5.71	6.05	6.16	² 6.37	6.60
Miscellaneous..... do	.81	.79	.90	.97	.93
Coal..... do	5.93	5.57	4.00	5.00	5.00
Feldspar..... long ton	5.21	4.79	4.94	.....	.....
Gold..... troy ounce	35.00	.....	35.00	.....	35.00
Gravel..... short ton	.....	3.08	.....	² 1.53	1.57
Iron ore..... long ton	3.03	3.35	3.75	4.50	4.23
Lime..... short ton	9.57	10.13	9.86	11.15	10.22
Mica:					
Scrap..... do	28.24	21.84	23.47	25.88	24.01
Sheet..... pound	.21	.21	.26	1.45	5.25
Ocher..... short ton	.....	24.61	22.18	27.45	28.57
Peat..... do	30.00	23.50	18.25	17.70	17.38
Sand:					
Ground..... do	10.00	10.00	10.00	10.00	10.00
Structural and paving..... do	.54	.56	.57	.69	.65
All other..... do	1.33	1.47	1.60	1.48	1.70
Slate (flour and granules)..... do	6.33	6.92	7.23	7.41	7.41
Stone:					
Granite:					
Crushed..... do	1.27	1.23	1.46	1.55	1.56
Dimension..... do	² 25.97	² 19.33	² 20.68	² 18.60	² 19.04
Limestone:					
Crushed..... do	2.17	2.69	3.15	2.87	2.48
Dimension..... do	.....	.....	.....	3.76	2.58
Marble:					
Crushed..... do	5.00	5.01	7.69	.....	8.35
Dimension..... do	124.68	119.74	140.75	130.67	136.65
Miscellaneous:					
Crushed..... do	1.17	.97	1.50	.25	.....
Dimension..... do	4.00	4.00	.....	10.78	.....
Talc (sawed and ground)..... do	11.76	10.94	10.57	11.56	11.72

¹ For greater detail on prices by grade and markets, see vol. I, Minerals Yearbook, 1953.

² Revised figure.

³ Final figure. Supersedes preliminary figure given in commodity chapter.

TABLE 3.—DMEA projects in Georgia, 1953

Company	Mine	County	Commodity	Government participation
Hale-Georgia Mineral Corp.....	Hale-Ga. property.....	Bartow.....	Manganese.....	\$21,872
Empire Mica Co.....	Harrison W. Harp mine.....	Lamar.....	Mica.....	6,660
Howell and Anderson Mining Co.....	Thaddeus Persons mine.....	Monroe.....	do.....	8,100
Homer C. Mundy et al.....	Dickens mine.....	do.....	do.....	2,790
Stancel & Jones.....	Jones property.....	Pickens.....	Beryl.....	5,195
Sam L. Phillips et al.....	Jones-Bozeman mine.....	do.....	Mica.....	3,204
Empire Mica Co.....	Short-Mitchel mine.....	Upson.....	do.....	7,740
C. R. Phillips et al.....	J. H. Reynolds mine.....	do.....	do.....	5,985
Total.....	.....	.....	.....	61,546

REVIEW BY MINERAL COMMODITIES

METALS

Bauxite.—American Cyanamid Co. was the only bauxite producer in Georgia. Crude bauxite was mined in Bartow and Macon Counties and shipped to the Halls Station drying plant in Bartow County. Production decreased 34 percent in tonnage but only 5 percent in value below 1952.

Beryllium.—Small quantities of beryl were produced in Troup and Upson Counties in 1952, and shipments were reported in 1953. There was no new production. DMEA participated in one beryl exploration project in Pickens County.

Gold and Silver.—Minor quantities of gold and silver have been produced in Georgia in recent years. Only 2 ounces of gold was reported in 1953 from Gwinnett County, and neither gold nor silver was reported in 1952.

Iron Ore.—Production of brown iron ore in 1953 declined 43 percent from 369,300 tons in 1952 to 210,700 tons in 1953. Shipments in 1953 were 260,000 tons valued at \$1,101,000, a decrease of 19 and 24 percent, respectively, in quantity and value below the previous year. Production came from the Cartersville district, Bartow County, and the Cedartown district, Polk County. A small tonnage of red iron ore was produced in Walker County.

TABLE 4.—Production and shipments of usable brown iron ore, 1944–48 (average) and 1949–53

Year	Production (long tons)	Shipments (long tons)	Value	Year	Production (long tons)	Shipments (long tons)	Value
1944–48 (average).....	283, 183	283, 183	\$671, 613	1951 ¹	357, 754	357, 754	\$1, 339, 248
1949.....	228, 689	228, 689	692, 649	1952 ¹	369, 259	319, 959	1, 439, 251
1950 ¹	202, 427	202, 427	677, 248	1953 ¹	210, 664	259, 964	1, 100, 725

¹ Includes hematite: 1950—213 tons; 1951—266 tons; 1952—200 tons; 1953—250 tons.

Manganese Ore.—No manganese-ore production has been reported in Georgia since 1945, although some iron ores mined contained small quantities of manganese. The DMEA exploration project on the Hale-Georgia Mineral Corp. property near Cartersville, Bartow County, started in 1952, was completed in 1953.

NONMETALS

Asbestos.—Powhatan Mining Co. produced a small tonnage of amphibole asbestos from the Cornelia mine in Rabun County.

Barite.—Crude barite production in 1953 was 14 percent lower than in 1952. Sales decreased 18 percent in tonnage and 11 percent in value. All barite produced came from the vicinity of Cartersville, Bartow County.

Cement (Portland).—Production of portland cement in 1953 showed little change from 1952, but sales decreased 3 percent. Average unit prices, however, rose from \$2.54 to \$2.65 per barrel and the

value of total shipments was 1 percent above 1952. There were two cement plants in the State—Penn-Dixie Cement Corp. at Clinchfield, Houston County, and the Southern States Portland Cement Co. at Hockmart, Polk County.

Clays.—Clays ranked first in value among the minerals produced in the State and constituted 44 percent of the value of all minerals produced in 1953. Clays, including fuller's earth, sold and used by producers totaled 2,651,000 tons valued at \$23,455,000, increases of 3 and 1 percent, respectively, in quantity and value over 1952. Kaolin production was almost identical with the previous year, but its value was 5 percent greater. Miscellaneous clays, including that used for cement, increased 12 percent in quantity and 7 percent in value. Fuller's earth declined for the second year from its 1951 peak. Production in 1953 was 21 percent less than the previous year, and its value declined 18 percent.

Clays were produced in 17 counties in 1953, including fuller's earth in Bibb, Decatur, and Grady Counties and kaolin in Baldwin, Glascock, Richmond, Twiggs, Washington, and Wilkinson Counties. Other clays were mined in Bibb, Columbia, Crawford, Floyd, Fulton, Gordon, Polk, Richmond, Thomas, and Whitfield Counties.

TABLE 5.—Clays sold or used by producers, 1944–48 (average) and 1949–53

Year	Short tons	Value	Year	Short tons	Value
1944–48 (average).....	1,649,360	\$11,960,491	1951.....	2,603,338	\$23,199,758
1949.....	2,058,287	16,764,668	1952.....	2,562,182	23,137,507
1950.....	2,408,890	21,028,266	1953.....	2,651,163	23,455,315

TABLE 6.—Kaolin sold or used by producers in Georgia, 1944–48 (average) and 1949–53, by uses

Year	China clay, paper clay, etc.		Refractory uses		Total kaolin	
	Short tons	Value	Short tons	Value	Short tons	Value
1944–48 (average).....	780,855	\$9,365,297	111,543	\$550,251	892,398	\$9,915,548
1949.....	902,433	13,229,888	100,958	576,448	1,003,391	13,806,336
1950.....	1,087,174	16,533,582	133,481	806,946	1,220,655	17,340,528
1951.....	1,147,865	17,615,634	175,945	1,084,101	1,323,810	18,699,735
1952.....	¹ 1,145,063	¹ 17,635,838	¹ 183,192	¹ 1,166,355	1,328,255	18,802,193
1953.....	1,170,679	18,606,351	171,046	1,053,274	1,341,725	19,659,625

¹ Revised figure.

TABLE 7.—Miscellaneous clays sold or used by producers, 1944–48 (average) and 1949–53

Year	Short tons	Value	Year	Short tons	Value
1944–48 (average).....	739,195	\$557,012	1951.....	1,083,952	\$978,727
1949.....	929,138	753,761	1952.....	1,050,792	1,020,132
1950.....	1,024,095	804,190	1953.....	1,163,766	1,076,891

Feldspar.—No feldspar production has been reported from Georgia since 1951.

Lime.—Ladd Lime & Stone Co. at Cartersville, Bartow County, was the only producer of lime in the State. Lime sold and used by the producer in 1953 totaled 9,300 tons valued at \$95,500, increases of 19 percent in quantity and 9 percent in value above 1952.

Mica.—Sheet mica sold or used by producers in 1953 was 14,100 pounds valued at \$73,800, increases of 8 percent in quantity and 292 percent in value. General Services Administration purchased 5,198 pounds valued at \$72,265, whereas in 1952 it purchased only 1,027 pounds valued at \$16,159. Uncut punch and circle and half-trim mica totaled 8,900 pounds valued at \$1,500 in 1953, decreasing from 12,000 pounds valued at \$2,700 in 1952. Sheet mica was produced in eight or more counties in 1953, with Upson, Pickens, Monroe, and Hart the principal producers.

Scrap- and flake-mica production declined 8 percent in tonnage and 14 percent in value from 1952. The principal producing counties in 1953 were Cherokee, Hart, and Pickens.

Under the DMEA program to aid in exploration and development of strategic minerals, six mica projects were underway in Lamar, Monroe, Pickens, and Upson Counties. In 1953 DMEA'S share of the \$10,986 spent on these projects was \$9,886.

Mineral Pigments (Iron Oxide).—New Riverside Ochre Co., Cartersville, the only producer in the State, reported the production of 2,142 tons of yellow ochre valued at \$61,193, decreases of 30 and 27 percent, respectively, in quantity and value from 1952. The value of this ochre is not included in State total as it is considered a finished product.

Sand and Gravel.—Production of sand and gravel, totaling 2,051,000 tons and valued at \$1,901,000, was reported by 23 operators in 16 counties in 1953. Tonnage decreased 4 percent and value 6 percent from 1952. Bibb, Crawford, Dougherty, Effingham, Fulton, Muscogee, Talbot, and Thomas were the principal producing counties.

TABLE 8.—Sand and gravel sold and used by producers, 1944-48 (average) and 1949-53

Year	Short tons	Value	Year	Short tons	Value
1944-48 (average).....	796,259	\$517,025	1951.....	1,226,231	\$1,041,561
1949.....	1,984,488	1,757,680	1952.....	2,133,970	2,029,367
1950.....	1,211,782	1,936,726	1953.....	2,051,058	1,900,987

¹ Commercial only. Excludes Government-and-contractor production.

Sand and Sandstone (Ground).—Dawes Silica Sand Co., Inc., operating a plant at Dawesville, Thomas County, was the only producer of ground sand in Georgia in 1953.

Slate.—The Funkhouser Co. prepared slate flour and granules at its quarry and plant near Fairmont. Tonnage and value increased 13 percent above 1952.

Stone.—Stone, making up 35 percent of the State mineral production, was the second most important of its mineral commodities, being first in tonnage produced and second in value, surpassed only by clays. Thirty-one companies and five noncommercial agencies, operating quarries in 23 counties in 1953, produced 7,112,000 tons of stone

TABLE 9.—Sand and gravel sold or used by producers, by classes of operations and uses, 1951-53, in short tons

	1951		1952		1953	
	Short tons	Value	Short tons	Value	Short tons	Value
Sand—commercial:						
Glass.....	(1)	(1)	(1)	(1)	(1)	(1)
Molding.....	(1)	(1)	(1)	(1)	(1)	(1)
Building.....	557,170	\$299,779	994,498	\$717,529	1,037,669	\$667,371
Paving.....	324,461	201,003	449,712	278,130	438,629	285,469
Grinding and polishing.....	69,215	147,073	94,010	195,242	59,084	180,047
Engine.....	39,860	16,767	29,018	13,202	27,077	13,911
Filter.....	(1)	(1)	(1)	(1)	(1)	(1)
Railroad ballast.....			31,061	18,637	27,008	14,854
Other.....	109,449	119,318	209,843	238,709	156,893	174,718
Commercial total ¹	1,100,155	783,940	1,808,142	1,461,449	1,746,360	1,336,370
Government-and-contractor.....					1,350	750
Total sand ²	1,100,155	783,940	1,808,142	1,461,449	1,747,710	1,337,120
Gravel—commercial:						
Building.....			59,880	101,190	(1)	(1)
Paving.....			(1)	(1)	(1)	(1)
Other.....			37,126	35,910		
Commercial total ¹			97,006	137,100	(1)	(1)
Government-and-contractor.....	7,000	1,000	33,792	45,938	3,375	500
Total gravel ²	7,000	1,000	130,798	183,038	3,375	500
Sand and gravel:						
Commercial total ¹	1,100,155	783,940	1,905,145	1,598,549	1,746,360	1,336,370
Government-and-contractor total.....	7,000	1,000	33,792	45,938	4,725	1,250
Undistributed ³	119,076	256,621	195,030	384,880	299,973	563,367
Grand total.....	1,226,231	1,041,561	2,133,970	2,029,367	2,051,058	1,900,987

¹ Included with "Undistributed."² Total is incomplete, the portion not included being combined under "Undistributed."³ Totals of items under footnote 1.

TABLE 10.—Stone sold or used by producers, 1951-53, in short tons

	1951		1952		1953	
	Short tons	Value	Short tons	Value	Short tons	Value
Crushed stone:						
Granite.....	4,123,385	\$6,038,886	5,746,901	\$8,880,139	5,866,434	\$9,177,989
Limestone.....	956,443	3,014,190	1,218,515	3,498,420	899,105	2,230,111
Marble.....	9,851	75,748			188,900	1,578,008
Sandstone.....	2,000	3,000				
Miscellaneous.....	2,500	3,750	14,751	3,680		
Total crushed stone.....	5,094,179	9,135,574	6,980,167	12,382,239	6,954,439	12,986,108
Dimension stone:						
Granite.....	¹ 113,669	¹ 2,350,714	¹ 129,517	¹ 2,408,654	² 137,817	² 2,624,233
Limestone.....			(3)	(3)	4,142	10,684
Marble.....	17,385	2,446,952	17,953	2,345,979	15,626	2,135,277
Miscellaneous.....			4,445	29,236		
Total dimension stone.....	¹ 131,054	¹ 4,797,666	¹ 151,915	¹ 4,783,869	² 157,585	² 4,770,194
Grand total.....	¹ 5,225,233	¹ 13,933,240	¹ 7,132,082	¹ 17,166,108	² 7,112,024	² 17,756,302

¹ Revised figure.² Final figure. Supersedes preliminary figure given in commodity chapter.³ Included with "Miscellaneous."

valued at \$17,756,000 compared with 7,132,000 tons in 1952 with a value of \$17,166,000. Tonnage was virtually the same for both years, but the value in 1953 increased 3 percent above 1952.

Granite accounted for 84 percent of the tonnage and 66 percent of the value of total stone production, limestone 13 percent of both tonnage and value, and marble the remaining 3 percent of tonnage and 21 percent of the value. Crushed stone represented 98 percent of the tonnage and 73 percent of the value of all stone produced in 1953. Granite was produced in 14 counties, limestone in 8 counties, and marble in Pickens County only.

Talc.—Ground and sawed talc and soapstone production in 1953 was 57,900 tons valued at \$678,500—increases of 2 percent in tonnage and 4 percent in value above 1952. Murray is the only producing county in the State.

MINERAL FUELS

Coal.—Bituminous-coal production in 1953 was 14,100 tons valued at the mine at \$70,500—decreases of 56 percent in both tonnage and value from 1952. Production was reported from six mines in Dade and Walker Counties.

Peat.—Production of peat increased 7 percent—from 2,200 tons in 1952 to 2,300 in 1953. Lowndes and Ware were the only counties reporting production.

TABLE 11.—Production of peat, 1944–48 (average) and 1949–53

Year	Short tons	Value	Year	Short tons	Value
1944–48 (average).....	2,574	\$47,608	1951.....	2,250	\$41,000
1949.....	1,870	56,000	1952.....	2,150	38,000
1950.....	1,750	41,000	1953.....	2,305	(1)

¹ Bureau of Mines not at liberty to publish.

REVIEW BY COUNTIES

BALDWIN

Kaolin was produced for refractory use by the General Refractories Co. at the Wood mine near Milledgeville.

BARTOW

Mineral production in Bartow County declined 12 percent—from \$2,835,000 in 1952 to \$2,494,000 in 1953. The values of all minerals produced, except lime and slate granules, were lower than in the previous year. Barite, iron ore, limestone, and slate granules were the four most important minerals produced, with bauxite, lime, and iron oxide pigments making up the balance.

Barite was mined near Cartersville by B. R. Cain Mining Co., J. W. Cox, New Riverside Ochre Co., and Paga Mining Co.

The American Cyanamid Co. operated the Fountain and Julia bauxite mines and the Halls Station drying plant, all in Bartow County during the year.

Brown-ore shipments in 1953 were 113,000 tons valued at \$447,200—decreases of 23 percent in tonnage and 24 percent in value from the

previous year; however, production was only 63,700 tons—33 percent less than in 1952—the excess tonnage shipped coming from stocks. Producers active during 1953 were: Bartow Mines, Hale-Georgia Minerals Corp., Hodge Mining Co., Lake Mining Co., and Mosteller Bros.

Ladd Lime & Stone Co. mined dolomite for the manufacture of lime and mortar cements at its plant 2 miles west of Cartersville.

Stockbridge Stone Co. mined and crushed limestone at the White quarry in the northern part of the county.

Hale-Georgia Minerals Corp., in cooperation with DMEA, continued to explore company property in the Cartersville district for manganese.

New Riverside Ochre Co., the only producer in the State, reported an output of 2,142 tons of yellow ochre, as well as a large tonnage of barite. The value of ochre production has not been included in State total as shown in table 1.

The Funkhouser Co. mined slate just south of Fairmont and shipped slate flour and granules for use in manufacturing roofing materials.

TABLE 12.—Value of mineral production in Georgia in 1952-53, by counties, and principal minerals produced in 1953

County	1952	1953	Principal minerals produced in 1953 in order of value
Bartow.....	\$2,834,676	\$2,494,448	Slate, barite, iron ore, limestone, lime, mineral pigments (ochre), bauxite.
Bibb.....	625,995	683,459	Clays, fuller's earth, granite, sand.
Chattooga.....	1,182	-----	-----
Clayton.....	17,475	16,200	Sand.
Cobb.....	422,254	399,238	Granite.
Crawford.....	239,518	252,898	Sand, clays
Dade.....	22,500	33,000	Coal.
De Kalb.....	3,100,140	3,199,583	Granite.
Elbert.....	1,281,468	1,279,720	Granite, mica.
Fannin.....	3,180	20,368	Granite.
Fulton.....	390,174	392,171	Sand and gravel, clays.
Gilmer.....	1,139,515	1,327,494	Limestone.
Gordon.....	30,000	26,880	Clays.
Gwinnett.....	500	122,542	Granite, gold.
Hancock.....	314,189	369,321	Granite.
Henry.....	1,115,265	1,216,984	Do.
Murray.....	¹ 653,144	¹ 202,619	Talc and soapstone.
Muscogee.....	(²)	513,977	Sand and gravel, granite.
Oconee.....	-----	1,905	Mica.
Oglethorpe.....	369,605	533,385	Granite.
Pickens.....	3,830,355	3,747,374	Marble, mica.
Randolph.....	12,250	-----	-----
Richmond.....	2,677,280	2,438,403	Clays, granite, sand.
Upson.....	(²)	37,938	Mica.
Walker.....	149,400	47,434	Coal, limestone, iron ore.
Washington ³	4,069,357	4,768,916	Kaolin.
Whitfield.....	(²)	152,250	Limestone, clays.
Wilkinson ³	6,639,300	7,467,181	Kaolin.
Undistributed.....	⁴ 21,510,973	⁴ 19,649,342	-----
Total Georgia.....	51,450,000	51,395,000	-----

¹ 1952, sawed and ground; 1953, mine production, crude.

² Included with "Undistributed."

³ Production of 1 operator prorated between Washington and Wilkinson Counties.

⁴ Includes value of production for the following counties: Baldwin (kaolin), Berrien (sand), Chatham (sand), Cherokee (mica), Colquitt (sand), Columbia (clay), Decatur (fuller's earth), Dougherty (sand), Effingham (sand), Fayette (granite), Floyd (clay and limestone), Franklin (mica), Glascock (kaolin), Grady (fuller's earth), Hall (1952), Hart (mica), Houston (cement and limestone), Long (sand), Lowndes (peat), Macon (bauxite), Madison (granite), Meriwether (asbestos), Monroe (mica), Muscogee (1952), Polk (cement, iron ore, limestone and clay), Rabun (asbestos), Stephens (granite), Sumter (1952), Talbot (sand), Taylor (sand), Thomas (sand, ground sand and clay), Turner (sand), Twiggs (kaolin), Upson (1952), Ware (peat), Warren (granite), White (1952) and Whitfield (1952).

TABLE 13.—Lime sold and used by producer in Bartow County, 1944-48 (average) and 1949-53

Year	Short tons	Value	Year	Short tons	Value
1944-48 (average)-----	5,783	\$56,093	1951-----	10,616	\$104,626
1949-----	7,028	67,252	1952-----	7,854	87,587
1950-----	11,998	121,556	1953-----	9,345	95,484

BERRIEN

Bannockburn Sand Co. of Valdosta was the only mineral producer in 1953.

BIBB

The value of mineral production in 1953 was \$683,500, a 9-percent increase above the previous year. Miscellaneous clays, granite, and sand production increased, while fuller's earth output declined 11 percent.

Burns Brick Co. and Cherokee Brick & Tile Co. mined clay for use in their clay products plants at Macon, and the Diversey Corp. produced fuller's earth. Crushed granite was quarried by the Macon Stone Co., and sand pits were operated by Cornell-Young Co., Macon Brick & Block Co., and H. G. Tinker.

CHATHAM

Sand was produced by the J. W. Fitzgerald Co., Inc., of Savannah, and the Chatham County Highway Department.

CHEROKEE

Thompson-Weinman & Co. produced flake mica (sericite) for use in its grinding plant at Cartersville, and A. W. Amphlett mined a small quantity of sheet mica.

CLAYTON

K. H. & H. C. Phillips produced 8,700 tons of sand valued at \$16,200 during 1953.

COBB

Stockbridge Stone Co. and Cobb County Highway Department produced crushed granite from quarries north of Marietta.

COLQUITT

Baxter & Sanders reported the production of sand in 1953.

COLUMBIA

Georgia Vitrified Brick & Clay Co., mining shale for its own use, was the only mineral producer in the county.

CRAWFORD

The Atlanta Sand & Supply Co. produced 448,600 tons of sand in 1953, and Middle Georgia Pottery Co. mined clay for use in its plant at Lizella.

DADE

Coal produced in Dade County in 1953 was 6,600 tons, valued at the mine at \$33,000—a 47-percent increase in tonnage and value above 1952.

DECATUR

Attapulgus Clay Co. mined and processed fuller's earth at its operation near Attapulgus.

DE KALB

Granite, both crushed and dimension, was the only mineral produced in the county in 1953. Consolidated Quarries, Inc., produced crushed stone, curbing, and rubble at the Lithonia quarry; Davidson Granite Co. quarried architectural stone, curbing, paving blocks, and rubble at the Pine Mountain quarries, and Drew H. Kelly operated a quarry south of Lithonia producing curbing and rubble. Stone Mountain Grit Co. produced crushed granite for use as stone sand and poultry grit.

The total value of granite production in the county was 3 percent above 1952.

DOUGHERTY

Albany Lime & Cement Co. and Garrett Base Materials Products Co. produced sand from pits in the vicinity of Albany.

EFFINGHAM

Dawes Silica Mining Co., Inc., produced sand and was the only mining operation in the county.

ELBERT

Elbert County had a greater number of active granite quarries in 1953 than any other area in the southeast. Nine quarries operated by seven companies reported production of rough and dressed monumental stone in the vicinity of Elberton. The principal quarries were: American Granite Quarries, Inc., Coggins Granite & Marble Ind., Inc., (Blue Diamond, Oglesby & Stone Eternal Quarries), Comolli Granite Co., Elberton City Quarries, Inc., Elberton Granite Industries, George

TABLE 14.—Dimension granite sold or used by producers in Elbert County, 1949-53¹

Year	Short tons	Cubic feet	Value	Year	Short tons	Cubic feet	Value
1949.....	36,606	441,039	\$1,367,140	1952.....	35,003	421,725	\$1,229,813
1950.....	37,909	456,726	1,277,510	1953.....	39,254	472,967	1,212,089
1951.....	37,967	457,422	1,271,514				

¹ Revised figures.

T. Oglesby Co., and Robin Blue Quarries, Inc. Production of dimension granite in 1953 was 473,000 cubic feet (39,200 tons) valued at \$1,212,000, a 12-percent increase in tonnage but a 1-percent decrease in value. Crushed granite was quarried by R. V. Venable at Elberton, and H. F. Alexander mined sheet mica.

FANNIN

The Fannin County Highway Department quarried and crushed granite for use in highway construction.

FAYETTE

Tyrone Rock Products Co. produced crushed granite at its Tyrone quarry in the northern part of the county.

FLOYD

Oconee Clay Products Co. and Rome Brick Co. mined shale for the manufacture of clay products. Ledbetter-Johnson Co. and Floyd County Highway Department produced crushed limestone. No iron-ore production was reported in 1953.

FRANKLIN

William E. Hicks reported production of a small amount of sheet mica.

FULTON

Mineral production in 1953 was valued at \$392,200, a 1-percent increase above 1952. Atlanta Brick & Tile Co. and the Chattahoochee Brick Co. mined clay for the manufacture of brick. Sand and gravel was produced by C. J. Ross, Norton Quarries, and the Hitchcock Corp.

GILMER

Willingham-Little Stone Co., producing crushed limestone from a large underground operation near Whitestone, was the only mineral producer in the county.

GLASCOCK

Harbison-Walker Refractories Co. mined kaolin for refractory purposes at the Gibson mine.

GORDON

Shale was mined and used in the manufacture of brick by the Plainville Brick Co. in the southwestern part of the county.

GRADY

Fuller's earth was mined by the Cairo Production Co. in 1953.

GWINNETT

Gwinnett County Highway Department quarried and crushed 102,000 tons of granite valued at \$122,500 for use in road construction. Homer Mundy reported production of a minor amount of placer gold.

HALL

No mineral production was reported in 1953. The quarry and crushing plant of Quarries, Inc., south of Gainesville, was purchased by Hall County Highway Department, but no production was reported during the year.

HANCOCK

Weston & Brooker Co. continued operation of the Granite Hill quarry opened in 1952.

HART

The Funkhouser Co. produced flake mica from mica schist, and Henry Grindstaff and Payne Bros. reported production of sheet mica.

HENRY

Stockbridge Stone Co. produced crushed granite at its quarry near Stockbridge.

HOUSTON

Penn-Dixie Cement Corp. operated its quarry and cement plant at Clinchfield, and the Georgia Limerock Co. produced crushed limestone, principally for agricultural use.

LAMAR

Empire Mica Co., under a DMEA project, explored the Harrison W. Harp mine.

LONG

Dawes Silica Mining Co. produced sand and was the only mineral producer in 1953.

MACON

American Cyanamid Co. mined bauxite from the Lane-McMichaels mine and shipped it to the Halls Station drying plant near Kingston. Bartow County.

MADISON

Coggins Granite & Marble Industries of Elberton quarried granite, principally monumental stone, from the Piedmont quarry near Carlton.

MONROE

Sheet mica was produced by Howell & Anderson, Bruton & Howard, and Clay A. Cheek; Howell & Anderson also producing a small tonnage of scrap mica.

Two DMEA projects were active: Thomas Johnson explored the Thaddeus Persons mica mine, and Homer C. Mundy explored the Dickens mine.

MURRAY

Production of crude talc and soapstone in 1953 was 1 percent below 1952, but shipments of sawed and ground material increased 2 percent

above the previous year and were 4 percent higher in value. Cohutta Talc Co., Georgia Talc Co., and Southern Talc Co. operate mines and sawing and grinding plants at Chatsworth and vicinity. Murray was the only county in the State producing talc and soapstone.

TABLE 15.—Production of talc and soapstone in Murray County, 1944-48 (average) and 1949-53

Year	Crude			Year	Crude		
	Short tons	Short tons	Value		Short tons	Short tons	Value
1944-48 (average)	(1)	40,462	\$467,585	1951.....	78,500	77,895	\$823,133
1949.....	49,338	49,338	580,405	1952.....	58,411	56,491	653,144
1950.....	70,749	70,749	774,148	1953.....	57,891	57,891	678,474

¹ Data not available.

MUSCOGEE

The value of mineral production in Muscogee County in 1953 was \$514,000, more than double that of the previous year as a result of full scale operation of two new granite quarries. Columbus Rock Co. expanded production at its quarry on River Road opened in 1952, and M-C Granite Co. reported initial production of crushed granite from its new quarry near Fortson. Ferguson Sand and Gravel Co. mined sand and gravel.

OCONEE

Homer Mundy reported the production of 181 pounds of sheet mica valued at \$1,900 during 1953.

OGLETHORPE

Production of dimension granite in 1953 was 22,500 tons (256,900 cubic feet) valued at \$533,100, increases of 30 and 45 percent, respectively, in quantity and value above 1952. Quarries were operated by: Bennie & Harvey, Dixie Granite Quarries, Hoover Granite Quarries, Liberty Granite Co., and Oglethorpe Quarrying Co. Crushed granite was also produced by Bennie & Harvey.

PICKENS

Pickens maintained its place in 1953 as fourth ranking county in the State with respect to mineral production. The total value of minerals produced in 1953 was \$3,747,000, a 2-percent decline from the previous year's total of \$3,830,000. The Georgia Marble Co. was the principal producer, quarrying marble for dimension stone, both building and monumental, as well as crushed and ground marble; the latter was produced by the Calcium Products Division of the company.

Flake mica (sericite) was mined by Thompson-Weinman & Co. and shipped to its grinding plant at Cartersville. T. J. Birkmeyer and M. E. Burlson produced sheet mica.

DMEA aided in the exploration of the Jones property for beryl by Stancel & Jones, and the Jones-Bozeman mine for mica.

POLK

The total value of mineral production declined 7 percent below 1952. The value of cement shipments was 2 percent above that in the previous year, but the value of brown iron ore, produced and shipped, declined 21 percent and limestone 51 percent. Southern States Portland Cement Co. mined limestone for commercial sale, as well as for use in its cement plant at Rockmart. Brown-ore producers in the Cedartown area were: Albea-York Mining Co., Arrington Mining Co., E. L. Gammage, Graves & Acree, and Woodward Mines.

TABLE 16.—Shipments of brown iron ore in Polk County, 1949-53

Year	Long tons	Value	Year	Long tons	Value
1949.....	107,025	\$350,676	1952.....	165,522	\$822,802
1950.....	96,272	317,420	1953.....	146,690	652,306
1951.....	140,355	541,929			

RABUN

Powhatan Mining Co. produced a small tonnage of amphibole asbestos from the Cornelia mine near Dillard.

RICHMOND

Mineral production in 1953 totaled \$2,438,000—9 percent less than in 1952. Kaolin production increased 11 and 9 percent, respectively, in tonnage and value over 1952 and totaled 84,200 tons valued at \$519,000. The production of miscellaneous clays was substantially the same as in the previous year, but its value was 7 percent higher. Crushed-granite production was 961,900 tons valued at \$1,505,000—decreases of 18 percent in tonnage and 13 percent in value. Sand production declined over 50 percent below 1952.

Albion Kaolin Division of Interchemical Corp. mined refractory kaolin at Hepzibah, and Georgia-Carolina Brick & Tile Co. and Merry Bros. Brick & Tile Co. operated clay pits near Augusta. Superior Stone Co. operated the Dan quarry, and Richmond Sand Co. produced sand in 1953.

STEPHENS

Burkhart Quarry & Supplies, Inc., opened a new quarry for production of crushed granite near Toccoa during the year.

SUMTER

The Hatton-Thigpen Bauxite mine of American Cyanamid Co. was idle during 1953.

TALBOT

The Taylor Sand Co. and Brown Bros. operated sand pits near Junction City throughout the year.

TAYLOR

R. L. Brown produced sand near Howard in 1953.

THOMAS

The total value of mineral production in 1953 was substantially the same as in 1952. Arnold Brick Co. mined clay for use in its plant at Thomasville, and Dawes Silica Mining Co., Inc., produced washed sand and ground silica sand at Dawesville.

TABLE 17.—Production of ground sand in Thomas County, 1949–53

Year	Short tons	Value	Year	Short tons	Value
1949.....	771	\$7,712	1952.....	1,765	\$17,650
1950.....	1,176	11,760	1953.....	(1)	(1)
1951.....	1,874	18,740			

¹ Figure withheld to avoid disclosure of individual company operations.

TURNER

Quality Concrete Products Co. reported initial production of building sand from a new pit near Tifton.

TWIGGS

Production of kaolin in 1953 was 476,100 tons, a 9-percent decrease from 1952, when 521,100 tons was sold or used by the producers; the county dropped to second place in value of minerals produced in 1953. Mines and plants were operated by the Georgia Coating Clay Co., Macon; Georgia Kaolin Co., Dry Branch; and J. M. Huber Co., Huber.

TABLE 18.—Kaolin sold or used by producers in Twiggs County, 1949–53

Year	Short tons	Value	Year	Short tons	Value
1949.....	419,919	\$5,520,784	1952.....	521,077	\$7,487,877
1950.....	496,256	6,838,008	1953.....	476,051	(1)
1951.....	541,974	7,611,121			

¹ Figure withheld to avoid disclosure of individual company operations.

UPSON

Considerable more activity was noted in mica mining in the county than during 1952. There had been only 2 producers; but in 1953, 6 operators were active, mining 3,500 pounds of sheet mica valued at \$37,900. The principal producer was the partnership of Luther Johnson & Milton Burleson. Others were: Barron Mica Mining Co., Milton L. Hanson, Walter Lewis, C. R. Phillips and Yatesville Mining Co.

DMEA participated in the exploration of two properties: Short-Mitchell mine of Empire Mica Co. and J. H. Reynolds mine, operated by C. R. Phillips.

WALKER

Production of coal in 1953 was 7,500 tons valued at the mine at \$37,500 compared with 27,600 tons valued at \$138,000 in 1952. H. A. Davison mined 250 tons of red iron ore with a value of \$1,250 from

the Estell mine and H. R. Perry quarried limestone, principally for residential construction.

WARREN

Weston & Brooker Co. operated the Camak quarry producing crushed granite.

WASHINGTON

Washington County maintained its rank as third most important in the State with reference to the value of mineral production. Kaolin, the only mineral produced in the county, totaled 302,300 tons valued at \$4,769,000, increases of 16 and 17 percent, respectively, in tonnage and value above 1952. Mines and plants were operated by Champion Paper & Fibre Co., Edgar Bros. Co., Georgia Pigment Co., Thiele Kaolin Co., and United Clay Mines Corp.

TABLE 19.—Kaolin sold or used by producers in Washington County, 1949-53

Year	Short tons	Value	Year	Short tons	Value
1949.....	200,783	\$2,859,730	1952.....	259,977	\$4,069,357
1950.....	237,995	3,606,656	1953.....	302,250	4,768,916
1951.....	255,334	3,952,849			

WHITFIELD

Mineral production in 1953 totaled \$152,300. Dalton Brick & Tile Co. mined clay for use in its plant south of Dalton; Cooper & Maples and the Whitfield County Highway Department produced crushed limestone from quarries northeast of Dalton.

WILKINSON

Wilkinson was the leading county in value of mineral production in the State in 1953. Kaolin sold or used by producers was 454,000 tons valued at \$7,467,000, increases of 4 and 12 percent, respectively, in quantity and value above 1952. Six companies are active in the county, mining and processing kaolin: Edgar Bros. Co., Evans-Smith & Co., Harbison-Walker Refractories Co., D. C. Hardie, M & M Clays, Inc., Oconee Clay Products Co., Savannah Kaolin Co., and Southern Clays, Inc.

TABLE 20.—Kaolin sold or used by producers in Wilkinson County, 1949-53

Year	Short tons	Value	Year	Short tons	Value
1949.....	311,340	\$4,852,544	1952.....	435,528	\$6,630,300
1950.....	392,357	6,338,763	1953.....	454,000	7,467,181
1951.....	402,328	6,465,212			

The Mineral Industry of Hawaii and Pacific-Island Possessions

By R. B. Maurer¹ and Robert E. Wallace²



HAWAII

THE TOTAL VALUE of mineral production in the Hawaiian Islands in 1953 was \$3,332,000, which, compared with \$1,947,000, the total value in 1952, shows a sizable increase. However, this apparently noteworthy increase was due in part to the improved statistical coverage of the Territory's mineral industry in 1953. Activities that contributed to the mineral output were: Stone quarrying, the preparation of lime and sand and gravel, and the production of volcanic cinders, clays, and salt (sodium chloride).

Extensive research during the past years on the lateritic soils of the Hawaiian Islands revealed concentrations of iron, aluminum, manganese, and titanium oxides and about 0.1 percent of columbium in most areas. Of particular interest were the titanium deposits comprising the titaniferous-ferruginous lateritic soils, which are surface formations ranging from 1 to 6 feet in depth with a titanium oxide content of 8 to 35 percent, and the titaniferous clay deposits, the depths of which vary from 1 to 15 feet and which contain 6 to 25 percent titanium oxide. These typical deposits occur on the islands of Kauai, Lanai, Oahu, Molokai, Maui, and Hawaii. Any eventual working of the soils for their titanium content would depend upon development of an economic process for separating the titanium minerals. The titanium-rich soils were first described by McGeorge in 1917,³ and Sherman discussed their significance in 1952.⁴

CONSUMPTION AND MARKETS

All minerals produced in Hawaii in 1953 were consumed in the Territory; this output, however, was only a small part of the islands' mineral requirements. Petroleum, petroleum products, cement, and fertilizer materials comprised a large percentage of the mineral commodities imported.

EMPLOYMENT IN THE MINERAL INDUSTRY

The average number of persons employed in Hawaii at mining and quarrying operations during 1953 was 219. The average weekly wages of mineral-industry employees in 1953 was \$69.40 compared with \$63.01 in 1952, \$65.98 in 1951, and \$55.06 in 1950.

¹ Chief, Division of Mineral Industries, Region III, Bureau of Mines, San Francisco, Calif.

² Commodity-industry analyst.

³ McGeorge, W. T., Composition of Hawaiian Soil Particles: Hawaii Agric. Exper. Sta., Bull. 42, 1917, 12 pp.

⁴ Sherman, G. Donald, The Titanium Content of Hawaiian Soils and Its Significance: Proc. Soil Sci. Soc. American, vol. 16, 1952, pp. 15-18.

TABLE 1.—Mineral production in Hawaii and Pacific-Island possessions, 1952-53¹

Area and mineral	1952		1953	
	Short tons (unless other- wise stated)	Value	Short tons (unless other- wise stated)	Value
American Samoa:				
Sand and gravel ²			³ 1,320	³ \$425
Stone (crushed) ²			³ 74,750	³ 16,500
Total American Samoa.....				³ 17,000
Canton: Stone (crushed) ²	150	\$375	4,200	8,750
Guam: Stone (crushed) ²	948,000	870,000	2,080,650	5,573,169
Hawaii:				
Lime (open-market).....	8,894	240,786	7,431	223,575
Sand and gravel.....	⁴ 111,716	⁴ 143,541	110,558	156,853
Stone (except limestone for lime).....	705,994	1,545,301	1,518,649	2,918,423
Undistributed: Other nonmetallic minerals.....		17,164		33,409
Total Hawaii.....		1,947,000		3,332,000
Midway: Stone (crushed) ²	7,200	6,000	204	638
Wake: Stone (crushed) ²	4,260	8,000	11,980	20,615

¹ Production data for Canton and Wake furnished by the U. S. Department of Commerce, Civil Aeronautics Administration; Midway, by the U. S. Department of the Navy; Guam, by the Government of Guam; American Samoa, by the Government of American Samoa.

² Quantities are estimated short-ton equivalents of cubic yards reported.

³ Estimate.

⁴ Revised figure.

REVIEW BY MINERAL COMMODITIES

Clays.—The weathering of lavas has formed a variety of clays on the islands, but little of this material has been utilized in the islands' industries. High shrinkage is a factor that has limited the use of these clays in ceramics, and the minor production of miscellaneous clays in 1953 was for heavy clay products and the clay-pot industry. Hawaiian Gas Products, Ltd., and Wilsonite Brick Co., Ltd., produced miscellaneous clays on Oahu in the Honolulu area.

Lime.—Hawaiian Gas Products, Ltd., prepared hydrated lime and some quicklime at its Honolulu plant. The product was utilized in the building and chemical industries. The limestone was calcined with fuel oil in 2 shaft kilns and part of the product treated in 2 continuous hydrators. The annual capacity is 9,900 short tons.

Sand and Gravel.—Sand for building construction was produced on Oahu by Honolulu Construction & Draying Co., Ltd, at Kahuku and at a new operation on Paumalu Beach by Chang's Express. The National Park Service prepared road gravel on Hawaii for use in the national park.

Salt.—Salt (sodium chloride) produced from sea water by solar evaporation was utilized principally for curing hides and leather. Although the ultimate use of some salt sold to dealers was not determined, the crystalline salt is known to have been used in pickling certain Oriental foods. On Oahu evaporating ponds were operated by Wun Sung Wong at Pearl Harbor and Chun Mew Ting Co., at Honouliuli, but this relatively small salt production did not satisfy the local demand. Other than on the island of Maui there are few locations in the group of islands where the terrain and rate of evapora-

tion are conducive to large-scale production of salt from sea water by solar radiation.

Stone.—Basalt.—Basalt was quarried and crushed by the following companies on Oahu in Honolulu County for concrete, road metal, riprap, and miscellaneous uses: Clarke-Halawa Rock Co., Ltd., at Halawa; Hawaiian Rock & Supply Co., Ltd., and Pacific Concrete & Rock Co., at Honolulu; Honolulu Construction & Draying Co., Ltd., at Kailua; and Nanakuli Paving & Rock Co., at Nanakuli. On Hawaii, in Hawaii County, Corps Construction, Ltd., and James W. Glover, Ltd., produced basalt for concrete at Hilo.

Limestone.—On Oahu in Honolulu County Hawaiian Gas Products, Ltd., operated the Gaspro quarry at Waianae and produced limestone for lime, carbon dioxide gas manufacture, and aggregate material. Limestone was crushed at Lanikai by Kailua Limestone Co. for aggregates and miscellaneous uses.

Volcanic Cinders.—Walker-Moody Construction Co. produced crude and prepared volcanic cinders for aggregates at Makiki Heights on Oahu.

PACIFIC-ISLAND POSSESSIONS

AMERICAN SAMOA

Coral was quarried for roads and fills, and coral sand was utilized for aggregates. Both crushed basalt and basalt fines were produced for concrete aggregate.

CANTON

Graded coral was prepared by the Civil Aeronautics Administration for concrete and asphalt aggregates used in paving projects on the island.

GUAM

The entire mineral production of Guam in 1953 was coral quarried by contractors at civilian and military installations for use as aggregates, fills, and road material.

MIDWAY

There was a minor production of coral on Midway for construction work. It was necessary to import a higher grade of aggregate than was obtainable on the island due to the character of the work in progress.

WAKE

Graded coral was produced on Wake Island for aggregate in concrete and asphalt paving work by the Hawaiian Dredging Co., Pan American World Airways, and the Civil Aeronautics Administration.



The Mineral Industry of Idaho

By Kenneth D. Baber,¹ Frank B. Fulkerson,¹ Albert J. Kauffman, Jr.,² and Paul F. Yopes¹



LOWER average values for lead and zinc during 1953 brought about a decline of more than 13 percent in the value of mineral production in Idaho. Although the combined output of these 2 commodities remained nearly the same, the extreme drop of nearly 33 percent (\$8 million) in the value of zinc produced and the smaller decrease of 18 percent (\$4 million) in the value of lead recovered more than offset sizable gains in the value of phosphate rock and cobalt produced. Lead again became the leading commodity in terms of value after ranking behind zinc in 1951 and 1952. The State maintained second position nationally in the production of lead and zinc and was once again the leading silver and cobalt producer.

Counties having production valued in excess of \$1 million were Bannock, Bingham, Blaine, Bonneville, Caribou, Lemhi, and Shoshone. The latter was credited with nearly \$48 million worth of mineral production (\$11 million or 18 percent below the 1952 figure).

Important additions to mineral-production facilities completed or nearly completed during the year included a sulfuric acid plant, re-activation of an electrolytic antimony plant, a multimillion-dollar lead-smelter modernization program, and an electrolytic zinc pre-treatment plant.

A new stream-dredging code, effective in May, was passed by the State legislature. The new law required that dredge operators level tailings piles, provide stream channels, and install settling ponds to prevent roiling of downstream waters. The bulk of the Nation's domestic supply of monazite, a rare-earth mineral, was recovered by dredges from black-sand deposits in the Snake River Basin.

Wages and salaries paid workers in the State's metal and nonmetal mines and mills totaled nearly \$20 million but decreased 11 percent compared with 1952. This drop was the greatest relative decline experienced in any State in 1953 and contrasted to a gain of 2 percent in mining payrolls for the Nation as a whole.³ Higher wages were paid during the latter half of 1953 by the principal mining companies in the Coeur d'Alene region of Shoshone County, center of the State's metal-mining industry, under a new contract with the International Union of Mine, Mill & Smelter Workers, but low lead-zinc prices and high operating costs led to a drop in total employment in metal mining for the year as a result of mine closures, curtailed production of lower-grade ores, and a cutback on mine development. Production of mineral raw materials for the building industry was affected ad-

¹Commodity-industry analyst, Region II, Bureau of Mines, Albany, Oreg.

²Chief, Mineral Industry Division, Region II, Bureau of Mines, Albany, Oreg.

³Survey of Current Business, vol. 34, No. 8, August 1954, pp. 9-17.

versely by reduced construction activity; building in the State decreased 10 percent in 1953, as measured by wages and salaries paid construction workers. Total income payments from all sources decreased 3 percent, a decline in agricultural income and mining and construction payrolls being partly offset by a gain in trade and service income and increased income payments to individuals by Federal, State, and local Government bodies. Manufacturing payrolls (smelting, refining, logging and lumbering, etc.) were unchanged in 1953.⁴

In addition to the mineral values credited to Idaho in table 1, there are some that are not included, owing to lack of information. Many ores contain valuable minor constituents, such as arsenic, bismuth, cadmium, cobalt, nickel, platinum-group metals, selenium, tellurium, and some minor metals, such as gallium and germanium. These quantities sometimes are not known and sometimes, though known by analyses, are not accounted for metallurgically in the early processing stages or credited to mine or origin. These minor constituents are recovered at plants, frequently treating residues from the refining of such metals as copper, lead, and others, and in other ways. It is not possible in many such instances to distribute the mineral products by States of origin, and in some instances it is even difficult to obtain an accurate separation as to domestic and foreign sources. Another

TABLE 1.—Mineral production in Idaho, 1952-53¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Antimony ore and concentrate..... gross weight.....	4, 173	(?)	(?)	(?)
Beryllium concentrate.....			1	\$491
Clays.....			26, 229	21, 339
Cobalt (content of ore)..... pounds.....	23, 533	\$24, 683	(?)	(?)
Copper (recoverable content of ores, etc.).....	196, 516	(?)	1, 211, 039	(?)
Gold (recoverable content of ores, etc.)..... troy ounces.....	3, 213	1, 555, 092	3, 136	1, 800, 064
Gypsum.....	32, 997	1, 154, 895	17, 630	617, 050
Lead (recoverable content of ores, etc.).....	400	1, 200	150	450
Mercury..... 76-pound flasks.....	73, 719	23, 737, 518	74, 610	19, 547, 820
Mica: Scrap.....	887	176, 602	(?)	(?)
Sheet.....	170	5, 100		
Hand cobbled..... pounds.....	20, 020	115, 572	13, 882	154, 372
do..... do.....			229, 646	68, 894
Phosphate rock (marketable production)..... long tons.....	866, 330	2, 950, 160	1, 001, 969	4, 149, 943
Pumice and pumicite.....	88, 085	141, 253	85, 224	159, 833
Sand and gravel.....	3, 925, 863	2, 745, 201	3, 776, 180	2, 841, 440
Sand and sandstone (ground).....	9, 500	80, 000	5, 304	43, 865
Silver (recoverable content of ores, etc.)..... troy ounces.....	14, 923, 165	13, 506, 218	14, 639, 740	13, 249, 704
Stone (except limestone for cement).....	³ 1, 630, 034	³ 2, 441, 236	1, 141, 626	2, 260, 875
Titanium-iron concentrate (nontitanium use).....			1, 585	7, 500
Tungsten concentrate..... 60-percent WO ₃ basis.....	333	1, 245, 499	441	1, 665, 983
Zinc (recoverable content of ores, etc.).....	74, 317	24, 673, 244	72, 153	16, 595, 190
Undistributed: Barite, cement, columbium-tantalum concentrate (1953), abrasive garnet, fluorspar, quartz (1953), stone (crushed limestone, 1952), titanium concentrate (1951) vanadium, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2).....		3, 294, 115		3, 801, 999
Total Idaho.....		77, 848, 000		66, 987, 000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers). Excludes monazite. Some minerals that originated in Idaho cannot be credited owing to lack of information (see paragraph 1 on p. 2).

² Value included with "Undistributed."

³ Excludes certain stone, value for which is included with "Undistributed."

⁴ Work cited in footnote 3

mineral product of value—the production of which usually cannot be separated as to source—is byproduct sulfuric acid. The value of monazite produced cannot be credited, inasmuch as such information is not available under existing regulations of the Atomic Energy Commission.

During 1953 the program of the Defense Minerals Exploration Administration continued to encourage the systematic investigation of strategic and critical mineral occurrences. Financial assistance extended under the Government contracts was repayable from royalties on ore discovered and subsequently mined. Table 2 shows the projects that were active under the program during part or all of 1953.

TABLE 2.—Defense Minerals Exploration Administration contracts active during 1953

County	Name of operator	Name of property	Mineral	Total contract	Government participation, percent	Contract number
Bannock	J. R. Simplot Co.	Vanza	Mn	\$34,600	75	E611
Blaine	Silver-Star Queens Mines, Inc.	Silver-Star Queens	Pb-Zn	133,837	50	E152
	Snoose Mining Co.	Snoose	Zn	135,000	50	E120
	Sun Valley Lead-Silver Mines, Inc.	Blue Kitten	Pb-Zn	28,384	50	E160
Bonner	United Minerals, Inc.	Homestake	do	104,000	50	E18
	Funnell & Majer Mining Co.	Conjecture	do	53,228	50	E267
	Whitedelf Mining & Development Co.	Whitedelf	Pb	120,250	50	E189
Custer	Joseph L. Ausich	Champion	Pb-Zn	31,650	50	E361
	Louis Buchman, L. S. Breckon & J. A. Norden, a partnership.	Red Bird	Pb-Ag	58,990	50	E266
	Enderlin & Connolly	Meadow View	Zn	27,120	50	E294
	Wylie Gardner and L. R. Vance.	Hoodoo	Pb-Zn	46,270	50	E223
	Idaho Custer Mines	Livingston	do	97,737	50	E573
	J. R. Simplot Co.	Chalspar	CaF ₂	9,700	50	E543
Elmore	do	Dismal Swamp	Co-Ta-U	18,190	90	E545
Latah	Idaho Beryllium & Mica Corp.	Muscovite	Mica	28,700	90	E426
Lemhi	Bradley Mining Co.	Ima	W	122,400	75	E41
	do	do	do	112,000	75	E427
	Calera Mining Co.	Blackbird	Co-Cu	407,340	70	E645
	Centrida Mines, Inc.	Pope-Shenon	Cu	63,140	50	E651
	Defense Metals, Inc.	Wonder or Quinn	Th-U	68,265	90	E384
	Montana Coal & Iron Co.	Black Pine	Co-Cu	88,850	70	E329
	Northfield Mines, Inc.	Stevenson	do	233,150	70	E334
	Roger V. Pierce	Gilmore	Pb-Zn	64,145	50	E574
	J. R. Simplot Co.	Chamac	CaF ₂	57,900	50	E347
Owyhee	South Mountain Mining Co.	South Mountain	Pb-Zn-Cu	36,260	50	E177
Shoshone	Bunker Chance Mining Co.	Bunker Chance	Cu-Pb	152,530	50	E283
	Bunker Hill and Sullivan Mining and Concentrating Co.	Crescent	Pb-Zn-Cu	1,098,750	50	E493
	Day Mines, Inc.	Hercules	Pb-Zn	242,860	50	E484
	do	National	Cu-Pb-Zn	348,640	50	E31
	Jack Etherton and Walter Schmittroth, partners.	Big It	W	24,000	75	E343
	Golconda Lead Mines	Golconda	Pb-Zn	90,000	50	E475
	Highland-Surprise Consolidated Mining Co.	Highland-Surprise	do	282,110	50	E63
	Hypothek Mining & Milling Co.	East Hypothek	do	70,410	50	E380
	Idaho Mining Co.	Washington-Idaho	do	122,572	50	E88
	Nabob Silver-Lead Co.	Nabob	do	143,450	50	E184
	North Fork Mining Co.	Lucky Strike	do	44,500	50	E470
	North Idaho Mines, Inc.	Pony	W	13,200	75	E471
	Polaris Mining Co.	Polaris East Exploration	Cu-Pb-Sb	685,955	50	E541

TABLE 2.—Defense Minerals Exploration Administration contracts active during 1953—Continued

County	Name of operator	Name of property	Mineral	Total contract	Government participation, percent	Contract number
Shoshone...	Sidney Mining Co.	Sidney	Pb-Zn	\$200,290	50	E367
	Signal Mining Co.	New Hilarity	do	21,000	50	E421
	Silver Buckle Mining Co.	Vindicator	do	229,800	50	E594
	Spokane-Idaho Mining Co.	Douglas	do	142,634	50	E482
Valley.....	Sunset Mines, Inc.	Liberal King	do	91,045	50	E102
	Bradley Mining Co.	Springfield	W	5,600	75	E531
	do	Yellow Pine	Sb	175,368	75	E173
	do	do	do	53,000	75	E453
	Cosumnes Gold Dredging Co.	Paddy Flat	Monazite-Cb-Ta	28,825	90	E351
	do	White Hawk	Monazite-Cb-Ta	20,004	90	E350
	McRae Tungsten Corp.	Red Bluff	W	53,800	75	E406
	Verlon W. Vandeventer	Hull's Big Creek	Monazite	2,285	90	E584

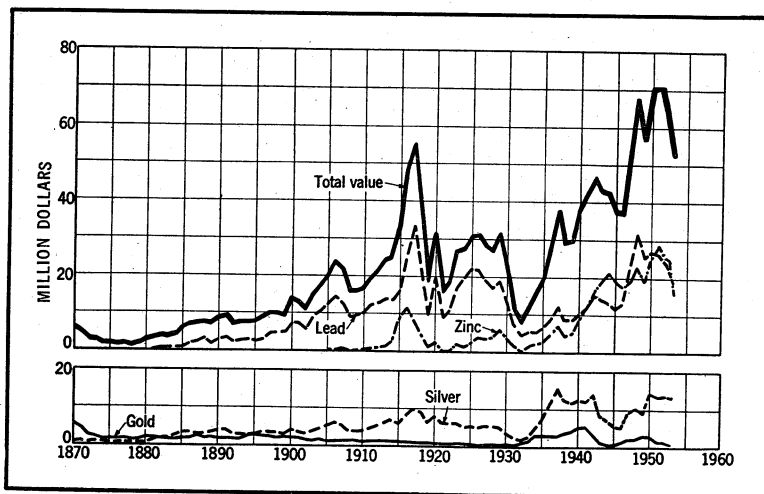


FIGURE 1.—Value of mine production of gold, silver, lead, and zinc, and total value of gold, silver, copper, lead, and zinc in Idaho, 1870 to 1953. The value of copper has been less than \$2,000,000 annually, except in a few years.

REVIEW BY MINERAL COMMODITIES

METALS

Antimony.—The output of antimony in Idaho during 1953 was limited to that produced by the Sunshine Mining Co. as a result of the reactivation in April of its electrolytic plant at the company mill near Kellogg. The action was taken to reduce smelter penalties for excessive antimony content in the bulk concentrates formerly produced. The plant, built in 1942 and closed in 1944, utilizes a hot sodium sulfide solution to dissolve the antimony from concentrates of ores from the Sunshine mine and neighboring properties operated by the company on a profit-sharing basis. The concentrates contained

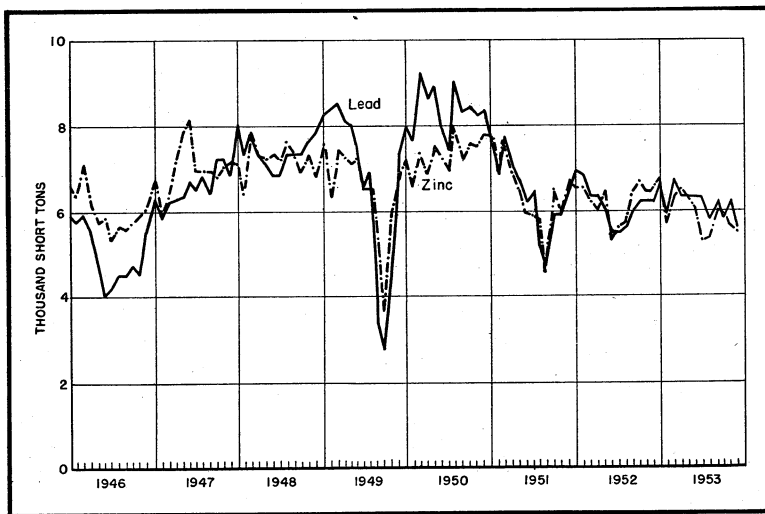


FIGURE 2 — Mine production of lead and zinc in Idaho, 1946-53 by months, in terms of recoverable metals.

about 17 percent antimony. The leach solution subsequently is electrolyzed to produce a metal containing over 95 percent antimony. According to the annual company report for 1953:

Starting April first copper-silver-antimony and lead-silver-iron concentrates were produced. The copper-silver-antimony concentrate was treated for removal of antimony and 749,000 pounds of cathode metal containing 722,800 pounds of antimony was recovered as a byproduct. The antimony is not readily marketable in the form of cathode metal and additional treatment may become necessary.

Production during the year was stockpiled.

The Bradley Mining Co. Yellow Pine mine at Stibnite, Valley County, and the Hermada Mining Co. Hermada mine near Atlanta, Elmore County, remained closed throughout the year. The Bradley operation, which formerly had been the Nation's principal domestic source of antimony, was closed in mid-1952 because of an unfavorable market; however, company officials indicated that operations would be resumed as soon as an increase in prices made such action feasible.

The Hermada antimony deposit was the subject of a Bureau of Mines report of investigations issued early in the year.⁵ According to the report, stibnite mineralization occurs over an area 1 mile wide from west to east and 2 miles long, which is referred to locally as the Swanholm district. High-grade stibnite ore has been produced from the deposit since 1947 by the Hermada Mining Co. The total output for 1947-50 was about 5,000 tons of ore, containing 650 short tons of antimony metal.

Antimonial lead was produced at the Bunker Hill & Sullivan Mining & Concentrating Co. Bunker Hill smelter from ores and concentrates shipped from mines without as well as within the State.

Beryllium.—Production of 1,890 pounds of beryl concentrates containing approximately 10 percent beryllium oxide was reported

⁵ Popoff, Constantine C., Hermada Antimony Deposit, Elmore County, Idaho: Bureau of Mines Rept. of Investigations 4950, 1953, 28 pp.

by the Idaho Beryllium & Mica Corp. from the Muscovite mica mine near Deary, Latah County. The material was shipped to the General Services Administration purchase depot at Custer, S. Dak.

Cadmium.—Cadmium metal was produced as a byproduct from lead and zinc ores processed in the Bunker Hill & Sullivan Mining & Concentrating Co. smelter and the Sullivan Mining Co. electrolytic zinc plant in Shoshone County. Company annual reports for 1953 record production of 125,546 pounds of cadmium at the smelter—an increase of nearly 7 percent from 1952—and 521,340 pounds of the metal at the electrolytic zinc plant—a decrease of approximately 5 percent.

Cobalt.—The Blackbird mine in Lemhi County, the only producer in the State, was operated by Calera Mining Co. on a limited basis throughout the year. According to the 1953 annual report of the Howe Sound Co., parent organization of Calera Mining Co., the company refinery at Garfield Utah, which was operated intermittently because of technical difficulties, treated a tonnage of concentrates in excess of that produced at the mine. Difficulties at the refinery were described as being due to the failure of equipment to withstand the corrosive and abrasive conditions to which it is subjected. The report also stated that progress was made in solving the difficulties and that, although operation was intermittent, 591,500 pounds of cobalt was recovered.

In describing operations at the mine, the report states that:

No large development program was undertaken but the work done was successful and resulted in a moderate increase in ore reserves. Effective January 1, 1954, additional men were employed and the operating organization will be expanded, keeping production in line with the requirements of the refinery. * * * A contract has been made with an agency of the United States Government for loans to cover 70 percent of the cost of an exploration campaign in previously undeveloped sections of the company's holdings. This work, which will total 6,000 feet, will explore for extensions of ore beyond the outlines of the presently known ore bodies and will also investigate the possibilities within a formation paralleling that which is now being exploited. Extensive surface trenching and diamond drilling are included in the program, which is for a two year period.

Ore bodies on the property were described as comprising complex pods and lenses containing an average of 0.7 percent cobalt and 1.5 percent copper.⁶

Other cobalt activity in the State included surface and underground exploration by Northfield Mines, Inc., on the Stevenson property near the Blackbird mine and by Montana Coal & Iron Co. at the Black Pine mine in the same vicinity. Both projects were under DMEA contracts, Government participation totaling 70 percent of the estimated costs.

Copper.—Production of copper declined about 2 percent from the 1952 total. Silver ore from the Sunshine mine and the Silver Summit mine, Coeur d'Alene region, Shoshone County, and cobalt-copper ore from the Blackbird mine, Lemhi County, were the principal sources of the 3,136 tons of copper produced in Idaho. Of the State total, 45 percent came from silver ore, 29 percent from copper ore, and the remainder largely from lead-zinc and lead ores.

Gold.—Production of gold decreased sharply for the third consecu-

⁶ Larsen, Junius, and Peters, William C., Resources for the Chemical Industry in the United States, Rocky Mountain States, Part I, Idaho: Ind. Eng. Chem., vol. 45, No. 11, November 1953, p. 2426.

tive year, and the annual yield fell below 20,000 ounces for the first time since 1945. The decline of 47 percent compared with 1952 can be attributed principally to the closing in mid-1952 of the Yellow Pine antimony-gold mine, Valley County, the largest producer of gold in the State during recent years. A further reduction in gold mining in Idaho occurred when Talache Mines, Inc., placed its Boise-Rochester operation, 1 mile east of Atlanta, on a standby basis effective October 15. Later, a group of former employees obtained a lease from the company and began operating the mine on a reduced scale. The principal producing firms, each exceeding an output of 1,000 fine ounces, were, in order of production, the Duval Co., Cassia County (Virginia group); Clearwater Dredging Co., Idaho County (bucket-line dredge); Talache Mines, Inc., Elmore County (Boise-Rochester group); and Tyee Mining Co., Idaho County (dragline dredge).

Lode properties continued to be the principal source of gold, contributing 67 percent of the State total. Of the metal produced from lode mines, 65 percent was recovered from gold ore, 17 percent from lead-zinc ore, and most of the remainder from silver and copper ores. In contrast to the decreased quantity of gold recovered from lodes, production from placer mines advanced from 4,321 ounces in 1952 to 5,887 in 1953, a gain of 36 percent. This increase was due in part to the output of the Clearwater Dredging Co., which in the fall of 1952 began operations with a diesel-electric bucketline dredge on the Crooked River placers near Elk City. In 1953 the dredge was operated for 10 months—from March 1 to December 24.

TABLE 3.—Mine production of gold, silver, copper, lead, and zinc 1944-48 (average), 1949-53, and total 1863-1953, in terms of recoverable metals ¹

Year	Mines producing		Material sold or treated ² (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1944-48 (average)---	149	59	3,398,411	41,840	\$1,464,393	9,272,008	\$7,564,475
1949-----	171	82	3,057,075	77,829	2,724,015	10,049,257	9,095,085
1950-----	155	75	3,300,215	79,652	2,787,820	16,095,019	14,566,805
1951-----	157	52	3,254,791	45,064	1,577,240	14,753,023	13,352,231
1952-----	132	29	3,008,230	32,997	1,154,895	14,923,165	13,506,218
1953-----	114	34	2,090,185	17,630	617,050	14,639,740	13,249,704
1863-1953-----			(³)	8,217,357	190,746,898	612,740,270	442,526,776

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1944-48 (average)---	1,508	\$520,730	75,890	\$18,529,895	83,136	\$20,105,347	\$48,184,839
1949-----	1,438	566,572	79,299	25,058,484	76,555	18,985,640	56,429,796
1950-----	2,107	876,512	100,025	27,006,750	87,890	24,960,760	70,198,647
1951-----	2,160	1,045,440	76,713	26,542,698	78,121	28,436,044	70,953,653
1952-----	3,213	1,555,092	73,719	23,737,518	74,317	24,673,244	64,626,967
1953-----	3,136	1,800,064	74,610	19,547,820	72,153	16,595,190	51,809,828
1863-1953-----	123,105	40,194,375	6,512,238	832,206,162	1,852,044	367,929,223	1,873,603,434

¹ Includes recoverable metal content of gravel washed (placer operations), ore milled, old tailings and old slag re-treated, and ore shipped to smelters during the calendar year indicated.

² Does not include gravel washed.

³ Figure not available.

TABLE 4.—Gold produced at placer mines, 1944-48 (average) and 1949-53, by classes of mines and methods of recovery

Class and method	Mines producing	Material treated (cubic yards)	Gold recovered		
			Fine ounces	Value	Average value per cubic yard
Surface placers:					
Gravel mechanically handled:					
Bucketline dredges:					
1944-48 (average)	4	2,107,453	9,624	\$336,854	\$0.160
1949	4	2,332,576	10,234	359,190	.154
1950	4	2,005,000	13,540	474,215	.237
1951	4	1,729,500	10,665	373,275	.216
1952	3	458,146	2,359	82,565	.180
1953	2	904,000	3,865	135,275	.150
Dragline dredges:					
1944-48 (average)	2	268,252	1,256	43,974	.164
1949	2	406,000	1,409	49,315	.121
1950	2	296,000	1,839	64,365	.217
1951	5	137,000	938	32,830	.240
1952	6	434,990	1,769	61,915	.142
1953	4	332,000	1,476	51,660	.156
Suction dredges:					
1944-48 (average)	2	4,158	25	861	.207
1949	2	11,765	54	1,890	.161
1950	1	500	15	525	1.050
Nonfloating washing plants: ¹					
1944-48 (average)	3	180,412	1,287	45,052	.250
1949	5	259,500	3,064	107,240	.413
1950	9	205,117	1,684	58,940	.287
1951-52					
1953	2	16,200	46	1,610	.100
Gravel hydraulically handled:					
1944-48 (average)	6	24,092	148	5,173	.215
1949	5	14,800	87	3,045	.206
1950	10	37,085	292	10,220	.278
1951	9	17,250	93	3,255	.189
1952	5	10,080	101	3,535	.351
1953	9	181,250	425	14,875	.082
Small-scale hand methods: ²					
1944-48 (average)	38	8,842	159	5,558	.629
1949	60	20,866	218	7,630	.366
1950	49	17,028	182	6,370	.374
1951	34	7,261	154	5,390	.742
1952	15	2,910	92	3,220	1.107
1953	17	2,810	75	2,625	.934
Underground placers (drift):					
1944-48 (average)	5	1,711	17	588	.344
1949	3	1,330	12	420	.316
1950-53					
Grand total placers:					
1944-48 (average)	³ 60	2,594,920	12,516	438,060	.169
1949	³ 82	3,046,837	15,078	527,730	.173
1950	75	2,560,730	17,561	614,635	.240
1951	52	1,891,011	11,850	414,750	.219
1952	29	906,126	4,321	151,235	.167
1953	34	1,436,260	5,887	206,045	.143

¹ Includes all placer operations using power excavator and washing plant, both on dry land; an outfit with movable washing plant is termed a "dry-land dredge."

² Includes all operations in which hand labor is principal factor in delivering gravel to sluices, long toms, dip boxes, pans, etc. "Wet" method used exclusively in Idaho.

³ A mine using more than 1 method of recovery is counted but once in arriving at total for all methods.

TABLE 5.—Mine production of gold, silver, copper, lead, and zinc in 1953, by counties, in terms of recoverable metals

County	Mines producing		Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer	Fine ounces	Value	Fine ounces	Value
Blaine.....	11	-----	254	\$8,890	576,025	\$521,332
Boise.....	5	6	345	12,075	686	620
Bonner.....	7	-----	383	13,405	91,569	82,875
Custer.....	13	-----	306	10,710	182,308	164,998
Elmore.....	4	1	2,561	89,635	27,845	25,201
Gem.....	3	1	65	2,275	783	709
Idaho.....	5	18	5,520	193,200	1,147	1,038
Owyhee.....	1	-----	30	1,050	19,210	17,386
Shoshone.....	43	-----	2,376	83,160	13,636,680	12,341,884
Valley.....	2	2	7	245	210	190
Undistributed ¹	20	6	5,783	202,405	103,277	93,471
Total.....	114	34	17,630	617,050	14,639,740	13,249,704

County	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
Blaine.....	42	\$24,108	2,697	\$706,614	3,136	\$721,280	\$1,982,224
Boise.....	-----	-----	6	1,572	-----	-----	14,267
Bonner.....	2	1,148	163	42,706	36	8,280	148,414
Custer.....	27	15,498	1,535	402,170	302	69,460	662,836
Elmore.....	-----	-----	-----	-----	-----	-----	114,836
Gem.....	-----	-----	7	1,834	4	920	5,738
Idaho.....	-----	-----	-----	-----	-----	-----	194,238
Owyhee.....	29	16,646	27	7,074	7	1,610	43,766
Shoshone.....	2,100	1,205,400	69,885	18,309,870	68,650	15,789,500	47,729,814
Valley.....	-----	-----	-----	-----	-----	-----	435
Undistributed ¹	936	537,264	290	75,980	18	4,140	913,260
Total.....	3,136	1,800,064	74,610	19,547,820	72,163	16,595,190	51,809,828

¹ Includes quantities and values which cannot be shown separately for Benewah, Boundary, Butte, Camas, Cassia, Clark, Clearwater, Latah, Lemhi, Lewis, and Nez Perce Counties.

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc in 1953, by months, in terms of recoverable metals ¹

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January.....	800	1,120,083	230	6,654	6,753
February.....	809	967,723	235	5,988	5,744
March.....	918	1,340,470	282	6,757	6,373
April.....	1,202	1,199,986	200	6,389	6,591
May.....	1,448	1,180,125	281	6,354	6,323
June.....	1,971	1,291,863	280	6,339	6,194
July.....	1,528	1,296,153	263	6,389	5,354
August.....	2,100	1,241,555	275	5,839	5,458
September.....	1,811	1,239,366	254	6,202	6,020
October.....	2,009	1,242,080	260	5,827	5,974
November.....	1,630	1,270,683	276	6,210	5,776
December.....	1,404	1,249,653	300	5,662	5,593
Total.....	17,630	14,639,740	3,136	74,610	72,163

¹ Mine production comprises ore, gravel, or other mineral material sold or treated and metal recovered as natural gold or as bullion from cyanidation or amalgamation and the estimated recoverable metal contained in concentrates, ores, tailings and other mineral materials shipped directly to smelters or sold to ore buyers within the year.

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in 1953, by classes of ore or other source materials, in terms of recoverable metals

Source	Number of mines ¹	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode ore:							
Dry gold.....	16	17,282	7,597	28,215	-----	-----	-----
Dry gold-silver.....	5	32	123	4,696	-----	547	-----
Dry silver.....	11	313,554	894	8,850,694	2,818,772	5,326,273	372,097
Total.....	32	330,868	8,614	8,883,605	2,818,772	5,326,820	372,097
Copper.....							
Copper-lead.....	8	66,299	666	23,429	1,828,300	54,000	14,000
Lead.....	1	53,792	17	86,149	124,000	217,000	-----
Lead-zinc.....	35	152,575	436	927,446	465,244	13,404,772	829,022
Total.....	76	1,617,098	3,075	5,600,756	3,416,888	138,188,182	127,713,672
Other "lode" material:							
Dry gold: Mill cleanings.....	1	10	8	8	-----	-----	-----
Lead-zinc: Old tailings.....	5	66,545	46	91,835	36,340	2,150,962	2,030,210
Zinc: Old slag.....	1	75,664	-----	62,472	-----	3,554,036	14,190,021
Total.....	7	142,219	54	154,315	36,340	5,704,998	16,220,231
Total "lode" material.....							
Gravel (placer operations).....	114	2,090,185	11,743	14,638,676	6,272,000	149,220,000	144,306,000
Total, all sources.....	34	-----	5,887	1,064	-----	-----	-----
Total, all sources.....	148	2,090,185	17,630	14,639,740	6,272,000	149,220,000	144,306,000

¹ Detail will not necessarily add to totals because some mines produce more than 1 class of material.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1953, by methods of recovery and types of material processed, in terms of recoverable metals

Type of material processed and method of recovery	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode:					
Amalgamation.....	5,412	1,676	-----	-----	-----
Cyanidation.....	1,169	44	-----	-----	-----
Total recoverable in bullion.....	6,581	1,720	-----	-----	-----
Concentration, and smelting of concentrates:					
Ore.....	4,367	14,313,563	6,099,092	142,224,576	128,009,414
Old tailings.....	46	90,041	36,340	2,085,272	1,989,671
Total.....	4,413	14,403,604	6,135,432	144,309,848	129,999,085
Direct smelting:					
Ore.....	749	169,109	136,568	1,290,462	76,355
Old tailings.....	-----	1,771	-----	65,654	40,539
Old slag.....	-----	62,472	-----	3,554,036	14,190,021
Total.....	749	233,352	136,568	4,910,152	14,306,915
Placer.....					
Grand total.....	5,887	1,064	-----	-----	-----
Grand total.....	17,630	14,639,740	6,272,000	149,220,000	144,306,000

Lead.—Production of lead increased 1 percent in 1953, owing principally to greater output of the metal from several large mines in Shoshone County which offset a curtailment at most of the State's lead-zinc mines. The value of the lead output declined 18 percent, despite the increase in quantity produced, because of lower average market prices. Leading mines from which lead production was increased to some extent in 1953 included Bunker Hill, Bunker Hill & Sullivan Mining & Concentrating Co.; Star, Sullivan Mining Co.; Page, Morning, and Frisco, American Smelting & Refining Co.; and Dayrock, Day Mines, Inc. These gains were accomplished by increasing ore production, limiting production of low-grade ores, or mining ore higher in lead content in preference to zinc due to the comparatively higher lead price. Increased output from the Clayton mine of Clayton Silver Mines, Custer County, after a strike caused reduced output in 1952 and a greater quantity of developmental ore from the

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1953, by counties and districts, in terms of recoverable metals

County and district	Mines producing		Material sold or treated (short tons)	Gold (lode and placer) (fine ounces)	Silver (lode and placer) (fine ounces)
	Lode	Placer			
Blaine County:					
Little Wood River (Muldoon) and Mineral Hill and Camas ¹	6	-----	1,914	23	14,471
Warm Springs.....	5	-----	93,531	231	561,554
Boise County:					
Boise Basin and Summit Flat ¹	4	4	49	326	268
Grimes Pass and South Fork of Payette River ¹	1	2	5	19	418
Bonner County:					
Clark Fork.....	3	-----	14,404	-----	5,060
Lakeview.....	3	-----	13,947	381	86,202
Pend Oreille.....	1	-----	150	2	307
Custer County:					
Alder Creek.....	1	-----	429	13	1,758
Bayhorse.....	4	-----	37,251	51	167,806
Seafoam.....	3	-----	652	49	6,255
Stanley Basin and Yankee Fork ¹	5	-----	2,238	193	6,489
Elmore County: Middle Boise and Pine Grove ¹	4	1	8,108	2,561	27,845
Gem County: Squaw Creek and West View ¹	3	1	111	65	783
Idaho County:					
Dewey Harpster.....	1	-----	5	3	2
Elk City.....	2	7	4	5,134	1,053
Florence or French Creek.....	-----	2	-----	12	7
Ten Mile.....	1	1	39	59	19
Warren.....	1	3	10	259	61
Lemhi County:					
Blue Wing.....	1	-----	53,792	17	86,149
Junction.....	3	-----	58	-----	725
Mackinaw.....	3	-----	35	8	71
McDevitt.....	1	-----	110	2	87
Mineral Hill.....	1	-----	92	13	3
Owyhee County: South Mountain.....	1	-----	973	30	19,210
Shoshone County:					
Beaver and Coeur d'Alene ¹	4	-----	27,086	44	28,998
Evolution.....	9	-----	333,529	568	8,830,766
Hunter.....	4	-----	350,889	463	774,536
Lelande.....	7	-----	111,313	93	147,633
Placer Center.....	4	-----	152,829	254	829,946
Yreka.....	15	-----	812,780	954	3,024,801
Valley County: Deadwood Basin.....	1	-----	7	-----	75
Undistributed ²	12	13	73,851	5,803	16,382
Total Idaho.....	114	34	2,090,185	17,630	14,639,740

For footnotes, see end of table.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1953, by counties and districts, in terms of recoverable metals.—Continued

County and district	Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
Blaine County:				
Little Wood River (Muldoon) and Mineral Hill and Camas ¹	2, 600	228, 000	219, 600	\$69, 770
Warm Springs.....	81, 400	5, 166, 000	6, 052, 400	1, 912, 454
Boise County:				
Boise Basin and Summit Flat ¹		11, 700		13, 185
Grimes Pass and South Fork of Payette River ¹		300		1, 082
Bonner County:				
Clark Fork.....	200	224, 800	24, 000	36, 846
Lakeview.....	3, 700	101, 000	47, 800	111, 142
Pend Oreille.....	100	200	200	426
Custer County:				
Alder Creek.....	27, 300			9, 881
Bayhorse.....	23, 300	2, 967, 000	527, 000	609, 627
Seafosm.....	3, 000	103, 000	77, 000	30, 585
Stanley Basin and Yankee Fork ¹	400			12, 743
Elmore County: Middle Boise and Pine Grove ¹				114, 836
Gem County: Squaw Creek and West View ¹		14, 000	8, 000	5, 738
Idaho County:				
Dewey Harpster.....				107
Elk City.....				180, 643
Florence or French Creek.....				426
Ten Mile.....				2, 082
Warren.....				9, 120
Lemhi County:				
Blue Wing.....	124, 000	217, 000		142, 579
Junction.....		29, 000		4, 455
Mackinaw.....	8, 000			2, 640
McDevitt.....	25, 000			7, 324
Mineral Hill.....				458
Owyhee County: South Mountain.....	58, 000	54, 000	14, 000	43, 766
Shoshone County:				
Beaver and Coeur d'Alene ¹	48, 000	1, 423, 200	1, 550, 400	406, 296
Evolution.....	2, 847, 400	6, 690, 000	2, 115, 000	9, 948, 988
Hunter.....	254, 600	27, 782, 700	50, 726, 400	10, 263, 339
Lelande.....	84, 000	7, 301, 000	11, 930, 400	2, 489, 405
Placer Center.....	451, 000	12, 026, 100	4, 658, 000	3, 000, 559
Yreka.....	515, 000	84, 547, 000	66, 319, 800	21, 621, 227
Valley County: Deadwood Basin.....				68
Undistributed ²	1, 715, 000	334, 000	36, 000	758, 031
Total Idaho.....	6, 272, 000	149, 220, 000	144, 306, 000	51, 809, 828

¹ Combined to avoid disclosure of individual company operations.

² Includes values and quantities that cannot be shown separately for St. Joe district, Benewah County; Port Hill district, Boundary County; Dome district, Butte County; Beaver Creek district, Camas County; Blackpine district, Cassia County; Birch Creek district, Clark County; Pierce district, Clearwater County; Burdorf-Marshall Lake, Camp Howard, Dixie, Salmon River, and Orogrande districts, Idaho County; Hoodoo district, Latah County; Blackbird, Eureka, Nicholia, and Texas districts, Lemhi County; Salmon River district, Lewis County; Snake River district, Nez Perce County; and Knox and Yellow Pine districts, Valley County.

Vulcan-Galena project of American Smelting & Refining Co., Shoshone County, also helped to prevent a decline of lead production for the State.

Eight mines produced over 2,500 tons of recoverable lead in 1953. In order of output, the eight were Bunker Hill, Page, Star, Morning, Dayrock, Sunshine (including adjoining areas operated by Sunshine Mining Co. for associated companies), Frisco (including Hull lease), and Triumph. These mines supplied 80 percent of the State's total lead. All but one, the Triumph in Blaine County, were Shoshone County mines, and all produced lead-zinc ore except the Sunshine, which supplied silver ore. Other large suppliers of lead included Lucky Friday, Sidney, and Tamarack, in Shoshone County, and Clayton, in Custer County. Shoshone County's share of lead production in

the State increased from 91 percent in 1952 to 94 percent in 1953. Lead-zinc ore supplied 83 percent of the Idaho output; lead ore, 9 percent; silver ore, 4 percent; and lead-zinc old tailings and old zinc slag most of the remainder.

The drop in lead-zinc prices and increased costs, combined with decreasing ore reserves, led to the end of large-scale production from the Morning mine late in 1953, after this mine had been operated continuously for 70 years. A limited operation was expected to continue through 1954 to mine a block of high-grade ore from the shaft pillar, after which the Morning mine was to be closed entirely.

The number of mines producing lead or lead-zinc ores in Idaho decreased from 98 in 1952 to 67 in 1953. The principal mines producing in 1952 but reported inactive in 1953 were the Monitor in Shoshone County and the Livingston in Custer County. Many smaller mines that were operated intermittently in 1952 were not worked at all in 1953 because of depressed metal prices. Of the mines producing in 1953, the Morning was the only sizable mine reported closed during the year. Several companies in the Coeur d'Alene region adopted incentive block-leasing systems to prevent mine shutdowns. Block leasing was introduced into the region in March at the Constitution mine of the Spokane-Idaho Mining Co. on Pine Creek. By the end of the year the system was being used by Day Mines, Inc., at the Tamarack and Sherman mines; Highland-Surprise Consolidated Mining Co., at the Highland-Surprise property; Mascot Mines, Inc., at the Little Pittsburgh; and Nabob Silver-Lead mines, at the Nabob mine. Under block leasing, sections and blocks of mines were turned over to lessees, and mining by the company in active areas usually was curtailed or discontinued. The system differed from usual mine leasing in that the company furnished lessees with nearly all mining equipment, continued to operate the mine haulage and hoisting facilities, and generally milled the ore produced by the lessees. In some instances block leasing was credited with upgrading ore mined and increasing the tonnage per man-shift.

Major exploration and development projects were in progress throughout 1953 at mines in Shoshone County. Good results were obtained at the Vulcan-Galena lease by American Smelting & Refining Co., and the initial development at the mine was expected to be completed successfully in 1955. At the Hecla-Atlas project, drifts and crosscuts were driven on the 2,400 level, but the results were said to be discouraging, and at the end of the year exploration was confined to a diamond-drilling survey. The new 2,000-level crosscut tunnel from the Star mine to the mill at Burke was completed. Expansion of surface plant facilities was marked by near completion of the multimillion-dollar smelter-modernization program at the Bunker Hill smelter and completion of the pretreatment plant at the Sullivan electrolytic zinc-reduction plant. Several major deep-exploration projects were underway with financial assistance provided by the DMEA.

Manganese.—Exploration and development were undertaken at the Vanza mine in Bannock County by J. R. Simplot Co., but no shipments were made during the year. The Bureau of Mines carried on trenching and sampling activity at the Markwell manganese prospect

in Butte County. The Cleveland deposits in Franklin County were described in an article.⁷

Mercury.—The output of mercury from the Hermes mine in Valley County by United Mercury Mines Co., the only producer in the State, increased substantially during the year despite a decline in mercury prices. Inaccessibility of the mine, in the Yellow Pine district near Stibnite, during winter months necessitated using ski-equipped aircraft to transport supplies and carry out mercury produced in furnaces at the mine. Reserves of commercial and marginal ore at the mine were estimated at 500,000 tons.⁸

Nickel.—Nickel was recovered from cobalt concentrates produced at the Blackbird mine in Lemhi County by Calera Mining Co. In 1953, 21,254 pounds was sold to the General Services Administration (GSA).

Rare-Earth Metals.—Activity continued at the alluvial gravel deposits near Cascade, Valley County. Three dredges in the area, operated by Baumhoff-Marshall, Inc., Idaho-Canadian Dredging Co., and Warren Dredging Co., supplied the bulk of the Nation's domestic supply of monazite, a rare-earth mineral. The output of concentrates from the dredges was trucked to Cascade for shipment by rail to the Baumhoff-Marshall sand plant in Boise, where the material, after drying, was separated into ilmenite, monazite, and zircon fractions through the use of electromagnetic and high-tension electrostatic equipment. The ilmenite and zircon fractions were stockpiled, and the monazite produced was shipped to the GSA and to Lindsay Chemical Co. Monazite-production statistics cannot be released because the mineral contains thorium, a fissionable element, and accordingly is classified for security purposes by the Atomic Energy Commission.

The output of monazite sands suffered a sharp cutback when the Warren Dredging Co. dredge overturned and sank, resulting in complete cessation of production by the company. The dredge was dismantled and equipment was salvaged.

Another deposit of the sands was worked by the K & D Mining Co. dredge near Burgdorff, Idaho County. Concentrates from the dredge underwent magnetic separation of the constituents in equipment owned by the Idaho Titanium & Mining Co. at Weiser.

Exploration activities conducted by Cosumnes Gold Dredging Co. at the White Hawk Basin and Paddy Flat deposits and by Verlon W. Vandeventer at the Hull's Big Creek property, all in Valley County, indicated the continued high interest in monazite production. J. R. Simplot Co. and Porter Bros. Corp. were engaged in exploring and developing the Dismal Swamp columbium-tantalum-uranium deposits in Elmore County and the Bear Valley columbium-tantalum-monazite placer deposits in Valley County, respectively.

A small quantity of columbium-tantalum concentrates, with a content of 50 percent contained combined pentoxides, was shipped by the Thornton Mining Corp. to the GSA purchase depot at Custer, S. Dak., from the Columbite mine near Garden Valley, Boise County.

Silver.—The quantity of silver recovered declined 2 percent compared with 1952. The Sunshine Mining Co. mined 12 percent more silver ore from the Sunshine mine (including areas operated for

⁷ Work cited in footnote 6.

⁸ Work cited in footnote 6.

affiliated companies), but the grade was lower than in 1952, causing a slight reduction in output of the metal. About 60 percent of the silver produced in the State was supplied by the Sunshine Mining Co. and the Polaris Mining Co.; the latter firm operated the Silver Summit mine. Lead-zinc ore from the Bunker Hill mine was the next most important source of silver. Of the State total, slightly more than 60 percent was recovered from silver ore, 31 percent from lead-zinc ore, and most of the remainder from lead ore. Shoshone County contributed 93 percent of the State's output.

Extensive deep-level exploration projects by crosscutting and diamond drilling were in progress at the Sunshine mine throughout 1953. Starting in April, the Sunshine Mining Co. began producing copper-silver-antimony and lead-silver-iron concentrates in its 1,350-ton flotation mill, in place of the bulk concentrate formerly produced. The company indicated that the change, which involved reactivation of the antimony-leaching plant, was necessitated by complications in marketing bulk concentrates. In September a program of enlarging the mill building and replacing old flotation equipment was undertaken.

Early in 1953 the American Smelting & Refining Co. made an important discovery of a high-grade silver vein on the 3,000 level of the Galena mine, where a major lead-silver exploration and development project was in progress.

Titanium.—Ilmenite, a titanium mineral, was recovered at the Baumhoff-Marshall, Inc., sand plant at Boise from heavy sands produced by dredges operating in Valley County (see Rare-Earth Metals). Except for a small quantity of the ilmenite which was sold for use as roofing granules, all production was stockpiled.

Tungsten.—The output of tungsten ore and concentrates during the year reached its highest level since 1946. The value of output exceeded \$1.5 million. Production was recorded from Adams, Custer, Lemhi, Shoshone, and Valley Counties, with the Bradley Mining Co. operation at the Ima mine in Lemhi County by far the largest. The progress of exploration work at the Ima mine was summarized in an article⁹ stating that

Vein systems at the Ima mine have been developed and exposed by underground working for a length of over 4,000 feet, and a vertical distance of more than 500 feet. The width across which the more or less parallel vein systems occur is nearly 1,000 feet in some areas. Limits of the ore zone beyond these distances have not yet been found, but indications are that extensions are substantial, and that the Ima mine will have a long life.

According to another article¹⁰ that summarized Idaho's mineral resources, widespread tungsten deposits are associated with the Idaho batholith. Structurally complex veins of hübnerite, scheelite, and silver-bearing sulfides were mined at the Ima mine, and reserves were estimated at over 1 million tons of commercial ore.

Scheelite ore was obtained from the Bradley Mining Co. Springfield mine in Valley County. The company reported that the ore, which was from a talus deposit, was first treated in a simple gravity plant at the mine, after which the resulting concentrates were trucked to

⁹ Engineering and Mining Journal, How DMEA Helped the Ima Mine: Vol. 154, No. 7, July 1953, p. 151.

¹⁰ Work cited in footnote 6.

Stibnite for electric separation. Operation was possible during the summer months only.

Scheelite and ferberite concentrates were produced by Schmittroth & Etherton in Shoshone County. Ore and low-grade concentrates from producers in Washington and Montana were treated, in addition to ore from the Big It mine. Other smaller producers during the year included R. C. Scriven at the Alaska group in Adams County; Clinton Gunderson and Ira Lambert, Hanni Mining Co. mine, Custer County; and Boise Dredging Co., Moose Creek dredge, Lemhi County.

Uranium.—Continued high interest in uranium resulted in numerous reports of radioactive mineral occurrences in the State during the year. Discovery of a radioactive mineral identified as pitchblende in the old upper workings of the Bunker Hill & Sullivan Mining & Concentrating Co. Crescent mine, Shoshone County, was reported. Defense Metals, Inc., was active at the Wonder vein near Tendoy in Lemhi County. A detailed description of the uranium mineralization discovered in the Sunshine mine in 1949 was given in an article.¹¹

Zinc.—In contrast to the 1-percent gain in lead production, the output of zinc decreased 3 percent in 1953. Advances in production from several large mines, including Star, Page, Morning, Frisco, and Triumph, prevented a greater decrease. Recovery of zinc from old smelter slag increased substantially. The 7 largest producing properties were in the Coeur d'Alene mining region, Shoshone County, which supplied 95 percent of the output. These were, in order of production, Star, Page, Bunker Hill, Bunker Hill smelter old slag dump, Morning, Frisco, and Sidney. The next largest production was taken from the Triumph mine in Blaine County, southern Idaho. All of these properties produced over 2,500 tons of zinc and supplied 87 percent of the State total. About 88 percent of Idaho's production was recovered from lead-zinc ore; 10 percent, old slag; 1 percent, lead-zinc old tailings; and most of the remaining 1 percent, lead ore (see also Lead).

NONMETALS

Abrasives.—The output of garnet and silica for use as abrasives was reported. More detailed information is given under these commodities.

Barite.—The open-pit at the Sun Valley property of J. R. Simplot Co. in Blaine County was inactive during 1953. Crude barite from a stockpile built up in 1952 was ground by the Simplot company at a plant in Pocatello for sale as drilling mud. Output was increased considerably over 1952; shipments were made to Texas, Oklahoma, California, and Canada.

Cement.—The Idaho Portland Cement Co. substantially increased the output of portland and Eagle masonry cements at the Inkom plant near Pocatello. For use at the plant the company quarried limestone locally and purchased silica, gypsum, and iron ore.

Clays.—Structural clay products were manufactured at four plants in southern Idaho, and refractories were produced at a plant at Troy, Latah County. The quantity of clays mined was slightly greater than in 1952. The development of Idaho's potential high-grade clay

¹¹ Kerr, Paul F., and Robinson, Raymond F., Uranium Mineralization in the Sunshine Mine, Idaho: Min. Eng., vol. 5, No. 5, May 1953, pp. 495-511.

deposits, of which the best known are in the Troy-Moscow area, has been retarded by lack of a bulk market in the Pacific Northwest. The deposits in the Troy-Moscow area probably contain the largest quantity and best grade of clays in the Northwest.

Fluorspar.—The flotation mill at the Chamac mine of Fluorspar Mines, Inc., at Meyers Cove, Lemhi County, sole producer of fluorspar in Idaho, was destroyed by fire on April 17. The company, a subsidiary of J. R. Simplot Co., suspended mining operations but continued an exploration program underway with DMEA assistance. In September the Simplot company terminated the exploration contract with the Government and surrendered its lease and option to A. E. Chambers, owner of the claims. Exploration and production ceased. The bulk of the fluorspar concentrates produced before the fire was sold to the GSA for stockpiling, and small quantities were also sold for use at aluminum-reduction plants and in glassmaking.

The Chamac mine claims were acquired by A. E. Chambers as an undeveloped prospect in 1941. The property was examined, metallurgical tests were made by various agencies and companies, and in 1944 a 100-ton flotation mill was built. A mill test of 6-day duration was made; however, the overall operation appeared to be noncommercial and was discontinued. During 1945 and 1946 the owner did some surface work, further exposing the fluorspar veins, and in 1947 the Aluminum Co. of America carried out an exploratory diamond-drilling program on three veins. J. R. Simplot Co. acquired the property under a lease-option agreement in 1950, rehabilitated the mill, and began open-pit mining and underground exploration in 1951. A DMEA contract was signed in June 1952. Mine work completed under the contract consisted of about 1,500 feet of drifting, cross-cutting, and raising.

In the Salmon River Canyon area of Lemhi County, 20 miles downstream from the end of the river road near Shoup, surface prospecting and trenching were done to determine the extent of fluorite deposits that had been found by Austin P. Smothers in 1952. Trenching on one vein exposed croppings 4 to 10 feet wide over 400 feet of strike assaying 94 percent CaF_2 .¹² The fluorite occurs in veins in biotite gneiss.

Garnet.—Shipments of garnet declined about 33 percent compared with 1952 due largely to the decreased demand for abrasive purposes. Garnet-bearing sands from the Emerald Creek deposits near Fernwood, Benewah County, were concentrated by the Idaho Garnet Abrasives Co. at its Fernwood plant. The principal use of the shipped product was for sandblasting.

A small output of abrasive garnet was reported for the first time from Idaho County. The garnet was recovered by the Idaho Titanium & Mining Co. from concentrates produced at the dredging operation of K & D Mining Co. at Ruby Meadows near Burgdorf. About 100 tons of refined garnet sand valued at \$45 per ton was sold.

Gypsum.—Deposits of gypsum along the Snake River about 20 miles northwest of Weiser in Washington County are the most promising potential source of the commodity in Idaho. The gypsum occurs in lenses dipping moderately to steeply, rather than in flat-lying beds.

¹² Engineering and Mining Journal, vol. 154, No. 6, June 1953, p. 140.

Production has been sporadic, and in 1953 only a small quantity, used for land plaster, was mined.

Mica.—Output of mica from a small producing area northwest of Deary in Latah County increased in 1953 to \$223,000. The entire production was sold to the GSA for the National Strategic Stockpile. The mica occurs in veinlike mica-quartz-feldspar pegmatites containing some beryl, which was also recovered.

The principal production was from the Muscovite mine of the Idaho Beryllium & Mica Corp. Both underground and surface mining was done. Sheet mica was shipped during the first part of the year, but later a changeover to shipment of hand-cobbed material was made. The operations of the company were described in an article.¹³ An exploration program at the mine was completed in 1953 under a DMEA contract made late in 1952, in which the agency agreed to provide 90 percent of the cost of a \$28,700 project. About 575 feet of underground workings was driven, some old workings were rehabilitated, and approximately 1,200 feet of diamond drilling was accomplished from surface and underground stations. Some ore was discovered that was possibly the downward extension of the new pegmatite discovered on the surface in 1952.

Production also was reported from the old Steelsmith property by Ed. Vennigerholz and Robert Olson.

Phosphate Rock.—There were substantial gains during 1953, both in the quantity of phosphate rock mined in Idaho and the tonnage processed at plants in the State. The annual mine output from the three producing areas exceeded 1 million long tons for the first time since mining was begun.

Over half of the rock was mined at the Gay open-pit mine of J. R. Simplot Co., Bingham County. Mining, from two panels, was carried on from May to November, and overburden was removed throughout the year. The formation was mined selectively in two stages. A 20-foot portion of about 25 percent P_2O_5 rock was mined separately for use in manufacturing elemental phosphorous at the Pocatello plant of Westvaco Chemical Division, Food Machinery & Chemical Corp., and a much thinner adjoining bed of about 32 percent P_2O_5 hardrock was mined for use at the J. R. Simplot Co. fertilizer manufacturing plant west of Pocatello.

A second major rock-producing area was in Caribou County, near Soda Springs. Morrison-Knudsen Co., Inc., operated the Ballard open-pit mine under contract for Monsanto Chemical Co. and also mined surface rock under contract for Anaconda Copper Mining Co. at Conda. Output from the Conda strip was increased over 1952 and furnished about 40 percent of the tonnage mined at Conda. The remaining 60 percent was mined underground from the foot- and hanging-wall beds at the No. 3 mine by the Anaconda company. A beneficiation and drying plant also was operated at Conda. All mine rock was crushed and in the winter also was dried before shipment. A washing plant was used to upgrade some of the rock by removing weathered clay that occurs in contaminating seams in the phosphate beds. Installation of Dorrelone classifiers reduced tailings loss in the plant.

¹³ Mining World, Strategic Mica From Idaho: Vol. 15, No. 1, January, 1953, pp. 31-33.

The third producing area was in Bear Lake County near Montpelier where the San Francisco Chemical Co. took over direct operation of its Waterloo open-pit mine from a contractor and continued development and exploration at the nearby Cumberland underground mine. A 3,300-foot exploratory tunnel was completed on the Central Farmers Fertilizer Co. property in Georgetown Canyon, and some preliminary stripping of overburden of a surface deposit was done by the company.

The phosphate-rock-processing industry continued to expand in 1953. At Soda Springs the initial elemental phosphorus furnace of the Monsanto Chemical Co., reported to be the largest in the world, started volume production in January. A second furnace was planned. At Pocatello 1953 was the first full year of operation of a fourth electric furnace completed late in 1952 at the Westvaco elemental phosphorus plant. Output at the plant was increased further by improvements in processing methods. Also near Pocatello, at the J. R. Simplot Co. Fertilizer Division plant, capacity for manufacturing normal superphosphate was expanded, and new facilities were installed enabling treble superphosphate to be produced in Idaho for the first time. Further expansion of the superphosphate plant was planned for 1954.

Exploration for new mining areas by Government agencies and private companies continued during the year, and several publications giving results of Geological Survey field investigations were issued.¹⁴

Significant discoveries of deposits in the Centennial Mountains on the Montana-Idaho border and in the Caribou Range of Idaho were reported in another Geological Survey circular.¹⁵

Pumice.—The quantity of pumice reported sold or used in Idaho was slightly less than in 1952; however, the gross value of output increased, owing to a higher unit value for crude material and also to a larger proportional output of crushed and sized material.

The principal producing area was in Bonneville County about 6 miles east of Idaho Falls. At the Albino pit and plant the Clark Concrete Construction Corp. produced 37,274 tons of crude and prepared pumice for use in manufacturing concrete blocks and lightweight concrete. Some prepared material was used also in acoustical plaster. At nearby Ammon the Katie Lee quarry and plant were operated by Pumice, Inc., and 45,500 tons of crude and prepared material was produced. Shipments were made to buyers as far east as Michigan; however, the principal market was in Idaho and Utah. Some pumice was sold for use as thermal insulation. A new processing plant, to be completed in 1954, was under construction. Use of roll crushers and screens for sizing aggregates and dry milling and air classification for preparation of ground products was planned. Limited production of kiln-dried pumice and pozzuolan was begun in 1953.

Near Hailey in Blaine County the Sun-ite Corp., Salt Lake City, Utah, mined and crushed 2,400 tons of pumice for use as lightweight

¹⁴ Davidson, D. F., McKelvey, V. E., O'Malley, F. W., and Smith, L. E., *Stratigraphic Sections of the Phosphoria Formation in Idaho, 1947-48, Part 1: Geol. Survey Circ. 208, 49 pp.*

McKelvey, V. E., Armstrong, F. C., Gulbrandsen, R. A., and Campbell, R. M., *Stratigraphic Sections of the Phosphoria Formation in Idaho, 1947-48, Part 2: Geol. Survey Circ. 261, 1953, 53 pp.*

O'Malley, F. W., Davidson, D. F., Hoppin, R. A., and Sheldon, R. P., *Stratigraphic Sections of the Phosphoria Formation in Idaho, 1947-48, Part 3: Geol. Survey Circ. 262, 1953, 43 pp.*

Sheldon, R. P., Warner, M. A., Thompson, M. E., and Pierce, H. W., *Stratigraphic Sections of the Phosphoria Formation in Idaho, 1949, Part 1: Geol. Survey Circ. 304, 1953, 30 pp.*

Davidson, D. F., Smart, R. A., Pierce, H. W., and Weiser, J. D., *Stratigraphic Sections of the Phosphoria Formation in Idaho, 1949, Part 2: Geol. Survey Circ. 305, 1953, 28 pp.*

¹⁵ Swanson, R. W., McKelvey, V. E., and Sheldon, R. P., *Progress Report on Investigations of Western Phosphate Deposits: Geol. Survey Circ. 297, 1953, 16 pp.*

concrete aggregate. A larger preparation plant was being constructed, and output of more than 18,000 tons was planned for 1954.

Sand and Gravel.—Production of sand and gravel was about the same as in 1952. More than two-thirds of the output, by value, was used for road construction and most of the remainder as a building material. Small quantities were used for railroad ballast and as engine sand. Production was reported from 31 of the 44 counties in the State. The leading producing counties, in order of output were Bonneville, Twin Falls, and Ada; together they supplied about half of the State total, by value. Much of the output from Bonneville County was used at the Bureau of Reclamation Palisades Project.

Silica.—Crushed quartz, used principally in the manufacture of ferrosilicon by Pacific Northwest Alloys, Inc., Spokane, was produced in Bonner County.

Ground plaster sand and blast sand were produced at Emmett, Gem County, by the Gem Silica Co. The silica sand was mined from an extensive deposit that forms a long, low range of hills south of Emmett. The sand contains about 30 percent feldspar. Output from the Gem plant decreased materially in 1953.

Stone.—Production of stone, reported from 12 counties, declined from the record high value set in 1952, owing largely to substantially reduced output of crushed quartzite for railroad ballast at one operation in Bannock County and to smaller quantities of crushed rock being used on highway projects. Demand at the Palisades project of the Bureau of Reclamation in Bonneville County increased from about 500,000 tons in 1952 to 585,000 in 1953.

Stone quarried was used largely at dam- and highway-construction projects. The largest producer of stone for other purposes was the Lewiston Lime Co., Seattle, Wash. Output of high-purity limestone by the company declined about 4 percent compared with 1952. About 57 percent of this was used at paper mills and the remainder in base-metal smelters, and sugar refineries and at foundries.

REVIEW BY COUNTIES AND DISTRICTS

ADA

Sand and gravel valued at nearly \$450,000 were produced in Ada County by three Boise firms (Chaussee Swan Gravel Co., Morrison-Knudsen Co., Inc., and Quinn Robbins Co., Inc.) and county crews and contractors for the county. The Boise Brick Co. mined clays and manufactured structural clay products.

Scheelite and powellite ores were shipped from the Alaska group by R. C. Scriven to the Getchell mill in Nevada. The operator reported having opened up two new mineralized veins on the property.

BANNOCK

A DMEA manganese project was active during the year at the J. R. Simplot Co. Vanza mine near Lava Hot Springs.

One of the leading mineral-processing plants in the State was operated at Inkom by Idaho Portland Cement Co., which produced all of the portland cement manufactured in Idaho. Limestone was

TABLE 10.—Value of mineral production in Idaho, 1952-53, by counties, and principal minerals produced in 1953

County	1952	1953	Principal minerals in order of value
Ada	\$445,260	\$446,430	Sand and gravel, clays.
Blaine	2,678,094	2,175,177	Zinc, lead, silver, barite, copper, pumice, sand and gravel, gold.
Boise	6,008	14,267	Gold, lead, silver.
Bonner	419,817	334,886	Silica, silver, lead, stone, gold, zinc, sand and gravel, copper.
Bonneville	1,487,886	2,000,451	Stone, sand and gravel, pumice, clays.
Boundary	(¹)	59,737	Sand and gravel, lead, silver, zinc, stone.
Butte	996	(¹)	Lead, silver, gold.
Camas	2,338	53,193	Stone, gold, lead, silver.
Canyon	89,667	218,735	Sand and gravel.
Cassia	144,082	282,221	Gold, sand and gravel, clays, silver.
Clark	(¹)	9,694	Sand and gravel, copper, silver.
Clearwater	86,000	245,276	Stone, gold, silver.
Custer	1,193,901	663,907	Lead, silver, zinc, copper, gold, tungsten.
Elmore	195,122	132,482	Gold, silver, sand and gravel.
Franklin	16,354	28,670	Sand and gravel.
Fremont		2,495	Do.
Gem	109,409	62,878	Silica, gold, lead, zinc, silver.
Gooding	15,380	1,712	Sand and gravel.
Idaho	124,368	238,638	Gold, sand and gravel, garnet, silver.
Jefferson		2,000	Sand and gravel.
Kootenai	388,352	103,185	Sand and gravel, stone.
Latah	127,105	341,284	Mica, stone, clays, sand and gravel, beryllium, gold.
Lemhi	(¹)	3,566,978	Tungsten, cobalt, copper, fluor spar, silver, lead, gold, zinc.
Lincoln		108,195	Sand and gravel.
Nez Perce	290,206	(¹)	Stone, sand and gravel, gold.
Oneida		14,975	Sand and gravel.
Owyhee	20,613	79,466	Sand and gravel, silver, copper, lead, zinc, gold.
Shoshone	58,534,097	47,857,517	Lead, zinc, silver, gold, sand and gravel, tungsten.
Teton		37,395	Sand and gravel.
Twin Falls	110,107	565,300	Sand and gravel, stone.
Valley	1,579,641	343,822	Mercury, tungsten, sand and gravel, gold, silver.
Undistributed ²	9,783,197	6,995,846	
Total	77,848,000	66,987,000	

¹ Included with "Undistributed" to avoid disclosure of individual company operations.

² Includes value of mineral production and principal minerals produced for the following counties: Adams (tungsten), Bannock (cement, sand and gravel, stone), Bear Lake (phosphate rock), Benewah (garnet, stone, gold), Bingham (phosphate rock, sand and gravel), Caribou (phosphate rock, vanadium), Lewis (stone, gold, silver), Minidoka (sand and gravel), Payette, (clays), Power (sand and gravel), Washington (gypsum). Also includes value of sand and gravel and tungsten production that cannot be assigned to specific counties.

quarried at the plant site, and the cement mill was operated throughout the year. Quartzite for railroad ballast was quarried and crushed near Inkom by Morrison-Knudsen Co., Inc., Boise. As demand for ballast was about 83 percent under 1952, the quarry was operated only 5 weeks; 82,000 tons was crushed, compared with 488,000 tons in 1952. Large quantities of sand and gravel for road construction and building purposes were mined in the county at commercial operations and by county and city road crews. An elemental phosphorus plant was operated by Westvaco Chemical Division, Food Machinery & Chemical Corp., and J. R. Simplot Co. manufactured phosphate fertilizers at plants west of Pocatello. Raw phosphate rock for both plants was obtained from the J. R. Simplot Co. open-pit Gay mine in Bingham County.

BEAR LAKE

Phosphate-rock-mining activity in the county increased in 1953. San Francisco Chemical Co., Montpelier, stepped up production slightly from the Waterloo strip mine, and also did some underground exploration at the nearby Cumberland property. At the Central

Farmers Fertilizer Co. mine in Georgetown Canyon 8 miles from Georgetown, a 3,300-foot exploratory tunnel was driven under contract by the Centennial Development Co., Eureka, Utah.

BENEWAH

Idaho Garnet Abrasives Co. produced garnet from Emerald Creek garnet-bearing sand deposits. The garnet was concentrated and sacked for shipment at a plant in Fernwood. The State Highway Department reported production of crushed rock for roadwork in the county.

BINGHAM

The open-pit Gay mine of J. R. Simplot Co. in the Fort Hall Indian Reservation, 18 miles east of Fort Hall, was the largest phosphate-rock producer in the western field. Stripping continued throughout the year, and shipping rock was mined from May to November. The output of phosphatic shale sold for use in manufacturing elemental phosphorus was increased greatly. Higher grade hard rock used in manufacturing fertilizers also was mined. Sand and gravel were produced by commercial operations and by county road crews, the principal use being for road construction.

BLAINE

The Sun-ite Corp. produced 2,400 tons of crushed pumice for use as lightweight aggregate at the Magic Reservoir operation near Hailey. A preparation plant with increased capacity was under construction. The open-pit barite mine of J. R. Simplot Co. was inactive, as market demands were filled from a stockpile built up in 1952. Sand and gravel were produced by contractors for State highway construction.

Little Wood River District.—Jeston Dehlin leased the Eagle Bird (John Logan) property from Garfield Silver-Lead Mines, Inc., on June 1 and shipped a small tonnage of lead ore to a smelter.

Mineral Hill and Camas District.—Silver Star-Queens Mines, Inc., developed the Queen group and shipped 1,210 tons of ore containing 8,481 ounces of silver, 156,021 pounds of lead, and 166,465 pounds of zinc. A total of 1,056 feet of drifts and crosscuts was driven during the year. Development of the Snoose mine by the Snoose Mining Co. of Boise resulted in production of 440 tons of lead-zinc ore with a gross metal content of 3,323 ounces of silver, 30,916 pounds of lead, and 91,037 pounds of zinc. The company reported that development and exploration consisted of drifting, 602 feet; crosscutting, 131 feet; raises and winzes, 159 feet; and diamond drilling, 1,000 feet. A small output was reported from the Bay State and Red Leaf mines (lead ore) and from the Little Cottonwood lease (lead-zinc ore).

Warm Springs District.—A greater quantity of zinc was recovered from the Triumph mine despite a slight drop in ore production in 1953; however, lead and silver recovery fell. A total of 93,132 tons of ore was milled in the Triumph Mining Co. 300-ton flotation plant, yielding 3,871 tons of lead concentrates containing 440,735 ounces of silver, 5,104,405 pounds of lead, and 218,114 pounds of zinc, and 5,636 tons of zinc concentrates containing 118,973 ounces of silver, 143,378 pounds of lead, and 6,005,863 pounds of zinc. Production

throughout the early part of the year was at a reduced rate after water flooded the four lower levels of the mine late in 1952. The water was pumped from the mine by early February, after which damage caused by the flood had to be repaired. A large sump was dug below the 1,000 level to handle the water coming into the lower levels, and a permanent pumping station was installed. Eugene Noxon operated the New Hope lead mine 8 miles west of Ketchum after leasing the property from Sun Valley Lead-Silver Mines, Inc., on May 1. During May and June Thornley U. Williams and Robert Douglas milled 300 tons of old lead-zinc tailings from the Hard Times and June Day dumps in a 25-ton gravity concentrator.

BOISE

Boise Basin District.—Jordan Placers, Inc., recovered gold and some silver from the Wharton placer deposit.

BONNER

A high-grade pod of quartz was mined under contract for Pacific Northwest Alloys, Inc., 3 miles northeast of Newport, Wash. Substantial quantities of sand, gravel, and crushed stone were prepared for road projects.

Clark Fork District.—Hope Silver-Lead Mines, Inc., milled about 14,000 tons of lead ore in the Hope 150-ton flotation mill. The company reported that the mill was operated for only 6 months but that the mine was worked throughout the year. The Whitedelf Mining & Developing Co. rehabilitated the Whitedelf mill and continued exploration and development at the mine.

Lakeview District.—Work was in progress throughout 1953 at two old mines that were being reopened and developed. Silver ore was shipped by the New Rainbow Mining Co., which began reopening and rehabilitating the lower workings of the Weber mine in 1951. Lyle Funnell and Donald E. Majer continued deep exploration and development at the Conjecture (Lakeview Silver) mine and also erected a 60-ton flotation mill. About 2,500 tons of silver ore was processed in the mill in 1953. The remaining production of the Lakeview district was credited to the Keep Cool mine of Idaho-Lakeview Mines Co., which produced lead-zinc ore.

BONNEVILLE

Largely as a result of production of crushed and broken stone, and sand and gravel valued at nearly \$1.7 million for the Bureau of Reclamation Palisades project, Bonneville County was the fourth ranking county in the State in terms of value of mineral output. Large quantities of sand and gravel also were mined for roads and general construction throughout the county. Bonneville County was the leading pumice-producing area in the Pacific Northwest, having an output of nearly 83,000 tons of crude and prepared pumice valued at nearly \$150,000. Clark Concrete Construction Corp. and Pumice, Inc., produced from deposits a few miles east of Idaho Falls. The Idaho Falls Brick & Tile Co., Idaho Falls, manufactured structural clay products from locally mined clays.

BOUNDARY

F. R. Hewett Co., Spokane, Wash., mined 40,000 tons of bank gravel for use on Idaho State highway projects. A small quantity of stone for rubble was quarried near Crossport by the Great Northern Railway Co.

Port Hill District.—The Idaho-Continental lead mine was operated part of the year by Northwood Mining & Leasing Co.

CAMAS

Crushed basalt for State highway projects was produced by contractors.

CANYON

Sand and gravel were produced by several companies and county road crews. Output was used principally for road construction, with smaller quantities for building material.

CARIBOU

Two large phosphate-rock producer-processors operated near Soda Springs in Caribou County. Anaconda Copper Mining Co. mined phosphate rock underground at Conda No. 3 mine and also obtained rock from a strip operation that was contract-mined by Morrison-Knudsen Co., Inc. The strip was operated from May through October. A washing, concentrating, and drying plant also was operated. Output was shipped by rail to the company metallurgical plant at Anaconda, Mont., where treble superphosphate and phosphoric acid were manufactured, and vanadium was recovered as a byproduct. Monsanto Chemical Co. began volume production of elemental phosphorus in January at an electric furnace plant at Soda Springs. Phosphatic shale was obtained from the Ballard open-pit mine about 12 miles from the plant. Mining was done under contract by Morrison-Knudsen Co., Inc. Silica rock used in the production of phosphorus also was mined by Morrison-Knudsen at an open pit near the plant. A small quantity of sand and gravel for use on roads was mined.

CASSIA

Sand and gravel were mined by county crews and by contractors for road use. The Burley Brick & Sand Co. used locally mined clays in manufacturing structural clay products at a plant in Burley.

Blackpine District.—The Virginia group, one of the principal sources of gold in Idaho, was operated throughout 1953 by the Duvall Co.

CLARK

Sand and gravel for road construction were mined by the county and by private contractors.

CLEARWATER

Four contractors produced crushed basalt valued at nearly \$250,000 for use as road-surfacing material on State highway projects.

CUSTER

Clinton Gunderson and Ira Lambert were active at the Hanni Mining Co. property. Scheelite ore from the mine was sent to the Salt Lake Tungsten Co. refinery in Salt Lake City, Utah. The operators reported that the deposit, which was discovered in November, was still in the developmental stage.

Alder Creek District.—About 430 tons of copper ore was shipped from the Copper Basin mine dump.

Bayhorse District.—The Clayton mine and mill of Clayton Silver Mines was the leading mineral-industry establishment in Custer County. Production, although on a reduced scale because of low metal prices, was increased substantially over the previous year, when a strike caused a shutdown for 3½ months. A total of 34,904 tons of lead-zinc ore was processed in the 100-ton flotation mill, and 1,526 tons of lead concentrates was produced containing 113,952 ounces of silver, 2,271,451 pounds of lead, 59,414 pounds of zinc, and some gold and copper. Zinc concentrates totaled 469 tons, all of which was stockpiled at the mill because of the depressed market for zinc. In view of the comparatively low cost of running the zinc circuit in the mill, the company decided to recover zinc as well as lead concentrate, rather than to run the zinc to waste through the tailings, in the expectation of marketing the zinc at a later date when the price is higher. Better stoping and haulage methods, including the drawhole method of pulling ore from stopes, resulted in a reduction in manpower. During the latter part of the year the average payroll at the mine and mill was 18 men. The company obtained electric power from the Salmon River Electric Cooperative, Inc., after transmission lines to the upper Salmon River area were completed in January. The diesel units used by the company for many years to furnish power were retained for emergency use to prevent flooding of the mine in case of a power failure. The partnership of Buchman, Breckon & Norden operated the Red Bird mine throughout 1953 but discontinued a development project early in the year when the lead price dropped. Ore totaling 1,894 tons, with gross content of 694,980 pounds of lead, as well as substantial quantities of silver, was shipped. La Florecita Mining Co. shipped a small tonnage of lead ore from the Turtle mine.

Seafoam District.—Fred & Earl Shirts shipped 285 tons of ore containing 13 ounces of gold, 4,464 ounces of silver, 2,462 pounds of copper, 68,252 pounds of lead, and 100,112 pounds of zinc from the Mountain King property. W. W. Ivie and E. W. Fox did some work at the Pactolus group in July and August, shipping 80 tons of lead ore. The geology of the district was the subject of a bulletin published during the year.¹⁶

Yankee Fork District.—Gold-silver ore produced from the General Custer mine by Lucky Custer Mining Co. comprised the principal output of Yankee Fork district. The McFadden silver mine on Eight Mile Creek was worked from June to October by Hilmer Lindburg and partners.

¹⁶ Treves, S. B., and Melear, J. D., *Geology and Ore Deposits of the Seafoam Mining District, Custer County, Idaho: Idaho Bureau of Mines and Geol., Pamph. 96. July 1953, 19 pp.*

ELMORE

A DMEA columbium-tantalum-uranium project was active at the J. R. Simplot Co. Dismal Swamp prospect.

Sand was dredged with a dragline by Wesley Shockley, Boise, near Glens Ferry. The entire output (34,000 yards) was used by the Union Pacific Railroad Co. The Mountain Home highway district crews produced road gravel.

Middle Boise District.—Talache Mines, Inc., discontinued production at the Boise-Rochester mine and mill on October 15 and put the operation on a standby basis. The company was one of the largest producers of gold in the State in recent years. Five former employees later were given a lease on the property, and production from the mine was resumed by this group on a reduced scale. The 400-ton amalgamation and concentration mill treated 8,072 tons of ore in 1953, the mill products containing 2,535 ounces of gold and 27,827 ounces of silver. Production of gold and silver was reported also from the Golden Stringer group, operated by E. T. Seaton.

FRANKLIN

Sand and gravel for road construction were mined by county crews and several private contractors.

FREMONT

Bank gravel for road fill was mined for State highway projects.

GEM

Gem Silica Co. mined quartz-feldspar sand deposits south of Emmett and operated a washing and grinding plant in Emmett, producing plaster sand and blast sand. Output decreased from 9,500 tons in 1952 to 5,304 tons in 1953. Private contractors mined sand and gravel for State highway projects.

GOODING

A small quantity of washed building sand was produced at the Johnson Red Sand pit at Gooding, and sand and gravel for road construction were mined by contractors and highway district crews. Wet-process phosphoric acid and phosphate fertilizers were manufactured by Gates Bros., Inc., at Wendell; however, operating difficulties were encountered, and the plant was closed during the year.

IDAHO

A portable sand and gravel plant was operated near Grangeville by J. Ben Luehrs and produced building and road gravel. There was increased activity in the exploration of fluorspar deposits (see discussion under Fluorspar) in the Salmon River area east of the Lemhi County line.

Elk City District.—A large share of the value of metal production of Idaho County came from placer gold and silver recovered by two dredges operating near the town of Elk City. Clearwater Dredging Co., the largest producer, operated its diesel-electric dredge, equipped with sixty-four 2-cubic foot buckets, on the Crooked River from

March 1 to December 24. The other large producer, Tyee Mining Co., operated a dragline excavator, bulldozer, and floating washing plant on the Red River for 8 months. Behrens Bros., Clair Johnson, and several smaller producers also recovered gold from placer deposits.

Warren District.—K & D Mining Co. dredged the Ruby Meadows placer on Ruby Creek near Burgdorf for several months. Gold was recovered at the bucketline dredge by amalgamation, and monazite concentrates were shipped to the Idaho Titanium & Mining Co. treatment plant at Weiser, where monazite (a rare-earth mineral) and byproduct garnet sand (valued at \$4,500 and sold for use as an abrasive) were obtained.

JEFFERSON

Bank gravel for road fill was mined for State highway projects.

KOOTENAI

Sand and gravel and crushed stone having a gross value of \$103,185 were produced by 5 companies and by county road crews. Output was used for road construction, in concrete work, and for railroad ballast.

LATAH

Mica and beryl concentrates were produced by Idaho Beryllium & Mica Corp. from the Muscovite mine near Deary. A DMEA project was underway at the mine during the year. The nearby Steelsmith property was reopened by Olson & Vennigerholz, and a small quantity of block mica was shipped. Troy Firebrick Co. manufactured high-heat-duty firebrick at a plant in Troy from refractory clay mined at the nearby Benson pit. The company also sold sacked fire clay. Crushed stone and sand and gravel were produced by several contractors for road-construction and maintenance projects.

LEMHI

A small quantity of tungsten was recovered by the Boise Dredging Co. Moose Creek dredge.

The Chamac mine and Myers Cove mill of Fluorspar Mines, Inc., were operated by J. R. Simplot Co., Boise, until April, when the mill was destroyed by fire. The company decided not to rebuild the mill and surrendered the lease on the mine. Some gravel was mined for road work.

Blackbird District.—Exploration (with DMEA assistance), development, and partial production at the Blackbird cobalt-copper mine were continued throughout 1953. The tonnage of ore milled in the Blackbird 1,000-ton mill was well under the 1952 total. Development reported by the Calera Mining Co. comprised drifting, 3,920 feet; raises, 1,712 feet; and diamond drilling, 1,082 feet. The company planned to increase production in 1954 to meet the requirements of the Garfield, Utah, cobalt refinery. Dwelling units constructed by the Defense Housing Authority will be occupied as the operation is expanded. Cobalt-copper exploration projects under the DMEA program were in progress also at the Stevenson property of Northfield Mines, Inc., and the Black Pine mine of Montana Coal & Iron Co.

Blue Wing District.—Bradley Mining Co. produced 53,792 tons of ore from the Ima mine compared with 46,443 tons in 1952. The ore, milled in the Ima 150-ton gravity-flotation mill, yielded 1,691 tons of copper-lead concentrate, containing 86,149 ounces of silver, 165,893 pounds of copper, and 219,315 pounds of zinc; 335 tons of hübnerite concentrates; and 16 tons of scheelite concentrates. DMEA exploration projects were active at the property.

McDevitt District.—Rulon Young shipped 110 tons of copper ore, containing 25,000 pounds of copper, from the Grandview group, 11 miles south of Salmon.

Mineral Hill District.—Some development was done at the Twilite group by Magnus Bevan. About 100 tons of ore treated by amalgamation yielded 13 ounces of gold and 3 ounces of silver.

Texas District.—The Hill Top lead-zinc mine was the principal producer in Texas District.

Yellow Jacket District.—Gold-copper-lead deposits of Yellow Jacket District were discussed in an Idaho Bureau of Mines publication.¹⁷

LEWIS

The Lewiston Lime Co., Inc., operated a limestone quarry and crushing and screening plant on Mission Creek about 25 miles southeast of Lewiston, on the Nez Perce Indian Reservation.

LINCOLN

Sand and gravel were produced by contractors for county and State road projects.

MINIDOKA

Bishop Sand & Gravel Co. operated a plant at Rupert, producing sand and gravel for concrete and for road material. Bureau of Reclamation crews also mined some sand and gravel.

NEZ PERCE

Crushed basalt was produced for State highway projects and Dunlick, Inc., Lewiston, operated a sand and gravel plant, producing these commodities for building purposes.

ONEIDA

Road gravel was mined under contract for State highway construction.

OWYHEE

Sand and gravel were mined under contract for State highway construction.

South Mountain District.—The only metal production in Owyhee County came from the South Mountain copper-lead-silver mine. Lessees operated the property during most of 1953.

PAYETTE

The Jensen Brick Co., Payette, manufactured common brick from locally mined clays.

¹⁷ Anderson, A. L., Gold-Copper-Lead Deposits of the Yellow Jacket District, Lemhi County, Idaho: Idaho Bureau of Mines and Geol. Pamph. 94, 1953, 41 pp.

POWER

Road sand and gravel was mined by contractors and by county road crews.

SHOSHONE

Metal production of the Coeur d'Alene mining region was at a fairly high rate, although mining companies, particularly the smaller firms, encountered difficulties because of the low prices for lead and zinc and increased operating costs.

Of the total lode material sold or treated in 1953, 68 percent was lead-zinc ore; 17 percent, silver ore; 7 percent, lead ore; 4 percent, lead-zinc old tailings; and 4 percent, old zinc slag. The tonnage of lead-zinc ore declined by 24 percent, owing in part to the discontinuance of a block-caving project based on low-grade ore by Bunker Hill & Sullivan Mining & Concentrating Co. because of depressed metal prices. American Smelting & Refining Co. increased the output of lead-zinc ore from the Page, Morning, and Frisco mines, and this partly offset declines in production from most other properties; however, the Morning mine was shut down in October. The volume of lead ore increased somewhat as the result of accelerated output from the Dayrock mine, and production of silver ore also advanced owing to an increased tonnage from the Sunshine mine.

TABLE 11.—Mine production of gold, silver, copper, lead and zinc in the Coeur d'Alene region, Shoshone County, 1949-53, and total, 1884-1953, in terms of recoverable metals

Year	Mines producing		Material sold or treated (short tons)	Gold, lode and placer (fine ounces)	Silver, lode and placer (fine ounces)
	Lode	Placer			
1944-48 (average).....	56	3	2,848,450	2,380	8,254,787
1949.....	61	1	2,282,614	2,438	9,146,146
1950.....	57	2	2,542,169	3,416	15,056,131
1951.....	67	-----	2,393,939	2,684	13,639,808
1952.....	58	2	2,327,536	2,476	13,752,081
1953.....	43	-----	1,788,426	2,376	13,636,680
1884-1953.....	-----	-----	(1)	412,626	517,351,514

Year	Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
1944-48 (average).....	2,326,400	140,975,000	157,494,800	\$43,526,993
1949.....	2,341,000	148,304,000	148,739,200	50,699,924
1950.....	3,791,000	189,394,000	172,205,000	64,555,947
1951.....	3,748,000	141,140,000	149,978,000	65,058,887
1952.....	3,724,000	134,660,000	140,632,000	58,459,368
1953.....	4,200,000	139,770,000	137,300,000	47,729,814
1884-1953.....	² 76,967	² 6,064,348	² 1,734,346	1,520,825,209

¹ Figure not available.

² Short tons.

In August, Bunker Hill & Sullivan Mining & Concentrating Co. and 16 other operators who negotiated with the union as a unit granted pay increases of 8½ cents per hour, retroactive to February 1. The new contract of the Sunshine Mining Co. with the union called for a

wage increase of 12 cents per hour, retroactive to July 1. The number of workers leaving the Coeur d'Alene mines for other areas of the Pacific Northwest to take seasonal employment in the woods, lumber mills, and agriculture was less than for several years due to the increased wages in the mines and a decline in job opportunities elsewhere. As a result, for the first time in a number of years, there was no shortage of skilled mine workers during the summer and fall months.

The Bunker Hill lead smelter near Kellogg recovered from company-mined material, custom ores and concentrates, and slag processed in the fuming plant 71,254 tons of lead, 14,500 tons of zinc, 1,023 tons of copper, 7,753,304 ounces of silver, and 5,516 ounces of gold. This production was second only to the record output of 1950. Custom material, in addition to ores and concentrates from domestic sources, included lead concentrates from Canada and Australia. Construction was completed on the new charge-preparation plant, and it was put into operation, resulting in a large increase in smelter capacity.

Production from the Sullivan electrolytic zinc plant near Kellogg totaled 54,037 tons of special high-grade slag zinc; in addition, the plant recovered 7,562 tons of zinc, 3,413 tons of lead, 132 tons of copper, 722,928 ounces of silver, and 3,911 ounces of gold from residues, dross, and other byproducts. The plant was operated at capacity, except in April and May, when a shortage of zinc concentrates made curtailment necessary. A new pretreatment plant was completed in August.

Schmittroth & Etherton produced scheelite and ferberite concentrates from the mill at the Big It mine. Ore from the mine and from producers in Washington and Montana was treated. DMEA tungsten projects were carried on at the Big It mine and at the North Idaho Mines, Inc., Pony lease.

The Bunker Hill & Sullivan Mining & Concentrating Co. produced sand and gravel for building, road paving, and railroad ballast. Most of the output was used by the company. The plant was operated only 5 weeks owing to limited need for the products.

Beaver District.—Most of the production in Beaver District was credited to the Sunset mine, operated the entire year by Korsage-Smith and Zanetti Bros., sublessees. The ore was processed in the Golconda and Rex custom mills near Wallace. Lead-zinc ore was produced also from the Silver Tip and Blue Grouse mines, both worked intermittently by lessees. Day Mines, Inc., reported that the Monitor lead-zinc mine and flotation plant, which were closed in November 1952 owing to low metal prices, remained inactive throughout 1953.

Evolution District.—The Sunshine Mining Co. silver output from the Sunshine mine and adjacent areas operated for affiliated firms was less than in 1952, despite an increased tonnage of ore mined. In 1953 the company milled 249,686 tons of ore. During the first 3 months of the year, 3,687 tons of bulk lead-silver concentrate was produced, with a gross metal content of 1,638,867 ounces of silver, 490,561 pounds of copper, and 1,283,257 pounds of lead. On April 1 the antimony leaching plant was reactivated to improve smelter returns, and changes in milling practice were made, so that during the remaining 9 months of 1953 copper-silver-antimony and lead-

silver-iron concentrates were recovered. The former product was treated to remove antimony. The copper-silver-antimony concentrate totaled 2,076 tons, containing 3,634,050 ounces of silver, 1,095,018 pounds of copper, and 419,165 pounds of lead, and the lead-silver-iron product comprised 10,685 tons, with a metal content of 2,229,884 ounces of silver, 664,023 pounds of copper, and 3,769,213 pounds of lead. In September an extensive program of reconstruction of the Sunshine mill was undertaken to enlarge the mill building and replace old flotation equipment. The Omega area of the Sunshine mine yielded the largest tonnage of ore in 1953, followed by the Rotbart, Rambo, Sunshine, and Suncon areas; the Snowstorm section was a minor source. Mine output was maintained at a high rate, except for brief periods in February, when the generator serving the main hoist burned out and had to be replaced, and September, when increased production costs necessitated some changes in underground operations, including suspension of work in several lower grade stopes. Development totaled 247 feet of shaftwork, 3,975 feet of drifts, and 4,947 feet of diamond drilling.

The Polaris Mining Co. operated the Silver Summit mine (Silver Summit and Purim claims) and milled 49,483 tons of silver ore, which yielded 1,872 tons of concentrates containing 1,261,150 ounces of silver and 838,247 pounds of copper. Although copper production gained, this output represented a decrease in both ore tonnage and silver output compared with the previous year. Development of the mine in 1953 added 12,000 tons to reserves, despite the tonnage mined during the year. The Polaris Mining Co. also developed and mined the New Purim area, which adjoins the Silver Summit mine on the west. Lead-zinc old tailings, principally from the DeBlock deposit, were the source of the remaining production in Evolution district.

Polaris Mining Co. began exploring properties in the Silver Belt east of the Silver Summit mine under an operating agreement with seven companies owning properties in the area. A loan was obtained from DMEA to aid in financing the project, which involves drifting 10,000 feet on the 3,000 level of the Silver Summit mine.

Hunter District.—American Smelting & Refining Co. discontinued large-scale mining at the Morning lead-zinc mine early in October, although a limited operation was continued to extract a block of high-grade ore from the shaft pillar. High production costs and low metal prices, coupled with a shortening ore body at the lower levels, led to the shutdown. The Morning production was greater than in 1952, despite the closure. Operated continuously since the 1880's, the mine long had been one of the largest lead and zinc producers in the Coeur d'Alene region; the 30-year period from 1910 to 1940 saw the greatest annual output from the property. The big mine was developed by means of a main adit 10,000 feet long, a vertical shaft 3,210 feet deep, and 2 offset vertical shafts, 1,545 feet and 258 feet, respectively. The mine was purchased by Federal Mining & Smelting Co. in 1905 and operated by that company until it was consolidated with American Smelting & Refining Co. early in 1953. The Morning mill and machine shops were kept open to service other properties of the company in the area.

Ore production from Sullivan Mining Co. Star mine at Burke decreased from 234,819 tons in 1952 to 227,649 in 1953. The average

grade of ore was higher, however, and the quantity of both lead and zinc recovered increased as a result. Drifting on the new 5,500 level opened ore of higher grade and greater length than on the 5,100 level, and this was largely responsible for the increased metal output. The new tunnel from the mill at Burke to the 2,000 level of the Star mine was completed late in 1953 and was expected to be in full use by mid-1954, after which the Hecla shaft and 4,000-level crosscut to the mine were to be abandoned and allowed to fill with water. Ventilation and water problems in the mine workings were increased by the shutdown of the adjacent Morning mine.

The Lucky Friday mine, operated by Lucky Friday Silver-Lead Mines Co., was also an important producer. The offset shaft was deepened from the 2,000 to the 2,400 level, and cross-cutting on the new 2,400 level reached the main Lucky Friday vein. Golconda Lead Mines milled 5,410 tons of lead-zinc ore from the Golconda mine and custom ore totaling 44,048 tons from the Lucky Friday mine, the Sunset and Silver Tip mines (Beaver district), and the Benton and Black Bear leases (Lelande district). The Golconda company curtailed mining operations in 1953 because of low metal prices.

Lelande District.—Lead and zinc output from the Frisco mine was increased substantially. American Smelting & Refining Co. operated the mine after April 30, when Federal Mining & Smelting Co. was merged with the parent firm. The ore was treated at the Morning mill near Mullan. Production from the Hull lease in the Frisco mine was at about the same rate as in 1952. The ore mined by the lessees was processed in a 90-ton flotation mill on the property. Day Mines, Inc., suspended production from the Hercules mine in March and began an extensive deep-exploration project at the property, with assistance from DMEA. The project included deepening the main shaft 400 feet and drifting 2,600 feet on a new 1,600 level to explore the Far West ore body. The company also terminated production from the Sherman mine and turned the property over to lessees. The 300-ton flotation mill at the Sherman mine was operated intermittently; in addition to ore mined by the company and lessees at the Sherman property, production from the Hercules mine also was treated. The Black Bear mine and the Benton lease, both small lead-zinc operations, were the only other active properties in Lelande district.

Placer Center District.—The Dayrock operation, the principal producing property of Day Mines, Inc., yielded a greater quantity of ore than in 1952. The ore was treated in the 250-ton flotation plant, where a lead concentrate was made. Most of the mine development (2,601 feet of drifts and crosscuts) in 1953 was on the Ohio vein at a new 950 level. After November all production from the Day Mines Tamarack property was by six block-leasing operations. Beginning in July company mining was cut back gradually as the blocks were leased. The lessees produced 6,483 tons of lead-zinc ore which averaged 3.5 percent lead, 5.9 percent zinc, and 1.3 ounces of silver per ton. This was in addition to the ore extracted by Corbin Neville & Stanley Clem from the Tamarack No. 5 lease, which was operated throughout 1953. Development ore from the Galena project added substantial quantities of lead and silver to the State totals. The extensive deep-level exploration and development in progress at the

Galena mine were a venture by two companies, American Smelting & Refining Co. and Day Mines, Inc., the former firm being the operating company. The property was leased from the owner, Vulcan Silver-Lead Co. The ore produced contained galena, sphalerite, and tetrahedrite (silver bearing). During 1953 drifts and crosscuts were driven 6,360 and 4,178 feet, respectively; raises totaled 1,056 feet; and diamond drilling totaled 4,611 feet. The mine was expected to reach the production stage in 1955.

Yreka District.—From company operations in the Bunker Hill mine, the Bunker Hill & Sullivan Mining & Concentrating Co. recovered in concentrates 28,627 tons of lead, 7,256 tons of zinc, and 2,298,595 ounces of silver, according to the company annual report to the shareholders. As compared with 1952, this represented an increase in lead and silver output and a decline in zinc production. In addition, the 3,000-ton mill recovered 146 tons of lead and 47 tons of zinc from old tailings. A considerable tonnage of zinc concentrates was put in storage because of the low zinc price. Lead and zinc produced by the Bunker Hill smelter and slag-fuming plant by reprocessing old blast furnace slag also were credited to Yreka district totals. John George, lessee, mined lead-zinc ore on the upper levels of the Bunker Hill mine. Federal Mining & Smelting Co. and (beginning May 1) American Smelting & Refining Co. operated the Page lead-zinc mine and increased the tonnage of ore mined. Production by Sidney Mining Co. from the Sidney group, another important producer in the Yreka district, totaled 60,413 tons, a decrease of about 7,000 tons from the previous year. The ore averaged 2.65 percent lead, 5.82 percent zinc, and 0.90 ounce of silver per ton. The quantity of zinc concentrates recovered by the 250-ton mill decreased from 9,530 tons in 1952 to 6,150 tons, but lead concentrates increased slightly from 2,190 tons to 2,214 tons. Spokane-Idaho Mining Co. discontinued company mining at the Constitution (Spokane-Idaho) property in March, and production throughout the remainder of the year was by block lessees. The ore mined by the lessees was transported by the company and milled in the 180-ton flotation mill on the property. The tonnage mined dropped from 48,806 in 1952 to 21,666 in 1953. At the nearby Douglas mine, owned by Spokane-Idaho Mining Co. and operated by lessees, 11,627 tons of ore was mined as compared with 10,259 tons in 1952. The ore was treated at the Spokane-Idaho mill on the Constitution property. The tonnage of ore mined and milled at the Highland-Surprise mine of Highland-Surprise Consolidated Mining Co. declined from 25,879 tons in 1952 to 14,960. Most of the output was by company mining, but some production came from block leases in old workings of the property. The block-leasing system was introduced in August. The main effort of the company in 1953 was directed toward completion of an extensive exploratory project underway with DMEA assistance. Decreases in ore production also were recorded at the Liberal King mine of Sunset Mines, Inc., and the Little Pittsburgh property of Mascot Mines, Inc. Nabob Silver-Lead Co. carried out exploration and development at its property but suspended production because of the low lead-zinc price, and Fisher Leasing Co. terminated its operation on the upper levels of the Nabob mine in February. Gibbonsville Mining & Exploration Co. completed construction

of a 400-ton tailings mill near Smelterville west of Kellogg and in April began mining its tailings deposit on the south fork of the Coeur d'Alene River. Built with the aid of a loan from the Reconstruction Finance Corporation, the mill was operated until September, producing a bulk lead-zinc concentrate. Under a contract entered into by the company in 1952 the refined metal obtained from the deposit by June 12, 1954, was to be purchased by DMPA at a floor price of 15½ cents per pound for slab zinc and 15 cents per pound for de-silverized pig lead.

TETON

Several contractors mined road sand and gravel.

TWIN FALLS

Sand and gravel and crushed stone valued at nearly \$600,000 were mined in the county. A large proportion was used in road construction.

VALLEY

Operations at the Hermes mine near Stibnite continued throughout the year, despite declining mercury prices. Output increased substantially over the previous year. Storm-caused power outages resulted in frost damage to the firebrick linings of furnaces at the mine. A DMEA antimony project was active at the Bradley Mining Co. Yellow Pine mine at Stibnite; however, the company mining and processing facilities were idle throughout the year. DMEA monazite projects were carried on at the White Hawk Basin and Paddy Flat properties by Consumnes Gold Dredging Co. and at Hull's Big Creek property by Verlon W. Vandeventer. Bradley Mining Co. produced scheelite concentrates at the Springfield mine. DMEA tungsten projects were active at the Springfield mine and at the McRae Tungsten Corp. Red Bluff mine.

A small quantity of road gravel was produced.

Deadwood Basin District.—E. W. Bowman began development at the Daisy King mine south of Deadwood Reservoir and made a test shipment of silver ore.

Unorganized (Knox) District.—Eureka Silver King Mines Corp. shipped silver ore produced during development at the Silver King property, near the headwaters of the south fork of the Salmon River. During 1953 about 470 feet of drifts and 59 feet of raises were driven.

WASHINGTON

The Northwest Gypsum Co. mined a small quantity of gypsum from a deposit about 20 miles northwest of Weiser; the output was sold for land plaster. The company, which planned to dispose of the property, worked the deposit only 1 month during the year.

The Mineral Industry of Illinois

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Illinois State Geological Survey.

By Alvin Kaufman¹



THE VALUE of mineral production from Illinois mines and quarries increased approximately 1 percent in 1953 compared with 1952. Of the 16 mineral commodities produced, the State's major products were coal, petroleum, stone, cement, and sand and gravel. Fuels continued to be the major commodity group, composing 79 percent of the aggregate value of 1953 mineral output. Metals, production of which was concentrated in Hardin and Jo Daviess Counties, contributed only 1 percent of the total value of all mineral products. A substantial portion of the State's metal output was yielded as a byproduct or coproduct of fluorspar production. The output of metals declined substantially during the year as a result of labor strikes and decreased fluorspar production. Nonmetals other than fuels were responsible for 20 percent of mineral value.

TABLE 1.—Mineral production in Illinois, 1952-53¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement.....376-pound barrels..	8,710,621	\$20,600,347	8,651,385	\$21,961,761
Clays.....	2,337,023	3,871,051	2,305,202	4,573,001
Coal.....	45,789,982	187,827,712	46,009,891	181,597,998
Fluorspar.....	188,293	9,481,223	163,303	8,567,026
Lead (recoverable content of ores, etc.).....	4,262	1,372,364	3,391	888,442
Lime (open-market).....	460,775	5,917,038	519,992	6,986,560
Natural gas.....million cubic feet..	10,183	1,650,000	9,282	1,559,000
Peat.....	(²)	(²)	2,151	(²)
Petroleum (crude)...thousand 42-gallon barrels..	60,089	165,850,000	³ 59,026	³ 170,590,000
Sand and gravel.....	19,584,308	19,214,195	21,521,806	20,540,549
Sand and sandstone (ground).....	267,180	2,342,549	276,215	2,461,767
Silver (recoverable content of ores, etc.).....				
troy ounces.....	3,781	3,422	2,338	2,116
Stone (except limestone for cement and lime)....	22,334,887	28,326,060	22,938,732	29,736,966
Zinc (recoverable content of ores, etc.).....	18,816	6,246,912	14,556	3,347,880
Undistributed: Natural-gas liquids, recovered elemental sulfur (1953), tripoli, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2). Excludes value of clays used for cement.....		⁴ 7,302,545		9,629,924
Total Illinois.....		460,005,000		462,443,000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

² Value included with "Undistributed."

³ Final figure. Supersedes preliminary figure given in commodity chapter.

⁴ Revised figure.

¹ Commodity-industry analyst, Region VIII, Bureau of Mines, Pittsburgh, Pa.

The major producing counties in Illinois, arranged in decreasing order of mineral value, were La Salle, Williamson, Christian, Franklin, and Fulton. Except for La Salle County, these demonstrated the importance of solid fuels to the economy of the State because of the large dollar income derived from coal production. La Salle County owes its predominant position to the concentration of the Illinois cement industry within its borders and to its \$7 million annual output of sand and gravel.

REVIEW BY MINERAL COMMODITIES

METALS

Zinc, lead, and silver were recovered from lead-zinc ores of northwestern Illinois and from fluorspar-zinc lead ores from southern Illinois in 1953. The principal source of zinc was Jo Daviess County, where mines also yielded an accessory production of lead. Lead, zinc, and silver were produced in Hardin County as byproducts or coproducts of fluorspar mining. In all, 21 metal mines were active in the State in 1953. Of these, the largest zinc and lead mines were operated by Tri-State Zinc, Inc., Galena and the major silver and second most important lead mines by Ozark-Mahoning Co., Rosiclare.

The production of zinc declined 23 percent compared with 1952, primarily as a result of the partial destruction by fire on March 31 of the Graham-Central mill of Eagle-Picher Co. in Jo Daviess County. The mill was rebuilt during the year, but operations were not resumed because of low zinc market prices. Labor strikes in southern Illinois mines in August and September, coupled with a drop in fluorspar production, caused a 20- and 38-percent drop below the previous year in lead and silver output, respectively.

In addition to the metals credited in table 1, unreported quantities of cadmium and germanium were recovered from zinc concentrates.

MINERAL FUELS

Coal.—Coal beds were mined in 35 counties in 1953 compared with 36 the previous year.

The major producing counties—in order of decreasing tonnage—were Christian, Williamson, Fulton, Franklin, and Perry. In 1953 there was a 220,000-ton increase in output compared with the previous year and an 11-percent decrease in the number of active mines. Illinois solid-fuel producers had one of the highest productivity rates (13.54 tons per man per day) in the Nation because of the important percentage of strip-mined coal and the high proportion of large mines. Sixteen percent of the State coal mines produced 500,000 tons or more in 1953 compared with a national average of 3.4 percent. Over 36 percent of the State soft-coal output is from strip pits. The average value of Illinois solid fuel per ton was \$3.95 in 1953.

The Bureau of Mines continued its research on coal-mine ventilation in 1953 in Illinois. A report was issued presenting the hazards and discussing the causes of accumulations of explosive mixtures of methane and air due to inadequate ventilation.² A modified plan for

² Herbert, C. A., Some Factors Affecting and Suggested Ways for Improving Coal-Mine Ventilation, With Particular Reference to Mines in Illinois, Indiana, and western Kentucky: Bureau of Mines Inf. Circ. 7656, 1953, 15 pp.

room-and-pillar panel mine development for the Central coal basin, comprising coal fields in Illinois, Indiana, and western Kentucky, was suggested. It was thought that this plan would eliminate many hazards of gas accumulations inherent in practices that have been followed.

TABLE 2.—Bituminous coal production, value, and employment in 1953, by counties

[Exclusive of mines producing less than 1,000 tons]

County	Production	Value ¹		Average number of men working daily	Average tons per man per day ²
		Average per ton	Total		
Bureau.....	687,448	\$4.08	\$2,804,788	129	23.00
Christian.....	6,722,125	3.42	22,991,942	2,073	15.28
Clinton.....	135,312	3.90	723,269	238	4.24
Douglas.....	229,354	4.33	992,860	74	13.36
Franklin.....	4,583,891	4.66	21,396,944	4,298	8.04
Fulton.....	5,349,236	3.82	20,453,862	1,040	23.67
Gallatin.....	160,167	3.74	599,132	125	6.20
Greene.....	1,395	4.07	5,678	3	3.55
Grundy.....	282,140	5.33	1,502,892	95	12.79
Hancock.....	11,133	6.17	68,659	14	11.52
Henry.....	59,434	4.66	276,899	71	7.51
Jackson.....	1,089,240	3.73	4,068,276	384	14.77
Jefferson.....	1,369,093	4.42	6,046,906	421	14.67
Kankakee.....	589,062	4.95	2,916,798	149	15.73
Knox.....	1,843,796	3.81	7,021,032	463	18.05
La Salle.....	11,641	4.73	55,014	6	4.63
Livingston.....	4,059	6.82	27,688	20	4.82
Logan.....	33,710	5.80	195,396	40	6.19
Macoupin.....	1,045,900	4.14	4,329,027	1,147	9.25
Madison.....	1,031,367	4.08	4,209,346	842	7.98
Marion.....	78,827	3.71	292,439	75	5.29
Menard.....	14,201	5.90	83,771	45	2.44
Montgomery.....	1,632,511	3.62	5,909,690	519	15.39
Peoria.....	365,823	4.65	1,702,419	160	13.65
Perry.....	4,305,501	3.57	15,371,857	1,553	15.20
Randolph.....	1,064,475	3.39	3,613,693	428	16.69
St. Clair.....	3,416,898	3.54	12,109,189	1,137	16.58
Saline.....	3,094,836	4.33	13,397,001	1,702	11.59
Sangamon.....	131,895	5.44	717,809	146	6.99
Schuyler.....	26,420	5.33	140,854	62	3.59
Tazewell.....	11,153	6.17	68,837	41	4.30
Vermilion.....	834,199	4.19	3,491,532	228	23.20
Washington.....	20,309	4.40	89,349	37	4.84
Will.....	136,083	5.17	703,639	37	15.36
Williamson.....	5,582,262	4.16	23,219,511	2,306	13.76
Total: 1953.....	46,009,891	3.95	181,597,998	20,108	13.54
1952.....	45,789,982	4.10	187,827,712	24,244	11.72

¹ Value received or charged for coal f. o. b. at mine, including selling cost. (Includes a value for coal not sold but used by producer, such as mine fuel and coal coked as estimated by producer at average prices that might have been received if such coal had been sold commercially).

² In certain counties the average tons per man per day is large, due to strip mining or mechanical loading underground.

Peat.—A small quantity of kiln-dried peat humus was produced by Manito Filler Co. from a 60-acre deposit in Tazewell County.

Petroleum and Natural Gas.—The production of petroleum and natural gas declined 2 and 9 percent, respectively, in 1953 as compared with the previous year. There were 2,165 wells drilled for oil and gas in 1953, exclusive of water or gas input wells, salt-water disposal wells, and old wells worked over. As a result of this activity 1,070 oil wells and 4 gas wells were brought in; the remaining 1,091 were dry holes. Drilling success improved as a result of the adoption of hydraulic fracturing. The fracture treatment has resulted in commercial production, particularly in the Aux Vases sandstone

from wells that could not otherwise have been profitably operated. Of the 533 wildcat wells drilled, 23 resulted in new pools and 40 in pool extensions. Four new pools and 7 extensions resulted from old wells worked over. The largest pool discoveries were Irvington-North in Washington County, Patoka South in Marion County, and Raleigh in Saline County. New producing zones in known oil areas were discovered by 13 wells; these cannot be properly classified as exploratory wells. Virtually all drilling activity was in southern Illinois. Wells were drilled in 47 of the State's 102 counties; producing wells resulted in 31 of these. However, more than half of the wells completed were in Wayne, White, Marion, Clay, Edwards, and Wabash Counties. Seven operators, utilizing compression and absorption methods, continued to produce a substantial quantity of natural-gas liquids.

NONMETALS

Cement.—Illinois cement production was the fourth largest mineral industry in the State in 1953. Output exceeded the previous year's production by 4 percent and broke all records. Despite this increase, shipments declined 1 percent, resulting in a 36-percent rise in stocks. Stocks at the mill at the end of 1953 were more nearly normal than they had been at the close of 1952. The industry operated at 92.9 percent of capacity compared with 89.2 percent in 1952. Capacity in 1953 was rated at 9,552,230 barrels of 376-pound capacity, whereas in the previous year it had been 9,549,290 barrels. As a result of various price increases in the spring of 1953, the average value of Illinois cement increased 7.6 percent. Consumption in the State, as measured by the destination of shipments from mills throughout the nation, increased 1.4 percent. This would indicate that approximately 2 percent of Illinois cement consumption was imported from outside the State. In order of decreasing output, producers were Marquette Cement Manufacturing Co. and Lehigh Portland Cement Co., Oglesby; Alpha Portland Cement Co., La Salle; and Medusa Portland Cement Co., Dixon.

TABLE 3.—Finished portland cement produced, shipped, and in stock, 1944-48 (average) and 1949-53

Year	Active plants	Production (barrels)	Shipments from mills			Stocks at mills on Dec. 31 (barrels)
			Barrels	Total value	Average value	
1944-48 (average).....	4	5,717,932	5,802,706	\$10,496,329	\$1.77	567,079
1949.....	4	8,127,656	7,976,972	16,645,730	2.09	¹ 629,380
1950.....	4	7,924,079	7,857,969	16,920,234	2.15	695,490
1951.....	4	8,453,783	8,377,387	19,853,132	2.37	801,886
1952.....	4	8,514,443	8,710,621	20,600,347	2.36	605,708
1953.....	4	8,869,342	8,651,385	21,961,761	2.54	823,665

¹ Revised figure.

Clays.—The quantity of clays sold and used in Illinois in 1953 decreased 1 percent from 1952; the value rose 18 percent. Miscellaneous clays, which were produced in 23 counties, were used in manufacturing building brick and other heavy clay products. Cook,

St. Clair, La Salle, and Vermilion Counties were the major producing areas. Of the 40 miscellaneous clay pits active in 1953, major producers were Illinois Brick Co., Cook County; Hydraulic Pressed Brick Co., St. Clair County; and Western Brick Co., Vermilion County. Fire-clay output was obtained from mines in La Salle, Greene, Grundy, Marshall, McDonough, Madison, Rock Island, and Vermilion Counties. Major uses of this commodity were refractories, heavy clay products, pottery, and stoneware. Illinois Clay Products Co., Grundy County, was by far the largest of the 14 fire-clay producers.

TABLE 4.—Clays (except clays for cement) sold or used by producers in 1952-53, by counties

County	1952		1953	
	Short tons	Value	Short tons	Value
Bond.....	39,885	\$36,664	42,566	\$63,840
Boone.....	2,000	2,000	(1)	(1)
Cook.....	685,833	685,833	684,034	944,908
Edwards.....	30,700	21,500	(1)	(1)
Fayette.....	6,979	6,979	6,979	6,979
Greene.....	51,929	128,671	29,612	75,327
Grundy.....	194,090	903,734	210,322	1,065,689
Jackson.....	6,094	15,235	(1)	(1)
Kankakee.....	(1)	(1)	100,180	200,360
Knox.....	48,563	48,563	51,492	102,984
Lake.....	60,762	60,762	68,500	137,000
La Salle.....	264,843	394,649	246,491	481,433
Livingston.....	16,020	16,020	19,920	39,840
Macoupin.....	300	300		
Madison.....	51,387	99,274	(1)	(1)
Marshall.....	33,000	77,028	38,331	76,662
McDonough.....	32,922	62,084	34,022	57,136
Menard.....	10,000	10,000	11,913	23,826
Mercer.....	34,324	34,324	35,923	53,884
Rock Island.....	5,715	17,145	(1)	(1)
St. Clair.....	188,271	206,839	(1)	(1)
Saline.....	69,362	208,086	58,987	117,974
Sangamon.....	46,543	64,835	67,853	135,706
Scott.....	13,142	47,000		
Tazewell.....	22,000	22,000	(1)	(1)
Vermilion.....	131,370	412,017	138,262	278,077
Undistributed.....	110,037	108,557	267,233	518,785
Total.....	2,156,071	3,690,099	2,112,620	4,380,419

¹ Included with "Undistributed" to avoid disclosure of individual company operations.

TABLE 5.—Clays sold or used by producers, 1944-48 (average) and 1949-53, by kinds

Year	Fuller's earth		Fire clay		Miscellaneous clays	
	Short tons	Value	Short tons	Value	Short tons	Value
1944-48 (average).....	38,951	\$377,940	320,046	\$791,217	1,558,801	\$1,250,976
1949.....	9,104	118,647	355,963	1,083,765	1,826,851	1,669,650
1950.....			433,423	1,431,372	2,086,008	1,966,336
1951.....			492,127	1,774,870	2,097,013	2,249,324
1952.....			450,444	1,544,668	1,886,299	2,324,583
1953.....			367,385	1,473,859	1,937,817	3,099,142

Fluorspar.—Production of Illinois fluorspar declined 13 percent and value dropped 10 percent in 1953 as compared with 1952. Despite the decline the State remained the largest fluorspar-producing area in the United States.

Mining activity was curtailed in midsummer by labor strikes. Ozark-Mahoning Co. was struck from August 1 to October 8. Minerva Oil Co. shut down on August 1 for 6 weeks. On September 18 the company agreed to a 13-cent hourly increase plus 1¼ cents more in insurance premiums. Rosiclare Lead & Fluorspar Mining Co. employees struck on August 1, idling 180 men. The company granted, on August 15, a 6-cent hourly increase plus an incentive bonus based on production. Work stoppage was averted by Aluminum Co. of America through negotiation of a new labor contract granting an 8½-cent increase across the board.

Fluorspar produced in 1953 was used as a flux in steelmaking (37 percent), as a chemical raw material for the manufacture of hydrofluoric acid (44 percent), in the production of glass and enamel (14 percent), and for various miscellaneous uses (5 percent). The value depended upon use. The average value for acid spar increased from \$61.59 in 1952 to \$64.13 in 1953; ceramic fluorspar jumped from \$48.74 in 1952 to \$52.66 in 1953; and metallurgical material dropped from \$38.47 to \$37.35 in 1953.

Fourteen producers operated an estimated 51 mines. Major producers were Minerva Oil Co., Cave in Rock; and Ozark-Mahoning Co., Aluminum Co. of America, and Rosiclare Lead & Fluorspar Mining Co., all of Rosiclare.

TABLE 6.—Fluorspar shipped from mines, 1944-48 (average) and 1949-53

Year	Quantity (short tons)	Value	
		Total	Average per ton
1944-48 (average).....	163, 551	\$5, 786, 868	\$35. 36
1949.....	120, 881	4, 621, 733	38. 23
1950.....	154, 623	6, 110, 765	39. 52
1951.....	204, 328	9, 294, 703	45. 49
1952.....	188, 293	9, 481, 223	50. 35
1953.....	163, 303	8, 567, 026	52. 46

Lime.—Lime output in Illinois in 1953 increased 18 percent compared with the previous year. This commodity was utilized for building, refractory, and chemical purposes. Production came from Marblehead Lime Co., Adams and Cook Counties; Standard Lime & Stone Co., Cook County; Aluminum Co. of America, St. Clair County; and Menke Stone & Lime Co., Adams County.

Perlite.—Considerable quantities of crude perlite were imported from southwestern United States for use in manufacturing expanded perlite in Illinois in 1953. Producers of expanded material were American Bildrock Co., Cook County; Lake Qurich Concrete Products, Inc., Lake County; Ryolex Corp. of Illinois, Champaign County; F. E. Schundler & Co., Inc., Will County; and Silbrico Corp., Cook County. Expanded perlite was used as a lightweight aggregate in plaster and concrete and as a filter aid.

Production decreased from 15,545 short tons in 1952 to 11,127 short tons in 1953, a drop of 28 percent. The quantity of expanded perlite sold or used in 1953 equaled production and was valued at \$712,238. In 1952, 14,562 short tons valued at \$776,728 had been sold or used.

Sand and Gravel.—Illinois sand and gravel output rose 10 percent

in 1953 compared with 1952, largely as a result of increased road construction. Sand composed 63 percent of the total value of production and 51 percent of output and gravel the remainder. The largest use for these commodities was as paving (41 percent) and building (38 percent) materials. An estimated 144 commercial and 27 non-commercial pits were active in 1953. The largest of these, in order of decreasing tonnage, were Material Service Corp., Consumers Co. of Illinois, and Chicago Gravel Co., all in Chicago. Commercial production was 96 percent of the total output. Major producing counties were La Salle, Will, McHenry, and Peoria.

TABLE 7.—Sand and gravel sold or used by producers, 1952–53, by classes of operations and uses

	1952		1953	
	Short tons	Value	Short tons	Value
COMMERCIAL OPERATIONS				
Sand:				
Glass.....	1,097,684	\$2,428,304	1,257,364	\$2,879,382
Molding.....	1,366,684	2,912,595	1,020,423	2,343,187
Building.....	4,389,300	3,261,431	4,428,688	3,274,134
Paving.....	2,312,853	1,741,341	3,230,802	2,318,874
Grinding, polishing, and blast.....	130,745	474,452	135,557	528,476
Fire or furnace.....	35,158	122,604	39,058	173,599
Engine.....	112,421	109,359	108,497	100,621
Filter.....	9,058	30,288	44,458	74,347
Railroad ballast.....	63,363	46,730	44,640	27,493
Other.....	376,865	870,313	575,314	1,204,733
Undistributed.....				
Total commercial sand.....	9,894,131	11,997,417	10,854,801	12,924,846
Gravel:				
Building.....	4,799,964	3,947,694	3,724,300	2,908,330
Paving.....	3,292,323	2,366,448	4,867,033	3,520,256
Railroad ballast.....	916,141	514,509	962,335	531,440
Other.....	197,999	103,955	326,466	211,717
Total commercial gravel.....	9,206,427	6,932,606	9,880,134	7,177,743
Total commercial sand and gravel.....	19,100,558	18,930,023	20,734,935	20,102,589
GOVERNMENT-AND-CONTRACTOR OPERATIONS				
Sand:				
Building.....				
Paving.....	28,690	27,221	138,769	73,787
Total Government-and-contractor sand.....	28,690	27,221	138,769	73,787
Gravel:				
Building.....	10,730	1,533	29,450	13,085
Paving.....	444,330	255,418	618,652	351,088
Total Government-and-contractor gravel.....	455,060	256,951	648,102	364,173
Total Government-and-contractor sand and gravel.....	483,750	284,172	786,871	437,960
ALL OPERATIONS				
Sand.....	9,922,821	12,024,638	10,993,570	12,998,633
Gravel.....	9,661,487	7,189,557	10,528,236	7,541,916
Grand total.....	19,584,308	19,214,195	21,521,806	20,540,549

Sand and Sandstone, Ground.—A substantial tonnage of ground sand and sandstone for use in cleaning and scouring compounds and enamel fillers and for various miscellaneous purposes was produced in La Salle and Ogle Counties. Production increased 3 percent compared with 1952.

TABLE 8.—Sand and gravel sold or used by producers in 1952-53, by counties

County	1952		1953	
	Short tons	Value	Short tons	Value
Bond.....	15,397	\$16,470	(1)	(1)
Bureau.....	475,017	635,985	310,435	\$224,660
Carroll.....	46,321	77,251	(1)	(1)
Cook.....	660,814	499,516	(1)	(1)
Kane.....	789,946	537,507	865,990	674,368
Lake.....	185,287	99,756	164,917	82,594
La Salle.....	3,043,218	6,576,975	3,133,900	7,179,570
Lawrence.....	274,914	147,811	204,867	92,051
Lee.....	(1)	(1)	341,295	230,724
Madison.....	256,441	216,904	282,781	216,597
McHenry.....	1,404,718	791,923	1,752,272	1,053,924
Ogle.....	686,450	478,192	491,136	340,556
Peoria.....	1,771,756	1,239,445	1,600,741	1,116,355
Rock Island.....	347,724	323,608	252,715	222,983
Sangamon.....	393,575	296,636	346,625	293,453
Tazewell.....	666,545	481,970	1,000,653	715,127
Wabash.....	206,250	172,546	(1)	(1)
Whiteside.....	111,716	77,441	177,927	115,776
Will.....	2,900,092	2,428,563	2,911,985	2,489,016
Winnebago.....	1,164,945	885,930	1,227,215	951,233
Woodford.....	129,249	97,378	(1)	(1)
Undistributed.....	4,053,933	3,132,388	6,456,352	4,541,562
Total.....	19,584,308	19,214,195	21,521,806	20,540,549

¹ Included with "Undistributed" to avoid disclosure of individual company operations.

Stone.—The Illinois stone industry produced at a record level in 1953. Output was approximately 3 percent above that of 1952 because of an 11-percent rise in the use of limestone for concrete aggregate and road construction. The State's small output of dimension stone increased tremendously, exceeding that of the previous year 10 times. Crushed sandstone for refractory use continued to be produced by Western Fire Brick Co., Granite City, Alexander County. Aside from this commodity, limestone remained the only

TABLE 9.—Stone sold or used by producers, 1952-53, by uses

Use	1952		1953	
	Quantity	Value	Quantity	Value
Dimension stone: Building stone:				
Rough construction..... short-tons.....	(1)	(1)	(1)	(1)
Finished cut and sawed..... cubic feet.....	(1)	(1)	(1)	(1)
Rubble..... short tons.....	719	\$3,812	(1)	(1)
Flagging..... cubic feet.....	6,659	4,656	31,963	-----
Approximate equivalent in short tons.....	566	10,492	23,263	\$18,340
Undistributed.....	580			131,940
Total dimension stone... approximate short tons.....	1,865	18,960	25,980	150,289
Crushed and broken stone:				
Riprap..... short tons.....	324,124	413,333	141,210	178,903
Fluxing stone..... do.....	862,992	1,193,933	288,583	475,980
Concrete and road metal..... do.....	15,702,331	18,929,697	17,355,884	21,546,699
Railroad ballast..... do.....	1,172,642	1,214,646	1,162,791	1,257,591
Agriculture..... do.....	3,258,578	4,208,143	2,867,486	3,847,163
Refractory stone (ganister)..... do.....	536	8,576	816	13,056
Miscellaneous..... do.....	1,011,819	2,338,772	1,095,982	2,267,285
Total crushed and broken stone..... do.....	22,333,022	28,307,100	22,912,752	29,586,677
Grand total..... approximate short tons.....	22,334,887	28,326,060	22,938,732	29,736,966

¹ Included with "Undistributed" to avoid disclosure of individual company operations.

TABLE 10.—Stone sold or used by producers in 1952–53, by counties

County	1952		1953	
	Short tons	Value	Short tons	Value
Adams.....	295, 735	\$550, 781	278, 472	\$544, 401
Clark.....	306, 839	438, 627	282, 752	423, 515
Cook.....	7, 616, 646	9, 461, 805	7, 633, 804	9, 763, 435
Greene.....	107, 697	144, 538	113, 339	156, 109
Hancock.....	245, 696	264, 917	(1)	(1)
Hardin.....	293, 572	362, 322	270, 736	335, 380
Henderson.....	49, 312	70, 491	115, 900	159, 950
Jo Daviess.....	33, 278	42, 436	200, 470	306, 977
Kankakee.....	1, 647, 018	1, 722, 898	(1)	(1)
La Salle.....	236, 208	265, 336	139, 306	153, 587
Lee.....	150, 280	153, 640	236, 340	251, 036
Livingston.....	635, 120	838, 102	678, 528	945, 935
McDonough.....	175, 979	217, 709	(1)	(1)
Ogle.....	179, 092	195, 025	313, 421	331, 424
Peoria.....	695, 770	701, 353	643, 863	671, 388
Randolph.....	(1)	(1)	1, 143, 711	1, 153, 912
Rock Island.....	458, 685	575, 509	439, 466	560, 371
St. Clair.....	2, 259, 166	2, 788, 903	1, 808, 060	2, 487, 798
Stephenson.....	151, 672	117, 201	233, 817	191, 225
Whiteside.....	300, 735	331, 466	287, 625	302, 989
Will.....	1, 249, 950	1, 713, 938	1, 626, 831	2, 292, 200
Winnebago.....	(1)	(1)	286, 328	353, 177
Undistributed.....	5, 246, 437	7, 319, 063	6, 205, 973	8, 372, 156
Total.....	22, 334, 887	28, 326, 060	22, 938, 732	29, 736, 966

¹ Included with "Undistributed" to avoid disclosure of individual company totals.

rock produced in Illinois. Concrete aggregate and road material remained the largest single uses (76 percent) of crushed and broken stone in Illinois in 1953. Agricultural stone ranked second in importance. Cook, Will, and Kankakee Counties (the Chicago district) remained the largest stone-producing area in the State, contributing 48 percent of the total output. This was principally the result of proximity to a large market rather than to any particular characteristic of the stone found in the area.

Major stone producers in Illinois in 1953, in order of decreasing production, were Material Service Corp., Lyons; Consumer Co. of Illinois, Chicago; Columbia Quarry Co. and Lehigh Stone Co., Kankakee; and Dolese & Shepard Co., Chicago.

Tripoli.—Tripoli from nearby horizontal unconsolidated beds of silica was mined in northern Alexander County by Ozark Minerals Co., Elco, and Tamms Industries, Inc., Tamms. These two companies produced a substantial quantity of prepared tripoli for use as an abrasive and filler material.

REVIEW BY COUNTIES

ADAMS

Sand and gravel, stone, and lime were produced in Adams County in 1953. Most important was limestone for flux, concrete aggregate, road material, and agricultural purposes. Major producers of this commodity were Black-White Limestone Co., Menke Stone & Lime Co., and Marblehead Lime Co., all of Quincy. The last two companies also produced lime for building and chemical purposes. Sand and gravel for building and paving use were produced by Quincy Sand Co., Quincy, and Blick's Construction Co.

ALEXANDER

The mines and quarries of Alexander County yielded clays, sand and gravel, stone, and tripoli in 1953. Producers of tripoli were Ozark-Minerals Co., Elco, and Tamms Industries, Inc., operator of the Alex mill near Tamms. Sand and gravel were produced by H. H. Halliday Sand Co., Cairo. Products of the company included structural paving and engine sand, as well as structural gravel. The county was the only area in the State from which sandstone was obtained. This commodity was crushed and sold for furnace and converter linings by Western Fire Brick Co., Granite City. A small quantity of miscellaneous clays was mined from the Ozark-Minerals Co. pit at Fayville.

TABLE 11.—Value of minerals produced in Illinois in 1952-53, by counties

County	1952	1953		
		Value	Rank	Principal minerals, in order of value
Adams.....	\$931, 470	\$972, 042	32	Lime, sand and gravel, stone.
Bond.....	53, 134	79, 984	74	Clays, sand and gravel.
Bureau.....	3, 664, 667	3, 029, 448	23	Coal, sand and gravel.
Christian.....	17, 694, 544	22, 989, 668	3	Coal.
Clark.....	438, 627	423, 515	44	Stone.
Cook.....	15, 726, 158	17, 758, 241	6	Clays, lime, sand and gravel, stone.
Douglas.....	795, 313	993, 103	31	Coal.
Edwards.....	21, 500	41, 400	80	Clays.
Franklin.....	25, 075, 711	21, 384, 232	4	Coal.
Gallatin.....	529, 522	599, 025	40	Do.
Greene.....	273, 209	237, 114	55	Stone, coal, clays.
Grundy.....	2, 404, 970	3, 022, 304	24	Sand and gravel, coal, clays.
Hancock.....	450, 959	250, 941	54	Stone, coal.
Hardin.....	12, 255, 977	10, 104, 334	10	Fluorspar, stone, gold, silver, lead, and zinc.
Jefferson.....	5, 728, 614	6, 051, 391	12	Coal.
Kankakee.....	5, 089, 268	4, 846, 845	16	Clays, coal, sand and gravel, stone.
La Salle.....	26, 872, 239	28, 306, 478	1	Cement, clays, coal, sand and gravel, silica, stone.
Lawrence.....	147, 811	92, 051	73	Sand and gravel.
Lee.....	3, 335, 734	4, 168, 610	22	Cement, sand and gravel, stone.
Livingston.....	924, 224	1, 013, 457	30	Clays, coal, stone, sand and gravel.
Macoupin.....	6, 859, 792	4, 330, 026	20	Clays, coal.
Madison.....	5, 918, 940	5, 013, 530	15	Clays, coal, sand and gravel, stone.
McHenry.....	838, 034	1, 121, 906	29	Sand and gravel, stone.
McLean.....	247, 381	251, 965	53	Sand and gravel.
Ogle.....	959, 254	971, 832	33	Stone, silica, sand and gravel.
Peoria.....	3, 618, 923	3, 488, 820	18	Coal, sand and gravel, stone.
Perry.....	16, 947, 948	15, 370, 639	8	Coal.
Rock Island.....	916, 262	815, 354	37	Clays, sand and gravel, stone.
St. Clair.....	16, 768, 343	15, 672, 757	7	Clays, coal, lime, sand and gravel, stone.
Saline.....	12, 590, 819	13, 518, 614	9	Clays, coal.
Sangamon.....	1, 820, 140	1, 146, 668	28	Clays, coal, sand and gravel.
Schuyler.....	127, 866	140, 819	64	Coal.
Tazewell.....	717, 790	828, 867	36	Clays, coal, sand and gravel.
Wabash.....	172, 546	178, 325	59	Sand and gravel.
Whiteside.....	408, 907	418, 765	45	Sand and gravel, stone.
Will.....	4, 723, 351	5, 535, 081	14	Coal, stone, sand and gravel.
Williamson.....	27, 286, 339	23, 247, 260	2	Stone, coal.
Woodford.....	97, 378	102, 492	70	Sand and gravel.
Undistributed ¹	236, 571, 336	243, 925, 087	-----	-----
Total.....	460, 005, 000	462, 443, 000	-----	-----

¹ Includes Alexander, Boone, Brown, Calhoun, Carroll, Champaign, Clinton, Coles, Crawford, Cumberland, De Kalb, De Witt, Du Page, Edgar, Effingham, Fayette, Fulton, Henderson, Henry, Jackson, Jersey, Jo Daviess, Johnson, Kane, Kendall, Knox, Lake, Logan, Macon, Marion, Marshall, Mason, Massac, McDonough, Menard, Mercer, Monroe, Montgomery, Pike, Pope, Pulaski, Randolph, Scott, Shelby Stark, Stephenson, Union, Vermilion, Warren, Washington, White, and Winnebago.

BOND

In 1953 the major mineral commodities produced in Bond County were sand and gravel for structural and paving uses. Greenville Gravel Co., Inc., Greenville, and Lindsey-Hart Co., Keyesport, were the only commercial producers. Shale for use in manufacturing heavy clay products was mined by Richards Brick Co., New Douglas, and Sheffield Shale Products Co., Sheffield.

BOONE

Sand and gravel for paving and road material were the principal mineral commodities produced in Boone County in 1953. The only commercial producers were Christensen Smith Co., Capron, and Vincent Spencer. Limestone for agricultural and miscellaneous purposes was quarried at Belvidere lime quarry, Belvidere. The county's sole producer of clays was Munson Bros. & Co., Capron.

BROWN

Miscellaneous clays for the manufacture of heavy clay products were produced in Brown County in 1953 by Frederick Brick & Tile Co., Mount Sterling. Crushed-limestone output was obtained from the quarry of the Western Illinois Stone Co.

BUREAU

A small quantity of bituminous coal was produced in Bureau County in 1953, principally for local use. In addition, four commercial sand and gravel pits were active during the year, operated by Western Sand & Gravel Co., Spring Valley; Hensen Bros.; Floyd Clapp, Walnut; and Frank J. Poscharsky, Wyagnet.

CALHOUN

Structural sand was produced in 1953 near Batchtown by Ellis Inman. The quarries of Paul E. Henten and Calhoun Quarry Co. produced limestone for concrete aggregate and agricultural purposes.

CARROLL

Molding and engine sand and paving gravel were produced in Carroll County by Howard Nelson, Lanark, and Nicol Sand Co., Savanna.

CHAMPAIGN

Expanded perlite and sand and gravel were the only mineral commodities produced in Champaign County in 1953. Gibson Bros., Champaign, and W. H. Troike and C. R. Plannkenhorn, Mahomet, produced building and paving sand and gravel. The Champaign plant of Ryolex Corp. of Illinois produced expanded perlite from raw material imported from southwestern United States.

CHRISTIAN

Christian County ranked first in the State in 1953 as a source of bituminous coal. The major producer in the county was Peabody Coal Co., operator of the No. 8, No. 17, and No. 10 mines. These

mines employed 1,989 men and were active an average of 212 days each during the year. These mines were highly mechanized, with 25 mining machines and 63 motors in operation.

CLARK

The quarries of Casey Stone Co., Casey, and Ralph E. Montgomery, and Quality Lime Co., Marshall, yielded limestone for concrete aggregate, road material, and agricultural purposes.

CLINTON

Mineral commodities produced in Clinton County included coal, stone, and sand and gravel. Sand and gravel were produced by Clinton County Highway Department, Carlyle. Concrete aggregate, road material, and agricultural stone were products of the limestone quarry operated by Huelsman Quarry, Inc., Carlyle. Soft coal was mined by the Citizen's Coal Co. and Breese Coal Co., both near Breese. These mines utilized 6 mining machines and 7 motors.

COLES

Stone and sand and gravel were produced in Coles County in 1953. Olen Humphres stone quarry, Ashmore, and Langs stone quarry, Charleston, produced limestone for riprap, concrete aggregate, road material, and agricultural purposes. Luther Martin recovered sand and gravel from a pit near Charleston.

COOK

Cook County ranked first in Illinois in 1953 in the production of stone, lime, clays, and expanded perlite. Limestone and dolomite were produced by Consumers Co. of Illinois, Dolese & Shepard Co., both of Chicago, and Materials Service Corp., Lyons. The output was sold principally for concrete aggregate, road material, railroad ballast, flux, and agricultural purposes. Standard Lime & Stone Co., La Grange, and Marblehead Lime Co., Chicago, produced substantial quantities of burnt lime for building, chemical, and refractory purposes. In addition, there were six producers of miscellaneous clays: Alexander Burkes & Sons, Cicero; Brisch Brick Co., Stickney; Carey Brick Co., Chicago; Chicago Brick Co., Dolton; Illinois Brick Co., Chicago; and Tuthill Building Materials Co., Riverdale. Sand and gravel for structural, paving, and railroad ballast purposes were produced by Chicago Gravel Co. and Construction Aggregates Corp., both of Chicago. Expanded perlite for plaster and concrete aggregate was manufactured from material imported from the southwestern United States by American Bildrok Co. and Silbrico Corp., both in Chicago.

CRAWFORD

The only mineral commodities produced in Crawford County in 1953 were structural and paving sand and gravel from the pit of William J. Wyke, Robinson.

CUMBERLAND

A. B. C. Gravel Co., M. D. Coslet, and George Spence, all of Greenup, reported output of building and paving sand and gravel.

DE KALB

Commercial producers of sand and gravel in De Kalb County were Kirkland gravel yard, Kirkland, and Elmer Larson, Inc., Malta. The output was sold for building and paving material. Concrete aggregate, road base, and agricultural stone were produced by the L. S. Hackney Estate limestone quarry.

DE WITT

Oscar Fortune, Kenney, and H. M. Rickgauer, Clinton, produced paving gravel in De Witt County in 1953.

DOUGLAS

The only mineral producer in Douglas County in 1953 was Bell & Zoller Coal Co., operators of a bituminous-coal mine near Murdock; it employed 69 persons and operated 223 days during the year. One mining machine and four motors were utilized.

DU PAGE

Elmhurst & Chicago Stone Co., Elmhurst, was the sole producer of limestone in Du Page County in 1953. This company and Henry Van Acker, Wayne, also produced sand and gravel for use as building and paving material.

EDWARDS

Production of miscellaneous clays for use in manufacturing building brick was reported from Edwards County in 1953 by Albion Brick Co., Albion.

EFFINGHAM

Winter stone quarry reported the output of stone for concrete aggregate, road material, and agricultural purposes.

FAYETTE

In 1953 clays and sand and gravel were produced in Fayette County. The latter materials were produced by Mulberry Grove Sand Co., Mulberry Grove, and D. L. Burtschi, Vandalia. The bulk of production was sold as molding sand, the rest being utilized for building purposes. St. Elmo Brick & Tile Co., Inc., St. Elmo, produced clays for use in manufacturing heavy clay products.

FRANKLIN

Franklin County was the fourth largest coal-producing area in Illinois in 1953. The major producing mines were the Chicago, Wilmington & Franklin Coal Co. No. 2 mine and the Old Ben Coal Corp. No. 9, both near West Frankfort. Other active mines included the Old Ben Coal Corp. No. 14 mine near Buckner, No. 15 mine near West Frankfort, No. 22 mine near Valier, and No. 11 mine near Coello, as well as the Chicago, Wilmington & Franklin Coal Co. No. 1 mine, Orient.

FULTON

In 1953 Fulton County ranked third in the production of soft coal. The Illinois Department of Mines and Minerals reported that there were 9 shipping mines and 21 other mines, producing predominantly for local consumption. Major producers were the Truax-Traer Coal Co. Red Ember mine near Fiatt and the United Electric Coal Co. No. 17 mine near Canton. Mines in the county used 20 mining machines, 11 motors, and 12 animals. Sand and gravel were the second most important mineral commodities produced in Fulton County. The pits of Duck Island Sand & Gravel Co., Canton, and Liverpool Materials Co., Liverpool, yielded building and paving material. Chipman limestone quarry, Farmington, reported output of limestone for agricultural purposes.

GALLATIN

The only mineral production of Gallatin County was bituminous coal, 89 percent of which was loaded on barges for shipment outside the local market area. Mines in the county utilized 8 mining machines, 5 motors, and 10 animals in producing soft coal. Major producers were Pekin Coal Co., Equality, and B. & W. Coal Co. and Oak Hill Coal Co., both near Junction.

GREENE

Fire clay was produced in Greene County by John V. Wyatt and Whitehall Sewer Pipe & Stoneware Co., both of Whitehall. The output of these two pits was utilized for chemical and common stoneware, as well as for heavy clay products. In addition, Whitehall Sewer Pipe & Stoneware Co. reported production of miscellaneous clays also for use as heavy clay products. Concrete aggregate, road material, railroad ballast, and agricultural stone were produced from the quarries of Chester Castleberry, White Hall; Oran Orton, Hillview; and Martin Valstad, Carrollton.

GRUNDY

Mines and quarries in Grundy County yielded fire clay, coal, and sand and gravel. The sole producer of clays, which were utilized for refractory and heavy clay products, was Illinois Clay Products Co., Joliet. Paving-sand output was reported by Material Service Corp., Grundy. Soft coal was produced by Morris Coal & Mining Co., Morris, and No. 3 Coal Corp., South Wilmington.

HANCOCK

The Gray Quarries, Hamilton, and W. F. Hamma Nauvoo, quarried limestone in Hancock County in 1953. The output was used as riprap, concrete aggregate, road metal, and agricultural stone. The Triple S. Coal mine No. 2 near Augusta operated part of the year.

HARDIN

Hardin County continued in 1953 as the principal source of fluorspar in the United States. The 11 active operators in the county made 94 percent of the State's shipments in that year. The principal producers were Minerva Oil Co., Cave in Rock; and Ozark-Mahoning

Co., Aluminum Co. of America, and Rosiclare Lead & Fluorspar Mining Co., all of Rosiclare. Minerva Oil Co. reported installation of a new flotation plant at its Crystal mine for treating fines from the sink-and-float plant. The new unit went into operation on September 1. This company operated its fluorspar-zinc mine and 275-ton-per-day mill at Cave in Rock without interruption during the year, except for a labor strike from August 1 to September 18. James W. Patton & Sons, mining contractors, completed constructing a 710-foot shaft for Ozark-Mahoning Co. on the Oxford fluorspar tract, 5 miles north of Cave in Rock.

Lead, zinc, and silver were produced as byproducts or coproducts of fluorspar operations. The ore also contains minor quantities of cadmium, which are recovered in smelting zinc concentrates. This ore is probably higher in cadmium than ores from any other district in the United States. The major producer of silver in Illinois was Ozark-Mahoning Co., also the second largest zinc and lead producer in the State. J. L. Bean Stone Co. and P. R. Brown Stone Co., both of Golconda, and Okerson Quarry Co. and Rigsby & Barnard, both of Cave in Rock, quarried concrete aggregate, road material, and agricultural stone from their limestone quarries.

HENDERSON

Limestone was produced in Henderson County in 1953 by H. B. Graham Quarry Co., Gladstone, and Charles J. Moore and Olson Bros., Dallas City. This rock was utilized for riprap, concrete aggregate, road material, and agricultural purposes. Sand and gravel production in the county, predominantly noncommercial, was from the Henderson County Highway Department pit at Stronghurst. The only commercial producer was H. B. Graham Quarry Co. This material was sold for paving and road gravel.

HENRY

Collinson Bros., Moline, and Schadt Service Co., Silvis, produced sand and gravel in Henry County in 1953. The mines of the county also yielded a small tonnage of soft coal.

JACKSON

The mines and quarries of Jackson County in 1953 yielded clays, stone, and bituminous coal. Soft-coal production was obtained from the No. 1 drift and No. 1 strip mines of Truax-Traer Coal Co. and from the Joliana Mining Co. operations, all near Elkville. In addition to these three major operations, several small mines produced principally for local use. Limestone, largely for concrete aggregate and road material, was produced by Illinois Quarry Co., Ava. Jackson County Brick Co., Campbell Hill, produced fire clay for manufacturing drain tile.

JEFFERSON

The only mineral commodity produced in Jefferson County was bituminous coal from the No. 3 mine of Chicago, Wilmington & Franklin Coal Co. near Waltonville.

JERSEY

Substantial tonnages of limestone and sand and gravel were produced in Jersey County in 1953. The latter commodities were produced by Jersey County Highway Department, Jerseyville. Limestone, which was sold as concrete aggregate and road material and for agricultural purposes, was quarried by Jersey Quarry, Inc. Fieldon.

JO DAVIESS

Lead and zinc remained the principal mineral products of Jo Daviess County in 1953. Of the seven active mines, Tri-State Zinc, Inc., Galena, was the leading lead and zinc producer in Illinois. This company operated its group of mines and 850-ton jig and flotation mill at the same rate as in 1952. Eagle-Picher Co., Mining and Smelting Division, operators of the Spillane, Feehan, and Snyder mines, as well as a 75-ton-per-hour jig and flotation mill a few miles north of Galena, was the county's second largest producer. The company Graham mill burned during the early part of the year but was rebuilt. W. E. Broege, Warren, and Elmer G. Wiene Sons, Galena, were the only commercial producers of limestone in the county in 1953. The bulk of the rock output, however, came from the noncommercial operation of the Jo Daviess County Highway Department, Galena.

JOHNSON

Charles Stone Co., Cypress, and Southern Illinois Stone Co., Buncombe, were the only mineral producers in Johnson County in 1953. These firms produced limestone for concrete aggregate, road material, railroad ballast, and agricultural purposes.

KANE

Mines and quarries of Kane County yielded sand and gravel and stone in 1953. H. D. Conkey & Co., Mendota, Material Service Corp., South Elgin, and Fox Valley Gravel Co., Aurora, were commercial producers of building and paving sand and gravel. Fox River Stone Co., Elgin, was the sole producer of limestone for rough construction, rubble, flagging, flux, concrete aggregate, road material, and agricultural stone. In addition, a small quantity of natural red oxides for mineral pigments was produced by George D. Smith Chemical Works, Inc., Maple Park.

KANKAKEE

In 1953 soft coal, stone, clays, and sand and gravel were produced in Kankakee County. Bituminous coal was obtained from the 14E mine of the Northern Illinois Coal Corp. near Wilmington. Second to coal in value of output was limestone for rubble, cut stone, flagging, riprap, concrete aggregate, road metal, railroad ballast, and agricultural stone. The major producer was Lehigh Stone Co., Kankakee. Others reporting output of this commodity were Manteno Limestone Co., Manteno, and Bourbonnais Stone Quarry, Bradley. Brick and drain and building tiles were produced from clays mined by Kankakee Clay Products Co., Eastern Illinois Clay Co., and St. Anne Brick

& Tile Co., all near St. Anne. Molding sand was produced from a pit near Rockton by Portage-Manley Sand Co.

KENDALL

The pits and quarries of Kendall County yielded limestone and sand and gravel in 1953. Limestone output was utilized for flux, concrete aggregate, road base, and agricultural stone. The only producer was Morris Limestone Co., Morris. Structural and paving sand and gravel were produced by Elmer Larson, Inc., Malta.

KNOX

Bituminous coal, clays, and sand and gravel were produced in Knox County in 1953. Major coal producers were Midland Electric Coal Corp. No. 3 mine; Little John Coal Co., Inc., No. 5 mine, Victoria; and Knoxville Mining Co. No. 2 mine, Galesburg. Clay was mined by Purington Brick & Tile Co. at its pit at Galesburg. The sole producer of paving and road gravel was L. K. Bandy Construction Co., Maquon.

LAKE

The mineral industries of Lake County produced sand and gravel, clays, magnesium compounds, and expanded perlite. The Johns-Manville Corp. produced magnesium compounds from dolomite for use in manufacturing insulation materials which, in terms of value, was the most important mineral commodity of Lake County. Next in importance was clay for use in brick manufacture mined by National Brick Co. near Deerfield. Sand and gravel, utilized principally for building materials, were produced commercially by B & J Sand & Gravel Co., Spring Grove, Town Lime Gravel Co. and Marvin Walker. Expanded perlite was produced by Lake Zurich Concrete Products Co., Lake Zurich, for use as a building material, from raw perlite imported from the southwestern United States.

LA SALLE

La Salle County ranked first in Illinois in 1953 in the production of mineral commodities. The mines and quarries of the county were responsible for output of sand and gravel, ground sand and sandstone, portland cement, clays, stone, and bituminous coal. The major mineral product was portland cement from the plants of Alpha Portland Cement Co., La Salle, and Lehigh Portland Cement Co. and Marquette Cement Manufacturing Co., both of Oglesby. Sand and gravel output was sold for use as glass, molding, blast, furnace, filter, and engine sands, as well as building and paving material. Of the 14 commercial pits in operation in 1953, the largest producers were Ottawa Silica Co., Ottawa, and Wedron Silica Co., Wedron. The Western Sand & Gravel Co., Spring Valley, and Standard Silica Corp. also produced ground sand and sandstone for cleansing and scouring compounds, enamels, glass, and foundry use. Conco-Meier Co. and Monmouth Stone Co., Lowell, Laclede-Christy Co., Ottawa, and Matthiessen & Hegeler Zinc Co., La Salle, produced fire clay. Output of miscellaneous clays was reported by Streator Drain Tile

Co., Streator Brick Division, and Hydraulic Pressed Brick Co., both near Streator; and National Fireproofing Corp., Ottawa. A small tonnage of bituminous coal was obtained from various mines for local use. The major producer of crushed limestone was Utica Stone Co.

LAWRENCE

Structural and paving sand and gravel were produced in Lawrence County by Vincennes Gravel Co., Inc., and Lawrenceville Sand & Gravel Co., Lawrenceville; and L. W. Gregory & Sons.

LEE

Medusa Portland Cement Co. operated a cement plant near Dixon, Lee County, in 1953. Butler Sand & Gravel Co., Inc., Franklin Grove, Rock River Ready Mix, Dixon, and C. C. Mackin produced structural and paving sand and gravel. Frank N. Butler, Stone Ridge Limestone Co., Wilmer Gerdes quarry, and Ward McGinnis produced stone in Lee County.

LIVINGSTON

Limestone and dolomite, soft coal, and clays were produced in Livingston County in 1953. Limestone and dolomite were produced by four companies operating five quarries. These were, in order of declining output, Pontiac Stone Co., Wagner Stone Co., Ocoya Stone Co., and Livingston Stone Co., all of Pontiac. The output was utilized for concrete aggregate, road base, agricultural purposes, and various miscellaneous uses. Brick and drain tile were produced from clay mined by Diller Tile Co., Chatsworth. A small quantity of bituminous coal was produced for local use by two small mines.

LOGAN

In terms of value, sand and gravel for building and paving material, as well as for engine sand, were the most important mineral products. The only producer was Lincoln Sand & Gravel Co., Lincoln. Limestone and dolomite for concrete aggregate, road material, and agricultural purposes were produced by Rocky Ford Limestone Co., Lincoln. Bituminous coal was produced at the Steve Bennis Deer Creek mine near Lincoln.

MACON

Decature Sand & Gravel Co., Inc., worked its pit at Decatur and produced sand and gravel for use in building and paving.

MACOUPIN

Mt. Olive Brick & Tile Co., Mount Olive, reported output of clays for use in brick manufacture. The major mineral commodity produced in the county, however, was soft coal. The largest producer was Superior Coal Co., Gillespie, operator of three large mines.

MADISON

Bituminous coal was produced by Lumaghi Coal Co., Collinsville, Mt. Olive & Staunton Coal Co., and the Livingston Mt. Olive Coal Co. In addition, there were three smaller companies whose entire output was sold locally. The coal mines of the county utilized 19 mining machines, 66 motors, and 12 animals underground.

Limestone and dolomite were quarried for riprap, concrete aggregate, road material, and agricultural purposes by Mississippi Lime Co. of Missouri and Reliance Whiting Co., both of Alton. Sand and gravel, predominantly for building and paving purposes, was produced from the pits of Mississippi Lime Co. of Missouri, Alton; G. W. Lohn, Inc.; Stocker Gravel & Construction Co., Highland; and Guth Sand Co., Granite City. Output of clays was reported by Alton Brick Co., North Alton, and National Clay Products Co., Collinsville.

MARION

Soft coal from the Marion County Coal Mining Corp. Glenridge mine near Centralia was the only mineral commodity produced in Marion County in 1953.

MARSHALL

The major mineral products of Marshall County in 1953 were sand and gravel produced by Consumers Co. of Illinois. Output was utilized for building and paving. The Peoria pit of Hydraulic Pressed Brick Co. yielded miscellaneous clays for use in manufacturing face brick.

MASSAC

Gravel and limestone were recovered from the quarries of Rue Densch and Massac Material Co., respectively. Limestone was used for concrete aggregate, road metal, and agricultural stone.

McDONOUGH

Colchester Stone Co., Moline; John McClure, Colchester, and Phillip Lewis & Sons, Macomb, produced limestone in McDonough County for riprap, concrete aggregate, road material, and agricultural stone. Clays were mined by Colchester Brick & Tile Co., Western Stoneware Co., J. R. Purtscher, and Baird clay mine, all of Colchester.

McHENRY

McHenry County ranked third in Illinois in the production of sand and gravel. Output was utilized for building and paving material, as well as for various miscellaneous uses. Producers were Consumers Co. of Illinois, operators of pits in both Algonquin and Cary; Crystal Lake Trucking & Excavating Co., Crystal Lake; Chicago & Northwestern Railroad; and Grove Gravel & Excavating Co., Fox River Grove. There was also a substantial output of limestone for flagging, concrete aggregate, road material, and agricultural purposes from quarries operated by Christensen & Smith, Capron, and Garden Prairie Stone Co., Inc., Marengo.

McLEAN

Sand and gravel were produced by Rowe Construction Co., Bloomington; McGrath Sand & Gravel Co., Inc.; B. W. Livengood, Heyworth; and O. B. McClure Co.

MENARD

Limestone, clays, and bituminous coal were produced in Menard County. Limestone for concrete aggregate, road material, and agricultural stone were obtained from the quarries of Athens stone quarry, Athens, and Indian Point Limestone Products Co., Mason City. Brick was manufactured from clays mined by Springfield Clay Products Co., Petersburg. A small quantity of soft coal for local consumption was produced by Wilcox & Verna Coal Co. and H. B. Wilson Coal Co., both of Petersburg; Greenview Fuel Co., Greenview; and Lloyd Coal Mine, Tallula.

MERCER

Independent Materials Co. produced a substantial quantity of limestone for use as concrete aggregate and road material, as well as a small amount of riprap, from its quarry at Viola. Pits of the Hydraulic Pressed Brick Co. in Shale City yielded shale for manufacturing brick.

MONROE

Columbia Quarry Co., the only mineral producer in Monroe County in 1953, quarried crushed and broken limestone for use as flux, concrete aggregate, road material, agricultural stone, and riprap.

MONTGOMERY

Freeman Coal Mining Corp. operated a large coal mine near Farmersville, Montgomery County, in 1953. This was the only commercial mineral operation in the county. The Montgomery County Highway Department, Hillsboro, produced a small quantity of paving gravel.

OGLE

Sand and gravel, stone, and silica were produced in Ogle County in 1953. The largest of the seven producers of sand and gravel was McGrath Sand & Gravel Co., Inc. These commodities were utilized mainly as building and paving material, engine sand, and railroad ballast. The National Silica Co., Oregon, reported production of silica for use as filler and for various miscellaneous purposes. In addition to the above products, the county had a substantial output of crushed and broken limestone for concrete aggregate, road material, and agricultural stone. The major commercial producers were William Seitz and Charles D. Willrett, Malta.

PEORIA

Peoria County ranked fourth in 1953 in Illinois in the production of sand and gravel. Six companies were active during the year, the largest being the McGrath Sand & Gravel Co., Inc. Production was

used for building and paving material and railroad ballast. Limestone and dolomite for flagging, concrete aggregate, road material, and agricultural purposes were quarried by six companies, the largest of which were The Long Rock Co., Princeville Stone Co., and Lamar Stone Co., all of Princeville. In addition, there was a substantial output of bituminous coal, most of which was sold locally. The major producers were Morgan Coal Co., Edwards; Pioneer Collieries Co. No. 1 mine, Laura; and J. & J. Coal Co.

PERRY

Perry County continued to rank fifth in the production of soft coal in Illinois in 1953. A substantial tonnage of this output was sold to railroad companies and for local use. Major producers were the Union Colliery Co., New Kathleen mine and The United Electric Coal Co. No. 11 mine, both at Du Quoin. The 11 mines in the county utilized 13 mining machines, 31 motors, and 12 animals in the production of coal. A small quantity of coal was also produced by hand.

PIKE

Sand and gravel were produced in Pike County in 1953 by Victor Callender and Pittsfield & Missouri Gravel Co., Moline, and Pike County Highway Department. Output was utilized for building and paving material and railroad ballast. Limestone and dolomite for agricultural purposes were quarried by Pearl Stone Co.

POPE

Fluorspar and sand and gravel were the only mineral commodities produced in Pope County in 1953. Egyptian Mining Co., Hicks Creek Fluorspar Mining Co., and P. M. T. Mining Co. were the only fluorspar producers active that year. James W. Patton & Sons, mining contractors, reported sinking a 150-foot exploratory shaft on the Scott fluorspar property. Sand and gravel were produced by the Pope County Highway Department, Golconda.

PULASKI

Columbia Quarry Co., only mineral producer in Pulaski County in 1953, quarried crushed and broken limestone for use as riprap, concrete aggregate, road material, railroad ballast, and agricultural purposes.

RANDOLPH

Bituminous coal, limestone, and sand and gravel were produced in Randolph County in 1953. Soft-coal output was obtained from the Percy-Sparta area. Major operators were Southwestern Illinois Coal Corp., Percy; Moffat Coal Co., Sparta; and Midwest Utilities Corp., Sparta. Limestone was produced mainly for concrete aggregate, road stone, and agricultural stone by Allied Chemical & Dye Corp., Solvay Process Division; Al Stotz, Waterloo; and Chester Quarry Co. Paving, building, railroad ballast, engine, and filter sands were produced by Southern Illinois Sand Co., Chester.

ROCK ISLAND

Limestone for use as concrete aggregate, road material, railroad ballast, and agricultural stone was produced by Collinson Stone Co. and Midway Quarry, Inc., Geneseo, and Cordova Quarry, Inc., Moline. Paving and building sand and gravel were produced by Moline Consumers Co., Moline; and Blackhawk Aggregates, Builders Sand & Gravel Co., and Rock Island Sand & Gravel Co., all of Rock Island. Miscellaneous refractories were manufactured from clays mined by Blackhawk Clay Products, Inc.

ST. CLAIR

In 1953 St. Clair County ranked first in Illinois in output of iron oxide pigments and second in production of lime and stone. In addition to these commodities, the county produced coal, clays, and sand and gravel. C. K. Williams & Co. was the only manufacturer of iron oxide pigments in St. Clair County; output ranged from red oxides to ochers. Lime for building and chemical purposes was produced by Aluminum Co. of America. Clays for brick and other heavy clay products, as well as lightweight aggregate, were produced by Hill Brick Co. and Hydraulic Pressed Brick Co., both in Edgemont. The mines and quarries of the county also yielded dimension limestone for use as rubble, rough architectural blocks, and flagging. Crushed- and broken-limestone output was utilized as riprap, concrete aggregate, road material, and agricultural stone. The major stone producer was Columbia Quarry Co. Other operators included East St. Louis Stone Co., East St. Louis; Casper Stolle Quarry & Construction Co., East St. Louis; and Hecker Quarry, Inc., New Athens. Building, paving, engine, and filter sands were mined by Missouri Illinois Materials Co. Soft coal was mined in 18 mines in the county, the largest of which were Seminole Coal Corp., Lenzburg; Perry Coal Co. St. Ellen mine, O'Fallon; Midwest Radiant Corp. No. 1 mine, Millstadt; and Mid-Continent Coal Corp. Green Diamond mine at Marissa.

SALINE

Bituminous coal was the major mineral commodity produced in Saline County. Output was obtained from 16 mines, the largest of which were Peabody Coal Co., Galatia and Harrisburg, and Sahara Coal Co., Inc., Harrisburg. Ford Brick & Tile Co., Harrisburg, reported production of shale for use in manufacturing brick, drain tile, and various other heavy clay products.

SANGAMON

Bituminous coal was produced in Sangamon County by Eddy Coal Co., Cantrall; Farrand Coal Co., Riverton; Cantrall Coal Co., Springfield; and Wenneborg Coal Co. No. 2 mine, Sherman. Sand and gravel were mined by Springfield Sand & Gravel Co., Springfield; and Clear Lake Sand & Gravel Co. and Buckhart Sand & Gravel Co., Mechanicsburg. Clays were produced by Poston Brick & Concrete Products Co. and Springfield Clay Products Co., both in Springfield. These commodities were utilized in manufacturing brick, drain tile, and

various other heavy clay products, as well as lightweight aggregates. Solomon Grinding Service and Tamms Industries, Inc., both of Springfield, manufactured red oxides and mineral blacks for mineral pigments.

SCHUYLER

Bituminous coal was the only mineral commodity produced in Schuyler County in 1953. Output was obtained from the pits of the Green Coal Co., Camden; D. & D. Coal Co., Rushville; Wheelhouse Coal Co. No. 2 mine, Rushville; A. H. McCormack & Sons, Rushville; and Booz Coal Co.

SCOTT

Crushed and broken limestone taken from Krueger quarry and Thomas quarry, Winchester, was the major mineral product in Scott County. Output was utilized for concrete aggregate, road material, and agricultural purposes. A small tonnage of sand was obtained from the Homer E. Grady pit at Exeter.

STEPHENSON

Limestone and sand and gravel were produced in 1953. Stone output was utilized for concrete aggregate, road material, and agricultural stone. Commercial producers included Tri-County Quarries, Polo; Ray Askey, Orangeville; Arthur Zimmerman, Pecatonica; and W. E. Braege. Output of sand and gravel was reported by Kent Township and West Point Township Highway Departments.

TAZEWELL

Sand and gravel for building, paving, engine, and railroad-ballast purposes were produced by McGrath Sand & Gravel Co., Inc., Pekin; and C. A. Powley, Peoria Concrete Construction Co., and Hoffer Construction Co., East Peoria. Clay was mined by Peoria Brick & Tile Co. from its pit at East Peoria for use in manufacturing heavy clay products. Tazewell County also held the distinction of being the only area in Illinois in which peat was produced. The one producer was Manito Filler Co., Peoria, operator of a peat bog in Tazewell County near Manito, Mason County. The output was utilized in mixed fertilizers. There was also a small production of bituminous coal from the mines of the Lakeside Coal Co. and Pekin Coal Mining Co., both at Pekin.

UNION

The only mineral product of Union County in 1953 was limestone. This rock was used as irregular stone, as well as being crushed and broken for sale as riprap, concrete aggregate, road material, and agricultural purposes. Producers were Anna Quarries, Inc., and Jonesboro Stone Co., both at Anna.

VERMILION

Vermilion County ranked fourth in Illinois in clay production. Producers were Western Brick Co. and General Refractories Co., both with pits at Danville. The Material Service Corp. Fairmont

quarry yielded limestone and dolomite for concrete and road base. Blakeney Gravel Co., Elton Wagner Co., and Jesse Speranza, Danville, reported the production of sand and gravel for building and paving use. In addition, there was a large output of bituminous coal. The largest producer was Fairview Collieries Corp. Harmattan mine, Danville. The 13 active coal mines in the county utilized 6 mining machines, 9 motors, and 5 animals underground.

WABASH

Wabash County sand and gravel pits produced building, paving, and railroad ballast. This commodity was produced by Mt. Carmel Sand & Gravel Co., Mount Carmel; Allendale Gravel Co., Allendale; and Dunobar Sand & Gravel Co., Belmont.

WARREN

Crushed and broken limestone for use as riprap, concrete aggregate, and road material, as well as for agricultural purposes, was produced by Monmouth Stone Co., Monmouth. Output of soft coal was reported by Miller Mining Co., Alexis.

WASHINGTON

Concrete aggregate, road base, and agricultural stone were quarried by Radom Quarry Co. from its limestone quarry near Radom. Bois Coal Co. Kuhn mine, Dubois, and Venedy Coal Co. mine at Venedy produced bituminous coal.

WHITE

The only mineral products reported in White County in 1953 were building and paving sand and gravel from the pit of Frashier Bros.

WHITESIDE

A substantial quantity of crushed and broken limestone and dolomite was produced in Whiteside County. The output was used for concrete aggregate, road material, railroad ballast, and agricultural stone. Commercial producers, in order of decreasing tonnage, were Fred R. MacKenzie & Co., Galesburg; Alldritt Bros., Morrison; Cordova Quarry, Moline; and Minor Bros., Rock Falls. Sand and gravel were produced by eight commercial operators, the largest of which were Midwest Sand & Gravel Co., Sterling, and Rein & Dahl.

WILL

Will County ranked second in Illinois in 1953 in output of sand and gravel and third in production of stone. The major mineral commodities were sand and gravel for use as building, paving, and railroad-ballast purposes. Producers were Material Service Corp., Lockport, and Chicago Gravel Co., Plainfield and Rockdale. Stone quarries in the county yielded flux, concrete aggregate, road base, railroad ballast, and agricultural stone. These limestone quarries were operated by Lincoln Crushed Stone Co., National Stone Co., Material

Service Corp., and F. E. Schundler, Inc., all of Joliet. F. E. Schundler, Inc., also produced expanded perlite for use as lightweight aggregate in plaster and as a filter aid. Soft coal was produced by Wilmington Coal Mining Corp., Braidwood.

WILLIAMSON

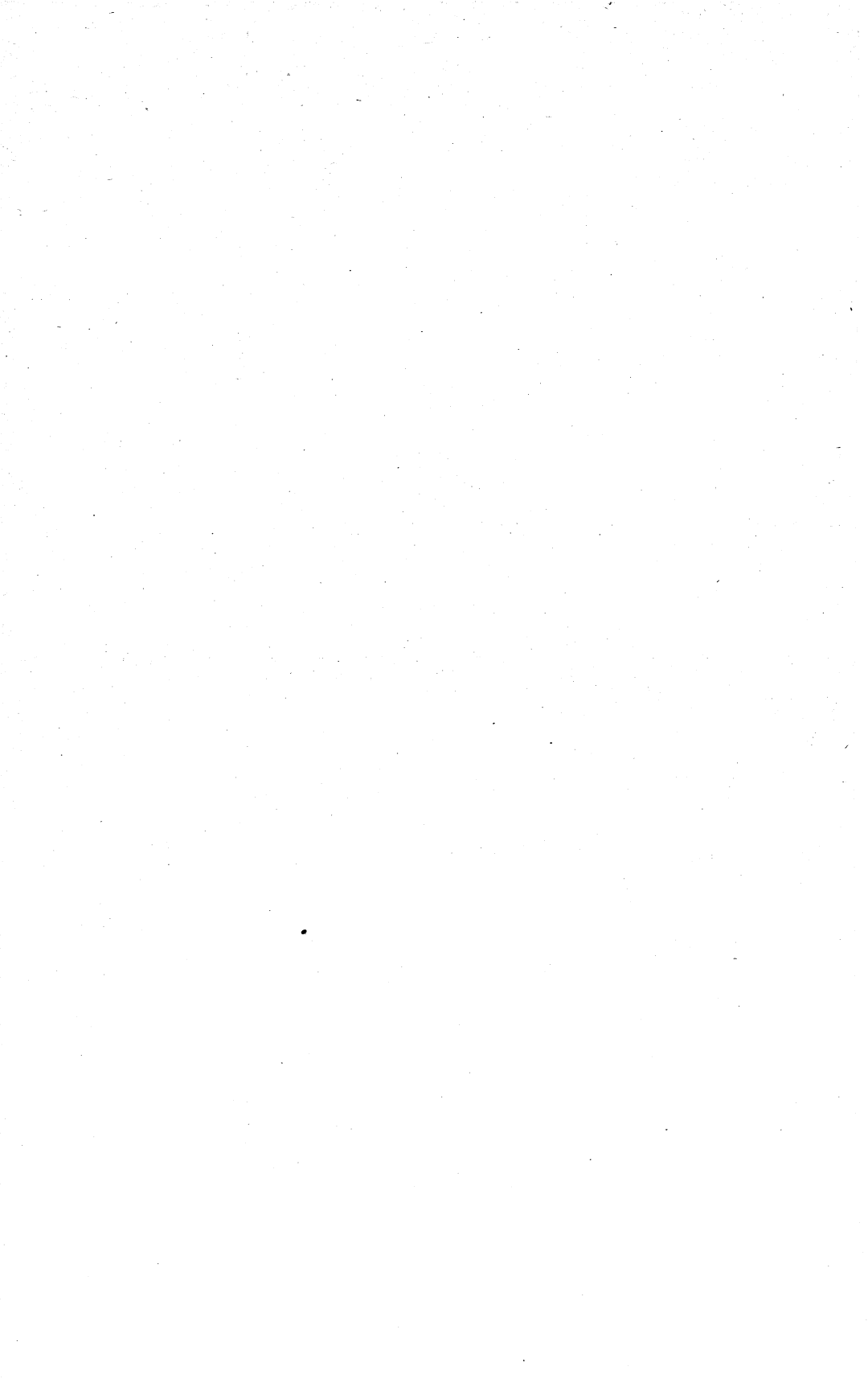
Williamson County ranked second among the coal-producing counties of Illinois in 1953. Major producers were Freeburn Mining Co. No. 3 mine; Bell & Zoller Coal Co. No. 2 mine, Johnston City; and the No. 3 Ziegler. Approximately 33 mines were active in the county. These utilized 58 mining machines, 77 motors, and 29 animals.

WINNEBAGO

Structural and paving sand and gravel, as well as railroad ballast and engine sand, were produced in Winnebago County in 1953 by eight operators. The major producers were Consumers Co. of Illinois, Illinois Wisconsin Sand & Gravel Co., and Larson Bros. Sand & Gravel Co., Rockford. Crushed and broken limestone was produced by William Nordhop, Rockford; Porter Bros., Roscoe; Charles Ind Co., operator of Byrnes & Mulford quarries; and Gregory Excavating Co. Brown quarry.

WOODFORD

Sand and gravel were produced by John Keller & Sons, Eureka, and Timberline Gravel Co., Congerville. These were the only mineral products of Woodford County.



The Mineral Industry of Indiana

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Geological Survey, Indiana Department of Conservation.

By Alvin Kaufman¹ and John B. Patton²



INDIANA mineral production increased 4 percent in value in 1953 compared with 1952 because of substantial increases in the value of the petroleum, clays, and stone output. The State continued to rank as the Nation's leading dimension-limestone producer, as well as remaining a major producer of sharpening stones and calcareous marl.

The mines and quarries of Indiana produced a total of 13 mineral commodities; the most important in value were coal, petroleum, cement, and limestone. Fuels continued to compose the major portion of the value of the State mineral output. Coal, petroleum, and natural gas contributed 60 percent of the total, and nonmetals supplied the remainder. No metallic ores were produced in 1953. Major mineral producing counties, exclusive of petroleum and natural gas output, were Lake,³ Vigo, and Lawrence.

TABLE 1.—Mineral production in Indiana, 1952–53¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays.....	1,331,298	\$1,700,209	1,654,112	\$2,514,227
Coal.....	16,350,202	64,977,328	15,812,485	62,353,519
Marl, calcareous.....	16,414	9,021	13,540	6,398
Natural gas..... million cubic feet.....	836	79,000	701	49,000
Peat.....	10,115	49,775	6,919	41,049
Petroleum (crude)..... thousand 42-gallon barrels.....	12,037	33,100,000	² 12,823	² 37,570,000
Sand and gravel.....	11,546,014	9,279,908	11,203,059	9,500,914
Stone (except limestone for cement and lime) Undistributed: Abrasive stones, cement, lime, pyrites and recovered elemental sulfur. Excludes value of clays used for cement.....	9,126,837	21,965,454	² 9,212,887	² 22,297,183
		30,870,155		35,448,379
Total.....		162,031,000		169,781,000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers)

² Final figure. Supersedes preliminary figure given in commodity chapter.

¹ Commodity-industry analyst, Region VIII, Bureau of Mines, Pittsburgh, Pa.

² Principal geologist, Geological Survey, Indiana Department of Conservation, Bloomington, Ind.

³ Includes cement produced from slag.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal.—Despite a 3-percent decline in coal output in 1953 compared with 1952 soft coal continued to be Indiana's foremost mineral commodity, contributing 37 percent of the total 1953 mineral value.

The major producing counties were Vigo, Warrick, Pike, Knox, and Sullivan. The mines in these five counties supplied over three-fourths of Indiana's output during the year.

Mechanization of the underground coal mines continued with purchase in 1953 of 3 continuous miners (the first in the State), 7 mobile loaders, and 6 shuttle cars.⁴

The necessity for producing better coal at lower prices was also recognized by the strip-mining branch of the coal industry. Lone Star Coal Co., Inc., began auger experiments in the early part of 1953 in its Coal Bluff strip mine, Vigo County. These efforts were discontinued later in the year.

Tremendous impetus was given the coal industry by the start of construction of one of the world's largest steam-generating units near Madison, Jefferson County. Output will be used by the Atomic Energy Commission at its Portsmouth, Ohio, plant. Fuel demands will be met by barging coal up the Ohio River from several new mines specifically opened for that purpose in Warrick County, Ind., as well as in Kentucky. Two of the major mines opened in anticipation of the power plant were the Victoria mine of Sunlight Coal Corp. and the Wright mine of Boonville Collieries Corp.

Yankeetown Dock Corp. began during the year to construct new preparation facilities at Yankeetown to handle the output of Indiana coal for the power station. When completed this plant will include a McNally rotary breaker, as well as screening facilities.

TABLE 2.—Production of bituminous coal, 1952-53, by counties

County	1952		1953	
	Production (net tons)	Average value per ton	Production (net tons)	Average value per ton
Clay.....	1, 101, 056	\$4. 08	1, 270, 487	\$3. 91
Davess.....	444, 325	4. 26	162, 953	4. 12
Dubois.....	27, 371	3. 62	14, 507	3. 59
Fountain.....	58, 237	5. 82	46, 678	5. 93
Gibson.....	844, 956	4. 14	738, 012	4. 12
Greene.....	578, 354	4. 13	643, 687	4. 01
Knox.....	2, 323, 287	3. 79	1, 987, 923	3. 84
Martin.....	1, 468	4. 48	.....	.....
Owen.....	132, 829	4. 86	28, 453	3. 83
Parke.....	11, 804	5. 50	2, 222	5. 40
Pike.....	2, 609, 250	3. 69	2, 493, 343	3. 62
Spencer.....	43, 741	4. 67	29, 803	4. 57
Sullivan.....	1, 994, 683	4. 03	1, 911, 082	4. 08
Vermillion.....	198, 525	4. 12	178, 632	4. 06
Vigo.....	3, 237, 891	4. 21	3, 375, 199	4. 26
Warrick.....	2, 742, 425	3. 80	2, 929, 502	3. 74
Total.....	16, 350, 202	3. 97	15, 812, 485	3. 94

⁴ Coal Age, February 1954, pp. 84-88.

The Bureau of Mines studied the hazards and causes of explosive mixtures of methane and air resulting from inadequate coal-mine ventilation.⁵ A modified plan of room-and-pillar panel mining was developed from these studies, which may eliminate many dangers of gas accumulations inherent in present methods used in some coal fields of Illinois, Indiana, and western Kentucky.

Peat.—Output of peat reported by producers in Indiana in 1953 decreased 32 percent compared with 1952. Production was reported by six producers in Grant, Blackford, Wells, Allen, DeKalb, and Kosciusko Counties. The bogs yielded mostly moss peat, although a substantial quantity of reed or sedge peat was also mined. Output was utilized for soil-improvement purposes.

TABLE 3.—Production of peat, 1947–53

Year	Number of producers reporting	Short tons	Value	Year	Number of producers reporting	Short tons	Value
1947.....	3	3,957	\$14,760	1951.....	5	5,699	\$22,824
1948.....	3	2,288	11,576	1952.....	9	10,115	49,775
1949.....	7	7,949	28,537	1953.....	6	6,919	41,049
1950.....	5	5,793	18,966				

Petroleum and Natural Gas.—Indiana petroleum production increased 7 percent in 1953 compared with 1952, but the output of natural gas dropped 16 percent. The record output of petroleum resulted from the accrued effects of a high drilling tempo since 1949, as well as the introduction of secondary recovery methods. Exploratory activities in 1953, mostly in the Mississippian formations, resulted in discovery of 22 new fields, 16 extensions, and 7 new pays.

A total of 1,312 wells was completed in Indiana in 1953.⁶ Of these, 896 were drilled for development purposes, and 416 as wildcats. Of the wells completed, 458 were brought in as oil wells and 31 as gas wells; 823 resulted in dry holes. The average footage drilled per well was recorded as 1,642 feet.

Approximately 4.5 million barrels of crude petroleum was added to Indiana's reserves as a result of new discoveries. Estimated proved reserves of crude oil increased to 62 million barrels as of January 1, 1954; estimated proved reserves of natural gas were believed to be 36 billion cubic feet, as of that date. These reserve estimates were based on fuel recoverable under operating conditions in the State in 1953. Due to expanded use of secondary recovery methods, actual reserves probably were substantially larger.

⁵ Herbert, C. A., *Some Factors Affecting and Suggested Ways for Improving Coal-Mine Ventilation, With Particular Reference to Mines in Illinois, Indiana, and western Kentucky*: Bureau of Mines Inf. Circ. 7656, 1953, 15 pp.

⁶ Data from the Indiana Department of Conservation, Geological Survey, Indiana University, Bloomington, Ind.

TABLE 4.—Production of crude oil, 1953, by major fields ¹

Field	County	Year dis-covered	Area (acres)	1953 production (barrels)	Number of wells, 1953	
					Produc-ing	Com-pleted
Black River Consolidated.....	Posey.....	1950	260	297, 513	21	19
Caborn Consolidated.....	do.....	1940	1, 260	546, 712	100	5
Claypole Hills Consolidated.....	Knox.....	1944	380	121, 369	36	0
Erskine.....	Vanderburgh.....	1931	370	251, 035	64	4
Fairbanks.....	Sullivan.....	1950	420	358, 207	19	0
Ford South.....	Posey.....	1950	560	311, 929	52	2
Griffin Consolidated.....	Gibson and Posey.....	1938	5, 790	1, 248, 632	557	15
Heusler.....	Posey.....	1938	720	104, 228	51	0
Lamott.....	do.....	1941	480	107, 073	38	2
Martin.....	Posey and Vanderburgh.....	1947	580	136, 680	57	1
Marts.....	Sullivan.....	1949	340	186, 448	21	1
Monroe City West.....	Knox.....	1950	670	137, 201	60	6
Mount Caramel Consolidated.....	Gibson and Knox.....	1941	1, 630	574, 438	159	3
Mount Vernon Consolidated.....	Posey.....	1941	1, 530	505, 472	142	4
Mumford Hills.....	Gibson and Posey.....	1940	510	102, 373	41	2
New Harmony South.....	Posey.....	1944	550	206, 945	96	0
Owensville East.....	Gibson.....	1948	700	160, 295	70	4
Owensville North.....	do.....	1943	1, 630	226, 916	99	16
Patoka East.....	do.....	1947	610	404, 523	56	6
Petersburg West.....	Pike.....	1953	130	101, 034	13	13
Plainville.....	Daviess.....	1950	350	150, 551	58	0
Riley South.....	Vigo.....	1952	240	267, 739	11	5
Rochester.....	Gibson.....	1948	380	1, 007, 242	38	0
Spencer.....	Posey.....	1948	450	264, 187	41	4
Springfield Consolidated.....	do.....	1946	860	122, 808	87	2
Terre Haute East.....	Vigo.....	1951	360	271, 467	17	3
Union-Bowman Consolidated.....	Gibson, Knox, and Pike.....	1941	15, 950	600, 418	366	47
Welborn Consolidated.....	Posey.....	1941	1, 100	404, 586	114	29
West Hovey.....	do.....	1944	190	150, 902	17	4
Undistributed.....				3, 494, 077	1, 519	1, 115
Total.....				12, 823, 000	4, 020	1, 312

¹ Adapted from Dawson, T. A. and Flanagan, W. H., Oil and Gas Developments in Indiana: AIME Statistics of Oil and Gas Development and Production, 1954, pp. 13-21.

NONMETALS

Abrasive Materials.—The only producer of natural whetstones in Indiana in 1953 was Indiana Sandstone Co., Inc. This organization operated the Hindostan Whetstone quarry near Orleans, Orange County.

Cement.—The output of cement (portland and natural) in 1953 increased 9 percent compared with 1952. Apparent consumption, as measured by shipments into Indiana, increased 3 percent during the year. The quantity of cement shipped from plants was less than that produced, resulting in a 28-percent increase in stocks. Average value per 376-pound barrel increased from \$2.47 in 1952 to \$2.57 in 1953.

Lone Star Cement Corp., Limesdale, Putnam County; Lehigh Portland Cement Co., Mitchell, Lawrence County; Louisville Cement Co., Inc., Speed, Clark County; and Universal Atlas Cement Co., Buffington, Lake County, were the active producers in 1953. Louisville Cement Co., Inc., also continued to produce natural cement from the Silver Creek limestone at its Speed plant.

Clays.—Production of Indiana clays in 1953 increased 24 percent compared with the previous year. The 19 fire-clay producers supplied 35 percent of the State total clay tonnage and 46 percent of the value.

The remaining 31 clay pits active during the year yielded miscellaneous clays. A total of 28 counties produced clays in 1953; Clay, Martin, Greene, and Lake Counties were the major producing areas. The largest producers of raw clays were Brazil Hollow Brick & Tile Co., Brazil; Loogootee Clay Products Co., Loogootee; and Bloomfield Brick Co., Bloomfield. Miscellaneous clays output was used entirely for manufacturing heavy clay products, such as building brick, drain tile, and sewer pipe. A substantial portion of fire clay was also utilized for these products, although refractories, portland cement, glazing slip, pottery, and stoneware were important uses.

TABLE 5.—Clays sold or used by producers, 1944-48 (average) and 1949-53

Year	Fire clay		Miscellaneous clays		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1944-48 (average).....	259, 848	\$437, 881	565, 675	\$430, 857	825, 523	\$868, 738
1949.....	379, 677	656, 829	916, 062	744, 965	1, 295, 739	1, 401, 794
1950.....	503, 661	801, 118	909, 072	804, 301	1, 412, 733	1, 605, 419
1951.....	499, 723	821, 672	1, 025, 008	1, 092, 785	1, 524, 731	1, 914, 457
1952.....	397, 336	732, 025	933, 962	968, 184	1, 331, 298	1, 700, 209
1953.....	582, 639	1, 163, 687	1, 076, 502	1, 349, 563	1, 654, 112	2, 514, 227

Lime.—The only producer of burnt lime in Indiana in 1953 was Louisville Cement Co., Inc., which operated its limekiln and a batch hydrator at Milltown, Harrison County, until November, when the plant was shut down and dismantled. Both quick and hydrated lime for building, chemical, and industrial purposes was produced.

Marl, Calcareous.—Calcareous marl output, as reported by producers in Indiana in 1953, dropped 18 percent from 1952. Production was obtained from the pits of M. E. Zellers, Kewanna, Fulton County; Luther & Haney, operators of pits on the Grace E. King, John Sroufe, and J. C. Roscoe properties, Noble County; Sylvan O. Shull, Rome City, Noble County; and Sylvester Harness, Stark County. The output was used locally for agricultural purposes.

TABLE 6.—Production of calcareous marl, 1944-48 (average) and 1949-53

Year	Number of producers reporting	Short tons	Value	Year	Number of producers reporting	Short tons	Value
1944-48 (average).....	9	23, 306	\$13, 715	1951.....	4	12, 960	\$18, 129
1949.....	8	44, 026	49, 543	1952.....	5	16, 414	9, 021
1950.....	6	20, 380	13, 977	1953.....	4	13, 540	6, 398

Pyrites.—A small quantity of pyrites was produced as a byproduct of coal mining by the Snow Hill Coal Corp. from its Talleydale mine, Vigo County. It was obtained by jigging breaker refuse. Output ceased in the spring of 1953 because of excessive recovery costs.

Sand and Gravel.—Production of sand and gravel declined 3 percent in 1953 compared with 1952. The major use of these commodities continued to be for paving and structural purposes, 87 percent of output being thus utilized. In addition, a substantial tonnage of molding and engine sands, as well as railroad ballast, was produced. Reports

were received from approximately 94 pits active in 50 counties. Standard Materials Corp., Indianapolis, American Aggregates Corp., Richmond and Indianapolis, and Terre Haute Gravel Co., Inc., Terre Haute, were the largest producers. Major producing counties continued to be Marion, Vermillion, Tippecanoe, and Vigo.

TABLE 7.—Sand and gravel sold or used by producers, 1952-53, by uses

	1952		1953	
	Short tons	Value	Short tons	Value
Sand:				
Molding.....	480,378	\$663,568	499,290	\$672,166
Structural.....	1,531,819	1,143,778	1,745,960	1,476,207
Paving (commercial).....	2,040,634	1,494,408	2,096,126	1,628,489
Paving—Government-and-contractor operations.....	16,679	8,367	131,322	78,803
Engine.....	113,421	80,794	72,087	43,019
Other.....	24,257	16,827	34,283	10,320
Undistributed ¹	225,640	144,729	293,478	254,455
Total sand.....	4,432,828	3,557,471	4,872,546	4,163,459
Gravel:				
Structural.....	1,887,053	1,572,947	1,735,956	1,667,002
Paving (commercial).....	4,061,966	3,382,895	3,583,081	2,974,015
Paving—Government-and-contractor operations.....	387,089	176,313	412,430	203,008
Railroad ballast.....	702,331	527,348	523,815	438,916
Other.....	74,747	62,934	75,231	54,514
Total gravel.....	7,113,186	5,722,437	6,330,513	5,337,455
Total sand and gravel.....	11,546,014	9,279,908	11,203,059	9,500,914

¹ Includes fire or furnace and railroad-ballast sands.

Stone.—The total stone output increased 1 percent in 1953 compared with 1952. Sandstone blocks for the manufacture of building stone were quarried by Indiana Sandstone Co., Inc., west of Orleans, Orange County, and the Mansfield Stone Co., Mansfield, Parke County, as well as by other producers. Crushed limestone was 95 percent of stone tonnage but only 51 percent of value in 1953. This differential resulted from the high unit value of dimension stone. Indiana has long been famous for its building stone. The Salem limestone, the major formation utilized, has been quarried primarily in Monroe and Lawrence Counties. There were 32 quarries that reported producing dimension limestone and 58 quarries output of crushed stone. In addition to the usual commercial output of crushed material, a considerable tonnage was derived from mill spalls sold by the dimension-stone producers to grinders. The spalls were ground for chemical uses.

The largest dimension-stone producers, in point of value, were Indiana Limestone Co. and Ingalls Stone Co., both of Bedford; and B. G. Hoadley Quarries, Inc., and Bloomington Limestone Corp., both in Bloomington. The major crushed-limestone producers were Newton County Stone Co., Inc., Kentland; Ohio & Indiana Stone Corp., Greencastle; and Monon Crushed Stone Co., Monon. The largest use of crushed stone was for concrete aggregate and road base.

These composed 69 percent of the crushed output, and agricultural uses were responsible for an additional 22 percent. The remaining 9 percent was for miscellaneous purposes.

TABLE 8.—Stone sold or used by producers, 1952–53, by uses

	1952		1953	
	Quantity	Value	Quantity	Value
Dimension stone:				
Building:				
Rough construction..... short tons.....	(1)	(1)	32	\$160
Rough architectural..... cubic feet.....	2, 220, 698	\$2, 417, 319	2, 158, 768	2, 387, 741
Finished (cut and sawed)..... do.....	3, 397, 036	8, 238, 750	3, 920, 407	8, 602, 147
Rubble..... short tons.....	(1)	(1)	22, 339	39, 356
Flagging..... cubic feet.....	(1)	(1)	-----	-----
Undistributed..... short tons.....	46, 159	149, 331	-----	-----
Total..... short tons (approximate).....	453, 445	10, 805, 400	463, 275	11, 029, 404
Crushed and broken stone:				
Riprap..... short tons.....	201, 971	318, 788	147, 456	268, 975
Fluxing stone..... do.....	41, 669	43, 572	94, 699	115, 364
Concrete and road metal..... do.....	5, 682, 691	6, 910, 201	6, 050, 245	7, 380, 014
Railroad ballast..... do.....	483, 047	571, 383	364, 099	429, 794
Agriculture..... do.....	2, 118, 185	2, 737, 675	1, 952, 490	2, 488, 027
Other..... do.....	145, 829	573, 435	140, 623	585, 605
Total..... do.....	8, 673, 392	11, 160, 054	8, 749, 612	11, 267, 779
Grand total..... do.....	9, 126, 837	21, 965, 454	9, 212, 887	22, 297, 183

¹ Included with "Undistributed" to avoid disclosure of individual company data.

REVIEW BY COUNTIES ⁷

ADAMS

John W. Karch Stone Co., Bryant, and Meshberger Bros. Stone Corp., Lingrove and Pleasant Mills, produced agricultural stone, concrete aggregate, and road material. R. D. Jones and Krick Tyn-dall Co. operated clay pits at Berne and Decatur, respectively. The clay produced was used in the manufacture of drain tile.

ALLEN

W. W. Gravel Co., Inc., Roanoke, and May Sand & Gravel Corp. and Brudi Stone & Gravel Co., both of Fort Wayne, produced sand and gravel during the year for use as building and paving material. May Sand & Gravel Corp. also produced a substantial quantity of crushed limestone for use as concrete aggregate and road material. Miscellaneous clays for the manufacture of heavy clay products were mined by Walter Bolyard Tile Co., Monroeville, and Klopfenstein Tile Works, Grabill. A small quantity of moss peat was mined by R. W. Wiegman Grading & Peat Moss Co. from a 27-acre peat deposit near Huntertown, 8 miles south of Auburn.

Excludes petroleum and natural gas.

TABLE 9.—Value of mineral production, in Indiana, 1952-53, by counties

County	1952	1953			
		Value	Rank	Percent	Principal minerals
Clark.....	\$9,455,461	\$9,521,438	4	6	Cement, stone.
Clay.....	4,874,450	5,940,604	7	3	Coal, clays, sand and gravel.
Greene.....	2,537,495	2,660,880	9	2	Do.
Lake ¹	13,844,879	18,446,187	1	11	Cement, clays, sand, and recovered sulfur.
Lawrence.....	9,805,553	11,480,629	3	7	Stone, cement.
Marion.....	1,678,928	1,850,716	10	1	Sand and gravel.
Monroe.....	6,782,380	5,319,686	8	3	Stone.
Pike.....	9,628,133	9,025,902	5	5	Coal.
Putnam.....	5,800,426	5,952,273	6	4	Cement, stone, clays.
Vermillion.....	1,471,919	1,397,896	11	1	Coal, sand and gravel, clays.
Vigo.....	14,299,240	15,001,705	2	9	Do.
Undistributed ²	80,178,864	83,183,084	-----	48	Do.
Total.....	162,031,000	169,781,000	-----	100	Coal, cement, stone.

¹ Includes cement from slag.

² To avoid disclosure of individual company operations, counties with less than 3 producers are included in "Undistributed," as are petroleum and natural-gas figures (data not available on a county basis).

BARTHOLOMEW

The sole mineral producer in Bartholomew County in 1953 was Meshberger Stone Co. This company operated a quarry, crusher, and mill near Columbus. The output was sold for riprap, concrete aggregate, road material, agricultural purposes, and filter-bed use. A small quantity was also sold for metallurgical purposes.

BENTON

Mount Gilboa Gravel Co. continued to work its pit near Remington part of the year. Output consisted of unwashed paving and road gravel.

BLACKFORD

Montpelier Stone Co., Inc., Montpelier, quarried limestone for use as concrete aggregate, road material, agricultural stone, and rubble. Peat was produced from the bog of Hartford Peat & Gravel Co. near Hartford City; its output consisted of reed or sedge peat and was sold for soil-improvement purposes. High-grade tile was produced from the miscellaneous clays mined by Inman Tile Co., Hartford City.

BOONE

O. J. Percy, Pittsboro, and W. K. Murray, Frankfort, operated gravel pits in Boone County in 1953.

CASS

A substantial quantity of concrete aggregate, road material, agricultural stone, and metallurgical flux was produced by The France Stone Co. at its Keepport quarry near Logansport. Sand and gravel for building material and furnace sand were obtained from the plants of the Greenville Gravel Co. and Great Lakes Foundry Sand Co., both near Logansport.

CLARK

Louisville Cement Co., Inc., continued to produce both portland and natural cement at its Speed plant. The quarries of T. J. Atkins & Co., Inc., and Sellersburg Stone Co., near Jeffersonville and Sellers-

burg, respectively, yielded limestone which was crushed and sold for use as concrete aggregate, road base, and agricultural stone.

CLAY

Clay County continued in 1953 to be the major clay-producing area in Indiana. Virtually all output was fire clay obtained from the Brazil area and utilized for heavy clay products, portland cement, and high-grade tile. The seven producers, in order of decreasing value, were Brazil Hollow Brick & Tile Co., Quality Coal Corp., G. & F. Coal Corp., Big Bend Collieries Co., Inc., E. & K. Clay Co., and Hydraulic Pressed Brick Co., all of Brazil; and Clay City Pottery, Clay City. Big Bend Collieries Co., Inc., and G. & F. Coal Corp. also produced a substantial quantity of miscellaneous clays. Sand and gravel for paving purposes were produced by Clyde Bullerdick Gravel Co. from a pit and portable plant near Poland. Bituminous coal was also produced in Clay County, mostly from strip mines. The largest producers were Ayrshire Collieries Corp. and Big Bend Collieries, Inc., both near Brazil. The Coal III and Block coal seams were utilized.

CLINTON

A small quantity of paving gravel was produced in Clinton County by the county highway department.

CRAWFORD

Hy-Rock Products Co., Marengo, and Mulzer Bros., Eckerty, produced crushed and broken limestone for riprap, concrete aggregate, road base, railroad ballast, and agricultural purposes. Curtailment of farming, as a result of drought, caused sales of agricultural stone to drop. Hy-Rock Products Co. operated an underground mine and Mulzer Bros. an open quarry.

DAVISS

The major mineral commodity produced in Daviess County was bituminous coal. The largest producers were Hicks Coal Co., Cannelburg, and Chesser Coal Corp., Washington. The Central Indiana Coal Co. closed its Maid Marian mine in 1953. Production of building and paving sand and gravel was reported by Charles England Gravel Co., Plainville, and John E. Mize, Elnora.

DEARBORN

Dearborn Gravel Co., Lawrenceburg, and Laughery Gravel Co., Inc., Aurora, produced building and paving sand and gravel in Dearborn County in 1953.

DECATUR

Harris City Stone Corp., Greensburg, and New Point Stone Co., New Point, produced crushed and broken limestone from the Laurel formation for use as concrete aggregate and road material and for agricultural purposes.

DE KALB

Sand and gravel and peat were produced in De Kalb County in 1953. Marion J. Benjamin, who in previous years had reported

production of calcareous marl, temporarily closed his pit. Sand and gravel was produced by Stonestreet & Burtzner Bros. Co. near Garrett and Waterloo and Irving Bros. Gravel Co. near Spencerville. The output was used for building and paving material. Moss peat and peat humus were produced by Humus Peat Moss Co. from a pit near Corunna, Richland Township. The production was shredded and sold locally for soil-improvement purposes.

DELAWARE

Park Sand & Gravel Co., Leonard Shick Co., and J. & K. Stone & Gravel Co., Inc., all of Muncie, operated pits for the production of building and paving sand and gravel. J. & K. Stone & Gravel, Inc., also operated dolomite quarries near Eaton and Muncie. The output was crushed and broken for rubble, concrete aggregate, road material, and agricultural stone.

DUBOIS

A small quantity of bituminous coal was produced in Dubois County in 1953. Clays were produced from underground mines by Louisville Firebrick Works and Huntingburg Brick Co., both near Huntingburg. Huntingburg Brick Co. also produced shale from an open pit. The output of these two companies was used in manufacturing heavy clay products and refractories.

ELKHART

The only commercial producer of sand and gravel in Elkhart County in 1953 was Christner Gravel Co., Goshen, which operated for part of the year. The company owns both fixed and portable plants.

FAYETTE

Building and paving sand and gravel were produced at the fixed plants of Connersville Gravel Co., Inc., and Park Road gravel pit, both of Connersville.

FOUNTAIN

The mines and quarries of Fountain County yielded bituminous coal, sand and gravel, and clays in 1953. Neal Gravel Co. operated a pit near Attica for the production of building and paving sand and gravel. Poston-Herron Brick Co., Attica, and Veedersburg Clay Products Co., Inc., Veedersburg, produced substantial quantities of miscellaneous clays for use in manufacturing heavy clay products. Morgan Coal Co. was the principal coal producer.

FRANKLIN

The only commercial mineral producer active in Franklin County in 1953 was Herman H. Wessel Co, which operated an open pit near Batesville to produce miscellaneous clays for use in drain-tile manufacture.

FULTON

Calcareous marl for agricultural purposes was quarried near Kewanna by M. E. Zellers.

GIBSON

Bituminous coal and sand and gravel were mined in Gibson County in 1953. Short-Garrett-Higginbotham and Jewell Guller, both of Owensville, operated four dredges in 1953, on the Wabash River near Johnson. The output was utilized for building and paving sand and gravel. The Guller dredge was inactive 5 months of the year.

GRANT

Pipe Creek Stone Co. operated an open quarry near Swayzee to produce rubble, concrete aggregate, road base, agricultural stone, and blast-furnace flux. Irving Bros. Gravel Co., Inc., and S. & L. Gravel Co., both of Marion, reported a substantial production of building and paving sand and gravel. The 10-acre bog of Glacier Peat Moss Co. near Jonesboro, Fairmount Township, yielded a substantial quantity of moss peat for soil-improvement purposes.

GREENE

The mines and quarries of Greene County yielded bituminous coal, clays, and sand and gravel. Bloomfield Brick Co., Bloomfield, reported a substantial output of miscellaneous clays for use in manufacturing brick. Building and paving sand and gravel was mined by Concrete Silo Co., Inc., Bloomfield.

HAMILTON

Beaver & Son produced building and paving sand and gravel at its pit and plant at Noblesville. Stoney Creek Stone Co. broke ground in the Liston Creek limestone for a new crushed-stone quarry and plant east of Noblesville but did not produce from this quarry in 1953.

HANCOCK

Irving Materials, Inc., and Ed. Strubbe & Sons, both of Greenfield, and Delbert L. Reeves, Eden, operated fixed plants for producing building and paving sand and gravel. This was the only mineral commodity produced in Hancock County in 1953.

HARRISON

Corydon Stone Co., Corydon, and Davis Crushed Stone & Lime Co., Ramsey, produced limestone for concrete aggregate, road material, and agricultural stone. Louisville Cement Co., Inc., quarried limestone for lime manufacture. Output was utilized at the company plant near Milltown, which was dismantled and scrapped on November 11, 1953.

HENDRICKS

Anderson Gravel Co., Mooresville, produced unwashed paving gravel.

HENRY

Paul Craig, Greensboro, and Robert Hall, Lewisville, produced paving gravel during the year.

HUNTINGTON

Crushed limestone for concrete aggregate, road material, railroad ballast, and agricultural purposes was produced at The Erie Stone Co. quarry near Huntington. Majenica Tile Co. operated a surface mine for producing miscellaneous clays near Majenica. The output was utilized for farm drain-tile manufacture.

JACKSON

Shale for use in manufacturing heavy clay products was mined by Medora Brick Co. and Jackson Brick & Hollow Ware Co., both of Brownstown. Lehigh Portland Cement Co. also produced shale for use in cement manufacture.

JASPER

Louisville Pottery Co. operated an underground mine in Jasper County for producing fire clay. Building sand was produced by Peter Dziabis, Rensselaer.

JENNINGS

The North Vernon quarry of Paul Frank, Inc., yielded a substantial quantity of concrete aggregate, road base, and agricultural stone.

KNOX

Knox County continued to maintain its position as fourth largest coal-producing area in Indiana. As in 1952, the majority of the production was from underground mines. The principal producers were Enoco Collieries near Bruceville, and Shasta Coal Corp., operators of the Shasta mine near Bicknell. Coal output in Knox County declined compared with 1952 because of closing of the Standard Coal Co. Julian mine near Wheatland. Sand and gravel for building and paving material were produced by Lenahans & Konen, Inc., and White River Materials Co., both of Vincennes.

KOSCIUSKO

Building and paving sand and gravel, as well as railroad ballast and engine sand, were produced by Sturm & Dillard Gravel Co., Inc., Syracuse, and Western Indiana Gravel Co., Leesburg. Moss peat was produced by Sam Dausman from a 6-acre deposit near Leesburg, Plain Township. This material was sold for soil-improvement purposes.

LAGRANGE

A dredge and fixed plant were operated by Northern Indiana Sand & Gravel Co. northeast of Wolcottville to produce building and paving sand and gravel.

LAKE

Universal Atlas Cement Co. operated its plant at Buffington throughout the year. Limestone from Michigan and blast-furnace slag were the principal raw materials used. Miscellaneous clays for the manufacture of heavy clay products were mined by Natco Corp., Hobart, and National Brick Co., Munster. Sand and a small quan-

tity of gravel were produced by John N. Bos Sand Co., Gary, and Construction Aggregates Corp. The output consisted mostly of molding, building, paving, and engine sands. Expanded perlite was manufactured by the U. S. Gypsum Co., East Chicago, from crude material imported from the southwestern United States. This commodity was used as an aggregate in plaster.

LA PORTE

Portage-Manley Sand Co. and Producers Core Sand Corp. produced substantial quantities of molding and engine sands from the dunes along the Lake Michigan shore near Michigan City.

LAWRENCE

Lawrence County continued to rank as one of the leading mineral-producing areas in Indiana. Dimension limestone for building purposes remained the principal mineral commodity. Major producers were Indiana Limestone Co., Inc., operator of 3 quarries and 4 mills, and Ingalls Stone Co., operator of 2 mills and 1 quarry. All output was from the Salem limestone. A substantial output of crushed and broken limestone for use as concrete aggregate, road base, agricultural stone, flux, and riprap was produced by Mitchell Crushed Stone Co., Inc., Mitchell; Ralph Rogers & Co., Springville; Indiana Limestone Co., Inc.; and Oolitic Ground Limestone Co., Bedford. In addition, a substantial quantity of mill scrap was sold for use in glass manufacture and agricultural purposes. Most of this material was processed by Bedford Ground Limestone Co., Bedford. Lehigh Portland Cement Co. operated its cement kiln at Mitchell throughout the year. Raw material was quarried nearby.

MADISON

The Myers Gravel & Sand Co., Inc., Anderson, and Western Indiana Gravel Co., Dundee and Anderson, produced building and paving sand and gravel.

MARION

Standard Materials Corp. and American Aggregates Corp., both of Indianapolis, were the largest producers of sand and gravel in Marion County. Several others were John Jones & Sons, Inc., Spickelmier Co., and Flagle Gravel Pit, all of Indianapolis.

MARSHALL

A substantial quantity of miscellaneous clays for the manufacture of heavy clay products was mined by Bremen Clay Products Co., near Bremen. Sand and gravel for building and paving purposes were produced from a dredge by Burns Gravel Co., Culver.

MARTIN

Miscellaneous clays mined by Loogootee Clay Products Corp., Loogootee, from an open pit were the only mineral commodities produced in Martin County. The output was used for heavy clay products.

MIAMI

Sand and gravel for building, paving, and railroad-ballast purposes were produced by J. C. O'Connor & Sons, Inc., and Kickapoo Sand & Gravel Co., both of Peru.

MONROE

Limestone was the only mineral commodity produced in Monroe County; 16 stone mills and 12 quarries were active during the year. Of these, the largest quarries were operated by B. G. Hoadley Quarries, Inc., Bloomington; Empire Stone Co., Clear Creek; and Victor Oolitic Stone Co., Victor. The principal mills, near Bloomington, are owned and operated by Bloomington Limestone Corp. and Indiana Limestone Co., Inc. The output was sold predominantly as sawed and cut stone. A substantial quantity of limestone was crushed and utilized for concrete aggregate, road base, and agricultural purposes. The major producer of this commodity was Bloomington Crushed Stone Co., Bloomington. A substantial quantity of limestone was ground and sold as rubber filler in 1953 by Indiana Calcium Corp., Bloomington. This company operated a plant for grinding mill spall.

MONTGOMERY

Hydraulic Press Brick Co., Crawfordsville, reported output of shale in Montgomery County in 1953. Sand and gravel for building and paving were produced by Kitts Gravel Co., also of Crawfordsville.

MORGAN

Adams Clay Products Co., Brooklyn Brick Co., Inc., and Indiana Drain Tile Co., Inc., all of Brooklyn, produced shale for the manufacture of heavy clay products. Gravel for paving purposes was produced by Perle F. & Bobby Hill and Kivett Gravel Co., both of Martinsville. The Kivett Gravel Co. did not operate until May of 1953.

NEWTON

Newton County Stone Co., Inc., Kentland, produced concrete aggregate, road base, and agricultural stone from its limestone quarry.

NOBLE

Sylvan O. Shull, Rome City, and Luther & Haney, Albion, produced calcareous marl in Noble County. Luther & Haney operated pits on the J. C. Roscoe, Grace E. King, and John Scoufe properties. There was also a small output of miscellaneous clays from the surface mine of Frederick Landgraff near Albion.

ORANGE

Orange County was the only area in Indiana in 1953 to have a reported production of sandstone and whetstones. These mineral commodities were produced by Indiana Sandstone Co., Inc. Crushed limestone for use as concrete aggregate, road material, and agricultural stone was quarried by Radcliff & Berry, Inc., Orleans, and Calcar Quarries, Paoli.

OWEN

Crushed and broken limestone, dimension limestone, clays, sand and gravel, and bituminous coal were produced in Owen County in 1953. The V. J. strip mine near Linton yielded bituminous coal. Dimension limestone was produced as rough blocks at the Romona quarry of Ingalls Stone Co. Output was shipped to the company mills in Lawrence County. France Stone Products, Inc., and Dunn Limestone Co., Inc., operated quarries near Spencer. Their production was used as concrete aggregate, road material, agricultural stone, and open-hearth flux. A small quantity of plastic fire clay was produced near Coal City by The Maumee Collieries Co. Clayton Winders & Sons, Spencer, and Gosport Gravel Co., Inc., Gosport, produced building and paving sand and gravel from their fixed plants. The Winders Co. plant was idle during part of 1953 as a result of a water problem.

PARKE

Dimension sandstone for use as irregular-shaped stone and sawed stone was produced by Mansfield Stone Corp. The output of the company quarry at Mansfield was shipped to its mill at Rockville. S. L. Turner Coal & Clay Co. produced a large tonnage of plastic fire clay from a pit near Carbon. The output of this pit was utilized in the manufacture of heavy clay products. Paving sand and gravel, as well as railroad ballast, were produced by Western Indiana Gravel Co. from a pit near Montezuma. Bituminous coal was also produced in the county during the year.

PERRY

Cannelton Sewer Pipe Co., Cannelton, and U. S. Brick Co., Tell City, produced shale and clays for use in manufacturing sewer pipe and other heavy clay products.

PIKE

Pike County ranked third among Indiana coal-producing areas in 1953. Approximately 99 percent of the county soft-coal production came from various strip pits. Major producing properties, in order of decreasing output, were the Enos Coal Mining Co. Enos mine, Blackfoot Coal & Land Corp. Blackfoot mine near Kerwin, and Ayrshire Collieries Corp. Ayrshire No. 1 and No. 2 mines. All of these were strip operations in the coal IV and V seams.

PORTER

Molding, fire, and furnace sands were produced in Porter County by Crisman Sand Co., Inc., and Portage-Manley Sand Co. from plants near Crisman and Dune Park, respectively. Charles H. Schrock, Chesterton, McCool Loam Co., Chesterton, and J. S. Robbins, McCool, produced fire and miscellaneous clays during the year.

POSEY

Building sand and gravel, as well as railroad ballasts, were produced in Posey County by Hagemann Sand & Gravel Co. and Koch Sand & Gravel Co., both in Mount Vernon.

PULASKI

Francesville Drain Tile Co. and Medaryville Tile Co., in Francesville and Medaryville, respectively, produced miscellaneous clays for use in manufacturing drain tile and brick. Francesville Stone Co., Inc., Francesville, quarried dolomite for concrete aggregate, road base, and agricultural stone. The only producer of paving sand and gravel was Charles C. Engel, Monterey.

PUTNAM

Lone Star Cement Corp. continued to operate its cement plant near Limedale. Crushed and broken limestone was produced by France Stone Products, Inc., Greencastle No. 1 quarry; Manhattan Crushed Stone Co., Reelsville; Ohio & Indiana Stone Corp., Greencastle quarry; and Russellville Stone Co., Inc., Russellville. Most of the output was used for riprap, concrete aggregate, railroad ballast, road material, and agricultural stone. A substantial tonnage was also utilized for open-hearth flux and as whiting. Miscellaneous clays, as well as crushed limestone, were produced by the Indiana State Farm near Putnamville. Sand and gravel for building and paving purposes were produced by Clark & Sons from a dredge operating near Pleasant Gardens.

RANDOLPH

H. & R. Stone Co., Ridgeville, quarried crushed and broken dolomite for use as concrete aggregate, road base, and agricultural purposes. George Hutchens and George Bascom recovered pit-run gravel from a fixed plant $1\frac{1}{2}$ miles west of Lynn.

RIPLEY

Ripley County Construction Co., Osgood, and Tri County Stone Co., Cross Plains, quarried limestone for concrete aggregate, road base, riprap, and agricultural purposes.

RUSH

McCorkle Stone Co., Milroy, and Rush County Stone Co., Inc., Milroy, produced dolomite for use as concrete aggregate, road material, and agricultural stone. A fixed gravel plant was operated during the year by W. P. Wolfal Co. three quarters of a mile west of Rushville.

ST. JOSEPH

Building and paving sand and gravel were produced by South Bend Sand & Gravel Corp., South Bend, and John G. Yerington, of Mishawaka; C. D. Smelser Co., Inc., and Concrete Products Corp., both of Mishawaka.

SCOTT

Scott County Stone Co., Inc., operated the Hardy quarry near Scottsburg in 1953. The limestone produced by this operation was utilized as concrete aggregate, road material, and agricultural stone. Expanded perlite from material imported from Southwestern States was produced by Airlite Processing Corp., Scottsburg. This material was utilized as a lightweight aggregate for plaster and concrete.

SHELBY

Cave Stone Co., Inc., Flat Rock, and St. Paul Quarries, Inc., St. Paul, produced limestone and dolomite for concrete aggregate, road base, railroad ballast, and agricultural stone. Building and paving sand and gravel was produced by E. T. Burnside, Shelbyville.

SPENCER

Bituminous coal, clays, and sand and gravel were mined in Spencer County in 1953. Rockport Brick & Tile Co. produced a small quantity of alluvial clay for use in manufacturing of drain tile. Bedford-Nugent Co., Inc., Rockport, recovered building and paving sand and gravel, and the Hardy Sand Co. pit near Richland yielded molding sand.

STARKE

Paving gravel was produced by Bruce Fletcher from a pit near Knox. Calcareous marl was recovered by Sylvester Harness near Grovertown.

SULLIVAN

Sullivan County continued to rank fifth among Indiana coal-producing areas. Major producers were Sherwood-Templeton Coal Co., operators of the Friar Tuck and Robin Hood mines near Linton; Central Indiana Coal Co. mine at Midland; and Hickory Grove Coal Mining Co. Minnehaha No. 6 near Sullivan. Sand and gravel were produced by the W. Carlisle Sand & Gravel Co. near Carlisle and Merom Gravel Co. near Merom. The Merom Gravel Co. dredge was idle part of the year as a result of a fire on September 27.

TIPPECANOE

Western Indiana Gravel Co., Lafayette, operated a sand and gravel plant in Tippecanoe County in 1953. The output was used for paving purposes and for railroad ballast.

VANDERBURGH

Standard Brick & Tile Corp. operated an open pit near Evansville to produce surface clay and shale. Building and paving sand and gravel were produced from the fixed plant of Bedford-Nugent Co., Inc., and Koch Sand & Gravel Co. near Evansville.

VERMILLION

The mines and quarries of Vermillion County yielded bituminous coal, sand and gravel, and clays in 1953. Miscellaneous clays for the production of heavy clay products, fire brick, and block were produced by Arketex Ceramic Corp., Dana; Clay City Pipe Co., Montezuma; and Cayuga Brick & Tile Co., Cayuga. Building and paving sand and gravel were produced from the pits of Standard Materials Corp. and Thornton Quarries Corp., near Clinton and Cayuga, respectively. The coal mines in the county yielded a substantial, but comparatively minor, output of bituminous coal.

VIGO

Vigo County continued in 1953 to rank first in the production of coal in Indiana. The total output during the year was greater than

in 1952, despite the closing of Snow Hill Coal Corp. Wabash mine and the Public Services of Indiana Corp. Dresser mine. Production increased because of sales to new power plants in the area. Major producers in 1953 were Viking Coal Corp. Saxton and Viking mines north of Terre Haute; Talleydale and Green Valley mines of Snow Hill Coal Corp. northwest of Terre Haute; Maumee Collieries Co. Chieftain No. 20 mine near Keller; and Truax-Traer Coal Co. Victory mine near Brazil. The mines and quarries of the county also yielded sand and gravel, pyrites, and shale. Shale for use in manufacturing heavy clay products was recovered from the mine of Terre Haute Vitrified Brick Works, Inc., West Terre Haute. Snow Hill Coal Corp. recovered pyrites as a byproduct from its Talleydale coal mine. Sand and gravel for use as building, paving, fire or furnace and railroad ballast material were produced by Wabash Sand & Gravel Co. from its fixed plant and dredge near Terre Haute, as well as by Terre Haute Gravel Co., Inc., Terre Haute; and G. A. Monninger, Terre Haute.

WARRICK

Warrick County maintained its position as second largest coal-producing area in the State. Major producers were Sunlight Coal Co., operator of the Sunlight No. 11 and No. 14 mines in Boone Township; Tecumseh Coal Corp. Tecumseh mine in Land and Owen Townships; and the Ingle Coal Corp. Ditney Hill mine near Elberfeld. All of these except the Ditney Hill slope mine were strip pits. The only new coal-industry construction and development activity reported in the county in 1953 was a tippie constructed by Lynnville Coal Corp., Lynnville. The tippie initially was to be used for Kentucky coal. It was anticipated, however, that eventually the new facilities will be used to process Indiana coal. Shale for use in manufacturing heavy clay products was produced by Boonville Brick & Tile Co., Boonville.

WAYNE

Building and paving sand and gravel, as well as railroad ballast, were produced by American Aggregates Corp. and DeBolt Concrete Co., both of Richmond; Fisher Gravel Co., Hagerstown; and Kirkpatrick Gravel Co., Cambridge City.

WELLS

The Erie Stone Co. and Heller Stone Co. produced limestone and dolomite from open quarries. The output was used for concrete aggregate, road base, agricultural purposes, railroad ballast, and open-hearth flux. Ballard Peat Moss Co., Warren, produced moss peat for soil-improvement purposes.

WHITE

Monon Crushed Stone Co., Monon, reported output of crushed and broken limestone for use as concrete aggregate, road material, railroad ballast, and agricultural stone.

WHITLEY

Allen-Whitley County Gravel Co., Inc., was the only mineral producer active in the county in 1953. This company operated a fixed plant near Columbia City for producing building and paving sand and gravel.

The Mineral Industry of Iowa

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of Iowa.

By Samuel A. Gustavson¹ and Donald F. Klyce²



MINERALS produced in Iowa in 1953 were valued at \$51,994,000, a slight decline from 1952; however, a reduced valuation for clay more than accounted for the decrease. In order of value, minerals or mineral products produced in the State in 1953 were cement, limestone, sand and gravel, coal, gypsum, clays, peat, and lime. Building-and-road-construction minerals represented nearly 90 percent of the total.

Figure 1 shows the total value of mineral output of Iowa from 1910 through 1953.

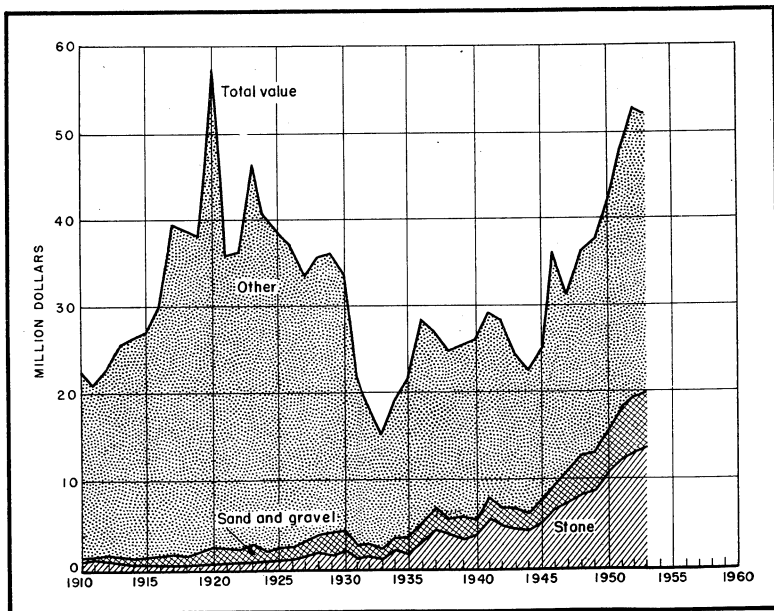


FIGURE 1.—Value of all minerals, sand and gravel, and stone (all types—separate data for stone not available 1910–18) produced in Iowa, 1910–53.

¹ Chief, Mineral Industry Division, Region V, Bureau of Mines, Minneapolis, Minn.

² Commodity-industry economist, Region V, Bureau of Mines, Minneapolis, Minn.

TABLE 1.—Mineral production in Iowa, 1952-53¹

Commodity	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement.....376-pound barrels.....	9, 336, 727	\$22, 849, 597	9, 111, 368	\$23, 330, 177
Clays:				
Used in manufacture of cement.....	344, 749	(²)	347, 583	(²)
Other.....	519, 918	2, 332, 283	565, 830	621, 718
Coal ³	1, 380, 733	5, 297, 074	1, 388, 006	5, 262, 373
Gypsum (crude).....	1, 122, 409	2, 797, 704	1, 151, 692	2, 939, 654
Peat.....	14, 500	110, 334	17, 233	(⁴)
Sand and gravel.....	10, 796, 979	6, 032, 898	10, 385, 322	6, 400, 827
Limestone:				
Used in manufacture of cement and lime.....	2, 359, 108	(²)	2, 470, 359	(²)
Other.....	9, 899, 404	13, 036, 726	10, 715, 078	13, 215, 352
Undistributed.....		24, 750		224, 242
Total Iowa.....		52, 481, 000		51, 994, 000

¹ Production as measured by mine shipments or mine sales (including consumption by producers).

² To avoid duplication, value not assigned.

³ Relates only to mines with an annual production of 1,000 tons or more.

⁴ Bureau of Mines not at liberty to publish; values combined under "Undistributed."

REVIEW BY MINERAL COMMODITIES

METALS

Iowa was not a producer of metals in 1953. In past years, however, lead, zinc, and iron have come from mines chiefly in Dubuque County. Some production or prospects of possible production also have been reported or noted in Allamakee, Clayton, and Jackson Counties. The first output of lead was reported to have been in 1788, and from 1907 through 1917 Iowa mines produced 585 short tons of lead valued at \$59,362 and 710 short tons of zinc valued at \$77,688. There has been no production since 1917. Information concerning lead and zinc operations before 1907 was published in Federal Geological Survey Bulletin 294, Zinc and Lead Deposits of the Upper Mississippi Valley, 1906 (pp. 81-148) and Iowa Geological Survey, volume 6, Lead and Zinc Deposits of Iowa, by A. G. Leonard, 1896 (66 pp.).

During 1951-52, 83 holes totaling 18,427 feet were drilled on lead-zinc property near Dubuque, Dubuque County, in the Upper Mississippi field under a contract between J. E. and L. M. Miller, Oak Park, Ill., operating under the name Durango Mining Co., and the Defense Minerals Exploration Administration (DMEA). Drilling was begun in November 1951 and was completed the following August. The work involved a total expenditure of \$29,700. The Government share of the cost was 50 percent, or \$14,850. The Government on April 27, 1953, certified that a discovery had been made. As a result of the exploration, lead concentrate containing about 8 tons of lead was produced but not sold. Production will be credited in the year when this material is marketed. On December 8, 1952, a fire destroyed the headframe and hoist at the mine. Mining was resumed December 18 following repairs.

NONMETALS

Cement.—Portland cement was produced by five companies. Shipments in 1953 were 9,111,000 barrels, a 2-percent decrease from 1952. Four of the companies also produced masonry cement and mortar, using portland cement and clinker. The average price per barrel for Iowa portland cement in 1953 was \$2.56 compared with \$2.45 in 1952. Production in 1953 was 9,341,000 barrels, an excess of 230,000 barrels over shipments. Stocks on December 31, 1953, were 1,099,000 barrels.

Clays.—Clays and shale were produced from 26 pits in 16 counties. Two pits produced fire clay. Most of the clay was used by producers for manufacturing building brick, tile, and other heavy clay products. Seven companies sold prepared clay for mortar mix. Production in 1953 was 566,000 tons—an increase of 45,900 tons over 1952. The average value of raw clay was reduced from \$4.49 a ton in 1952 to \$1.10 a ton in 1953.

Gypsum.—Four companies—Celotex Corp., Certain-Teed Products Corp., National Gypsum Co. and United States Gypsum Co.—mined crude gypsum and produced plaster, plasterboard, and other calcined products. Otto Wasem made calcined products from crude material produced by other companies. Production of crude gypsum in 1953 was 1,152,000 tons, an increase of 29,000 tons over 1952. The average value of crude gypsum was \$2.55 a ton in 1953 and \$2.49 in 1952. Calcined gypsum was valued at \$8.16 a ton in 1953 and \$7.46 a ton in 1952. Operations were confined to Webster County.

Lime.—Lime production was reported by Edward H. Groene operating the Hawkeye quarries at Fort Madison and the Linwood Stone Products Co. at Buffalo. Uses were agricultural, building, chemical, and industrial. Production in 1953 was 29 percent greater than in 1952.

Perlite.—Perlite does not occur in Iowa, but crude material produced in Arizona, Colorado, and New Mexico was expanded for plaster and concrete aggregate and other uses at the Midwest Perlite Products Co., Inc., at West Des Moines and the National Gypsum Co. at Fort Dodge.

Sand and Gravel.—Fifty-nine of Iowa's 99 counties reported production of sand and gravel in 1953.

Production by commercial operators increased 10 percent in volume and 7 percent in value over 1952, while noncommercial operations showed a 20-percent decline in volume from the previous year. Table 2 shows output by class of operation and use for 1952 and 1953.

Seventy-six commercial and 32 Government-and-contractor operators reported production in 1953. The 10 largest commercial producers were:

Automatic Gravel Products Co., Davenport.
Coon Valley Gravel Co., Des Moines.
Concrete Materials Co., Waterloo.
Concrete Materials Construction Co., Cedar Rapids.
Dyersville Sand and Gravel Co., Dyersville.
L. G. Everist, Inc., Sioux Falls, S. Dak.
Maudlin Construction Co., Webster City.
Northern Gravel Co., Muscatine.
Peters Construction Co., Des Moines.
Place Bros., Scranton.

TABLE 2.—Sand and gravel sold or used by producers, 1952-53, by classes of operations and uses

	1952			1953		
	Short tons	Value		Short tons	Value	
		Total	Average		Total	Average
COMMERCIAL OPERATIONS						
Sand:						
Building.....	1,562,413	\$1,274,391	\$0.82	1,553,823	\$1,300,260	\$0.84
Engine.....	30,117	38,622	1.28	24,488	33,192	1.36
Paving ¹	812,692	605,829	.75	743,108	555,386	.75
Railroad ballast.....	19,743	9,582	.49	24,601	11,309	.46
Other.....	28,752	32,583	1.13	82,216	62,174	.76
Undistributed ²	126,135	314,877	.....	139,215	362,651	.....
Total commercial sand.....	2,579,852	2,275,884	.88	2,567,451	2,324,972	.91
Gravel:						
Building.....	908,622	1,341,116	1.48	820,812	1,221,910	1.49
Paving ¹	2,168,638	1,363,509	.63	2,840,845	1,749,101	.62
Railroad ballast.....	151,826	84,780	.56	126,974	62,200	.49
Other.....	13,027	59,346	4.56	70,549	135,940	1.93
Total commercial gravel.....	3,242,113	2,848,751	.88	3,859,180	3,169,151	.82
Total commercial sand and gravel.....	5,821,965	5,124,635	.88	6,426,631	5,494,123	.85
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand: Paving¹.....						
	346,021	19,534	.06	464,613	87,273	.19
Total Government-and-contractor sand.....	346,021	19,534	.06	464,613	87,273	.19
Gravel:						
Building.....				91,000	16,000	.18
Paving ¹	4,628,993	888,729	.19	3,403,078	803,431	.24
Total Government-and-contractor gravel.....	4,628,993	888,729	.19	3,494,078	819,431	.23
Total Government-and-contractor sand and gravel.....	4,975,014	908,263	.18	3,958,691	906,704	.23
ALL OPERATIONS						
Sand.....	2,925,873	2,295,418	.78	3,032,064	2,412,245	.80
Gravel.....	7,871,106	3,737,480	.47	7,353,258	3,988,582	.54
Grand total.....	10,796,979	6,032,898	.56	10,385,322	6,400,827	.62

¹ Includes materials used in bridges, culverts, etc.² Includes filter, blast and molding sand.

Stone.—Production of stone in Iowa was limited to limestone. Some dimension limestone was produced, but the major portion was crushed. Crushed stone was used principally in riprap, concrete aggregate and road material, agricultural limestone, and various chemical and industrial applications. Concrete aggregate, road construction, and agricultural limestone consumed the greatest amounts. Production in 1953 was 4,600 tons of dimension stone and 10,710,000 tons of crushed stone. The value in 1953 totaled \$13,215,000 the greatest in Iowa's history. Limestone used for manufacturing cement and lime is reported separately and not assigned a value to avoid duplication in the values of cement and lime produced. The average value of crushed stone was \$1.23 a ton in 1953 and \$1.31 a ton in 1952. In 1953, 47 counties reported production of commercial limestone and 19 counties reported production by county and State governments. Table 3 shows production of limestone, by uses, in 1952-53.

The principal commercial producers in 1953 were: Concrete Materials Construction Co., Cedar Rapids; Missouri Valley Limestone Co., Des Moines; Kaser Construction Co., West Des Moines; E. F.

Schildberg, Greenfield; Linwood Stone Products Co., Buffalo; B. L. Anderson, Cedar Rapids; Iowa Limestone Co., Des Moines; Weaver Construction Co., Iowa Falls; River Products Co., Iowa City; Sargent Bros., Inc., Des Moines; Dubuque Stone Products Co., Dubuque; and Beu & Sons Co., Grundy Center.

TABLE 3.—Limestone sold or used by producers, by uses in Iowa, 1952-53 (exclusive of limestone used in the manufacture of cement and lime)

	1952		1953	
	Short tons	Value	Short tons	Value
Commercial:				
Agricultural.....	1,760,676	\$2,496,307	1,236,676	\$1,574,292
Dimension.....	7,432	32,887	4,561	23,375
Railroad ballast.....	3,500	5,250	8,185	9,822
Riprap.....	121,789	176,654	480,215	621,810
Road metal and concrete aggregate.....	1,677,167	1,864,538	7,636,332	9,263,959
Other (blast furnace flux, filter beds, fertilizer filler, mineral food).....	81,435	440,381	97,791	558,367
Total commercial.....	1,874,619	11,766,017	9,463,760	12,051,625
Noncommercial, all uses (concrete aggregate, road metal and riprap).....	1,152,885	1,270,709	1,251,318	1,163,727
Total commercial and noncommercial.....	1,989,404	13,036,726	10,715,078	13,215,352

Includes small tonnage of crushed rock.

MINERAL FUELS

Coal.—Bituminous coal was produced from mines in 12 Iowa counties. The production of coal from mines yielding over 1,000 tons in 1953 totaled 1,388,000 tons valued at \$5,262,000. The tonnage produced remained about the same in 1952 and 1953. The average value per ton was \$3.84 in 1952 and \$3.79 in 1953. The general trend of coal production in the State has been downward since the peak production year 1917. The longwall method of mining was employed in underground mines in Appanoose, Page, and Wayne Counties. As of January 1, 1953, recoverable reserves, assuming 50-percent recovery, were estimated at 14,232 million short tons.³ All reserves were of bituminous coal.

TABLE 4.—Ten largest producers of coal in Iowa, 1953

Company	Type of operation	County	Number of men	Days	
				Per year	Average month
Pershing Coal Co.....	Strip.....	Marion.....	52	147	12.2
Davis County Coal Co.....	do.....	Davis.....	12	218	18.2
South Iowa Coal Co.....	do.....	do.....	19	177	14.7
Beard Coal Co.....	do.....	Marion.....	11	300	25.0
Jude Coal Co., Inc.....	do.....	do.....	22	316	26.3
Lovilia Coal Co.....	No. 3 underground.....	do.....	43	234	19.5
Weldon Coal Co.....	Strip.....	do.....	13	271	22.6
Angus Coal Co.....	do.....	Mahaska.....	7	293	24.4
Kirkville Coal Co.....	do.....	Marion.....	15	292	24.3
Ver Steeg mine.....	do.....	do.....	4	260	21.7

³ Averitt, Paul, Berryhill, Louise R., and Taylor, Dorothy A., Coal Resources of the United States: Geol. Survey Circ. 293, 1954, p. 5.

TABLE 5.—Production, value, men working daily, days active, man-days, and output per man per day at bituminous-coal mines in Iowa, 1953, by counties (exclusive of mines producing less than 1,000 tons)

County	Production (net tons)				Average value per ton ³
	Shipped by rail or water ¹	Shipped by truck	Used at mine ²	Total	
Appanoose.....	44, 985	74, 716	2, 403	122, 104	\$5. 40
Boone.....	.....	6, 000	.....	6, 000	6. 21
Davis.....	40, 149	109, 764	81	149, 994	3. 28
Jasper.....	.....	2, 500	.....	2, 500	4. 60
Lucas.....	6, 076	8, 233	551	14, 860	5. 35
Mahaska.....	66, 385	65, 104	.....	131, 489	3. 40
Marion.....	496, 587	243, 999	65	740, 651	3. 48
Monroe.....	66, 929	44, 377	52	111, 358	4. 38
Page.....	.....	3, 260	.....	3, 260	8. 14
Van Buren.....	2, 771	28, 237	.....	31, 008	4. 92
Wapello.....	12, 096	54, 832	.....	66, 928	3. 79
Warren.....	.....	7, 854	.....	7, 854	4. 76
Total Iowa.....	735, 978	648, 876	3, 152	1, 388, 006	3. 79

County	Average number of men working daily				Average number of days mines worked	Number of man-days worked	Average tons per man per day ⁴
	Under-ground	Surface		Total			
		In strip pits	All others				
Appanoose.....	245	5	27	277	233	42, 056	2. 90
Boone.....	18	.....	3	21	70	1, 470	4. 08
Davis.....	4	27	14	45	254	11, 445	13. 11
Jasper.....	.....	4	1	5	106	530	4. 72
Lucas.....	22	.....	10	32	102	3, 272	4. 54
Mahaska.....	8	48	15	71	160	11, 355	11. 58
Marion.....	91	119	75	285	225	63, 996	11. 57
Monroe.....	92	.....	17	109	198	21, 620	5. 15
Page.....	11	.....	2	13	115	1, 495	2. 18
Van Buren.....	.....	20	10	30	190	5, 694	5. 45
Wapello.....	24	43	12	79	124	9, 804	6. 83
Warren.....	11	.....	2	13	205	2, 665	2. 95
Total Iowa.....	526	266	188	980	179	175, 402	7. 91

¹ Includes coal loaded at mine directly into railroad cars or river barges, hauled by truck to railroad siding, and hauled by truck to waterway.

² Includes coal used by mine employees, taken by locomotive tenders at tipples, used at mine for power and heat, coal transported to point of use by conveyor or tram, coal made into beehive coke at mine, and all other uses.

³ Value received or charged for coal f. o. b. mine, including selling cost. (Includes a value for coal not sold but used by producer, such as mine fuel and coal coked as estimated by producer at average prices that might have been received if such coal had been sold commercially.)

⁴ In certain counties the average tons per man per day is large due to strip mining or mechanical loading underground.

Peat.—A small quantity of peat was produced in Worth County in 1952 and 1953. Sales of peat humus and peat moss for bulk and packaged shipments were reported. To avoid disclosure of individual company figures, values were concealed in 1953.

REVIEW BY COUNTIES

ADAIR

Limestone was produced in the county by E. F. Schildberg, Greenfield, for use as agricultural limestone and road construction.

ADAMS

Missouri Valley Limestone Co. produced limestone for use as agricultural limestone and in road construction.

ALLAMAKEE

Roverud Construction Co., Spring Grove, Minn., and H. L. Leas, Monona, produced limestone from quarries in the county for use in road construction and as agricultural limestone.

Carlson Materials Co., Inc., Decorah, produced sand and gravel for building and road construction.

APPANOOSE

Iowa Clay Products Co., Centerville, was the only producer of clay. It was used for building brick and tile.

L. & W. Construction Co. and Porter & Magnall Construction Co., both of Centerville, produced limestone for use in road construction and for agricultural purposes.

Coal was produced from 18 underground mines and 1 strip mine. The largest producers were the Sunshine Coal Co. mines No. 3 and 4 and the Old King Coal Co., all of Centerville.

TABLE 6.—Value of mineral production in Iowa, 1952-53, by counties

County	1952	1953	Minerals produced in 1953, in order of value
Adams.....	(1)	\$250, 773	Stone.
Allamakee.....	\$103, 704	137, 895	Stone, sand and gravel.
Appanoose.....	1, 244, 989	1, 023, 632	Coal, stone, clays.
Audubon.....	(1)	49, 250	Sand and gravel, clays.
Benton.....	133, 004	322, 686	Stone, clays.
Black Hawk.....	612, 257	2, 569, 832	Stone, sand and gravel.
Boone.....	120, 714	64, 445	Coal, sand and gravel.
Bremer.....	67, 556	93, 733	Stone, sand and gravel.
Buchanan.....	(1)	192, 031	Stone.
Buena Vista.....	17, 843	28, 181	Sand and gravel.
Butler.....	261, 476	296, 403	Stone, sand and gravel.
Calhoun.....	17, 408	25, 558	Sand and gravel.
Carroll.....	58, 956	57, 131	Do.
Cedar.....	704	121, 887	Stone.
Cerro Gordo.....	11, 715, 706	10, 535, 336	Cement, stone, sand and gravel, clays.
Cherokee.....	110, 700	129, 404	Sand and gravel.
Chickasaw.....	24, 827	(1)	Stone.
Clay.....	(1)	51, 122	Sand and gravel.
Clinton.....	466, 338	439, 247	Stone, sand and gravel.
Dallas.....	92, 875	126, 635	Clays, sand and gravel
Davis.....	328, 379	491, 980	Coal.
Decatur.....	574, 017	249, 092	Stone.
Delaware.....	100, 000	376, 019	Stone, sand and gravel.
Des Moines.....	(1)	285, 964	Do.
Dubuque.....	869, 204	698, 201	Do.
Emmet.....	22, 787	26, 063	Sand and gravel.
Fayette.....	234, 928	208, 839	Stone, sand and gravel.
Floyd.....	607, 561	115, 649	Stone, clays, sand and gravel.
Franklin.....	81, 517	120, 246	Sand and gravel, clays, stone.
Fremont.....	(1)	284, 400	Stone.
Greene.....	249, 785	54, 199	Sand and gravel.
Grundy.....	74, 388	(1)	Sand and gravel, stone.
Hamilton.....	(1)	47, 813	Sand and gravel.
Hancock.....	27, 521	77, 923	Do.
Hardin.....	1, 748, 114	840, 512	Stone, sand and gravel.
Harrison.....	14, 036	1, 003	Sand and gravel.
Henry.....	(1)	112, 620	Stone, clays.
Howard.....	20, 589	29, 181	Sand and gravel, stone.
Humboldt.....	(1)	144, 629	Sand and gravel.
Jasper.....	(1)	11, 500	Coal.
Jefferson.....	20, 047	40, 250	Stone.
Johnson.....	629, 408	577, 723	Stone, sand and gravel.
Jones.....	40, 393	253, 146	Do.
Keokuk.....	733, 154	159, 295	Stone, clays.

See footnotes at end of table.

TABLE 6.—Value of mineral production in Iowa, 1952-53, by counties—Con.

County	1952	1953	Minerals produced in 1953, in order of value
Kossuth.....	77, 385	45, 806	Sand and gravel.
Lee.....	361, 956	231, 766	Stone, lime.
Linn.....	503, 257	491, 578	Stone, sand and gravel.
Louisia.....	438, 458	257, 695	Stone.
Lucas.....	98, 423	79, 501	Coal.
Lyon.....	108, 856	88, 555	Sand and gravel.
Madison.....	275, 518	221, 631	Stone.
Mahaska.....	968, 524	863, 597	Coal, sand and gravel, stone, clays.
Marion.....	3, 070, 803	2, 847, 354	Coal, sand and gravel, stone.
Mitchell.....	285, 815	239, 943	Stone, sand and gravel.
Monona.....	10, 554	9, 526	Sand and gravel.
Monroe.....	613, 220	487, 748	Coal.
Muscatine.....	608, 022	718, 455	Sand and gravel, stone.
O'Brien.....	19, 286	32, 620	Sand and gravel.
Osceola.....	4, 994	16, 722	Do.
Page.....	19, 380	26, 536	Coal.
Pocahontas.....	321, 320	(1)	Stone.
Polk.....	8, 567, 535	8, 875, 141	Cement, sand and gravel, stone, clays
Pottawattamie.....	(1)	457, 150	Stone.
Sac.....	66, 560	51, 702	Sand and gravel.
Scott.....	5, 849, 193	6, 590, 942	Cement, stone, lime, sand and gravel.
Story.....	363, 035	231, 487	Sand and gravel, stone, clays.
Tama.....	252, 863	(1)	Stone, sand and gravel.
Union.....	20, 773	-----	Sand and gravel, stone (1952).
Van Buren.....	424, 267	537, 799	Stone, coal, sand and gravel.
Wapello.....	485, 247	370, 351	Coal, stone, clays, sand and gravel.
Warren.....	43, 602	46, 985	Coal, clays.
Webster.....	3, 222, 425	3, 314, 656	Gypsum, stone, clays, sand and gravel.
Winnebago.....	61, 657	(1)	Sand and gravel.
Winnesiek.....	92, 266	(1)	Stone.
Woodbury.....	230, 953	225, 948	Sand and gravel, clays.
Worth.....	(1)	180, 421	Stone, peat.
Wright.....	54, 078	61, 368	Sand and gravel.
Undistributed ¹	3, 536, 256	2, 659, 952	
Total.....	52, 481, 000	51, 994, 000	

¹ Included in "Undistributed."

² Includes value of mineral production for which the Bureau of Mines is not at liberty to publish as indicated by footnote 1 and for the following counties: In 1952—Adair, Adams, Audubon, Buchanan, Clay, Clayton, Des Moines, Fremont, Hamilton, Henry, Humboldt, Jasper, Marshall, Mills, Montgomery, Palo Alto, Plymouth, Pottawattamie, Sioux, Worth; in 1953—Adair, Chickasaw, Clayton, Crawford, Grundy, Guthrie, Marshall, Montgomery, Palo Alto, Plymouth, Pocahontas, Sioux, Tama, Washington, Winnebago, Winnesiek. No mineral production was reported for the following counties in either 1952 or 1953: Cass, Clarke, Dickinson, Ida, Iowa, Jackson, Poweshiek, Ringgold, Shelby, Taylor, Wayne.

AUDUBON

Roxy Clay Works, Kimballton, produced clay for manufacturing heavy clay products. Road gravel was produced for the county highway department.

BENTON

Garrison Brick & Tile Works, Garrison, produced clay for building brick and tile. Limestone for riprap, road construction, and agricultural limestone was produced by B. L. Anderson, Inc., Cedar Rapids, and Vinton Lime & Rock Co., Vinton.

BLACK HAWK

Limestone for use as agricultural limestone and road construction was produced by: Beu & Sons Co., Grundy Center; Beu Limestone Co., Waterloo; Concrete Materials Construction Co., Cedar Rapids; and Pint Soft Lime Products Co., Raymond. B. L. Larson & Son (Cedar Falls), Jay B. Bagenstos & Son (La Porte City), and Concrete Materials Co., C. W. Shirey Co., and Waterloo Dredging Co. (all of Waterloo), produced sand and gravel for building and road use. Some engine sand was also produced.

BOONE

Dan Leininger, Boone, and the Chicago & Northwestern Railroad Co. produced sand and gravel for building and road purposes. Coal was produced from three underground mines. Operators were the Ogden Superior Coal Co., Ogden, and Jensen Coal mine and Martin & Brown, both of Boone.

BREMER

Limestone was produced by the Schield soft lime quarry, Waverly, and Beu & Sons Co., Grundy Center. The county highway department produced road gravel.

BUCHANAN

Limestone for use as riprap, road construction, and agricultural purposes was produced by Aurora Limestone Co., Aurora, and E. F. Patton, Independence. Crushed limestone was produced for the Buchanan County Highway Department for road construction.

BUENA VISTA

Gravel for road use was produced by and for the county highway department.

BUTLER

Mineral products were limestone and sand and gravel. Limestone producers were: Greene Limestone Co., Greene; Neymeyer Lime Co., Aplington; and Weaver Construction Co., Iowa Falls. Meyer & Muller and Charles Willeke & Sons (Aplington), Greene Limestone Co. (Greene) and Waverly Gravel & Tile Co. (Shell Rock), produced building and road sand and gravel.

CALHOUN

Road gravel was produced by and for the Calhoun County Highway Department.

CARROLL

Mrs. Anna Hacker, Leo H. Korwes, and Lloyd Otto, all of Carroll, and Robert H. Walters, Glidden, produced building and road sand and gravel. Road gravel was also produced for the Carroll County Highway Department.

CEDAR

Limestone was produced by the Cedar County Highway Department; B. L. Anderson, Cedar Rapids; C. B. DeWees quarries, Stone City; and Weaver Construction Co., Iowa Falls.

CERRO GORDO

Cerro Gordo County produces cement, clays, sand and gravel, and limestone. The county had 2 cement plants, 1 operated by Lehigh Portland Cement Co. and the other by Northwestern States Portland Cement Co., both at Mason City. Material used in cement manufacture is not included in the total value of mineral production for

the State. Clay or shale, limestone, and some gypsum, iron ore, and other materials were used in manufacturing cement and masonry mixes. Northwestern States Portland Cement Co. installed a new kiln.

Heavy clay products were produced by the Mason City Brick & Tile Co. for use as building brick and tile, drain tile, and mortar mix.

Limestone was produced in the county by the Ideal Sand & Gravel Co., Inc., and Grupp Bros. Lime Products, Mason City; Frank H. Norberg Co., Denver, Colo.; and the Rieken Limestone Co., Ackley.

Clear Lake Sand & Gravel Co., Clear Lake, and Ideal Sand & Gravel Co., Mason City, produced sand and gravel for building and road use and for railroad ballast. Road gravel was produced for the county highway department.

CHEROKEE

Shea Sand & Gravel Co., Cherokee, and Hultman & Son, Meriden, produced molding sand and building and paving sand and gravel. Road gravel was produced for the Cherokee County Highway Department.

CHICKASAW

Beu & Sons Co., Grundy Center, produced limestone for agricultural use and road construction.

CLAY

Stolley Construction Co., Inc., and Stolley Sand & Gravel Co., Spencer, produced blast sand and sand and gravel for building and road use.

CLAYTON

Various limestone quarries were operated in the county by H. L. Leas, Monona. Concrete Materials Co., Waterloo, produced molding sand.

CLINTON

Limestone, chiefly for road use, was produced by Concrete Materials Construction Co. (Cedar Rapids), Nicholas & Schrader (Charlotte), and the Clinton County Highway Department. Fred R. McKenzie & Co., Galesburg, Ill., produced engine sand and building sand and gravel. The Clinton County Highway Department produced sand and gravel for road purposes.

CRAWFORD

James Ballantine, Arion, produced road gravel.

DALLAS

Clay for use in manufacturing heavy clay products was produced by Adel Clay Products Co., Des Moines; Redfield Brick & Tile Co., Redfield; and United Brick & Tile Co., Kansas City, Mo. Road gravel was produced for the Dallas County Highway Department.

DAVIS

Coal was produced from 3 strip mines and 1 underground mine. The Davis County Coal Co., Ottumwa, and the South Iowa Coal

Co., Bloomfield, are among the 10 largest producers in the State. Both are strip mines.

DECATUR

Sargent Bros., Inc., Des Moines, and Grand River Limestone Co. produced limestone for agricultural use and road purposes.

DELAWARE

The companies producing limestone in Delaware County include Beu & Sons Co., Grundy Center; Weber Dehn, Manchester; and the Delaware County Highway Department. Production was chiefly for road use and agricultural limestone. Dyersville Sand & Gravel Co., Dyersville, produced building and paving sand and gravel.

DES MOINES

J. T. Leonhard Construction Co., Columbus Junction, and Raid Bros. Construction Co., Denmark, produced limestone for riprap, road purposes, and agricultural limestone. Spring Grove Sand & Gravel Co., Burlington, produced building and paving sand.

DUBUQUE

Limestone for riprap, road construction, ballast for railroads, and agricultural use was produced in the county during the year. Producers include Dubuque Stone Products Co., Dubuque; Dyersville Sand & Gravel Co., Dyersville; V. E. Dzaboff, Cascade; and Dubuque County Highway Department.

Dubuque Sand & Gravel Co. and Molo Sand & Gravel Co., Dubuque, produced building and paving sand and gravel.

EMMET

Chicago, Rock Island & Pacific R. R. Co. and the Minneapolis & St. Louis Railway Co. produced sand and gravel for railroad ballast. Sand and gravel for road use was produced by and for the Emmet County Highway Department.

FAYETTE

Limestone was produced by the Fayette Stone Co. and Fayette County Highway Department for use as agricultural limestone and road construction. Oelwein Sand & Gravel Co., Oelwein, and Reisner Sand & Gravel Co., Sumner, produced building and paving sand and gravel.

FLOYD

Clays for use in manufacturing heavy clay products were produced by Rockford Brick & Tile Co., Rockford; Greene Limestone Co., Greene; and Heckman Reynolds, Inc., Floyd. Ed Becker of Charles City produced filter sand.

FRANKLIN

Sheffield Brick & Tile Co., Sheffield, produced heavy clay products. Louis C. Toft, Dows, produced building and paving sand and gravel. Road gravel was produced for the Franklin County Highway Department.

R. H. Phillips, Hampton, and Rieken Limestone Co., of Ackley, produced limestone for agricultural and road uses.

FREMONT

Fred Wenke and Jack Stanley, Thurman, produced limestone for road purposes, riprap, and agricultural use.

GREENE

Pound Construction Co., Scranton, and the Minneapolis & St. Louis Railway Co. produced gravel for road use and railroad ballast.

GRUNDY

Limestone was produced in this county by Beu & Sons Co., Grundy Center, for use in road construction. This company and Ben Ankes, Wellsburg, also produced building sand and road gravel.

GUTHRIE

Road gravel was produced by K. H. Buttler, Guthrie Center, and by and for the county highway department.

HAMILTON

Road gravel was produced for the Hamilton County Highway Department.

HANCOCK

Road gravel was produced by and for the Hancock County Highway Department.

HARDIN

Beu & Sons Co., Grundy Center, and Rieken Limestone Co., Ackley, produced limestone, chiefly for road construction and agricultural use. Limestone was produced for stock feed, road use, rubble, and agricultural use by Iowa Limestone Co., Des Moines, and Weaver Construction Co., Iowa Falls. Clary Concrete Materials Co., Eldora, and Iowa Falls Sand & Gravel Co., Iowa Falls, produced building and paving sand and gravel.

HARRISON

Road gravel was produced for the Harrison County Highway Department.

HENRY

Winfield Brick & Tile Co., Winfield, produced clay for heavy clay products.

Concrete Materials Construction Co., of Cedar Rapids, and the Henry County Highway Department produced crushed limestone, chiefly for use in road construction.

HOWARD

Howard County Highway Department produced limestone, and sand and gravel. Ed Kubik, Elma, produced road gravel.

HUMBOLDT

Concrete Products Co. and Iowa Sand & Gravel Co., both of Humboldt, produced building and paving sand and gravel. Road gravel was also produced for the Humboldt County Highway Department.

JASPER

Coal was produced from a strip mine by the Hopkins Coal Co., Colfax.

JEFFERSON

The Jefferson County Highway Department produced limestone, chiefly for riprap and road purposes.

JOHNSON

Limestone for use in road construction and as agricultural limestone was produced by B. L. Anderson, and Concrete Materials Construction Co., Cedar Rapids, and River Products Co., Iowa City. Central Sand & Gravel Co., Iowa City, produced building and paving sand and road gravel.

JONES

Limestone, chiefly for use as rubble or riprap, was produced by the Jones County Highway Department. B. L. Anderson, Cedar Rapids, and Weaver Construction Co., Iowa Falls, produced limestone for road construction. C. B. DeWeese Quarries, Stone City, produced limestone for flagging, riprap, and road and agricultural uses. Reichart Sand & Gravel Co., Monticello, produced building and paving sand and building gravel. Road gravel was produced for the county highway department.

KEOKUK

John Nelson & Sons and What Cheer Clay Products Co., both of What Cheer, used clay in manufacturing heavy clay products. Limestone was produced for agricultural use and road construction by Kaser Construction Co., West Des Moines.

KOSSUTH

Road sand and gravel was produced by and for the Kossuth County Highway Department.

LEE

Raid Bros. Construction Co., Denmark, and the Lee County Highway Department reported production of limestone for riprap and road construction. Lime production was reported by Edward H. Groene, who operated the Hawkeye Quarries at Fort Madison.

LINN

Producers of limestone for use on roads or for agricultural purposes were: L. Crawford Lime-Quarry Co., Cedar Rapids, and Linn County Highway Department.

Concrete Materials Construction Co. and Kings Crown Plaster Co., Cedar Rapids, produced building and paving sand and paving gravel. Some engine sand was also produced.

LOUISA

Limestone production in Louisa County was reported by: Dillon Stone Co., Columbus Junction; Louisa County Lime Products Co., Wapello; and the Louisa County Highway Department. The limestone produced was chiefly for riprap, road construction, and agricultural use.

LUCAS

Coal was produced from underground mines by the R. F. Ellis Coal Co. and the Powell Coal Co., both of Chariton, and the Ritchey Coal Co., Melrose.

LYON

Road gravel was produced by, and road sand for, the Lyon County Highway Department.

MADISON

Madison County reported the production of limestone for road metal and agricultural use by Sargent Bros., Inc., Des Moines, and the Madison County Highway Department.

MAHASKA

Clay, chiefly for heavy clay products, was produced by Oskaloosa Clay Products Co., Oskaloosa. Mahaska County Highway Department produced crushed limestone for road purposes. Concrete Materials Co., Waterloo, produced sand and gravel for building, paving, and railroad ballast.

Coal was produced from 10 mines—2 underground and 8 strip. The strip mine of the Angus Coal Co., Oskaloosa, was one of the leading producers in the State.

MARION

Limestone was produced chiefly for concrete or road material by Hess & Lynch Rock Materials Co., Knoxville, and Kibbey Limestone Co., Carlisle. Pella Construction Co., Pella, and E. Groenendyk Sand & Gravel, Tracy, produced building sand and gravel.

Marion County continued to be the largest coal producer in Iowa. In 1953, 15 strip mines and 10 underground mines were operating. The Pershing Coal Co. and the Ver Steeg mine (both of Knoxville), Weldon Coal Co. and Kirksville Coal Co. (Harvey), and Jude Coal Co. Inc., and Lovilia Coal Co., mine number 3 (Bussey) were among the largest producers in the State.

MARSHALL

Concrete Materials & Construction Co., Cedar Rapids, and Empire Sand & Material Co., Marshalltown, produced sand and gravel for building and road use and railroad ballast.

MITCHELL

L. R. Falk, St. Ansgar, and Grupp Bros. Lime Products, Mason City, reported production of limestone for road purposes and agricultural use. Lawrence H. Decklever (Osage), Irwin C. Wheeler (Riceville), and L. R. Falk (St. Ansgar) produced sand and gravel for building and road use.

MONONA

Road gravel was produced for the Monona County Highway Department.

MONROE

Coal was produced from nine underground mines. Lovilia coal mine No. 2, the O'Brien Coal Co., Acme Coal Co., and the Karpan Coal Co. were the leading producers.

MONTGOMERY

The Kaser Construction Co., West Des Moines, and the Missouri Valley Limestone Co., Des Moines, produced limestone for road and agricultural uses.

MUSCATINE

Limestone was produced in the county for riprap and road uses by the Muscatine County Highway Department. Automatic Gravel Products Co., Davenport, and Hahn Bros. Sand & Gravel Co. and Northern Gravel Co., Muscatine, produced blast, engine, filter, and building and paving sand and gravel.

O'BRIEN

Road sand and gravel was produced by and for the O'Brien County Highway Department.

OSCEOLA

Road sand was produced for the Osceola County Highway Department.

PAGE

McKinley Coal Co., Villisca, produced coal from an underground mine.

PALO ALTO

Bauk Construction Co., Emmetsburg, and the Palo Alto County Highway Department produced road gravel.

PLYMOUTH

Wiltgen Ready Mix Concrete, Le Mars, produced building and paving sand and gravel. The Plymouth County Highway Department produced gravel for road use.

POCAHONTAS

Midwest Limestone Co., Gilmore City, reported production of limestone for use as riprap, road material, and agricultural limestone.

POLK

Cement, clays, limestone, and sand and gravel were produced in the county. Producers of cement, for masonry and portland cement, were: Hawkeye Portland Cement Co. of Iowa, Des Moines; and Penn-Dixie Cement Corp., West Des Moines. The Goodwin Brick & Tile Co., Iowa Pipe & Tile Co., United Brick & Tile Co., and Des Moines Clay Co., all of Des Moines, produced clay, chiefly for manufacturing heavy clay products, brick, vitreous clay pipe, and tile. Midwest Perlite Products Co., Inc., West Des Moines, expanded perlite for plaster and

concrete aggregate. Limestone was produced in the county for use as riprap by Gendler Stone Products Co., Des Moines. Coon Valley Gravel Co. and Peters Construction Co. (both of Des Moines), I. J. Bishop (Runnels), J. W. Lehman (Sheldahl), Concrete Materials Co. (Waterloo), and West Des Moines Sand Co. (West Des Moines), produced sand and gravel. Production was chiefly for building and road purposes.

POTTAWATTAMIE

Limestone was produced in Pottawattamie County by Missouri Valley Limestone Co., Des Moines, for road purposes and agricultural limestone.

SAC

Road gravel was produced for the Sac County Highway Department.

SCOTT

Dewey Portland Cement Co., operated a cement plant at Davenport. Production was chiefly portland and masonry cements. Limestone was produced in the county by Dewey Portland Cement Co., Davenport; LeClaire Quarries, Inc., LeClaire; Linwood Stone Products Co., Buffalo; Rollie Schneckloth, McCausland; and Scott County Highway Department. The limestone was produced for use in road construction, riprap, and flux, and for agricultural purposes. Builders Sand & Gravel Co., Davenport, produced building sand. Hydrated and quick lime for building, chemical, and industrial uses was produced by Linwood Stone Products Co.

SIOUX

Rock Valley Cement Block & Tile Co. (Rock Valley); L. G. Everist, Inc. (Sioux Falls, S. Dak.); produced sand and gravel for building, paving, railroad ballast, and engine sand.

STORY

Heavy clay products were produced by Nevada Brick & Tile Co. Ray Cook, Ames, produced limestone for road and agricultural uses and road gravel for the Story County Highway Department.

TAMA

Limestone was produced for agricultural and road purposes by Joseph Wenke, Toledo. Flint Crushed Gravel Co., Des Moines, produced building and paving sand and gravel.

VAN BUREN

Producers of limestone in Van Buren County were: B. L. Anderson, Cedar Rapids; Douds Stone, Inc., Douds; Kaser Construction Co., West Des Moines; Valley Limestone & Gravel, Inc., Farmington; Weaver Construction Co., Iowa Falls; Concrete Materials Construction Co., Cedar Rapids; and the Van Buren County Highway Department. Production was chiefly for roads, riprap, and agricultural purposes. Valley Limestone & Gravel, Inc., Farmington, produced

building and paving sand. The Douds Stone, Inc., quarry is underground.

Coal was produced from 4 mines—3 strip and 1 underground. Leading producers were the Hamlin Bros. Coal Co., Bonaparte; Ladtsdale Coal Co., Eldon; and the New Globe Coal Co. of Ottumwa.

WAPELLO

Clay for use in manufacturing building brick and tile was produced by Ottumwa Brick & Tile Co., Ottumwa. Wapello Stone Quarries reported production of limestone for road use and agricultural limestone. The City of Ottumwa produced road gravel.

Coal was produced from 6 strip mines and 1 underground mine. The Lanning Coal Co., Kirkville, and the Star Coal Co., Pella, were the leading producers.

WARREN

Clay, chiefly for manufacture of brick and vitreous clay pipe and tile, was produced in the county by Carlisle Brick & Tile Co., Carlisle. The S & R Coal Co., Carlisle, produced from an underground mine.

WASHINGTON

Limestone for road construction and agricultural use was produced by Kaser Construction Co., West Des Moines.

WEBSTER

Four companies produced clay in Webster County—the Johnston Clay Works, Inc., Kalo Brick & Tile Co., Lehigh Sewer Pipe & Tile Co., and Vincent Clay Products Co., all of Fort Dodge. This clay was used chiefly in producing brick and vitreous clay pipe and tile.

Four companies—Celotex Corp., Certain-Teed Products Corp., National Gypsum Co., and the United States Gypsum Co.—mined crude gypsum and produced plaster, plasterboard, and other calcined products. Otto Wasem manufactured calcined products from crude material produced by other companies. National Gypsum Co. operated a perlite-expansion plant for the manufacture of lightweight plaster mixes. United States Gypsum Co. also operated a perlite-expansion plant.

Fort Dodge Limestone Co., Fort Dodge, was the chief producer of limestone. It is an underground operation.

Kenneth Carlson (Dayton), Fort Dodge Sand & Gravel Co. (Fort Dodge), Casey Estate (Lehigh), and the Webster County Highway Department produced sand and gravel for construction use and as railroad ballast.

WINNEBAGO

Road gravel was produced by Francis Berhow, Buffalo Center, and by and for the Winnebago County Highway Department.

WINNESHIEK

Bruening Rock Products, Inc., Decorah, produced limestone for agricultural use.

WOODBURY

Clay was produced in the county by Sioux City Brick & Tile Co., Sioux City; and Ballou Brick Co., Sergeant Bluff. Most of the clay was used in heavy clay products. Concrete Materials Co., Waterloo, produced sand and gravel for building use and road construction and as railroad ballast.

WORTH

Limestone Products Co., produced limestone and crushed rock for agricultural and road use.

The Colby Pioneer Peat Co. and the Eli-Colby Co., both of Hanlontown, produced peat.

WRIGHT

Oscar Nelson, Belmond, produced building sand and gravel and gravel for roads. Road gravel was also produced by the Wright County Highway Department.

The Mineral Industry of Kansas

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the State Geological Survey of Kansas.

By F. F. Netzeband¹ and Walter H. Schoewe²



KANSAS has ranked among the first 10 States in mineral production in the United States, with few exceptions, each year since 1918. In 1953 it was ninth. The value of mineral production in Kansas in 1953 totaled \$413.2 million (table 1)—2 percent more than the 1952 mineral value. The State produced 21 minerals in 1953.

Coal, lead, and zinc were mined in southeast Kansas, and other mineral products were distributed over much of the State. Oil and gas continued to be the most important minerals in value. Oil was produced in 1,202 fields in 66 counties and gas from 79 fields in 52 counties in 1953. Most of the gas came from the Hugoton field in the southwestern part of the State; this important field comprises areas in Finney, Grant, Hamilton, Haskell, Kearny, Morton, Seward, Stanton, and Stevens Counties. There were 165 oil- and 22 gas-pool discoveries, and 3 previously abandoned oil or gas pools were revived in 1953. Development of the Greenwood gas field in Morton County and discovery of the Norton pool in Norton County highlighted the year's exploration.³ Oil, gas, and related hydrocarbon commodities produced in 1953 comprised approximately 86 percent of the State's total mineral output.

The Defense Minerals Exploration Administration (DMEA) had no contracts in Kansas in 1953.

TRENDS AND DEVELOPMENTS⁴

Most new developments in the mineral industries of Kansas centered around the oil and gas business.

The Kanotex Refining Co. and Crude Transit Co. of Arkansas City sold out to the Anderson-Prichard Oil Corp. of Oklahoma City, Okla. Kanotex and Crude Transit had just completed large expansion and improvement programs by constructing a \$2 million catalytic cracking plant at Arkansas City. As a result, the daily crude refining capacity was increased from 9,500 to 13,000 barrels. In February Cities Service Oil Co. started a 4-million-gallon LP-gas underground storage terminal in a salt formation underlying its property 1 mile west of Hutchinson. The Skelly Oil Co. began the first phase of establishing a large underground storage reservoir in the salt formation for LP-gases on its

¹ Commodity-industry analyst, Region VI, Bureau of Mines, Amarillo, Tex.

² Geologist, State Geological Survey of Kansas.

³ Ver Wiebe, W. A., Goebel, E. D., Hornbaker, A. L., and Jewett, J. M., 1954, Oil and Gas developments in Kansas during 1953: State Geological Survey of Kansas, Bulletin 103, August 1954, 204 pp.

⁴ Kansas Business, 1953, 64 pp.

TABLE 1.—Mineral production in Kansas, 1952-53¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement ².....376-pound barrels.....	8, 811, 762	\$20, 956, 886	8, 546, 250	\$21, 428, 536
Clays.....short tons.....	665, 582	789, 293	670, 694	749, 579
Coal.....do.....	2, 028, 601	7, 902, 590	1, 715, 004	7, 101, 386
Helium.....cubic feet.....	38, 509, 000	491, 000	42, 782, 800	563, 923
Lead (recoverable content of ores, etc)				
.....short tons.....	5, 916	1, 904, 952	3, 347	876, 914
Natural gas.....million cubic feet.....	412, 544	34, 241, 000	420, 607	36, 172, 000
Natural-gas liquids:				
Natural gasoline.....thousand gallons.....	115, 206	7, 286, 000	(³)	(³)
LP-gases.....do.....	77, 406	3, 116, 000	(³)	(³)
Petroleum (crude).....thousand 42-gallon barrels.....	114, 807	293, 910, 000	* 114, 566	* 308, 180, 000
Salt (common).....short tons.....	911, 744	6, 850, 027	905, 227	7, 480, 556
Sand and gravel.....do.....	8, 380, 065	5, 023, 593	8, 728, 291	5, 668, 308
Stone (except limestone for cement).....do.....	8, 830, 871	12, 051, 740	8, 769, 152	11, 303, 950
Zinc (recoverable content of ores, etc) ⁴.....do.....	25, 482	8, 460, 024	15, 515	3, 568, 459
Undistributed: Natural cement, gypsum, pumice, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3). Excludes value of clays used for cement.....		* 386, 847		10, 137, 870
Total.....		403, 370, 000		413, 231, 000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers)

² Excludes natural cement, value for which is included with "Undistributed."

³ Value included with "Undistributed."

⁴ Final figure. Supersedes preliminary figure given in commodity chapter.

⁵ Revised figure.

48-acre tract 1 mile west of Conway in the western part of McPherson County.

Numerous pipeline projects were completed during the year. The Sinclair Pipeline Co. constructed a 670-mile 22- to 24-inch crude-oil pipeline from Cushing, Okla., to East Chicago, Ind. This pipeline was laid in the eastern part of Kansas, with modern electrical pump stations at Caney in Montgomery County and Humboldt in Allen County. Another pipeline in northeastern Kansas was constructed by the Platte Pipe Line Co.; this was a 20-inch line that extended from Wyoming to Illinois, a distance of 1,149 miles. This line had a daily crude-oil capacity of 150,000 barrels. Construction of a \$10 million products pipeline for the Augusta Pipe Line Co. and the Kanab Pipe Line Co. was begun in October. This pipeline was extended from Arkansas City and Wichita, Kansas, to Fairmont, Nebr. During the same month the Panhandle Eastern Pipe Line Co. extended its gathering line to include the new deep gas wells developed east of Liberal in Seward County. Completion of the Colorado Interstate Gas Co. big gathering plant northwest of Elkhart, Morton County, was expected by December. This plant was constructed to gather, cool, and clean the gas from the expanding Greenwood field. A 20-inch gathering line and a 20-inch, 900-pound, high-pressure line to connect with a north-south line near Campo, Colo. was contemplated.

The Standard Oil Co. of Indiana refinery at Neodesha, Wilson County, operated its new modern units, construction of which was begun in 1951. The new facilities consisted of a 9,000 barrel-per-stream-day fluid catalytic cracking unit with its own vapor-recovery unit, and a 1,000-barrel-per-stream-day sulfuric acid alkylation unit. Several other refineries completed expansion projects. The El Dorado Refining Co. at El Dorado, Butler County, started its new catalytic

cracking facilities, gas-concentration facilities, and a revamped and extended polymerization plant in January. The refinery processed 12,000 barrels of crude oil per day. The new expansion program also necessitated construction of 400,000 barrels of storage tankage, a water-treatment plant for processing raw water, a complete new electrical-supply system (including distribution lines and transformers), new pipelines, a new 4-mile crude supply line and 3 miles of 8-inch water-supply line. The Derby Oil Refining Co. was making jet fuel at its Wichita refinery and planning additional facilities for higher octane gasoline. The Cities Service Gas Co. completed considerable construction during 1953, which included a new compressor station at Hesston, Sedgwick County; an addition to the Greensburg compressor station at Greensburg, Kiowa County; completion of the Colony storage field in Anderson County; and the gathering system in the Hugoton gas field in western Kansas.

The Eagle-Picher Co. erected a large zinc roaster and sulfuric acid plant at Galena in Cherokee County.

Custom Mills and Smelters.—Four mine mills were operating in 1953—the No. 8 Ballard of National Lead Co., the Brewster of W. M. & W. Mining Co., the Blue Mound of Dines Mining Co., and the Wade Rea of Rea Lead & Zinc Co. Eagle-Picher Co. operated the only lead smelter in Kansas at Galena, Cherokee County, which treated ores from the Tri-State district and Illinois. Two pigment plants were also active in Kansas in 1953—the Coffeyville plant of the Ozark Smelting & Mining Co. and the Cherryvale plant of the National Zinc Co., Inc.

EMPLOYMENT IN THE MINERAL INDUSTRIES

Employment.—Total employment in the Kansas mineral-fuels industries in 1953 approximated that in 1952. The coal industry employed over 650 men who worked an average of 121 days during the year. Approximately 10,500 persons were employed in the oil and gas industries in 1953—4 percent in exploration, 14 percent in drilling, 29 percent in production, 24 percent in pipeline operation, 11 percent in refining, and 18 percent in miscellaneous. Employment in the metallic and nonmetallic industries in 1953 totaled more than 3,300, of which 86 percent were in the nonmetallic and 14 percent in the metallic industries.

Accidents.—For the fourth successive year, no fatal accidents occurred in the coal industry of Kansas. However, the oil and gas industry reported 2 fatal accidents for 1953, 1 in pipeline construction and 1 in drilling.

Wages.—The wages for mineral fuels and nonmetallic workers increased in 1953 following a similar trend in business on a national basis. The wages of metal miners dropped slightly during the year.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal.—The 1953 output of coal in Kansas totaled 1,715,000 tons valued at \$7,101,000, a decrease of 15 percent in production and 10 percent in value. Seven counties produced coal, with Crawford County as the leader, followed by Cherokee, Osage, and Bourbon;

strip mines produced 98 percent of the total output, with underground operations the remaining 2 percent. The industry worked an average of 169 days during the year, with an average daily output of 10,148 tons.

TABLE 2.—Coal production, 1944–48 (average) and 1949–53

Year	Number of mines			Short tons	Value	
	Under-ground	Strip	Total		Total	Average per ton
1944–48 (average).....	58	33	91	2,874,721	\$8,549,111	\$2.97
1949.....	54	32	86	2,031,117	7,968,140	3.82
1950.....	48	32	80	2,124,980	8,233,527	3.87
1951.....	22	46	68	1,961,101	7,734,478	3.94
1952.....	15	32	47	2,028,601	7,902,590	3.90
1953.....	28	21	49	1,715,004	7,101,386	4.14

Natural Gas.—Kansas produced the fifth largest volume of natural gas in the Nation in 1953, with a total of 420,607 million cubic feet valued at approximately \$36 million. In addition to this marketed volume, 1,197 million cubic feet was used for repressuring, and 48,559 million cubic feet was vented. This production originated in 45 counties, with the famous Hugoton field contributing the major part of the State output. The 5 leading natural-gas-producing counties, in the order of their production, were: Stevens, Grant, Kearny, Haskell, and Finney. In all, 380 gas-producing wells were drilled in Kansas in 1953—64 more than in 1952. Estimated proved recoverable reserves of natural gas in Kansas were reported at 15,788 billion cubic feet in 1953 by the Committee on Natural Gas Reserves of the American Gas Association.

TABLE 3.—Marketed production of natural gas, 1944–48 (average) and 1949–53

Year	Million cubic feet	Value	Year	Million cubic feet	Value
1944–48 (average).....	184,785	\$9,369,000	1951.....	417,538	\$33,821,000
1949.....	294,078	15,910,000	1952.....	412,544	34,241,000
1950.....	364,024	24,026,000	1953.....	420,607	36,172,000

Natural-Gas Liquids.—Kansas produced the sixth largest volume of natural-gas liquids in the Nation in 1953, as output increased 8 percent over 1952. LP-gases composed 40 percent of the total production and 29 percent of the value, while natural gasoline and cycle products were responsible for 60 percent of the volume and 71 percent of the value. Proved recoverable reserves of natural-gas liquids were estimated at 177,728,000 barrels, up 6 percent over 1952 estimates.⁵

Petroleum.—Kansas produced 114,566,000 barrels of crude oil valued at \$308,180,000, a slight decrease in quantity but a 5-percent increase in value over 1952. Sixty-six counties produced oil; the 5 leading producers were Barton, Russell, Ellis, Butler, and Rice. The 35,420 producing wells ranked Kansas as producer of the Nation's fifth largest output of crude oil. The average daily output per well was 9.1 barrels per day in 1953, a slight decrease from the 9.5

⁵ American Gas Association, Gas Facts, 1953, 276 pp.

average of 1952. The average price per barrel increased to \$2.69 in 1953 from the 1952 average of \$2.56, reflecting the general increase of about \$0.25 per barrel in June. Proved recoverable reserves of crude oil in Kansas were estimated at 913 million barrels in 1953, according to the API Committee on Petroleum Reserves.

TABLE 4.—Natural-gas liquids produced, 1944-48 (average) and 1949-53, in 42-gallon barrels

Year	Natural gasoline		LP-gases		Total	
	Barrels	Value	Barrels	Value	Barrels	Value
1944-48 (average).....	1,548,000	\$3,626,000	508,000	\$813,000	2,056,000	\$4,439,000
1949.....	1,880,000	4,772,000	768,000	1,164,000	2,648,000	5,936,000
1950.....	2,572,000	6,146,000	1,115,000	1,487,000	3,687,000	7,633,000
1951.....	2,645,000	6,931,000	1,621,000	2,445,000	4,266,000	9,376,000
1952.....	2,743,000	7,286,000	1,843,000	3,116,000	4,586,000	10,402,000
1953.....	(1)	(1)	(1)	(1)	4,936,000	9,750,000

¹ Figure withheld to avoid disclosure of individual company operations.

Kansas refineries received 87,954,000 barrels of crude oil in 1953; 65,762,000 barrels was Kansas production, 9,068,000 came from Oklahoma and 11,847,000 from Texas.⁶ Pipelines transported 98 percent of all crude oil shipped to Kansas in 1953. Of the 4,783 wells drilled in 1953, 2,209 were for oil, and 2,126 were dry; 1,040 were wildcats, and 161 were productive of either oil or gas or both.⁷ Of the 14 refineries in Kansas, 13 were operating as of December 31, 1953, with a daily crude-oil capacity of 262,200 barrels. There was also 90,071 barrels capacity in cracking plants, 83,491 barrels capacity of which was operating. Additional construction will add 2,500 barrels to this daily capacity.

TABLE 5.—Production of petroleum (crude), 1944-48 (average) and 1949-53, in 42-gallon barrels

Year	Barrels	Value		Year	Barrels	Value	
		Total	Average per barrel			Total	Average per barrel
1944-48 (average).....	101,687,000	\$173,824,000	\$1.71	1951.....	114,522,000	294,320,000	\$2.57
1949.....	101,868,000	262,820,000	2.59	1952.....	114,807,000	293,910,000	2.56
1950.....	107,586,000	276,500,000	2.57	1953.....	114,566,000	308,180,000	2.69

TABLE 6.—Production of petroleum (crude) by months, 1953, in 42-gallon barrels

Month	Barrels	Month	Barrels	Month	Barrels
January.....	10,377,000	June.....	9,695,000	October.....	6,575,000
February.....	9,421,000	July.....	10,238,000	November.....	9,047,000
March.....	10,378,000	August.....	10,137,000	December.....	9,326,000
April.....	9,813,000	September.....	9,717,000	Total.....	114,566,000
May.....	9,842,000				

⁶ American Petroleum Institute, Facts and Figures, 11th edition, 322 pp.

⁷ American Gas Association, Gas Facts, 1953, 276 pp.

TABLE 7.—Production of crude petroleum 1949–53, by fields, in thousand barrels

[Oil and Gas Journal]

Field	1949	1950	1951	1952	1953
Bemis-Shutts.....	4,560	4,681	4,287	3,741	3,526
Bloomer.....	2,492	2,716	2,782	2,344	2,067
Burnett.....	3,497	2,747	3,044	2,709	2,824
Burton-Haury.....	1,211	1,127	1,026	909	781
Chase.....	3,253	3,078	2,786	17,152	16,007
El Dorado.....	3,084	3,019	3,202	3,454	3,939
Fairport.....	908	1,243	1,135	879	834
Geneseo-Edwards.....	2,803	2,960	3,001	3,304	3,061
Gorham.....	1,445	1,406	2,452	1,990	1,793
Hall-Gurney.....	3,433	3,159	3,637	3,954	4,640
Kraft-Prusa.....	5,463	5,870	6,326	5,449	4,721
Morel.....	1,399	1,337	2,301	2,092	1,798
Ray.....	1,246	1,484	1,822	1,624	1,393
Silica-Raymond.....	4,597	5,147	4,950	(¹)	(¹)
Stoltenberg.....	2,098	1,962	1,760	1,471	1,270
Trapp.....	8,905	8,645	7,686	6,469	6,081
Other fields.....	49,733	56,639	61,921	67,304	69,831
Total.....	100,132	107,220	114,118	114,845	114,566

¹ Silica included with Chase.

TABLE 8.—Indicated demand for petroleum, by months, 1953, in 42-gallon barrels

Month	Barrels	Month	Barrels	Month	Barrels
January.....	9,813,000	June.....	10,612,000	October.....	8,359,000
February.....	8,656,000	July.....	10,640,000	November.....	9,263,000
March.....	10,388,000	August.....	9,921,000	December.....	9,224,000
April.....	9,686,000	September.....	9,024,000	Total.....	115,358,000
May.....	9,772,000				

TABLE 9.—Sales of petroleum products, 1949–53, in thousand barrels

Product	1949	1950	1951	1952	1953
Gasoline.....	16,746	17,463	18,723	19,798	21,004
Kerosine.....	910	1,030	1,344	1,290	1,100
Range oil.....	496	592	906	916	880
Distillate fuel oil.....	3,185	4,527	5,552	5,695	5,938
Residual fuel oil.....	8,174	5,835	7,068	6,062	5,247

TABLE 10.—Capacity of petroleum refineries and cracking plants in 1953 (barrels per day)

Company	Location	Crude-oil capacity			Cracked-gasoline capacity		
		Operating	Shut down	Building	Operating	Shut down	Building
Anderson-Pritchard Oil Corp.....	Arkansas City.....	13,000	2,000	-----	2,550	3,950	-----
The Chanute Refining Co.....	Chanute.....	-----	1,500	-----	-----	530	-----
Cooperative Refinery Assn.....	Coffeyville.....	24,500	-----	-----	5,200	-----	-----
Do.....	Phillipsburg.....	8,000	-----	-----	1,900	-----	-----
Derby Oil Co.....	Wichita.....	16,000	-----	-----	4,661	-----	-----
El Dorado Refining Co.....	El Dorado.....	11,500	-----	-----	4,500	2,100	-----
M. F. A. Oil Co.....	Chanute.....	2,000	-----	-----	400	-----	-----
National Cooperative Refinery Assn.....	McPherson.....	24,000	-----	-----	7,000	-----	-----
Phillips Petroleum Co.....	Kansas City.....	55,000	-----	-----	15,000	-----	-----
Shallow Water Refining Co.....	Shallow Water.....	4,000	-----	-----	1,250	-----	-----
Skelly Oil Co.....	El Dorado.....	45,000	-----	-----	19,000	-----	-----
Sacony-Vacuum Oil Co., Inc.....	Augusta.....	27,500	-----	-----	9,030	-----	2,500
Standard Oil Co., (Ind.).....	Neodesha.....	19,700	-----	-----	7,000	-----	-----
Vickers Petroleum Co., Inc.....	Potwin.....	12,000	-----	-----	6,000	-----	-----
		262,200	3,500	-----	83,491	6,580	2,500

TABLE 11.—Oil- and gas-well drilling in 1953, by counties

County	Proven field wells			Exploratory wells			Total		
	Oil	Gas	Dry	Oil	Gas	Dry	Oil	Gas	Dry
Barber	10	11	8		4	21	10	15	29
Barton	200	4	159	16	1	84	216	5	243
Butler	184		70	4		61	188		131
Clark	1		2		1	2	1	1	4
Clay						1			1
Coiley				1		9	1		9
Comanche		1	3		1	2		2	5
Cowley	210	3	115	11		48	221	3	163
Decatur	10		8			7	12		15
Dickinson	2		2			5	2		7
Edwards	3			2		5	5		5
Ellis	167		121	32		105	199		226
Ellsworth	28		13	1		17	29		30
Ford					1	3		1	3
Geary						1			1
Gove	3		2	1		3	4		5
Graham	55		40	8		27	63		67
Greenwood				2		16	2		16
Harper	1	1	1		1	6	1	2	7
Harvey	3	2	5			8	3	2	13
Hodgeman			2	1		6	1		8
Jackson						1			1
Jewell						1			1
Kingman	14		9	2		17	16		26
Kiowa			1	4		4			5
Lane	1			1		3	2		3
Logan						4			4
Lyon	20	1	3	1		8	21	1	11
McPherson	43	1	15	9		19	52	1	34
Marion	25		25	4		23	29		48
Marshall			2			1			3
Mitchell						3			3
Morris	2		1	2		3	4		4
Nemaha	4		1	1		1	5		2
Ness	1		3			7	1		10
Norton	24			5		21	29		21
Osborne			2			2			4
Ottawa						1			1
Pawnee	66	4	30	8	3	54	74	7	84
Phillips	5		5			6	5		11
Pratt	64	2	22	6		36	70	2	58
Rawlins						1			1
Reno	5	1	16	1		24	6	1	40
Rice	95	1	71	3		20	98	1	91
Riley						2			2
Rooks	110		92	21		55	131		147
Rush	11	1	10	2	1	23	13	2	33
Russell	197	1	79	2		22	199	1	101
Saline	69		15			15	69		30
Scott			1			3			4
Sedgwick	17		1	1		15	18		23
Sheridan	9		6	1		10	10		16
Sherman						2			2
Smith						1			1
Stafford	187	1	126	13		85	200	1	211
Sumner	30		28	2		26	32		54
Thomas				1		2	1		2
Trego	27		20	2		29	29		49
Wabaunsee			1			2			3
Wichita						3			3
Woodson						5			5
Total: 1953	1,903	35	1,143	169	13	997	2,072	48	2,140
1952	1,866	236	955	226	18	1,052	2,092	254	2,007

METALS

Mine production of lead and zinc in Kansas dropped sharply in 1953 as metal prices continued the decline begun in 1952, and the Eagle-Picher central mill (to which many Kansas operators shipped their ore) was closed owing to a 5-month strike. The Eagle-Picher Co. continued construction of a modern zinc roaster and acid plant at its Galena lead smelter. The acid plant will convert SO₂ gas from the zinc roaster to sulfuric acid by the contact method. Part of this acid production will be used by a farmers' cooperative organization in

preparing a superphosphate fertilizer. Production was expected by mid-1954. The Eagle-Picher Co. acquired the Muncie lease of the Bilharz Mining Co. in the largest business transaction of the year in the Tri-State mining district. Zinc-metal stocks rose significantly during the year, with year-end stocks reported by the American Zinc Institute at 180,620 tons, a 100-percent increase over beginning stocks.

Cadmium, Germanium, Gallium, and Indium.—These minor metals occur as trace elements in the lead-zinc ores of Kansas and are recovered as byproducts from flue dusts of zinc-smelting operations. It is impossible to accurately assign State origin to these metals, since the accumulated flue dusts at smelters are derived from shipments of domestic and imported sources, which are not individually analyzed for the trace elements.

Lead.—Mine production of recoverable lead declined 43 percent in quantity and 54 percent in value in 1953 compared with 1952 as lead metal price dropped from 14½ cents in January to 13½ cents in December and zinc-metal price from 13 cents in January to 10 cents in December. The Eagle-Picher Co., producing from 7 mines, produced the largest quantity of lead in Kansas, followed by National Lead Co., with 6 operations; Mark Twain Mining Co.; Harris Mining Co.; and Contack Mining Co. All of the mines were in Cherokee County in the southeast corner of the State.

Zinc.—Mine production of recoverable zinc in 1953 dropped 39 percent in quantity and 58 percent in value from 1952 as zinc-metal prices continued a decline begun in 1952, and many Kansas producers were unable to have their ore milled because of the closing of a large custom mill in Oklahoma the latter half of the year. During 1953 52 lead-zinc mines were operating in Kansas, but only 10 were active as the year closed. The National Lead Co., with 6 operations, produced the largest quantity of zinc in Kansas, followed by the Eagle-Picher Co., Mark Twain Mining Co., Harris Mining Co., and Little Ben Mining Co.

Mine production in Kansas reflected the weakened lead and zinc price structures of the 1953 metal markets and declined as metal prices dropped. The domestic zinc price quickly showed the unusual strength for the metal at the January 2, 1953 opening of free trading

TABLE 12.—Mine production of lead and zinc, 1944-48 (average), 1949-53, and total 1876-1953, in terms of concentrates and recoverable metals ¹

Year	Mines producing	Lead concentrate (galena)		Zinc concentrate (sphalerite)		Recoverable metal content ²			
						Lead		Zinc	
		Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1944-48 (average)	81	10,260	\$1,689,416	87,627	\$9,010,529	7,776	\$1,855,192	47,375	\$11,360,038
1949	70	12,973	2,463,056	54,969	4,262,380	9,772	3,087,952	29,433	7,299,384
1950	66	12,218	1,833,537	50,579	4,581,839	9,487	2,561,490	72,176	7,717,984
1951	78	11,920	2,582,335	53,281	6,651,855	8,947	3,095,662	28,904	10,521,056
1952	84	7,747	1,582,699	47,077	5,685,236	5,916	1,904,952	25,482	8,460,024
1953	58	4,399	665,189	28,668	2,064,783	3,347	876,914	15,515	3,568,450
1876-1953	-----	808,167	67,320,908	5,295,026	249,461,632	616,707	81,264,027	2,751,048	390,485,562

¹ Based on Kansas ore ("dirt") and old tailings treated at mills during the calendar year indicated.

² In calculating metal content of the ores from assays allowance has been made for smelting losses of both lead and zinc. In comparing the values of concentrate ("ore") and metal it should be borne in mind that the value given for the concentrate is that actually received by the producer, whereas the value of the lead and zinc is calculated from the average price for all grades.

TABLE 13.—Tenor of lead and zinc ore, old tailings milled (1952), and concentrates produced, 1952-53

	1952		1953; crude ore
	Crude ore	Old tailings	
Total material milled..... short tons..	1,444,882	102,000	881,254
Total concentrate produced:			
Galena..... do.....	7,747		4,399
Sphalerite..... do.....	45,898	1,179	28,668
Ratio of concentrate to material milled:			
Lead..... percent.....	0.54		0.49
Zinc..... do.....	3.18	1.16	3.25
Metal content of material milled ¹ :			
Lead..... do.....	0.41		0.38
Zinc..... do.....	1.72	0.58	1.76
Average lead content of galena concentrate..... do.....	77.85		77.63
Average zinc content of sphalerite concentrate..... do.....	60.25	55.47	60.12
Average value per ton:			
Galena concentrate.....	\$204.30		\$151.21
Sphalerite concentrate.....	120.62	\$126.56	72.02

¹ Figures represent metal content of the crude ore ("dirt") only insofar as it is recovered in the concentrate; data on tailing losses not available.

TABLE 14.—Mine production of lead and zinc, by months, in 1953, in terms of recoverable metals

Month	Lead (short tons)	Zinc (short tons)	Month	Lead (short tons)	Zinc (short tons)
January.....	503	2,117	August.....	182	926
February.....	381	1,807	September.....	146	1,043
March.....	375	2,044	October.....	151	1,020
April.....	467	1,825	November.....	42	297
May.....	602	1,964	December.....	63	163
June.....	292	1,413	Total.....	3,347	15,515
July.....	143	896			

TABLE 15.—Quoted prices of 60-percent zinc concentrate and 80-percent lead concentrate at Joplin, Mo., in 1953 (E&MJ Metal and Mineral Markets)

Zinc concentrate		Lead concentrate		Zinc concentrate		Lead concentrate	
Week ended—	Price per short ton	Week ended	Price per short ton	Week ended	Price per short ton	Week ended—	Price per short ton
Jan. 1-Jan. 7.....	\$84.00	Jan. 1-Jan. 7.....	\$184.50	Sept. 4-Sept. 10.....	\$60.00	May 15-May 21.....	\$159.30
Jan. 8-Jan. 15.....	87.00	Jan. 8-Jan. 29.....	173.70	Sept. 11-Dec. 31.....	56.00	May 22-June 18.....	162.90
Jan. 16-Jan. 29.....	84.00	Jan. 30-Apr. 2.....	166.50			June 19-July 16.....	166.50
Jan. 30-Feb. 5.....	80.00	Apr. 3-Apr. 16.....	159.30			July 17-July 23.....	170.10
Feb. 6-Mar. 5.....	70.00	Apr. 17-Apr. 30.....	144.90			July 24-Sept. 17.....	173.70
Mar. 6-Sept. 3.....	65.00	May 1-May 14.....	152.10			Sept. 18-Dec. 31.....	166.50

in zinc on the London Metal Exchange after 14 years of Government control. The zinc price opened in 1953 at 13 cents a pound, up ½ cent from the 1952 closing price, then gradually fell to 10 cents by September, where it held for the rest of the year. Lead, on the other hand, opened at 14½ cents (down ¼ cent from the 1952 closing price), then fluctuated through a minor price range until September, when it steadied at 13½ cents for the remainder of the year.

TRI-STATE DISTRICT

The Tri-State district of Kansas, Oklahoma, and southwestern Missouri produced 3,455,000 tons of crude ore in 1953, 44 percent less

than the 1952 production. This crude ore yielded 17,400 tons of lead concentrates, valued at \$2,716,000, containing 13,300 tons of recoverable lead, and 102,821 tons of zinc concentrates, valued at \$7,456,000, containing 55,700 tons of recoverable zinc. Lead-concentrate production in 1953 was 52 percent less than in 1952 and zinc-concentrate recovery 38 percent less. Kansas supplied 25 percent of the district's lead concentrates and 28 percent of the zinc and Oklahoma 70 percent of the lead concentrates and 60 percent of the zinc; southwest Missouri produced the remaining 5 percent of the lead and 12 percent of the district's zinc concentrates.

The average lead recovery in the Tri-State district dropped to 0.50 percent in 1953, compared with 0.54 percent in 1952, with zinc recovery at 2.98 percent, up from 2.48 percent in 1952.

There were 194 mines operating in the Tri-State district in 1953, compared with 319 in 1952. Of the 194 active mines, 52 were in Kansas, 120 in Oklahoma, and 22 in Southwest Missouri. Only 40 mines were operating at the end of 1953, as zinc metal settled at 10 cents and zinc concentrate prices dropped from \$84 per ton in January to \$56 in September. Eighteen mine mills were operating in the district at the beginning of the year—3 in Kansas, 9 in Oklahoma, and 6 in Southwest Missouri; this number was reduced to 8 at the end of the year, with only 1 mill operating in Kansas at that time.

TABLE 16.—Mine production of lead and zinc in the Tri-State district, 1944-48 (average) and 1949-53, in terms of concentrates and recoverable metals

Year	Lead concentrate (galena)		Zinc concentrate (sphalerite)		Recoverable metal content			
	Short tons	Value	Short tons	Value	Lead		Zinc	
					Short tons	Value	Short tons	Value
1944-48 (average).....	33,459	\$5,566,226	247,357	\$26,266,556	25,224	\$6,049,119	132,552	\$31,673,364
1949.....	41,471	7,824,788	147,178	11,445,018	30,883	9,759,028	78,628	19,499,744
1950.....	40,714	6,245,660	150,019	13,934,927	31,157	8,412,390	80,558	22,878,472
1951.....	36,300	7,720,550	170,263	21,023,818	26,906	9,309,476	91,553	33,325,292
1952.....	36,333	7,388,754	167,474	19,537,949	27,356	8,808,632	90,512	30,049,984
1953:								
Kansas.....	4,399	665,189	28,668	2,064,783	3,347	876,914	15,515	3,568,450
S. W. Missouri.....	791	135,603	12,257	849,141	622	162,964	6,801	1,564,230
Oklahoma.....	12,213	1,915,195	61,896	4,541,616	9,304	2,437,648	33,413	7,684,990
Total.....	17,403	2,715,987	102,821	7,455,540	13,273	3,477,526	55,729	12,817,670

TABLE 17.—Tenor of ore and concentrates in Tri-State district, 1949-53

	1949	1950	1951	1952	1953
Total material milled:					
Crude ore..... short tons.....	4,470,778	4,700,698	5,990,100	6,140,155	3,454,980
Tailings and slimes..... do.....	1,602,620	967,926	746,673	604,350	
Ratio of concentrate to material milled:					
Lead..... percent.....	0.68	0.72	0.54	0.54	0.50
Zinc..... do.....	2.42	2.65	2.53	2.48	2.98
Metal content of material milled:					
Lead..... do.....	0.51	0.55	0.40	0.41	0.38
Zinc..... do.....	1.29	1.42	1.36	1.34	1.61
Average lead content of galena concentrate..... do.....	75.98	78.08	75.62	76.79	77.81
Average zinc content of sphalerite concentrate..... do.....	59.36	59.66	59.74	60.04	60.22
Average value per ton:					
Galena concentrate.....	\$188.68	\$153.40	\$212.69	\$203.36	\$156.06
Sphalerite concentrate.....	77.76	92.89	123.48	116.66	72.51

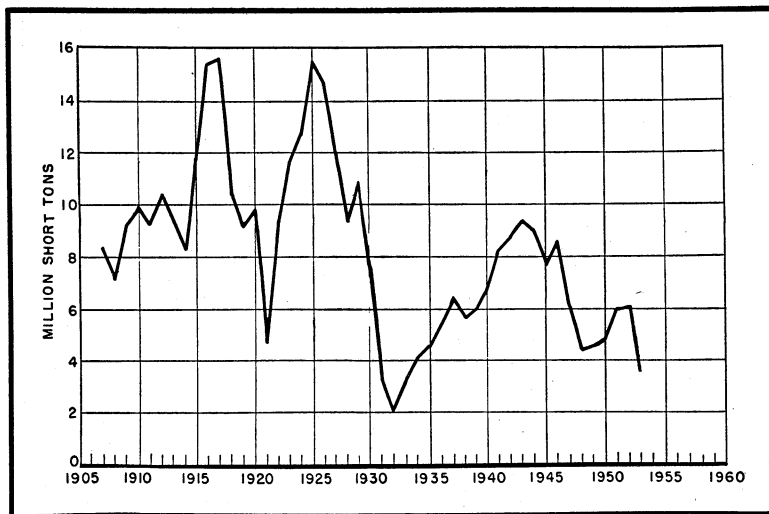


FIGURE 1.—Quantity of crude ore (rock) milled in the Tri-State district, 1907-53.

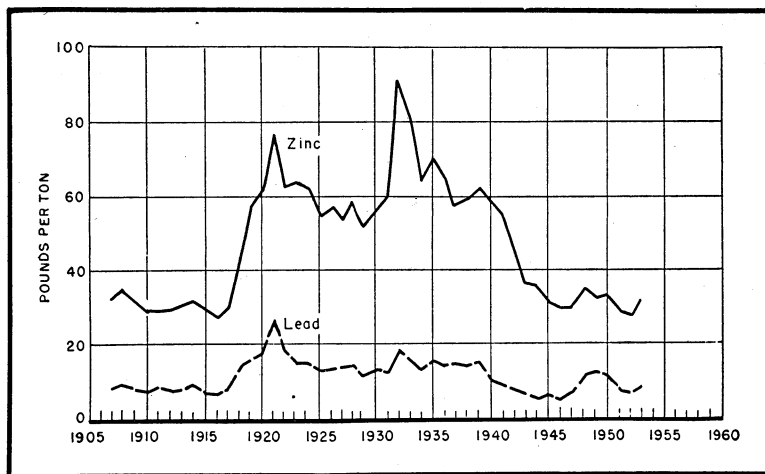


FIGURE 2.—Metal recovered per ton of crude ore (rock) milled in the Tri-State district, 1907-53.

NONMETALS

Cement.—In dollar value, cement in Kansas ranked third among the minerals produced in 1953. Production totaled 8,766,206 barrels, an increase of 93,323 barrels or slightly more than 1 percent compared with the 1952 output. Shipments of portland cement in 1953 were 3 percent less than in the previous year, but due to a price increase of 13 cents per barrel the 1953 value of shipments was 2 percent (\$471,650) greater than in 1952. The total value of portland-cement shipments in Kansas in 1953 was \$21,428,536, and the price per barrel was \$2.51. Six companies, operating in five eastern counties, continued to produce portland cement, as in former years.

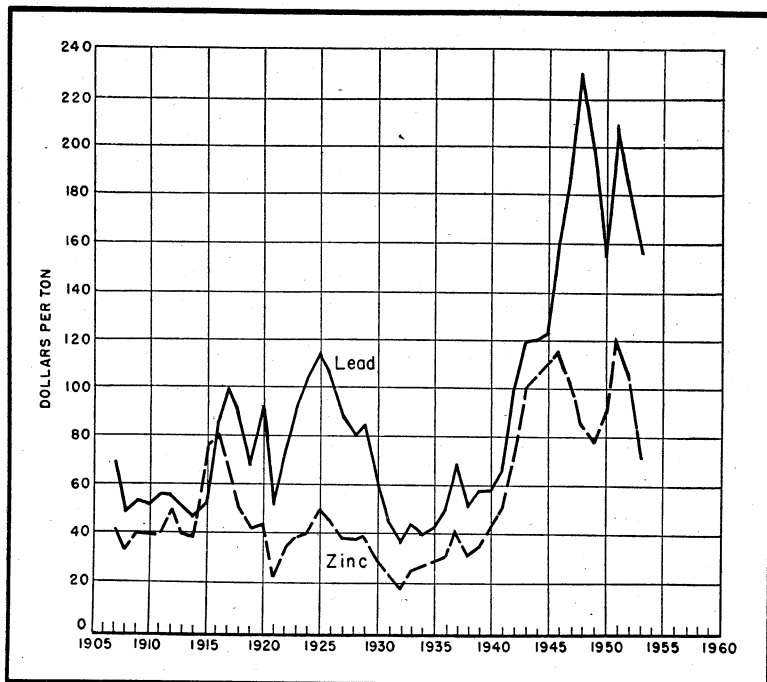


FIGURE 3.—Average prices received by sellers per ton of concentrate in the Tri-State district, 1907-53.

Production of portland cement in Kansas has been increasing during the past 5 years. In 1949 production was 7,824,620 barrels, and since 1950 production exceeded 8,500,000 barrels annually. In 1953 production was 8,766,206 barrels or 12 percent greater than in 1949. With increasing prices, the total value of shipped portland cement has risen until 1953, when shipments, although somewhat less than in 1952, were \$21,428,536 or 27 percent more than in 1949.

TABLE 18.—Production and shipments of portland cement, 1944-48 (average) and 1949-53, in 376-pound barrels

Year	Production	Shipments	Value of shipments	Average value per barrel
1944-48 (average).....	5,457,971	5,639,867	\$10,078,523	\$1.79
1949.....	7,824,620	7,640,540	16,880,156	2.21
1950.....	8,616,357	8,759,103	19,400,068	2.21
1951.....	8,514,521	8,163,916	19,413,144	2.38
1952.....	8,672,883	8,811,762	20,986,886	2.38
1953.....	8,766,206	8,546,250	21,428,536	2.51

Cement (Natural).—Natural cement was produced solely by the Fort Scott Hydraulic Cement Co. of Fort Scott in Bourbon County. Production has fluctuated very slightly from year to year.

Clays.—Clay production in Kansas in 1953 amounted to 5,100 tons more than in 1952, an increase of 1 percent, it amounted to 670,700 tons in 1953 and 665,600 tons in 1952. The value of clays in 1953 was

\$750,000, whereas in 1952 it was \$789,300, a decrease of 5 percent. In dollar value, clays produced (except for cement) rated 13th among the minerals produced in the State. Clay or shale was produced by 9 companies operating in 8 counties. All clay or shale produced was used by the producers themselves. Barton and Cloud Counties produced fire clay and Allen, Cherokee, Crawford, Montgomery, Saline, and Wilson Counties miscellaneous clay shales. In addition to the plastic fire clays and miscellaneous clay shales produced in 1953, clays amounting to 348,000 tons valued at approximately \$348,000 were also produced by the cement industry. The total output of clays and shale, regardless of use, was slightly greater (4 percent) in 1953 than it was in 1952, and its value was 2 percent greater in 1953.

TABLE 19.—Clays sold or used by producers 1944-48 (average) and 1949-53, in short tons

Year	Short tons	Value	Year	Short tons	Value
1944-48 (average).....	417, 230	\$285, 298	1951.....	708, 910	\$680, 821
1949.....	600, 216	455, 181	1952.....	665, 582	789, 293
1950.....	706, 615	563, 670	1953.....	670, 694	749, 579

Gypsum.—Gypsum in Kansas was produced by the National Gypsum Co. of Buffalo, N. Y., near Medicine Lodge, Barber County, and by the Certain-teed Products Corp. of Ardmore, Pa., at Blue Rapids, Marshall County. Gypsum production in the State declined in 1953 from that reported in 1952. Although the tonnage of crude gypsum greatly exceeded that of calcined gypsum produced, the value of the latter was much greater than the value of the crude gypsum.

Diatomaceous Marl.—Diatomaceous marl, first discovered in Kansas by the Kansas State Geological Survey about 1929 in Wallace and Logan Counties, was produced by the DeLore Division of the National Lead Co. of St. Louis, Mo., in 1953. The deposits were mined in sec. 10, T. 11 S., R. 38W., in Wallace County and trucked to the company processing plant at Edson, Sherman County, about 17 miles from the mine. This material is used as a flattening inert pigment for oil and water emulsion paints. Mining of the marl was begun in 1949, but it was not until midsummer of 1953 that the company opened its plant at Edson for processing this commodity.

Perlite.—Crude perlite is not known to occur in Kansas. However, in 1952 a plant at Kansas City, Wyandotte County, using crude rock from deposits in nearby States, produced expanded perlite for use mainly as a lightweight aggregate, replacing heavier materials in plaster and concrete.

Pumicite or Volcanic Ash.—The production of pumicite or volcanic ash in Kansas increased 40 percent in value from 1952. Quantitatively the annual tonnage of pumicite produced decreased 3 percent.

Salt.—Salt, the fifth most important mineral commodity produced in Kansas, in 1953 exceeded the 1952 value in dollar value by \$630,529, an increase of 9 percent. Production in 1953 was 905,227 short tons or 6,517 tons less than in 1952, a decrease of less than 1 percent. Salt was mined in Kansas by 5 companies operating in 3 counties—Ellsworth, Reno, and Rice. Reno was the leading producer. Al-

though 59 percent of the salt produced in the State came from shaft mines, the value of the salt produced by evaporation more than doubled that of the shaft-mined product. Since 1949 the total value of salt produced in Kansas has increased \$2,262,712 or 43 percent.

TABLE 20.—Salt sold or used by producers, 1944-48 (average) and 1949-53

Year	Evaporated salt		Rock salt		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1944-48 (average).....	343, 266	\$2, 961, 480	524, 577	\$1, 379, 564	867, 843	\$4, 341, 044
1949.....	334, 611	3, 616, 344	497, 831	1, 601, 500	832, 442	5, 217, 844
1950.....	344, 751	4, 066, 310	501, 623	1, 848, 204	846, 374	5, 914, 514
1951.....	360, 785	4, 659, 036	540, 132	1, 980, 307	900, 917	6, 639, 343
1952.....	358, 887	4, 775, 741	552, 857	2, 074, 286	911, 744	6, 850, 027
1953.....	370, 599	5, 285, 805	534, 658	2, 194, 751	905, 227	7, 480, 556

Sand and Gravel.—Sand and gravel, the seventh most important mineral commodities produced in Kansas in 1953, were obtained from 75 counties in the State. Production of 8,728,000 tons of sand and gravel in 1953 showed a 4-percent increase over that in 1952, when 8,380,000 tons was obtained. The value of the sand and gravel produced in 1953 was \$5,668,000, or 13 percent greater than the 1952 value of \$5,024,000. In 1953, over 95 commercial and over 50 noncommercial producers were operating in the State. The commercial producers supplied 6,678,000 tons of the sand and gravel produced, whereas the non-commercial producers were credited with 2,050,000 tons. The greatest production of sand was obtained from Wyandotte County, followed by Sedgwick County—the 2 counties in which the 2 largest Kansas cities are located, Kansas City and Wichita, respectively. Most of the sand produced was used for structural and paving purposes. Other sand was used as railroad ballast, for glass, filtering, molding, engine, and miscellaneous purposes. Gravel was employed largely for paving.

The trend in the sand and gravel industry was upward. Table 21 gives data on sand and gravel production in Kansas for 1944-48 (average) and the 5-year period 1949-53.

TABLE 21.—Sand and gravel sold or used, 1944-48 (average) and 1949-53

Year	Commercial		Noncommercial		Total sand and gravel		
	Short tons	Value	Short tons	Value	Short tons	Value	Average value per ton
1944-48 (average)....	3, 090, 637	\$1, 869, 238	858, 676	\$303, 270	3, 949, 314	\$2, 172, 508	\$0. 55
1949.....	4, 860, 975	2, 943, 733	1, 325, 744	384, 187	6, 186, 719	3, 327, 920	. 54
1950.....	4, 987, 710	3, 246, 970	4, 793, 413	3, 535, 315	9, 781, 123	6, 782, 285	. 69
1951.....	6, 167, 690	4, 234, 173	1, 509, 198	513, 371	7, 676, 888	4, 747, 544	. 62
1952.....	6, 797, 975	4, 675, 216	1, 582, 090	348, 377	8, 380, 065	5, 023, 593	. 60
1953.....	6, 678, 241	4, 946, 934	2, 050, 050	721, 374	8, 728, 291	5, 668, 308	. 65

Stone.—Stone production, which ranked third in importance among mineral commodities produced in Kansas, amounted to 8,769,000 tons valued at \$11,304,000 in 1953, excluding certain stone included in "Undistributed."

Limestone, which quantitatively composed 80 percent of all stone produced in the State, was obtained from 45 counties, chief of which were Wyandotte, Elk, Johnson, and Jefferson. Sandstone, credited with 7 percent of all stone production for the year, was quarried and processed in Elk, Gray, Lincoln, Phillips, and Sherman Counties; Lincoln and Phillips Counties were the leading producers. Miscellaneous stone, composing essentially 13 percent of all stone produced, came essentially from Cherokee, Lyon, and Miami Counties. Over 50 commercial producers and at least 25 noncommercial producers, including county highway departments and Federal agencies, produced stone in Kansas in 1953.

According to usage, most of the stone produced in the State was for concrete and road metal. Next in importance was stone used for riprap. Stone for railroad ballast increased almost 42 percent or 387,807 tons when compared with stone used for the same purpose in 1952.

Except for 1953, the trend in stone production and value in Kansas has increased steadily (table 22). Compared with quantity and value of stone production in 1949, the 1953 quantity and value show an increase of 47 and 42 percent, respectively.

TABLE 22.—Stone sold or used by producers, 1949–53, by kinds

Year	Limestone		Sandstone		Miscellaneous stone		Total stone	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1949.....	4, 427, 530	\$7, 242, 558	175, 610	\$253, 045	1, 375, 280	\$455, 887	5, 978, 420	\$7, 951, 490
1950.....	5, 594, 790	7, 673, 016	612, 220	793, 331	1, 423, 290	453, 860	7, 630, 300	8, 920, 207
1951.....	5, 824, 103	8, 284, 559	277, 446	444, 108	1, 089, 934	329, 845	7, 191, 483	9, 058, 512
1952.....	7, 551, 061	11, 204, 877	295, 246	485, 871	984, 564	360, 992	8, 830, 871	12, 051, 740
1953.....	7, 026, 871	10, 045, 111	591, 424	800, 008	1, 150, 857	458, 831	8, 769, 152	11, 303, 950

REVIEW BY COUNTIES³

In 1953, 49 Kansas counties each produced minerals valued at \$1 million or more. Of these, 25 counties each produced minerals valued between \$1,000,000 and \$5,000,000, 14 between \$5,000,000 and \$10,000,000, 5 between \$10,000,000 and \$20,000,000, 3 between \$20,000,000 and \$30,000,000, 1 between \$30,000,000 and \$40,000,000, and 1 more than \$40,000,000. Each of the remaining 56 counties produced less than \$1,000,000 in mineral wealth. The following county review lists only the highlights of mineral production in the county and does not necessarily report all producers.

ALLEN

Allen County produced cement, oil, stone, clay, and gas valued at over \$8,610,000 in 1953. Most of the mineral wealth of the county was contributed by the nonfuel mineral commodities, although the share of oil and gas exceeded \$1,600,000. The Lehigh Portland Cement Co. at Iola and the Monarch Cement Co. at Humboldt produced portland cement and Humboldt Brick & Tile Co. at Humboldt and the United Brick & Tile Co. at Iola manufactured brick and tile. The Monarch Cement Co. also produced crushed limestone.

³ Oil and gas data taken from State published report. Ver Wieb, W. A. Goebel, E. D. Hornbaker, A. L. and Jewett, J. M., Oil and Gas Developments in Kansas During 1953: State Geological Survey of Kansas, Bull. 103, August 1954, pp. 1-204.

TABLE 23.—Value of mineral production in Kansas, by counties, 1952–53

County	1952	1953	Principal minerals produced in 1953, in order of value
Allen	\$8,431,805	\$8,610,766	Cement, petroleum, clays.
Anderson	1,657,421	1,838,728	Petroleum, stone, sand and gravel.
Barber	3,444,477	4,048,303	Petroleum, natural gas, gypsum.
Barton	44,376,292	45,617,778	Petroleum, natural gas, sand and gravel.
Bourbon	732,772	2,497,252	Petroleum, stone, natural cement.
Brown	25,966		
Butler	21,119,436	23,240,551	Petroleum, stone, natural gas.
Chase	89,044	103,053	Do.
Chautauqua	2,134,247	2,248,293	Do.
Cnerokee	12,996,014	7,016,150	Zinc, coal, lead.
Clark	92,440	135,623	Petroleum, natural gas, sand and gravel.
Cloud	266,517	284,197	Sand and gravel, clays.
Coffey	263,290	88,969	Stone, petroleum, sand and gravel.
Cowley	6,819,319	9,598,974	Petroleum, stone, natural-gas liquids.
Crawford	3,595,818	3,511,504	Coal, stone, petroleum.
Decatur	447,072	585,804	Petroleum, sand and gravel.
Dickinson	355,641	439,421	Petroleum, sand and gravel, stone.
Doniphan	150,330	341,582	Stone.
Douglas	672,582	162,300	Stone, petroleum.
Elk	1,938,287	2,098,796	Stone, petroleum, natural gas.
Ellis	28,705,466	29,552,388	Petroleum, sand and gravel, natural gas.
Ellsworth	10,634,941	10,080,374	Petroleum, salt, sand and gravel.
Finney	3,136,782	3,208,046	Natural gas, petroleum, natural-gas liquids.
Ford	133,686	150,064	Sand and gravel, petroleum, natural gas.
Franklin	1,246,389	1,393,296	Petroleum, stone, coal.
Geary	312,444	292,145	Stone, sand and gravel.
Grant	10,534,313	10,681,261	Natural gas, natural-gas liquids, sand and gravel.
Greenwood	17,748,711	14,964,098	Petroleum, stone, sand and gravel.
Harper	56,125	71,807	Petroleum, natural gas, sand and gravel.
Harvey	107,060	575,693	Petroleum, sand and gravel, natural gas.
Haskell	3,777,944	3,873,390	Natural gas, natural-gas liquids, sand and gravel.
Jefferson	353,796	485,858	Stone.
Johnson	732,788	632,586	Do.
Kearny	6,614,300	6,910,575	Natural gas, natural-gas liquids, petroleum.
Kingman	2,220,589	2,072,670	Petroleum, natural-gas liquids, natural gas.
Kiowa	26,225	23,462	Petroleum, sand and gravel, natural gas.
Labette	152,146	296,481	Stone, petroleum, natural gas.
Lincoln	476,381	559,503	Stone, sand and gravel, pumicite.
Linn	2,438,860	348,588	Petroleum, stone, sand and gravel.
Lyon	792,419	890,122	Do.
Marion	1,710,629	2,020,632	Petroleum, stone, natural gas.
Marshall	541,111	513,623	Gypsum, sand and gravel, stone.
McPherson	8,845,454	8,932,343	Petroleum, sand and gravel.
Meade	563,338	1,691,528	Petroleum, natural gas, sand and gravel.
Miami	1,946,623	1,808,956	Petroleum, stone, natural gas.
Montgomery	6,479,191	6,692,569	Cement, petroleum, clays.
Morris	219,614	220,644	Stone, petroleum, natural gas.
Morton	1,975,757	2,092,370	Natural gas, sand and gravel.
Neosho	5,629,270	5,626,677	Cement, petroleum, stone.
Osage	259,500	341,390	Stone, coal.
Pawnee	1,726,513	3,269,638	Petroleum, natural gas, sand and gravel.
Phillips	7,479,015	6,191,448	Petroleum, stone, sand and gravel.
Pottawatomie	236,790	85,746	Sand and gravel, stone.
Pratt	7,286,526	7,420,916	Petroleum, natural gas, sand and gravel.
Reno	9,254,312	9,274,196	Salt, petroleum, natural-gas liquids.
Rice	26,417,644	23,934,107	Petroleum, salt, sand and gravel.
Riley	251,000	118,500	Stone, sand and gravel.
Rush	1,425,185	1,513,297	Petroleum, helium, natural-gas liquids.
Saline	2,996,804	4,290,859	Petroleum, sand and gravel, clays.
Sedgwick	4,802,187	5,430,327	Petroleum, natural-gas liquids, sand and gravel.
Seward	3,900,052	3,905,102	Natural gas, natural-gas liquids, petroleum.
Shawnee	362,433	504,739	Stone, sand and gravel.
Sherman	51,643	8,645	Sand and gravel, stone.
Stafford	16,876,957	18,328,561	Petroleum, natural gas, sand and gravel.
Sumner	4,754,715	4,465,378	Petroleum, sand and gravel.
Thomas	6,005	41,298	Sand and gravel, petroleum.
Trego	2,089,156	2,771,081	Petroleum, sand and gravel.
Wabauensee	910,959	1,546,923	Petroleum, stone, sand and gravel.
Wilson	2,865,905	2,864,598	Cement, petroleum, stone.
Woodson	1,638,078	1,949,636	Petroleum, stone, natural gas.
Wyandotte	6,895,160	6,633,645	Cement, stone, sand and gravel.
Various	428,915	145,154	Sand and gravel, stone.
Undistributed ¹	72,724,376	79,166,134	
Total	403,370,000	413,231,000	

¹ Includes value of mineral production and principal minerals produced from the following counties: Atchison (stone), Clay (sand and gravel), Comanche (sand and gravel), Edwards (petroleum, natural gas), Gove (petroleum, sand and gravel), Graham (petroleum), Gray (stone, sand and gravel), Greeley (sand and gravel), Hamilton (natural gas, sand and gravel), Hodgeman (petroleum), Jackson (stone), Jewell (sand and gravel), Lane (petroleum), Leavenworth (stone, natural gas), Logan (sand and gravel), Nemaha (petroleum, stone), Ness (petroleum, sand and gravel), Norton (petroleum), Osborne (petroleum), Ottawa (sand and gravel), Republic (sand and gravel, stone), Rooks (petroleum), Russell (petroleum, sand and gravel), Scott (petroleum, sand and gravel), Sheridan (petroleum, sand and gravel), Smith (sand and gravel), Stanton (natural gas, sand and gravel), Stevens (natural gas, sand and gravel), Wallace (stone, sand and gravel), Washington (stone, sand and gravel), Wichita (sand and gravel).

ANDERSON

Oil and limestone were Anderson County's principal products. Garnett Rock Co. was the only commercial limestone crusher. The highway department operated its own stone and gravel pits.

ATCHISON

Atchison County produced limestone used for road materials and agricultural purposes.

BARBER

Barber County's leading products were oil and natural gas. National Gypsum Co., the State's leading gypsum producer, operates in this county. Natural-gas liquids and sand and gravel were also produced.

BARTON

Barton County ranks first in Kansas in the production of mineral wealth. In 1953 the total value of all mineral production exceeded \$45,500,000. Virtually all of the wealth produced (over 99 percent) was from the mineral fuels—oil, gas, and natural gasoline. Nonfuel mineral commodities included sand, gravel, and clays. Oil and gas were produced from 127 pools, 19 of which were discovered in 1953.

BOURBON

The total value of minerals produced in Bourbon County approximated \$2,500,000. Minerals, in order of production, were oil, limestone, cement, and coal. Coal was obtained from three strip mines.

BUTLER

Butler County, fifth in importance among Kansas mineral producers, contributed over \$23 million to the State's mineral economy. Like Barton County, Butler's mineral wealth came essentially from its 65 oil and gas fields, 3 of which were discovered during 1953. Of the nonfuels, stone was the only mineral commodity produced.

CHASE

Two commercial producers and the highway department supplied limestone for road materials and agricultural purposes. Petroleum and gas also were produced.

CHAUTAUQUA

Oil was the principal mineral produced, with a value of over \$2 million. Limestone was second in value, natural gas and sand and gravel followed in that order.

CHEROKEE

Cherokee County, with mineral production valued at over \$7 million, led all other counties in the number of mineral commodities exploited. Minerals produced include zinc, coal, lead, stone, clays, and sand and gravel. Cherokee County was the second largest coal producer in the State. Of the coal companies operating in the county, the Pittsburg-Midway Coal Co. was the largest, having produced most of all coal mined in the county. Zinc and lead, produced in the southeast corner of the county, were the only metals mined in the State and were associated with the Tri-State Lead and Zinc district.

The Eagle-Picher Co. operated its lead smelter and pigment plant as in former years, treating lead ores from Kansas, Oklahoma, Missouri, and Illinois.

CLARK

Petroleum and gas were the leading products of Clark County. San Ore Construction Co. produced paving sand and the highway department paving gravel.

CLAY

Sand and gravel for road purposes were the only mineral products in Clay County.

CLOUD

Sand and gravel contributed 75 percent of the county's mineral wealth. Clays, produced by Cloud Ceramics, supplied the other 25 percent.

COFFEY

Limestone was the leading product of Coffey County; oil and sand and gravel were also produced.

COMANCHE

The only products of this county were sand and gravel, used for road materials.

COWLEY

In 1953 Cowley County produced over \$9,500,000 in oil, stone, natural gasoline, LP-gases, gas, and sand and gravel. Most of the mineral wealth was associated with the mineral-fuel commodities. The Cities Service Oil Co. operated a natural-gasoline plant at Arkansas City. Stone, produced mainly of the dimensional type, was valued at over \$500,000.

CRAWFORD

W. S. Dickey Clay Mfg. Co. was the leading Kansas producer of clay, used in heavy clay products. Six deep coal mines and 13 strip mines were operated. Oil, natural gas, and limestone were other products.

DECATUR

Oil produced in Decatur County was valued at over \$560,000. Sand and gravel were also produced.

DICKINSON

Over 250,000 barrels of oil was produced in Dickinson County. Limestone and sand and gravel were also produced and used for road materials and agricultural purposes.

DONIPHAN

Six quarries, 3 of which were operated by 1 company, produced limestone used for road materials and agricultural purposes.

DOUGLAS

One dimension-limestone and 3 crushed-limestone companies produced limestone valued at over \$150,000. A small quantity of petroleum was also produced.

EDWARDS

Oil and natural gas valued at approximately \$100,000 were the only mineral products of this county.

ELK

Crushed limestone was the leading product of Elk County, with a value exceeding \$1,500,000. The chief uses of this limestone were for road materials, railroad ballast, and agriculture. Oil was second in value; natural gas and sand and gravel followed in that order.

ELLIS

Ellis County was one of the leading oil producers in the State; it ranked third in 1953, with a valuation of about \$30 million. In 1953, production came from 89 pools, 17 of which were discovered during the year. A small quantity of sand and gravel and some gas were produced, in addition to the oil.

ELLSWORTH

Ellsworth, 10th in rank among Kansas counties in the production of mineral wealth in 1953, produced oil and gas valued at over \$9,300,000 and nonmetallic minerals, salt, and sand and gravel valued at approximately \$700,000. Salt was produced at Kanopolis by the Independent Salt Co. of Chicago, Ill.

FINNEY

Natural gas was the leading product of Finney County, with a value of over \$2,600,000. Petroleum ranked second, with a value of about \$400,000. Natural-gas liquids and sand and gravel were also produced.

FORD

Sand and gravel, produced by three commercial firms, was the leading mineral commodity of Ford County. These materials, used for concrete, mortar, and road materials, were valued at approximately \$150,000. Small quantities of oil and gas were also produced.

FRANKLIN

The leading mineral product of Franklin County was oil, valued at over \$1,200,000. Red Star Coal Co. operated 1 deep coal mine. Limestone and sand and gravel were produced for road materials and agricultural purposes.

GEARY

Walker Cut Stone Co. produced both crushed and dimension limestone. Other producers were 2 commercial sand and gravel companies.

GOVE

Gove County's main product was petroleum, valued at almost \$100,000. Sand and gravel were supplied by the highway department for road materials.

GRAHAM

Graham County produced only oil, obtained from 37 pools, of which 7 were discovered during the year.

GRANT

Grant County included the second largest natural-gas-producing region in the State, contributing over \$7 million to the wealth of the county. Natural-gas liquids had a valuation of almost \$3,500,000. The highway department produced a small quantity of sand and gravel.

GRAY

The county's only mineral activity was a small production of sandstone and gravel for highway uses.

GREELEY

Only one commercial sand and gravel producer was listed for mineral activity in this county in 1953.

GREENWOOD

Greenwood County produced oil valued at approximately \$15 million, as well as stone and sand and gravel in 1953. Fifty-five pools were producing oil in the county, 2 of which were producing for the first time during the year. Natural gasoline was produced by the Cities Service Oil Co.

HAMILTON

Hamilton County produced natural gas and sand and gravel.

HARPER

Small quantities of oil, natural gas, and sand and gravel were this county's only products.

HARVEY

Oil was the leading product of Harvey County in 1953. Howard R. Thack produced structural and paving sands. Some natural gas was also produced.

HASKELL

Approximately 32 million cubic feet of natural gas, with a value of over \$2,500,000, was produced in 1953. Natural-gas liquids contributed a value of more than \$1 million. Sand and gravel were produced for the highway department by contractors.

HODGEMAN

Petroleum was the only mineral produced in the county.

JACKSON

The only mineral operation for 1953 in Jackson County was one limestone quarry operated by G. W. Baker.

JEFFERSON

Crushed limestone was produced at three quarries and used for road material.

JEWELL

The only mineral activity in Jewell County was production of gravel used for road materials.

JOHNSON

Crushed-limestone production from 3 commercial quarries and 1 quarry operated by the highway department furnished road material.

KEARNY

Kearny County produced essentially mineral fuels—gas, natural gasoline, oil, and LP-gases—and sand and gravel. Production was valued at close to \$7 million.

KINGMAN

The leading product of Kingman County in 1953 was oil, valued at over \$1,600,000. Natural-gas liquids were second, with a value of over \$300,000. Natural gas was third, and one commercial company produced sand and gravel.

KIOWA

A small quantity of petroleum and natural gas was produced in Kiowa County. Other mineral activity was the highway department's operation of sand and gravel pits.

LABETTE

Crushed stone was the leading product of Labette County in 1953, oil was second, and natural gas was third. One strip-coal mine was operated.

LANE

Lane County's only mineral production was a small quantity of oil.

LEAVENWORTH

The main product of Leavenworth County was limestone mined from 1 commercial quarry and 2 noncommercial quarries. A small quantity of natural gas was also produced.

LINCOLN

Crushed stone was the leading mineral product of Lincoln County in 1953. This stone was produced at two quarries operated by Quartzite Stone Co., Inc., and used for road materials and railroad ballast. Sand and gravel were produced by M. W. Watson. Lincoln County was 1 of 3 counties in the State producing pumicite used for floor sweeps and ceramics.

LINN

Oil was Linn County's leading product. Limestone was obtained from two commercial operators and the highway department and used for road materials and agricultural purposes. A small quantity of natural gas was produced. Coal was produced from 1 deep and 3 strip coal mines.

LOGAN

Sand and gravel were the only minerals produced in Logan County and were used for road materials.

LYON

Oil was the county's leading production, and approximately 300,000 barrels were produced. Sand and gravel ranked second in value. Limestone was produced by Riddle Quarries.

MARION

Oil, valued at over \$2,000,000, led in the county's production of minerals. Crushed stone was produced, with a valuation of over \$200,000. A small quantity of natural gas, and sand and gravel was also produced.

MARSHALL

Marshall County was 1 of 2 counties producing gypsum and contributed about one-third of the total quantity produced in the State. Sand and gravel were produced by 4 commercial and 2 noncommercial operators.

McPHERSON

Oil was produced in McPherson County from 37 pools, 7 of which operated for the first time in 1953. A small quantity of sand and gravel was also produced.

MEADE

Oil and natural gas were the principal products of Meade County, with oil valued at almost \$1,250,000 and natural gas at approximately \$250,000. San Ore Construction Co. produced paving sand. The Cudahay Packing Co. provided about two-thirds of the pumicite produced in the State; it was used in cleansing and scouring compounds.

MIAMI

Miami County produced oil valued at over \$1,500,000. Crushed stone and a small quantity of natural gas were other products.

MONTGOMERY

Montgomery County produced oil and gas in 1953 valued at about \$2 million and cement, stone, clay, and sand and gravel valued at almost \$5 million. Cement was produced by the Universal Atlas Cement Co. at Independence; it was the county's leading mineral product. Two companies manufactured brick and tile. United Brick & Tile Co. and Ludowici-Celanden Co. were active in 1953, but V. V. V. Brick & Tile Co. was idle.

MORRIS

One company operated four limestone quarries; their products were used for road materials and agricultural purposes. Sand and gravel were also produced and used for road materials. Almost 39,000 barrels of oil and a small quantity of natural gas were produced.

MORTON

Morton County was seventh in the production of natural gas in the State in 1953, with a valuation exceeding \$2 million. The county also had one producer of sand and gravel.

NEMAHA

One limestone quarry was operated during the year, and some petroleum was produced.

NEOSHO

Neosho County produced cement, oil, stone, and gas. The mineral fuels, mainly oil, were valued at over \$1,650,000, and the mineral nonfuels amounted to approximately \$4 million. Cement was produced by the Ash Grove Lime & Portland Cement Co. at Chanute.

NESS

About 285,000 barrels of oil was produced. Sand and gravel were produced and used for road materials.

NORTON

Oil and pumicite were reported from Norton County in 1953.

OSAGE

Two plants produced limestone used for agricultural purposes. Almost 17,000 tons of coal was removed from 3 deep mines and 4 strip mines.

OSBORNE

Petroleum was the chief product of Osborne County, with a valuation of over \$200,000 in 1953. A small quantity of sand and gravel was produced by the highway department.

OTTAWA

The only mineral product in Ottawa County was gravel used for road materials.

PAWNEE

Oil contributed almost \$3 million to the county revenue for 1953. Natural gas and sand and gravel were also produced.

PHILLIPS

Over 2 million barrels of oil was produced in 1953, with a value of nearly \$6 million. Other commodities were sandstone and sand and gravel.

POTTAWATOMIE

Over 115,000 tons of sand and gravel and a small quantity of limestone were produced and used for road materials.

PRATT

The chief minerals produced in Pratt County were oil and gas, with a valuation of over \$7,300,000. There were two sand and gravel producers.

RENO

Reno County produced salt, oil, natural gasoline, LP-gases, natural gas, and sand and gravel, with a total valuation of over \$9 million. The Barton, Carey, and Morton Salt Cos., with plants at Hutchinson, produced salt that ranked first among the minerals produced in the county.

REPUBLIC

Limestone for agricultural purposes was produced at one quarry. Sand and gravel for road purposes were produced by the highway department.

RICE

Rice County, fourth most important mineral producer in the State, produced oil and gas valued at over \$22,300,000 in 1953. Production came from 53 pools, of which 5 were new. Salt was obtained by the American Salt Co. and the Carey Salt Co. at Lyons. In addition, stone and sand and gravel were produced.

RILEY

Manhattan Cut Stone Co. and Manhattan Stone Co. produced dimension limestone for building purposes. One commercial sand and gravel company was in operation.

ROOKS

Rooks County, sixth in rank among Kansas mineral-producing counties, produced oil from 89 pools, 14 of which were discovered during 1953.

RUSH

The State's only production of helium was found in Rush County. In 1953 helium produced was valued at over \$550,000. Petroleum was the leading mineral. Natural gas and natural-gas liquids were also produced.

RUSSELL

Russell County was primarily an oil producer. Over 12,500,000 barrels of oil was produced from 31 pools, 2 of which were discovered in 1953. Russell County ranked second in oil production as well as in the total value of all minerals produced in the State. A small quantity of sand and gravel was also produced.

SALINE

Petroleum production exceeded 1,500,000 barrels. One clay company was in production, and two sand and gravel quarries were in operation.

SCOTT

Oil and paving sand were the only minerals produced in Scott County.

SEDGWICK

Sedgwick County produced oil, natural gasoline, sand and gravel, LP-gases, natural gas, and stone in 1953, valued in all at \$5,400,000. Oil was produced from 31 pools of which only 1 was new. The Cities Service Oil & Gas Co. operated its cycle plant at Wichita. Sand and gravel were produced by 10 commercial companies.

SEWARD

Seward County produced only mineral fuels valued at over \$3,900,000. Natural gas was the most important, with natural gasoline, LP-gases, and oil the other commodities produced.

SHAWNEE

Two limestone quarries and 6 sand and gravel quarries operated in 1953, with combined production valued at over \$500,000.

SHERIDAN

Oil was Sheridan County's chief mineral product. Sand and gravel were produced by the highway department.

SHERMAN

Small quantities of stone and sand and gravel were produced in 1953.

SMITH

The highway department produced gravel for its own use.

STAFFORD

Stafford County, seventh in importance, produced oil, gas, and sand and gravel valued at over \$18,300,000. Oil production came from 135 pools, 19 of which were discovered in 1953.

STANTON

Natural gas and paving sand were produced in Stanton County.

STEVENS

Stevens County, in the Hugoton gas area, produced over 101,000 million cubic feet of gas valued at almost \$9 million in 1953. This output placed the county in first place in gas production in the State. The county also had one sand and gravel operator.

SUMNER

Mineral production for Sumner County included oil valued at over \$4 million and sand and gravel used for road materials.

THOMAS

Small quantities of petroleum and sand and gravel were this county's mineral products.

TREGO

Approximately 1,000,000 barrels of oil was produced in 1953. The highway department and one commercial operator produced sand and gravel for road purposes.

WABAUNSEE

The leading product of Wabaunsee County was oil. Crushed stone and sand and gravel were also produced.

WALLACE

Two companies produced limestone and sand and gravel.

WASHINGTON

One company produced limestone for agricultural purposes. The highway department produced sand and gravel for road materials.

WICHITA

This county had only one commercial sand and gravel producer.

WILSON

Wilson County had 1 cement plant (the Consolidated Cement Corp.) and 2 clay plants in operation. Two quarries produced limestone for road materials and agricultural purposes. Natural gas and petroleum were also produced to give the county a mineral production with total value of almost \$3 million.

WOODSON

Woodson County produced oil, stone, and natural gas. Oil was the most important product, with a value of over \$1,800,000.

WYANDOTTE

Wyandotte County reported cement, expanded perlite, stone, sand and gravel, and a small quantity of gas in 1953. The total value of all minerals produced exceeded \$6,600,000. Next to Allen County, Wyandotte was the most important in the State in the production of the nonfuel mineral commodities. Cement was produced at Bonner Springs by the Lone Star Cement Corp. A number of commercial operators produced stone and sand and gravel. The Panacalite Perlite, Inc., produced expanded perlite at its Kansas City, Kans., plant.

The Mineral Industry of Kentucky

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of Interior, and the Kentucky Geological Survey.

By Richard H. Mote ¹ and Alvin Kaufman ²



MINERAL production of Kentucky declined 4 percent in value in 1953 as compared with 1952, primarily because of an equivalent drop in the value of coal output.

There was little change in 1953 in the relative importance of the various mineral commodities to the economy of the State. Coal, petroleum, natural gas, and stone continued to rank as the major mineral products, composing 95 percent of the total value. Coal output alone supplied 79 percent. The largest coal-producing counties were again the major mineral producing areas, in terms of dollars. Harlan, Hopkins, Pike, Floyd, and Letcher Counties contributed 53 percent of the value of mineral output in the Commonwealth.

TABLE 1.—Mineral production in Kentucky, 1952-53 ¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays	880, 874	\$5, 101, 266	711, 209	\$3, 118, 352
Coal	66, 114, 341	317, 386, 725	65, 060, 478	302, 871, 877
Fluorspar	48, 308	1, 863, 262	47, 244	2, 100, 493
Lead (recoverable content of ores, etc.)	60	19, 320	52	13, 624
Natural gas..... thousand cubic feet ..	73, 427, 000	15, 934, 000	71, 405, 000	15, 638, 000
Natural-gas liquids:				
Natural gasoline..... thousand gallons ..	30, 660	2, 191, 000	35, 406	2, 394, 000
LP-gases..... do	156, 198	3, 963, 000	176, 232	4, 993, 000
Petroleum (crude)..... thousand 42-gallon barrels ..	11, 918	32, 890, 000	² 11, 518	² 33, 520, 000
Sand and gravel.....	3, 334, 261	2, 656, 053	3, 052, 155	2, 899, 932
Stone (except limestone for cement).....	³ 8, 817, 859	³ 10, 816, 707	³ 7, 429, 505	³ 9, 268, 237
Zinc (recoverable content of ores, etc.).....	3, 280	1, 088, 960	489	112, 470
Undistributed: Native asphalt, cement, stone (dimension sandstone and limestone for cement).....	-----	4, 535, 564	-----	4, 811, 752
Total Kentucky.....	-----	398, 446, 000	-----	381, 742, 000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

² Final figure. Supersedes preliminary figure in commodity chapter.

³ Excludes certain stone, value for which is included with "Undistributed."

¹ Chief, Mineral Industry Division, Region VIII, Bureau of Mines, Pittsburgh, Pa.

² Commodity-industry analyst, Region VIII, Bureau of Mines, Pittsburgh, Pa.

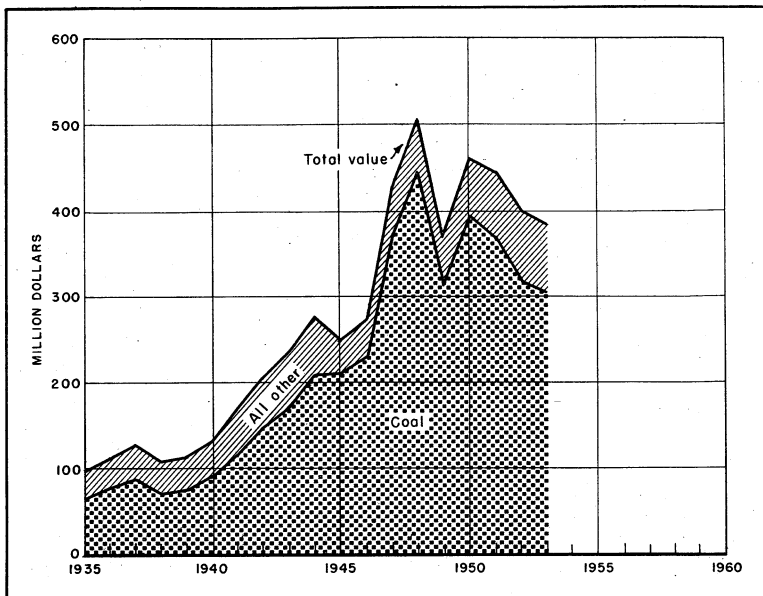


FIGURE 1.—Value of coal and total mineral production in Kentucky, 1935-53.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Asphalt.—Kentucky asphalt was obtained as a residue from the refining of petroleum and from bituminous sandstones. Petroleum asphalt was the more important, tonnagewise. Ashland Oil & Refining Co. Catlettsburg Refinery and Sohio Petroleum Co., Covington, yielded this commodity for use as paving and roofing cement and flux.

The Commonwealth was 1 of 3 States in the Nation to produce bituminous sandstones. The output was obtained from the Kentucky Rock Asphalt Co. open quarry near Kyrock, Edmonson County. The rock contains 3 to 15 percent bituminous material, which is considered to be a derivative of petroleum altered by oxygen in circulating ground water. The processed material contained a uniform 7 percent bitumen and was utilized for surfacing streets and highways.

Coal.—Kentucky remained in 1953 the third largest producer of bituminous coal in the Nation. The Commonwealth's output declined 2 percent, which was consistent with the moderate drop in national production. Symptomatic of the depression in the coal industry was decreased number of active Kentucky mines, which dropped from 1,865 in 1952 to 1,688 in 1953.

Many operators resorted to increased mechanization in order to continue in production. As a result, the percentage of underground output mechanically loaded jumped from 61 in 1952 to 67 in 1953. This increase reflected a 2,552,000-ton net gain in mechanically loaded production compared with a 3,129,000-ton drop in output hand loaded.

Kentucky soft-coal producers purchased 18 mobile loaders, 2 continuous miners, 17 room conveyors, and 5 augers in 1953.³ Augers were used to mine coal beds with thick overburden that ordinarily would not have been economic prospects. Four auger mines were active in Magoffin, Pike, and Muhlenberg Counties.

The necessity for improving the competitive position of Kentucky mines prompted construction of preparation plants by 11 companies.⁴ The largest of these were Harlan Fuel Co. installation of a 500-ton-per-hour Jeffrey unit at Yancey; a 400-ton-per-hour McNally-Pittsburg dense-medium preparation plant for the Blue Diamond Coal Co. near Tilford; and the Inland Steel Co. 300-ton-per-hour Link-Belt dumping and picking unit at the Wheelwright mine.

TABLE 2.—Bituminous-coal production,¹ 1952-53, by counties (exclusive of mines producing less than 1,000 tons)

County	1952 (short tons)	1953				
		Short tons	Average value per ton	Average ton per man per day	Strip pro- duction	Number of strip pits
Bell.....	1,711,869	1,666,215	\$5.04	5.73	221,607	10
Boyd.....	332,009	332,010	3.99	9.55	243,006	1
Breathitt.....	937,969	1,009,714	5.29	6.37	288,275	1
Butler.....	99,483	95,192	3.82	7.21	9,021	2
Carter.....	194,289	129,006	5.01	5.60	-----	-----
Clay.....	840,777	793,804	4.57	4.04	24,984	1
Clinton.....	54,012	19,194	4.16	4.85	-----	-----
Daviess.....	616,094	612,354	2.60	17.63	524,733	2
Elliott.....	170,155	17,945	4.17	3.84	-----	-----
Floyd.....	5,568,927	5,586,543	5.85	6.26	-----	-----
Greenup.....	100,664	40,650	4.09	9.94	35,000	1
Hancock.....	60,000	125,000	3.47	15.63	125,000	1
Harlan.....	9,592,450	10,090,002	5.85	5.80	81,494	3
Henderson.....	267,080	265,176	3.63	5.85	-----	-----
Hopkins.....	13,122,620	12,477,321	3.41	16.73	4,410,826	19
Jackson.....	242,430	149,515	4.79	4.10	13,850	4
Johnson.....	460,721	460,723	4.62	4.62	-----	-----
Knott.....	839,687	837,581	4.33	10.61	3,487	1
Knox.....	223,012	177,789	4.95	4.88	31,270	2
Laurel.....	157,563	229,682	4.57	4.65	79,876	8
Lawrence.....	84,804	55,473	4.08	5.73	21,340	2
Lee.....	252,050	179,092	5.20	3.90	9,150	2
Leslie.....	2,353,362	2,400,653	4.18	8.50	-----	-----
Letcher.....	4,698,496	5,038,218	5.77	7.90	150,482	4
Magoffin.....	181,696	256,901	4.14	14.97	192,863	2
Martin.....	92,465	15,292	4.94	8.73	-----	-----
McCreary.....	480,300	210,610	4.61	6.91	69,132	4
McLean.....	12,447	7,733	3.90	6.72	1,440	1
Menfee.....	-----	9,435	4.67	5.92	1,135	1
Morgan.....	169,366	48,909	4.87	5.65	17,264	6
Muhlenberg.....	4,455,744	4,830,060	3.18	15.12	1,643,905	6
Ohio.....	1,629,803	1,335,995	3.41	19.05	1,261,712	6
Owsley.....	16,290	7,603	5.67	3.72	-----	-----
Perry.....	5,302,662	4,957,218	4.99	7.64	27,932	2
Pike.....	8,843,444	8,218,341	4.97	6.27	3,528	1
Pulaski.....	279,742	228,909	4.31	6.19	115,244	14
Rockcastle.....	168,333	109,315	4.23	5.25	40,940	9
Rowan.....	21,991	-----	-----	-----	-----	-----
Union.....	631,384	1,212,491	3.30	9.95	-----	-----
Wayne.....	40,436	32,137	3.77	4.48	-----	-----
Webster.....	287,039	352,081	4.19	26.18	335,448	1
Whitley.....	512,182	425,491	4.17	9.33	330,057	5
Wolfe.....	8,494	13,105	4.92	4.71	5,605	3
Total.....	66,114,341	65,060,478	4.66	8.00	10,319,606	125

³ Coal Age, February 1954, p. 88.

⁴ Work cited in footnote 3, p. 86.

The largest producing mines in the State in 1953 were the Homestead Coal Co. Homestead strip mine, Hopkins County; U. S. Steel Corp. Lynch No. 32, Harlan County; West Kentucky Coal Co. Pleasant View mine, Hopkins County; and Inland Steel Co. Wheelwright mine in Floyd County. All ranked among the 50 biggest mines in the United States. Counties with the largest production of soft coal were Hopkins, Harlan, and Pike.

Oven coke was produced by Allied Chemical & Dye Corp. Semet-Solvay Division from 120 Semet-Solvay and 76 Wilputte ovens near Ashland.

Petroleum and Natural Gas.—Despite a 3-percent decline in output of petroleum and of natural gas compared with 1952, production of these two commodities continued to rank second and third, respectively, among the State's mineral industries. Decreased production of petroleum was accompanied by a decline in the number of producing wells from 16,950 in 1952 to 16,600 in 1953. The average value at the wellhead for 1 barrel of petroleum continued to rise, increasing to \$2.91 in 1953 from \$2.76 the previous year.

Kentucky gas producers marketed 71,405 million cubic feet of natural gas with an average value at the well of 21.9 cents per thousand cubic feet. In addition to the production of natural gas and petroleum there was a substantial output of natural gasoline and LP-gases from five plants operated by four companies.

Development in the Commonwealth's petroleum and natural-gas industry in 1953 resulted in the completion of 1,163 wells. Of these, 398 were oil wells, 194 were gas producers, 1 was a service well, and 571 were dry holes. No drilling was done below a depth of 5,000 feet. Wildcat activities were generally unsuccessful, although a new gas pool was discovered in Bell County. In all 213 wildcat wells were drilled, resulting in 17 oil and 4 gas producers. The remaining 192 were dry.⁵

TABLE 3.—Production of crude petroleum 1953, by counties, in 42-gallon barrels

[Kentucky Geological Survey]

County	Production (barrels)	County	Production (barrels)	County	Production (barrels)
Allen.....	79,483	Henderson.....	2,559,126	Ohio.....	1,194,941
Barren.....	11,320	Hopkins.....	74,223	Pike.....	11,758
Butler.....	62,986	Johnson.....	137,338	Powell.....	62,417
Clinton.....	83,491	Knott.....	23,887	Union.....	1,853,247
Cumberland.....	22,419	Lawrence.....	156,703	Warren.....	58,537
Daviess.....	1,229,691	Lee.....	420,296	Wayne.....	34,760
Elliott.....	54,921	McLean.....	791,471	Webster.....	1,427,531
Estill.....	183,006	Magoffin.....	372,764	Wolfe.....	40,837
Floyd.....	14,976	Martin.....	34,279	Undistributed.....	139,615
Hancock.....	213,286	Muhlenberg.....	140,838		
Hart.....	26,853			Total.....	11,518,000

METALS

Lead and zinc continued to be the only metals mined in Kentucky in 1953. Output of these commodities declined 13 and 85 percent, respectively, compared with 1952. The substantial decline in zinc production was due principally to closure of Alcoa Mining Co. Hutson

⁵ Oil and Gas Journal, Annual Review Issue: Jan. 25, 1954, pp. 124-153.

mine in Livingston County on January 15. Operations were suspended because of the decline in the market price of zinc metal. The company also ceased development work on its Silver-Royal mine in the same county. Except for the small output of zinc yielded by the Hutson mine, all metals recovered were byproducts or coproducts of fluorspar mining. The number of metal producers declined from 7 in 1952 to 5 in 1953. The largest by far were United States Steel Corp. Tabb No. 1 mine and Ozark-Mahoning Co. Commodore mine, both in Crittenden County.

NONMETALS

Cement.—Kosmos Portland Cement Co., Inc., operated the only portland-cement plant in Kentucky. The plant, approximately 20 miles south of Louisville at Kosmosdale, utilized as raw material the Ste. Genevieve limestone quarried near Brandenburg, Meade County, and alluvial clay from the Ohio River flood plain.

Clays.—Output of Kentucky clays declined 19 percent in 1953 compared with 1952. Fire clay was the major type produced, with miscellaneous clays second and ball clay third. Ball clays were mined by four producers in Graves County from the Holly Springs formation. The largest were Kentucky-Tennessee Clay Co., Pryorsburg, and Old Hickory Clay Co., Hickory. Output was utilized in manufacturing whiteware, art pottery, high-grade tile, kiln furniture, and refractories, as well as in enameling. The State was the second largest ball-clay producing area in the Nation.

Fire clay was produced in Kentucky by 18 mines operating in 6 counties. The major producing center was the Olive Hill area in Carter County, although substantial output was also obtained from Hancock, Graves, and Greenup Counties. Major producers were General Refractories Co., Harbison-Walker Refractories Co., and North American Refractories Co. Although a large percentage of fire-clay output was utilized for firebrick and blocks, a substantial tonnage was also used for the manufacture of heavy clay products, saggars, pins, stilts, and high-grade tile, as well as various miscellaneous refractories.

Building brick, drain tile, sewer pipe, and various other heavy clay products were manufactured from Kentucky miscellaneous clays. The largest of the 17 producers of this commodity in 1953 were Big Run Coal & Clay Co., Ashland; West Point Brick Co., West Point; and Barbourville Brick Co., Barbourville. Hardin, Boyd, and Jefferson Counties were the major counties yielding miscellaneous clays.

TABLE 4.—Clays sold or used by producers, 1944-48 (average) and 1949-53

Year	Ball clay		Fire clay		Miscellaneous clays		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1944-48 (average).....	91,020	\$926,410	430,792	\$1,605,631	142,498	\$111,593	664,310	\$2,643,634
1949.....	89,281	1,076,531	373,637	1,727,056	161,463	125,551	624,381	2,929,138
1950.....	105,690	1,325,161	422,898	2,090,094	189,624	180,710	718,212	3,595,965
1951.....	111,215	1,411,175	583,291	3,660,626	185,734	202,484	880,240	5,274,285
1952.....	107,211	1,372,695	526,238	3,450,046	247,425	278,525	880,874	5,101,266
1953.....	100,482	974,637	348,359	1,809,988	262,368	333,727	711,209	3,118,352

Fluorspar.—Kentucky dropped from second to third place among the fluorspar-producing States in 1953. The Commonwealth's output declined 2 percent compared with the previous year to the lowest point since 1938. In the face of record national consumption, the number of active mines decreased from 125 in 1952 to 49 in 1953.

The distress in the Kentucky fluorspar industry was largely the result of record imports, mostly from Mexico. The average value of the Mexican material was \$26.14 per ton compared with \$44.46 for the Kentucky product.

Output continued to come from Crittenden, Livingston, and Caldwell Counties. Major producers of crude fluorspar were United States Steel Corp. Tabb No. 1, Yandell No. 2, and Big Four mines, all in the Mexico-Marion area; Ozark-Mahoning Co. Delhi-Babb and Commodore mines; Roberts and Frazer Carr mine near Carrsville and Tinsley and the Loyd Nancy Hanks mine near Salem in Livingston County. The average value per ton of fluorspar increased 15 percent in 1953 compared with the previous year. The new value was one of the highest ever reported for this commodity.

TABLE 5.—Fluorspar shipped from mines, 1944-48 (average) and 1949-53

Year	Short tons	Value		Year	Short tons	Value	
		Total	Average per ton			Total	Average per ton
1944-48 (average)---	89, 244	\$2,692,614	\$30. 17	1951-----	68, 635	\$2,334,485	\$34. 01
1949-----	63, 438	2,018,209	31. 81	1952-----	48, 308	1,863,262	38. 57
1950-----	80, 137	2,554,668	31. 88	1953-----	47, 244	2,100,493	44. 46

Sand and Gravel.—Major production of sand and gravel in Kentucky continued to be obtained from dredges working the Ohio River channels rather than from land deposits. Output declined 8 percent in 1953 compared with the previous year. Production was utilized predominantly for structural and paving purposes, although a substantial tonnage was used for railroad ballast and engine sand. Structural and paving sand and gravel composed 86 percent of total production.

Stone.—Crushed limestone and dimension sandstone were produced in Kentucky in 1953. In terms of value, quarrying of stone ranked fourth among the State's mineral industries. Rubble, flagging, and dressed building stone were produced at the sandstone quarries of Kentucky Flagstone Co., Lewisburg, and Kolor Stone Quarries, Russellville, both in Logan County.

Output of crushed limestone decreased 15 percent in 1953 compared with the previous year. Production was obtained mainly from Jefferson, Ohio, Caldwell, and Rockcastle Counties. Concrete aggregate and road metal, which made up 82 percent of total stone production, declined 14 percent compared with 1952. Major producing companies were Kentucky Stone Co. and Louisville Crushed Stone Co., both of Louisville; and Cedar Bluff Stone Co., Inc., Princeton.

TABLE 6.—Sand and gravel sold or used by producers, 1952-53

	1952		1953	
	Short tons	Value	Short tons	Value
Sand:				
Structural.....	840, 110	\$771, 761	901, 093	\$908, 173
Paving.....	425, 481	365, 677	411, 416	332, 233
Engine.....	95, 632	83, 131	67, 628	60, 030
Gravel:				
Structural.....	395, 236	469, 012	746, 353	911, 756
Paving.....	1, 049, 860	551, 254	551, 013	396, 397
Railroad ballast.....	343, 906	241, 503	323, 508	250, 580
Other.....	83, 604	79, 643	(¹)	(¹)
Undistributed.....	100, 432	94, 072	46, 144	40, 763
Total sand and gravel.....	3, 334, 261	2, 656, 053	3, 052, 155	2, 899, 932

¹ Included with "Undistributed" to avoid disclosure of individual company totals.

TABLE 7.—Stone sold or used by producers, 1952-53, by uses

Use	1952		1953	
	Quantity	Value	Quantity	Value
Dimension stone (building):				
Rough construction..... short tons.....	¹ 1, 000	¹ \$3, 000		
Rough architectural..... do.....	(²)	(²)	(²)	(²)
Rubble..... do.....			(²)	(²)
Dressed stone..... cubic feet.....			(²)	(²)
Flagging..... do.....	(²)	(²)	(²)	(²)
Total dimension stone.....	¹ 1, 000	¹ 3, 000	(²)	(²)
Crushed and broken stone:				
Riprap..... short tons.....	(³)	(³)	36, 377	\$40, 254
Concrete and road metal..... do.....	7, 131, 284	8, 911, 758	6, 108, 354	7, 813, 930
Railroad ballast..... do.....	535, 346	465, 526	607, 073	560, 678
Agriculture..... do.....	925, 516	1, 119, 886	677, 701	853, 375
Miscellaneous..... do.....	(³)	(³)		
Undistributed..... do.....	224, 713	316, 537		
Total crushed and broken stone.....	¹ 8, 816, 859	¹ 10, 813, 707	¹ 7, 429, 505	¹ 9, 268, 237

¹ Incomplete to avoid disclosure of individual company totals.

² Bureau of Mines not at liberty to publish.

³ Included with "Undistributed" to avoid disclosure of individual company totals.

REVIEW BY COUNTIES

ADAIR

Shamrock Stone Co., Inc., produced concrete aggregate, road material, and agricultural stone in 1953 from its leased quarry at Columbia.

ANDERSON

Kentucky Stone Co. produced crushed limestone from the Tyrone quarry for use as concrete aggregate, road base, railroad ballast, and agricultural stone.

BARREN

J. F. Pace Construction Co. produced concrete aggregate, road material, and agricultural limestone from a quarry near Glasgow.

BELL

Bituminous coal was the only mineral commodity produced in Bell County in 1953. The Kentucky Ridge Coal Co. Crockitt mine near Field, the Garco mine of Garmeada Coal Co. near Middlesboro, and the Davisburg mine of Margo Coal Mining Co., Pineville, were the largest producers. These companies also operated cleaning plants consisting of shaker and vibrating screens.

BOONE

The output of paving gravel, only mineral commodity produced in the county in 1953, was reported by the Boone County Road Department.

TABLE 8.—Value of mineral production in Kentucky (excluding petroleum and natural gas), 1952-53, by counties

County	Value		Principal minerals produced in 1953
	1952	1953	
Bell.....	\$9,398,160	\$8,397,724	Coal.
Breathitt.....	5,121,311	5,341,387	Do.
Breckinridge.....	304,075	224,712	Stone, clays.
Butler.....	381,020	363,633	Coal.
Caldwell.....	644,724	479,629	Stone, fluorspar.
Carter.....	4,009,707	2,250,182	Clays, coal, stone.
Christian.....	778,142	147,116	Stone, clays.
Clay.....	4,128,215	3,627,684	Coal.
Crittenden.....	1,376,208	1,954,184	Fluorspar, stone, metals.
Daviess.....	1,991,770	1,974,027	Coal, sand and gravel, clays.
Elliott.....	803,132	74,831	Coal.
Fayette.....	954,442	499,567	Stone, sand and gravel, clays.
Floyd.....	31,965,641	32,681,277	Coal.
Graves.....	1,372,695	1,050,989	Clays.
Greenup.....	446,311	272,087	Coal, clays.
Hardin.....	392,321	199,304	Stone, clays.
Harlan.....	7,266,927	59,026,512	Coal.
Jackson.....	1,216,999	716,177	Do.
Jefferson.....	6,263,078	7,216,060	Cement, stone, sand and gravel, clays.
Johnson.....	2,174,603	2,128,540	Coal.
Knott.....	3,753,401	3,626,726	Do.
Laurel.....	779,937	1,049,647	Do.
Leslie.....	11,390,272	10,034,730	Do.
Livingston.....	2,024,969	574,121	Fluorspar, metals, stone.
Logan.....	260,289	324,687	Do.
Magoffin.....	714,065	1,063,570	Coal.
Marion.....	330,240	229,120	Stone, sand and gravel.
Martin.....	458,626	75,542	Coal.
McCreary.....	2,415,909	970,912	Stone.
McLean.....	50,410	30,159	Coal.
Muhlenberg.....	14,802,920	15,359,591	Do.
Owsley.....	90,410	43,109	Do.
Perry.....	27,838,976	24,736,518	Do.
Pike.....	44,128,786	40,845,155	Do.
Rowan.....	340,615	91,104	Clays.
Union.....	2,290,110	4,038,362	Coal, sand and gravel, clays.
Webster.....	1,211,305	1,475,219	Coal.
Wolfe.....	45,783	64,477	Do.
Undistributed ¹	154,529,496	148,483,629	
Total.....	398,446,000	381,742,000	

¹ Includes value of natural gas and petroleum, also value of mineral production for the following counties: Adair, Anderson, Barren, Boone, Boyd, Boyle, Campbell, Carroll, Casey, Clinton, Cumberland, Edmonson, Fleming, Franklin, Gallatin, Grayson, Hancock, Harrison, Hart, Henderson, Hopkins, Jessamine, Kenton, Knox, Lawrence, Lee, Letcher, Madison, Mason, McCracken, Meade, Menifee, Mercer, Metcalfe, Monroe, Morgan, Ohio, Powell, Pulaski, Rockcastle, Russell, Simpson, Todd, Trigg, Warren, Wayne, and Whitley.

BOYD

Bituminous coal remained the major mineral commodity produced in Boyd County. Largest operators were Charles E. Yates Coal Co., Ferguson Coal Co., and Big Run Coal & Clay Co., Inc., all of Ashland; and Bear Creek Coal Co., Catlettsburg. Most of the Charles E. Yates Co. production was strip-mined. Big Run Coal & Clay Co. was the only coal producer in the county with a mine near a railroad. Miscellaneous clays output was also obtained from Big Run Coal & Clay Co. underground operation.

BOYLE

Caldwell Stone Co., Danville produced crushed limestone in Boyle County. This commodity was utilized for concrete aggregate, road material, and agricultural stone. The Boyle County Road Department, produced a small quantity of paving gravel.

BREATHITT

Major soft coal producers in Breathitt County were Pond Creek Pocahontas Co. and The United Electric Coal Co., operators of the No. 3 and Skyline 23 mines, respectively, near Evanston. The Skyline 23 was a strip operation in the Eastern Kentucky No. 11 and No. 12 seams.

BRECKENRIDGE

Limestone was quarried and sold for use as concrete aggregate, road material, railroad ballast, and agricultural purposes by Hardinsburg Stone Co., Hardinsburg, and Kentucky Stone Co., Inc. A high-grade tile was produced from miscellaneous clays by Murray Tile Co., Inc., Cloverport.

BUTLER

Eight active coal mines, seven of which were underground operations, yielded a small quantity of soft coal in Butler County in 1953.

CALDWELL

Cedar Bluff Stone Co., Princeton, and The Louisville & Nashville Railroad Co. produced crushed limestone for use as riprap, railroad ballast, concrete aggregate, road base, and agricultural stone. Fluorspar was produced in 1953 by 4 mines compared with 11 in 1952. The largest mine was operated by P. L. Perkins, Princeton.

CAMPBELL

Campbell County was in 1953 the major Kentucky county in which molding sand was produced. Output was obtained from the pit of Newport Sand & Gravel Co., Inc.

CARROLL

Carrollton Gravel Sand Co., Inc., produced sand and gravel for structural and railroad ballast purposes in Carroll County; this was the only mineral operation active in the county in 1953.

CARTER

The clay mines of Carter County furnished 66 percent of Kentucky's fire-clay output in 1953. Seven underground and 5 surface mines were active during the year. Major producers were General Refractories Co., Brinegar and Olive Hill; and North American Refractories, Lowe Bailey, Hayward, and Taylor. Output of crushed limestone for use as concrete aggregate and road material was obtained from the Standard Slag & Stone Co. mine at Lawton. A small production of bituminous coal was reported in 1953.

CASEY

The underground limestone mine of Casey Stone Co. near Bethelridge remained active in 1953. Output was utilized principally for concrete aggregate and road material.

CHRISTIAN

Hopkinsville Stone Co., Inc., and Christian Quarries, Inc., both of Hopkinsville, produced crushed limestone for concrete aggregate, road material, and agricultural purposes in Christian County. Dalton Bros. Brick Co., Hopkinsville, surface-mined miscellaneous clays for use in manufacturing heavy clay products.

CLAY

Bituminous coal was the only mineral commodity produced in Clay County in 1953. Of the 43 active mines the largest were Eagle Branch Coal Co. No. 3 at Manchester; Bright Shade Coal Co. No. 1 at Bright Shade; Thomas Coal Co. No. 3 near Manchester; and Polly Marcum Branch Coal Co., Garrard.

CLINTON

Caldwell Stone Co. produced crushed limestone from a quarry near Albany. Output was used for concrete aggregate, roadstone, and agricultural stone.

CRITTENDEN

Fluorspar was the major mineral commodity produced in Crittenden County in 1953. Output was obtained from 41 mines, the largest of which were Tabb No. 1, Yandel No. 2, and Big Four of the United States Steel Corp., and Ozark-Mahoning Co. Commodore mine, all in the Mexico-Marion area. A substantial tonnage of crude fluorspar was also milled by the Pennsylvania Salt Manufacturing Co. at its flotation mill near Mexico. This company purchased the Crider & Lennen metallurgical fluorspar mill and adjacent tailing stockpiles in 1951. L. West and R. R. Walden reported that these tailings assayed approximately 26 percent calcium fluoride.⁶ The tailings were milled in the area, then shipped to the Burleson Concentrator at Marion for drying. After treatment at the concentrator the material was shipped via Illinois Central Railroad to the company Calvert City hydro-fluoric acid plant. The Mexico operation was believed to be Kentucky's first acid-grade fluorspar flotation mill. The United States Steel Corp. Lafayette and Tabb No. 1 mines and Ozark-Mahoning Co. Commodore mine produced lead and zinc as byproducts of the

⁶West, L., and Walden, R. R., Milling Kentucky Fluorspar Tailings: Min. Eng., May 1954, p. 542.

fluorspar operations. Limestone was produced near Marion in Crittenden County by Alexander Stone Co. Output was utilized principally for concrete aggregate, road material, and agricultural stone.

CUMBERLAND

Cumberland Construction Co., Burkesville, produced a substantial tonnage of crushed limestone for concrete aggregate and road material in 1953.

DAVISS

Sand and gravel, clays, and coal were mined in Daviess County in 1953. The largest soft-coal mine active in the county was the K-9 or Panther strip mine of Green Coal Co., Owensboro, which produced from the Western Kentucky No. 9 seam. The output was screened and crushed in a semiportable tippie. There were 13 other coal-producing mines in the county in 1953. Owensboro River Sand & Gravel Co., Inc., Owensboro, and Koch Sand & Gravel Co. produced structural, paving, and engine sand, as well as paving gravel. Miscellaneous clays were produced by Owensboro Clay Products Co. and Joseph L. Clark Tile Co., both with offices in Owensboro. Clay output was used in the manufacture of heavy clay products.

EDMONSON

Kentucky Rock Asphalt Co. quarried bituminous sandstone. The rock was crushed, pulverized, mixed by machinery, and delivered by conveyor belt to river barges for transportation to markets down the Green River.

ELLIOTT

A small quantity of bituminous coal was produced in Elliott County in 1953.

FAYETTE

Central Rock Co. and Blue Grass Stone Co., both of Lexington, operated an underground mine and an open quarry, respectively, for the production of concrete aggregate, road material, and agricultural limestone. Big Run Coal & Clay Co. underground mine yielded fire clay for use in manufacturing heavy clay products.

FLEMING

Gorman Construction Co. quarried crushed limestone for use as concrete aggregate, road material, and agricultural stone near Flemingsburg.

FLOYD

Bituminous coal was the only mineral commodity produced in Floyd County. Of the 223 coal mines active in the county, Inland Steel Co., Wheelwright, Price No. 1, and Price No. 2 mines, all near Wheelwright, were the major producers. The No. 1 and No. 2 mines of Princess Elkhorn Coal Co., Inc., near David, and The Elk Horn Coal Corp. No. 28 mine near Wayland were also substantial producers. Output was predominantly from drift openings in the Elkhorn 1, 2, or 3 seams. These ranged from 30 to 48 inches in thickness. Preparation methods ranged from jiggling to hand picking.

FRANKLIN

A substantial tonnage of crushed limestone was yielded by the underground mines of Blanton Stone Co., Inc., and Frankfort Builders Supply Co., both of Frankfort. Output was sold for concrete aggregate, road material, and agricultural stone.

GALLATIN

Gallatin Sand & Gravel Co., Warsaw, produced a substantial tonnage of structural and paving sand and gravel in Gallatin County.

GRAVES

Ball clay was produced in Graves County in 1953. Output was obtained by open-pit mining from the Holly Springs formation of Tertiary age. The ball clay occurs in large lenses associated with other refractory clays. Producers in 1953 were Kentucky-Tennessee Clay Co., Pryorsburg; Old Hickory Clay Co., Hickory; Kentucky Clay Mining Co., Viola; and Coaley Clay Co., Kentucky-Tennessee Clay Co. and Kentucky Clay Mining Co. also produced fire clay.

GRAYSON

Rodgers & Brunnhoeffler and Ragland Bros. operated limestone quarries near Leitchfield. Output was crushed and sold for concrete aggregate, road material, and agricultural stone.

GREENUP

Virgil Murray, South Shore, and M. A. McCoy and Elva Clark, both of Greenup, surface-mined fire clay in Greenup County. Bituminous coal was also produced in the county.

HANCOCK

Fire clay and bituminous coal were produced in Hancock County in 1953. Owensboro Sewer Pipe Co. reported the output of fire clay from an open pit near Lewisport.

HARDIN

The Upton mine and Stephensburg quarry of Kentucky Stone Co. yielded limestone for concrete aggregate, road material, and agricultural stone. West Point Brick Co., West Point, produced a substantial tonnage of miscellaneous clays for manufacturing heavy clay products.

HARLAN

Harlan County ranked first in Kentucky in total value of mineral output as well as in the value of soft-coal production. In terms of tonnage, the county was the second largest coal-producing area. Major producers in 1953 were 3 United States Steel Corp. mines near Lynch; International Harvester Co., Benham; and 3 Peabody Coal Co. mines near Kenvir. Virtually all the county coal-preparation plants utilize shaker screens and vibrators. There were 233 mines active during the year, of which 56 were on the Louisville & Nashville Railroad.

HARRISON

Genet Stone Co. produced concrete aggregate, road material, and agricultural stone from its limestone quarry near Cynthiana.

HART

Limestone for concrete aggregate and roadstone was quarried at Horse Cave by McClellan Stone Co.

HENDERSON

Bedford-Nugent Co., Inc., produced sand and gravel for structural, paving, and railroad-ballast purposes in Henderson County. The mines of the county also reported soft-coal production.

HOPKINS

Hopkins County ranked as the largest bituminous-coal-producing area in Kentucky, as well as second in total value of mineral output. Major producers were west Kentucky Coal Co., Inc., Madisonville, operator of the Atkinson, East Diamond, and Pleasant View mines; Homestead Coal Co., Earlington; and Miners Coal Co. Fies mine, Madisonville. The seams being mined in the county during the year ranged in thickness from 40 inches to 7 feet. The largest producers operated cleaning and preparation plants, consisting of dewatering screens, McNally-Pittsburg jigs, and hydroseparators.

Clark's Clay Products Co., Ashbyburg, produced a small quantity of clay.

JACKSON

Bituminous coal was the only mineral commodity produced in Jackson County in 1953. The number of active mines decreased from 56 in 1952 to 37 in 1953. Major producers were Sturgill Coal Co. Blie Branch mine near Sand Gap and No. 1 mine at Waneta and Travis Creek Fuel Co., New Zion.

JEFFERSON

Cement, stone, sand and gravel, and clays were produced in Jefferson County in 1953. Of the five limestone producers the largest were Louisville Crushed Stone Co., Louisville; Falls City Stone Co. (formerly Derby Stone Co.) Buechel; and Jefferson County Stone Co., Anchorage. Output of these quarries was crushed for use as concrete aggregate, road material and agricultural stone.

Sand and gravel were recovered from the Ohio River by floating dredges. These operated in the river channel adjacent to Jefferson, Oldham, Trimble, Carroll, and Crittenden Counties. Output was attributed to Jefferson County because there is no way to determine actual production of each county. Major producers were Ohio River Sand Co., Inc., E. T. Slider, Inc., Louisville Sand & Gravel Co., and R. W. Green Sand & Gravel Co., all with offices in Louisville. Their output was utilized mainly for structural and paving sand and gravel, although a small quantity of engine and molding sand, as well as gravel for railroad ballast, was also produced.

Kosmos Portland Cement Co., Inc., continued to work its six-kiln cement plant near Kosmosdale in 1953. Portland and masonry cements produced were shipped by truck, railroad, and boat to nearby

cities, such as Evansville, Ind., and Cincinnati, Ohio. Raw materials utilized included the Fredonia member of the Ste. Genevieve limestone quarried near Brandenburg in Meade County, and alluvial clays mined on the Ohio River flood plain. Southern Brick & Tile Co. and Louisville Pottery Co., both of Louisville, produced miscellaneous clays for use in manufacturing heavy clay products.

JESSAMINE

Kentucky Stone Co., Inc., in Jessamine County, produced a substantial tonnage of concrete aggregate, road metal, and agricultural stone, the only mineral commodities reported in the county in 1953.

KENTON

Franxman Brothers Co. quarry near Covington yielded crushed limestone for concrete aggregate and road material.

KNOTT

A total of 73 mines in Knott County produced bituminous coal in 1953. The largest producer by far was Knott Coal Corp., Anco.

KNOX

Bituminous coal and clays were mined in Knox County in 1953. Of the 88 coal mines active during the year, the largest were Correale Mining Corp. No. 1 strip mine near Artemus; Jackson Coal Co. No. 3 underground mine near Hammond; and the C. & E. Coal Co., Trooper. Major seams worked in the county were the Blue Gem, Dean, and Jellico. Barbourville Brick Co., Barbourville, produced a substantial tonnage of miscellaneous clays for use in manufacturing heavy clay products.

LAUREL

Bituminous coal was produced in Laurel County by 34 mines in 1953. Major producers were Sky-Top Coal Co. No. 2 mine and London Coal Co., both of Pittsburg; and John Bullock Coal Co., Co., London. The Pittsburg seam was the most important productive bed.

LAWRENCE

Engine sand and soft coal were the only mineral commodities produced in Lawrence County in 1953. The one producer of sand was Elkhorn Sand Co., Inc., Louisa.

LEE

Bituminous coal and limestone were produced in Lee County in 1953. The Yellow Rock quarry of Kentucky Stone Co., Inc., yielded crushed limestone for use as concrete aggregate, road material, railroad ballast, and agricultural purposes. Thirteen mines produced coal.

LESLIE

Bituminous coal was produced in Leslie County at 60 mines in 1953, 15 less than in 1952. Major producers were Mary Gail Coal Co. No. 3 and Smith Coal Co. No. 1, both of Wooton; New Big Creek Mining Co. No. 3, Manchester; and Citation Coal Co. No. 1, Hyden. The only seam being worked in the county in 1953 was the Hazard No. 4.

LETCHER

Letcher County continued to rank fifth among bituminous-coal-producing counties of Kentucky. In all, 274 mines were active in the county in 1953, the largest of which were Consolidation Coal Co. (Kentucky) Hendrix mine at Deane, 214 mine at McRoberts, and No. 204 mine at Jenkins. The Elkhorn Coal Corp. No. 6 mine at Jackhorn and Big Chief mine of South-East Coal Co. at Seco were also substantial producers. Major seams being worked in Letcher County were the Elkhorn No. 3, Whitesburg, and Highsplint. Bed thickness ran from 40 inches up to 5 feet. Concrete aggregate and road material were produced at the limestone quarries of Levisa Stone Corp., Jenkins, and Letcher Stone Co.

LIVINGSTON

In keeping with the general depression in the domestic fluorspar industry, the number of active fluorspar mines in Livingston County declined from 12 in 1952 to 3 in 1953. These operations yielded an aggregate 11,400 tons of crude ore compared with 23,900 tons in 1952. The largest producer was Roberts & Frazer, operator of the Carr mine near Carrsville. Output from this mine was fluorbarite. Other producers were the Tracey Harris Goering mine, Salem, the Mitchell mine of Cooper & Smith, Lola, and the Tinsley & Loyd Nancy Hanks property near Salem. Byproduct output of metals from fluorspar mines ceased in 1953; as a result the county dropped to second place in production of zinc. Only one mine, the Alcoa Mining Co. Hutson property, yielded zinc in 1953. As a result of the low market price of zinc the company closed the mine on January 15, 1953, and ceased developing the Klondike and Silver-Royal fluorspar mines. Rosiclare Lead & Fluorspar Mining Co. also closed its Kentucky operations during the year. Ward & Montgomery, Verna, produced limestone for concrete aggregate, road material, and agricultural stone.

LOGAN

Kentucky Flagstone Co., Lewisburg, and Kolor Stone Quarries, Russellville, quarried dimension sandstone. Output was utilized for dressed building stone, rubble, and flagging. Kentucky Stone Co. Inc., produced crushed limestone for concrete aggregate, road material, railroad ballast, and agricultural stone near Russellville.

MADISON

Kentucky Stone Co., Inc., operated a limestone quarry near Boonesboro for producing concrete aggregate, road base, and agricultural stone. A small quantity of ball clay was produced by Etta Grinstead for use in manufacturing high-grade tile.

MAGOFFIN

Bituminous coal was the only mineral commodity produced in Magoffin County. Six mines were active and produced mainly from the Millers Creek, Hazard No. 4, and Hindman seams. The largest producer was the Tip-Top strip mine of Buchanan Coal Co.

MARION

Lebanon Stone Co. and Ward & Montgomery Co., both of Lebanon, produced crushed and broken limestone for use as concrete aggregate,

road material, and agricultural stone. Sand and gravel for structural purposes were produced by Marion County Road Department.

MARTIN

The mines of Martin County yielded a small quantity of bituminous coal.

MASON

Spahr Brick Co. near Maysville mined clays for use in manufacturing heavy clay products.

McCRACKEN

Federal Materials Co., Inc., and Massac Materials Co., both of Paducah, produced sand and gravel for railroad ballast, structural, and paving purposes, as well as engine sand.

McCREARY

Bituminous coal was the only mineral commodity produced in McCreary County in 1953. The major producer was Stearns Coal & Lumber Co., with mines near Worley, Stearns, and Blue Heron.

McLEAN

Five small mines in the vicinity of Island produced bituminous coal in McLean County.

MEADE

Kentucky Stone Co., Inc., reported a substantial output of concrete aggregate, road metal, and agricultural stone from its limestone quarry near Guston.

MENIFEE

The Frenchburg limestone quarry of A. W. Walker & Son yielded concrete aggregate, road metal, and agricultural stone. Coal mines of the county reported output of a small quantity of bituminous coal.

MERCER

The Mercer County Road Department, Harrodsburg, produced a substantial quantity of crushed limestone for concrete aggregate and road material.

METCALFE

Montgomery & Co., Knob Lick, continued to quarry high-calcium limestone at its quarry in Metcalfe County in 1953.

MONROE

Limestone crushed for concrete aggregate and road material was quarried by Monroe-Cumberland Crushed Stone Co., Tompkinsville.

MORGAN

Crushed limestone for concrete aggregate, road base, and agricultural purposes, as well as soft coal, was produced in Morgan County. The Licking River Limestone Co. Licking River quarry, near Zag, produced limestone.

MUHLENBERG

Bituminous coal was the major mineral commodity produced in Muhlenberg County in 1953. Of the 37 active mines the largest were

Brier Creek mine of Crescent Coal Co. near Central City; the Vogue strip mine near Madisonville operated by Terteling Bros., Inc.; and the Graham mine of the W. G. Duncan Coal Co. near Graham.

OHIO

The mines and quarries of Ohio County yielded bituminous coal and limestone. Soft coal was produced by 19 mines, the largest being the Ken mine of the Ken Coal Co. near Beaver Dam, Alston Coal Co. Winner mine, and River View Coal Co., Inc., near Hartford. Fort Hartford Stone Quarry, Olaton, and State Contracting & Stone Co., Sulphur Springs, quarried limestone. The output was sold for concrete aggregate, road material, riprap, railroad ballast, and agricultural stone.

OWSLEY

Bituminous coal was the only mineral commodity produced in Owsley County in 1953. Six small mines operated in the Conklin-Booneville area.

PERRY

Perry County was one of the major sources of bituminous coal in Kentucky in 1953. Output was obtained from 101 mines operating mostly in the Hazard No. 4 and No. 7 seams. The major producer was Blue Diamond Coal Co., operator of Leatherwood, Leatherwood No. 2, and Blue Diamond mines near Leatherwood, Tilford, and Blue Diamond, respectively.

PIKE

Pike County continued in 1953 to rank third in the State soft-coal output. Mines active during the year totaled 338, the largest of which were Republic Steel Corp. No. 4 and Republic mines, Elkhorn City; Norfolk and Western Railway Co. Pond Creek mine near Williamson, W. Va.; and Feds Creek Coal Co., Inc., Biggs.

POWELL

A. W. Walker & Sons quarried limestone from the White Rock quarry near Clay City. Output was utilized for concrete aggregate, road base, and agricultural purposes. H. B. Sipple Brick Co., Stanton, produced miscellaneous clays.

PULASKI

Limestone and bituminous coal were produced in Pulaski County in 1953. Somerset Stone Co., Inc., and Strunk Construction Co. operated quarries near Somerset and Tateville, respectively, for the production of crushed limestone. This commodity was utilized for concrete aggregate, road-stone and agricultural stone.

ROCKCASTLE

Kentucky Stone Co., Inc., produced crushed limestone from the Mount Vernon and Withers quarries. Output was used for concrete aggregate, road material, railroad ballast, and agricultural stone. There was also a small production of soft coal.

ROWAN

General Refractories Co., Haldeman; Lee Clay Products Co., Inc., Clearfield; and Kentucky Fire Clay Co., Morehead, produced fire clay in Rowan County in 1953. Lee Clay Products Co., Inc., one of the

two producers of clay sewer pipe in the State, also produced miscellaneous clays. Clay output was used in manufacturing heavy clay products, firebrick, and block. A small output of bituminous coal was reported during the year.

SIMPSON

The only mineral producer in Simpson County was Southern Stone, Co., Inc., Franklin. Limestone output from the company quarry was used for concrete aggregate, road material, and agricultural lime.

TODD

Kentucky Stone Co., Inc., and Todd County Stone Co., both of Elkton, produced crushed limestone for concrete aggregate, road material, and agricultural stone.

TRIGG

Cedar Bluff Stone, Inc., operated a limestone quarry near Cerulean in 1953. Output was crushed or broken for riprap, concrete aggregate, road material, railroad ballast, and agricultural purposes.

UNION

A substantial tonnage of bituminous coal was produced in Union County in 1953. Major producers were Poplar Ridge Coal Co., Sturgis, and Uniontown Coal Mining Co., Uniontown. Output was obtained from the No. 9 and the Western Kentucky No. 9 seams. The thickness of these beds ranged from 54 to 59 inches. A small quantity of miscellaneous clays was produced by Clark Clay Products Co., Uniontown, for use in brick manufacture. Paving sand as well as structural sand and gravel was produced by Union Sand & Gravel Co.

WARREN

McClellan Stone Co. operated a dolomite quarry near Bowling Green, Warren County. Its output was sold for concrete aggregate, road material, and agricultural lime.

WAYNE

The mines and quarries of Wayne County produced coal and limestone in 1953. Bassett Products Co. quarry yielded limestone for concrete aggregate, road material, and agricultural stone. Nine coal mines were active during the year, the largest of which was Turkey Creek Coal Co. No. 1 mine near Denny.

WEBSTER

Soft coal, virtually all of which was recovered by strip mining, was the only mineral commodity produced in Webster County in 1953. Four mines were in operation, the largest being Precision Washed mine of Hart & Hart near Providence.

WHITLEY

Bituminous coal was produced at 53 mines in Whitley County in 1953; Osborne Mining Co., Inc., operator of a strip mine near Corbin, was the largest producer. Miscellaneous clays for use in the manufacture of heavy clay products were mined by Corbin Brick Co., Corbin.

WOLFE

A small quantity of soft coal was produced in Wolfe County in 1953.

The Mineral Industry of Louisiana

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of Louisiana.

By E. F. Netzeband,¹ Leo Hough,² and W. G. Diamond³



LOUISIANA established a new value record of \$965 million for mineral production in 1953 (table 1). This represented a 14-percent increase over the 1952 figure of \$848 million. Production of 7 minerals and 4 mineral fuels was reported in 1953. Louisiana was the second largest producer in the United States of natural gas, the third largest producer of petroleum and natural gasoline, and the fourth largest producer of LP-gases. Important quantities of sulfur, cement, salt, sand and gravel, and lime were produced. The mineral fuels—crude oil, natural gas, and natural-gas liquids—were the State's most important minerals in value and composed 93 percent of the total. Crude oil was produced in 56 of the State's 64 parishes (counties), natural gas in 51 parishes, and other minerals in 29 parishes.

TABLE 1.—Mineral production in Louisiana, 1952–53¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays.....	390,136	\$433,808	624,427	\$951,612
Natural gas..... million cubic feet..	1,237,143	82,889,000	1,293,644	106,079,000
Natural-gas liquids:				
Natural gasoline and cycle products				
thousand gallons..	672,042	48,579,000	665,532	55,421,000
do.....	297,444	14,890,000	287,280	12,654,000
LP-gases.....	243,929	645,090,000	256,632	721,150,000
Petroleum (crude)..... thousand 42-gallon barrels..	2,553,448	7,807,693	3,061,234	9,189,526
Sand and gravel.....	6,005,119	6,736,524	4,538,387	5,162,248
Sulfur (Frasch process)..... long tons.	1,449,668	32,015,000	1,609,364	43,453,000
Undistributed: Cement, gypsum, lime, stone (1952), and elemental sulfur. Excludes value of clays used in cement.....		\$9,959,888		11,176,929
Total Louisiana.....		848,401,000		965,237,000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

² Final figure. Supersedes preliminary figure in commodity chapter.

³ Revised figure.

Most producers of minerals in Louisiana found it necessary in 1953 to continue developing out-of-State markets for their products; however, industrialization of the State economy had greatly advanced during the previous several years owing to an ample labor supply, coastal ports for ocean commerce, and abundant and low-cost fuel.

¹ Commodity-industry analyst, Region VI, Bureau of Mines, Armarillo, Tex.

² Geologist, Louisiana Geological Survey.

³ Statistical clerk, Region VI, Bureau of Mines, Amarillo, Tex.

EMPLOYMENT IN MINERAL INDUSTRIES

Employment.—Total employment in Louisiana's mineral-fuel industries increased slightly in 1953 over 1952. Approximately 24,000 persons were employed in the oil and gas industries in 1953, 6 percent in exploration, 10 percent in drilling, 21 percent in production, 10 percent in pipeline operation, 45 percent in refining, and 8 percent in miscellaneous. About 1,000 were employed in Louisiana nonmetallic industries in 1953, of whom 52 percent were in the salt industry and 33 percent in the cement industry.⁴

Accidents.—No major disasters were reported in Louisiana for any of the mineral or mineral-fuel industries in 1953. The oil and gas industry reported nine fatal accidents in 1953; none were reported for nonmetallics. The frequency and severity rates of the mineral industries, in general, improved slightly over 1952.

Wages.—Following a similar trend in industrial wages on a national basis, wages of mineral fuels and nonmetallic workers increased in 1953.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Louisiana was an important source of the Nation's petroleum, natural gas, and natural-gas liquids in 1953.

Natural Gas.—1953 production of marketed gas in Louisiana was second largest in the Nation, amounting to 1,294,000 million cubic feet valued at \$106 million, a 5-percent increase over 1952 in production and a 28-percent rise in value (table 9). Natural gas was produced in 51 Louisiana parishes. The five leading producing parishes were Terrebonne, Acadia, Union, Claiborne, and Bossier.

TABLE 2.—Marketed production of natural gas, 1944-48 (average) and 1949-53¹

Year	Million cubic feet	Value	Value per thousand cubic feet, mills	Year	Million cubic feet	Value	Value per thousand cubic feet, mills
1944-48 (average)	574, 023	\$20, 727, 200	36	1951	1, 054, 199	\$61, 143, 000	58
1949	732, 845	32, 025, 000	44	1952	1, 237, 143	82, 889, 000	67
1950	831, 771	44, 084, 000	53	1953	1, 293, 644	106, 079, 000	82

¹ Comprises gas sold or consumed by producers, including losses in transmission, amounts added to storage, and increases in gas pipelines.

Of the 444 wildcats drilled in 1953, 61 were productive for an average of 14 percent, and 383 holes were dry. The estimated proved reserves of natural gas increased 10 percent in 1953 to 34,459,000 million cubic feet from 1952 estimates.⁵

There were 1,610 miles of field and gathering lines and 7,450 miles of transmission lines, making a total of 9,060 miles of natural-gas pipelines in Louisiana in 1953.⁶

⁴ Jones, Nina L. and Bradley, Neil B., *Injury Experience in the Oil and Gas Industry of the United States in 1953*: Bureau of Mines HSS 430, Aug. 31, 1954, 8 pp.

⁵ American Gas Association, *Gas Facts: 1953 Data*, p. 41.

⁶ Work cited in footnote 6, p. 62.

Natural-Gas Liquids.—Louisiana was the Nation's third largest producer of natural-gas liquids in 1953, with a total of 23 million barrels valued at \$68 million (table 3). Production of natural gasoline and cycle products decreased 1 percent in quantity but increased 14 percent in value from 1952. LP-gases decreased 3 percent in quantity and 15 percent in value from 1952. Proved reserves of natural-gas liquids were estimated at 813,214,000 barrels, up about 14 percent over 1952 estimates.⁷

TABLE 3.—Natural-gas liquids produced, 1944-48 (average) and 1949-53, in 42-gallon barrels

Year	Natural gasoline and cycle products		LP-gases		Total	
	Barrels	Value	Barrels	Value	Barrels	Value
1944-48 (average).....	10,933,000	\$24,580,000	3,102,000	\$6,003,000	14,035,000	\$30,583,000
1949.....	13,936,000	45,259,000	5,318,000	9,573,000	19,254,000	54,832,000
1950.....	14,603,000	44,548,000	6,165,000	7,991,000	20,768,000	52,539,000
1951.....	15,643,000	49,202,000	6,839,000	15,374,000	22,482,000	64,576,000
1952.....	16,001,000	48,579,000	7,082,000	14,890,000	23,083,000	63,469,000
1953.....	15,846,000	55,421,000	6,840,000	12,654,000	22,686,000	68,075,000

TABLE 4.—Production of natural-gas liquids in 1953, by types of product

Product	Gallons	Value	Product	Gallons	Value
Natural gasoline.....	211,638,000	\$15,067,000	Finished gasoline and naphtha.....	270,942,000	\$27,417,000
LP-gases.....	287,280,000	12,654,000			
			Other products ¹	182,952,000	12,937,000

¹ Includes condensate, kerosine, distillate fuel, etc.

Petroleum.—Louisiana was the third largest producer of crude oil in 1953 when 256,632,000 barrels was produced valued at \$721 million, a 5-percent increase in quantity and 12-percent rise in value over 1952 (table 5). Crude oil was produced in 56 of the State's 64 parishes. The five leading oil-producing parishes were Plaquemines, Lafourche, Terrebonne, Iberia, and St. Mary.

There were 14,220 producing oil wells in Louisiana in 1953, 930 more than in 1952. The average daily output per well in 1953 was 49.4 barrels compared with 51.7 barrels in 1952. The average price per barrel of crude at the well was \$2.81 in 1953 compared with \$2.64 in 1952.

Exploratory drilling decreased slightly in 1953 when 627 wells were completed, 98 of which were oil producers, 15 gas, 38 condensate producers, and 476 dry holes. Estimated proved reserves as of December 31, 1953, were 2,760,000,000 barrels, up 8 percent over 1952 estimated reserves.⁸

Eleven new fields were discovered in North Louisiana during 1953, 7 less than in 1952. Eight fields were oil and 3 gas-condensate. Six

⁷ Work cited in footnote 4, p. 133.

⁸ American Petroleum Institute, Facts and Figures: 11th ed. 1954, pp. 88, 129.

oil discoveries were made in the Wilcox sands; 1 oil well was completed from Cotton Valley sands, and 1 condensate well was completed from the Smackover formation. The chief fields discovered in North Louisiana were: Bee Brake field, Concordia Parish; Carlton field, Ouachita Parish; and Rosebud field, Concordia Parish.

South Louisiana had 34 new discoveries in 1953, 3 less than in 1952. Twenty-one of the discoveries were oil and 13 were gas and/or condensate. The more important fields discovered were: Bayou Long field, St. Martin Parish; Boutte field, St. Charles Parish; Coffee Bay and Cut-Off fields, Lafourche Parish; Franklin and Sweet Bay Lake fields, St. Mary Parish; Halter-Island field, St. Mary and Terrebonne Parishes; Hollywood and Orage Grove fields, Terrebonne Parish; and Sullivans Lake field, Iberville Parish.

The average daily demand for crude oil in 1953 was 701,000 barrels compared with 661,500 in 1952.

TABLE 5.—Production of crude petroleum, 1944-48 (average) and 1949-53

Year	Thousand 42-gallon barrels	Value		Year	Thousand 42-gallon barrels	Value	
		At wells	Average per barrel			At wells	Average per barrel
1944-48 (average).....	149, 190	\$266, 930, 000	\$1. 79	1951.....	232, 281	\$614, 680, 000	\$2. 65
1949.....	190, 826	507, 730, 000	2. 66	1952.....	243, 929	645, 090, 000	2. 64
1950.....	208, 965	554, 520, 000	2. 65	1953.....	256, 632	721, 150, 000	2. 81

TABLE 6.—Production of crude petroleum in 1953, by months

Month	Thousand 42-gallon barrels	Month	Thousand 42-gallon barrels	Month	Thousand 42-gallon barrels
January.....	21, 917	June.....	21, 266	November.....	20, 901
February.....	20, 016	July.....	21, 919	December.....	21, 572
March.....	22, 274	August.....	22, 030	Total.....	256, 632
April.....	21, 295	September.....	21, 362		
May.....	21, 474	October.....	20, 606		

TABLE 7.—Production of crude petroleum, 1949–53, by districts and fields
(Thousand barrels)

District and field	1949	1950	1951	1952	1953 ¹
Gulf Coast:					
Anse la Butte.....	2,160	2,194	2,442	2,373	2,165
Avery Island.....	2,376	2,649	3,018	3,090	3,111
Barataria.....	3,468	3,450	3,294	2,876	2,351
Bay de Chene.....	370	815	1,259	1,288	1,302
Bay Marchand.....	376	1,986	2,428	2,004	1,560
Bay St. Elaine.....	2,055	2,230	2,672	2,733	3,194
Bayou Blue.....	805	1,071	1,122	1,156	1,158
Bayou Mallett.....	711	874	1,253	1,604	1,796
Bayou Sale.....	4,996	4,737	5,139	5,199	4,710
Caillon Island.....	4,135	5,335	6,499	7,136	8,540
Charenton.....	1,512	1,361	1,136	1,176	1,278
Cox Bay.....		29	1,123	2,102	2,700
David Haas.....	1,084	1,170	1,128	1,117	837
Delta Farms.....	7,581	7,648	7,190	6,751	6,480
Dog Lake.....	556	901	1,320	1,276	1,530
Duck Lake.....	103	414	1,123	2,269	2,935
East White Lake.....	1,217	1,321	1,443	1,427	1,479
Egan.....	2,381	2,136	2,083	2,041	2,017
Erath.....	1,246	1,214	1,178	1,179	1,370
Garden Island.....	1,509	1,614	1,583	1,590	1,590
Gibson.....	1,717	1,539	1,460	1,498	1,410
Golden Meadows.....	4,156	5,020	4,864	4,546	3,918
Good Hope.....	2,177	2,240	2,434	2,288	2,045
Grand Bay.....	3,590	3,766	3,853	3,638	3,768
Gueydan.....	2,115	2,217	2,325	1,970	1,570
Hackberry.....	3,626	3,519	3,621	3,780	4,512
Horseshoe Bayou.....	1,178	1,246	1,346	1,303	1,394
Iowa.....	2,212	1,947	2,282	2,513	2,842
Jeanerette.....	887	947	1,067	1,084	1,137
Jennings.....	1,207	1,104	893	861	791
Lafitte.....	4,017	4,332	4,489	4,467	4,650
Lake Chicot.....	1,083	1,031	1,105	1,104	1,072
Lake Pelto.....	1,584	1,625	2,173	2,456	2,697
Lake Salvador.....	1,842	1,972	2,086	1,843	1,831
Leeville.....	1,910	2,112	2,205	2,417	3,251
Main Pass.....	306	1,331	2,057	2,445	4,287
New Iberia.....	1,577	1,462	1,470	1,275	1,241
North Crowley.....	1,753	1,767	1,659	1,390	1,504
Paradis.....	3,698	3,649	3,626	3,411	3,445
Pine Prairie.....	1,416	1,168	1,048	984	955
Point a-La-Hache.....	304	1,603	2,484	2,746	2,689
Port Barre.....	1,456	1,470	1,438	1,285	1,327
Quarantine Bay.....	3,445	3,725	3,960	3,480	3,151
Romre Pass.....		606	2,315	3,641	4,570
St. Gabriel.....	1,629	1,577	1,793	2,095	1,778
Section 28.....	1,103	1,296	1,117	1,343	1,244
Sunshine.....	152	771	1,257	979	790
Tepetate.....	3,977	3,788	3,321	2,647	2,149
University.....	2,844	2,840	2,203	1,811	1,534
Venice.....	4,614	5,001	5,742	5,965	5,728
Ville Platte.....	1,969	1,888	1,462	1,424	1,335
Vinton.....	3,740	3,872	3,960	3,786	3,618
Weeks Island.....	2,922	5,183	8,199	10,680	11,258
West Bay.....	2,182	2,404	2,936	3,123	3,132
West Cote Blanche.....	1,827	1,704	2,392	2,830	2,865
West Lake Verrett.....	1,393	1,472	1,782	1,966	1,757
White Castle.....	1,594	1,692	1,672	1,563	1,343
Other Gulf Coast ²	30,511	36,720	46,239	52,995	63,439
Total Gulf Coast.....	146,433	164,755	188,768	200,019	214,130
Northern:					
Big Creek.....	1,664	1,443	1,468	1,432	1,279
Caddo.....	4,969	5,689	4,995	5,111	5,438
Delhi.....	7,545	6,733	6,679	6,436	5,916
Haynesville.....	5,339	5,444	5,480	5,008	4,445
Lake St. John.....	7,300	6,695	5,871	4,870	4,015
Lisbon.....	1,703	2,216	1,481	889	891
Nebo ³	2,438	2,328	2,302	2,272	2,268
Olla ⁴	2,625	2,490	2,294	2,203	2,106
Ora.....	1,896	1,085	656	480	324
Rodessa.....	1,302	1,186	1,043	934	868
Other Northern ²	7,612	8,901	11,244	14,275	14,952
Total Northern.....	44,393	44,210	43,513	43,910	42,502
Total Louisiana.....	190,826	208,965	232,281	243,929	256,632

¹ Final figures.² Includes crude oil consumed on leases and net change in stocks held on leases for entire district.³ Includes Hemphill, Trout Creek, and Jena.⁴ Includes Little Creek and Summerville.

TABLE 8.—Indicated demand for petroleum in 1953, by months, in 42-gallon barrels

Month	Indicated demand (barrels)	Month	Indicated demand (barrels)	Month	Indicated demand (barrels)
January.....	22,051,000	June.....	21,958,000	November.....	20,309,000
February.....	19,546,000	July.....	21,481,000	December.....	21,625,000
March.....	21,093,000	August.....	20,940,000		
April.....	22,552,000	September.....	21,095,000	Total: 1953...	255,863,000
May.....	21,811,000	October.....	21,402,000	1952.....	242,110,000

TABLE 9.—Sales of petroleum products 1949-53, in thousands 42-gallon barrels

Product	1949	1950	1951	1952	1953
Gasoline.....	11,722	13,196	14,303	15,510	16,742
Kerosine.....	1,462	1,522	1,550	1,572	1,425
Range oil.....	892	964	1,050	1,051	876
Distillate fuel oil.....	4,021	4,619	5,224	5,840	6,212
Residual fuel oil.....	15,088	11,158	10,917	10,407	9,912

TABLE 10.—Capacity of petroleum refineries and cracking plants in 1953, barrels per day

Company	Location	Crude-oil capacity			Cracked-gasoline capacity		
		Oper-ating	Shut down	Build-ing	Oper-ating	Shut down	Build-ing
Inland:							
Bayou State Oil Corp.	Hosston.....	1,000					
Calumet Refining Co.	Princeton.....	900					
Cotton Valley Solvents, Inc.	Cotton Valley.....	4,000					
Great National Refining Corp.	Ida.....	800					
Stanolind Oil & Gas Co.	Superior.....	6,200			2,680		
Gulf:							
Bay Petroleum Corp.	Chalmette.....	18,000			7,000		
Breaux Bridge Oil Refining Co.	Anse La Butte.....	1,000			780		
Canal Refining Co.	Church Point.....	1,700					
Cities Service Refining Co.	Lake Charles.....	155,000		20,000	37,400		4,000
Continental Oil Co.	West Lake (Lake Charles).	45,000			15,245		
Esso Standard Oil Co.	Baton Rouge.....	266,475	48,525		61,780		
Evangeline Refining Co., Inc.	Jennings.....	1,000		500	288		
Ingram Products Co.	Meraux.....		4,200	2,800			1,800
Pan-Am Southern Corp.	Destrehan.....	30,000			9,200		
Petco Corp.	Marrero.....	6,000			3,575		
Shell Oil Co., Inc.	Norco.....	50,000		25,000	10,200		20,000
Total.....		587,075	52,725	48,300	148,148		25,800

TABLE 11.—Oil and gas well drilling in 1953, by parishes

Parish	Proven field wells			Exploratory wells			Total		
	Oil	Gas	Dry	Oil	Gas	Dry	Oil	Gas	Dry
Acadia	21	29	11	3	6	14	24	35	25
Allen		6	2	2	1	3	2	7	5
Ascension	1	1	3		1	3	1	2	6
Assumption	1	1	4	2	3	6	3	4	10
Avoyelles			3			4			7
Beauregard	3	3	5	6	2	11	9	5	16
Bienville	1	5	6			7	1	5	13
Bossier	22	23	15		2	15	22	25	30
Caddo	505	22	67	2	1	3	507	23	70
Calcasieu	55	10	17	3	1	14	58	11	31
Caldwell						3			3
Cameron	29	21	19	4	3	15	33	24	34
Catahoula	1	1	4	1		16	2	1	20
Claiborne	21	3	16	3	1	6	24	4	22
Concordia	32		23	7		28	39		51
De Soto	20	19	35	1		10	21	19	45
East Baton Rouge	3		2	1		3	4		5
East Carroll		1	1					1	1
Evangeline	5	1	4			5	5		9
Franklin		1	4					1	6
Grant			6	1		9	1		15
Iberia	36	2	19	1		4	37	2	23
Iberville	19	1	10		2	5	19	3	15
Jefferson	26	2	10	1		5	27	2	15
Jefferson Davis	12	12	5	1	1	15	13	13	20
Lafayette	1		2				1		2
Lafourche	96	13	36	9	3	5	105	16	41
La Salle	13		18	1		9	14		27
Lincoln	3	17	10		1	1	3	18	11
Livingston			2			1			3
Madison			2			3			5
Morehouse						3			3
Natchitoches	1		7			5	1		12
Orleans			2	1		4	1		6
Ouachita		2			1	2		3	2
Plaquemines	169	12	58	13	3	29	182	15	87
Pointe Coupee	30	4	5	2	1	3	32	5	8
Rapides	3		2	1	1	2	4	1	4
Red River	4		1			5	4		6
Richland	2	1	5			4	2	1	9
Sabine	2	1	2			9	2	1	11
St. Bernard				1	1	9	1	1	9
St. Charles	11	3	13	3	2		14	5	13
St. Helena						2			2
St. James	5		4			1	5		5
St. John the Baptist			2			3			5
St. Landry	14	8	9	2	4	14	16	12	23
St. Martin	24	11	22	1	2	1	25	13	23
St. Mary	33	7	13	5	1	16	38	8	29
Tensas	2	1	3	1		4	3	1	7
Terrebonne	76	31	29	6	16	4	82	47	33
Union		43	2			6		43	8
Vermilion	12	6	4		2	14	12	8	18
Vernon						1			1
Washington						2			2
Webster	58	1	26	2	1	3	60	2	29
West Baton Rouge	5	1	4			2	5	1	6
Winn	6		6			6	6		12
Gulf of Mexico	3	4	1				3	4	1
Total: 1953	1,386	330	581	87	63	379	1,473	393	960
1952	1,111	295	590	82	83	383	1,193	378	973

Louisiana refineries received 210,522,000 barrels in 1953, of which 135,258,000 barrels was Louisiana production, with 46,276,000 barrels from Texas, 24,000 barrels from New Mexico, and 1,005,000 barrels imported. Pipelines transported a major portion of the crude oil shipped to Louisiana refineries in 1953; and boats carrying nearly all of the balance of the total volume, as reported below:⁹

Type of transportation:	Quantity shipped	
	Intrastate (barrels)	Interstate (barrels)
Pipelines.....	84, 004, 000	66, 352, 000
Boats.....	49, 576, 000	7, 282, 000

There were 16 refineries in Louisiana in 1953; 15 operated at a daily crude-oil capacity of 587,075 barrels as of January 1, 1954 (table 10). There was 48,300-barrel daily capacity under construction, with 52,725-barrel capacity shut down. Cracking plants operated at a daily capacity of 148,148 barrels.

NONMETALS

Cement.—1953 production of portland cement from oystershells in Louisiana declined from 1952. Cement was produced from plants near Baton Rouge and New Orleans. Shipments in 1953 were less than production, so that stocks at mills at the year end increased over 1952.

Clays.—Clays were produced in 13 parishes in 1953 and were used for cement manufacture and for brick and tile. Shale was used in manufacturing lightweight aggregate. One of the Nation's largest lightweight-aggregate plants was at Erwinville in Pointe Coupee Parish. Total production of all clays increased 60 percent in quantity and 119 percent in value over 1952 (table 12).

TABLE 12.—Miscellaneous clays sold or used by producers, 1944-48 (average) and 1949-53¹

Year	Short tons	Value	Year	Short tons	Value
1944-48 (average).....	151, 556	\$123, 049	1951.....	306, 542	\$306, 542
1949.....	249, 912	193, 501	1952.....	390, 136	433, 808
1950.....	327, 067	273, 116	1953.....	614, 427	901, 612

¹ Excludes bentonite.

Gypsum.—Production of crude gypsum in Winn Parish in 1953 approximated that of 1952.

Lime.—Lime was produced in Calcasieu Parish in 1953 by the Mathieson Chemical Corp.

Perlite.—Crude perlite is not known to occur in Louisiana; however, in 1953 plants at New Orleans and Shreveport, using crude rock from deposits in Western States, produced expanded perlite for use mainly as lightweight aggregate in plaster and concrete.

⁹ Work cited in footnote 4, p. 183.

Salt.—Salt was produced in 5 parishes in 1953 and increased 20 percent in quantity and 18 percent in value over 1952 (table 13). Of the more than 3 million short tons produced, 121,000 short tons was evaporated salt, 930,000 short tons rock salt, and more than 2 million short tons in brine.

Sand and Gravel.—Production of sand and gravel in 1953 decreased 24 percent in quantity and 23 percent in value from 1952 for a total of 4,538,000 tons valued at \$5,162,000 (table 14). Production originated in 13 of the State's parishes and was used mainly for construction purposes.

Sulfur.—Louisiana remained the second largest sulfur producer in 1953. Shipments increased 11 percent in quantity and 36 percent in value (table 15). Sulfur was produced in Calcasieu and Plaquemines Parishes.

TABLE 13.—Salt sold or used by producers, 1944–48 (average) and 1949–53

Year	Short tons	Value	Year	Short tons	Value
1944–48 (average).....	1, 947, 314	\$5, 104, 720	1951.....	2, 737, 149	\$7, 662, 179
1949.....	2, 030, 076	5, 837, 714	1952.....	2, 553, 448	7, 807, 693
1950.....	2, 278, 811	6, 902, 502	1953.....	3, 061, 234	9, 189, 526

TABLE 14.—Sand and gravel sold or used by producers, 1949–53, in short tons

Year	Commercial		Noncommercial		Total sand and gravel		
	Short tons	Value	Short tons	Value	Short tons	Value	Average value per ton
1949.....	5, 050, 148	\$6, 107, 311	(1)	(1)	² 5, 050, 148	² \$6, 107, 311	\$1. 21
1950.....	5, 245, 714	6, 187, 065	259, 648	\$123, 360	5, 505, 362	6, 310, 425	1. 15
1951.....	6, 098, 898	7, 262, 749	285, 430	150, 821	6, 384, 328	7, 419, 570	1. 16
1952.....	5, 788, 098	6, 660, 994	217, 021	75, 530	6, 005, 119	6, 736, 524	1. 12
1953.....	4, 305, 597	5, 090, 598	232, 790	71, 650	4, 538, 387	5, 162, 248	1. 14

¹ Bureau of Mines not at liberty to publish.

² Incomplete figure, excludes noncommercial operations.

TABLE 15.—Sulfur produced and shipped from Frasch mines, 1944–48 (average) and 1949–53

Year	Production	Shipments		
	Long tons	Long tons	Value	Average value per ton
1944–48 (average).....	837, 033	843, 240	\$14, 066, 017	\$16. 68
1949.....	1, 134, 185	1, 111, 115	20, 000, 000	18. 00
1950.....	1, 243, 020	1, 256, 026	23, 700, 000	18. 87
1951.....	1, 311, 293	1, 152, 821	25, 400, 000	22. 03
1952.....	1, 508, 550	1, 449, 668	32, 015, 000	22. 08
1953.....	1, 640, 571	1, 609, 364	¹ 43, 453, 000	¹ 27. 00

¹ Estimated.

REVIEW BY PARISHES

Production of nonmetals and mineral fuels in 1953 were reported from 62 of the 64 parishes in Louisiana.

ACADIA

Petroleum, natural gas, and natural-gas liquids were produced in Acadia Parish, which was second in the production of natural gas in the State. Acadia Parish has one natural-gasoline plant at Egan, which uses the absorption process.

ALLEN

Petroleum and natural gas were produced from the Bel, Clear Creek, Kinder, S. E. Oberlin, and Reeves fields. The Bel Oil Corp. recovered natural gasoline at its North Elton plant.

ASCENSION

Petroleum and natural gas were produced from the Darrow and Sorrento fields in Ascension Parish.

ASSUMPTION

Petroleum and natural gas were produced from East Lake Verret and Napoleonville fields in Assumption Parish.

AVOYELLES

Petroleum and natural-gas liquids were produced in Avoyelles Parish. Avoyelles Parish has one natural-gasoline plant at Eola; it uses the absorption process.

TABLE 16.—Value of mineral production in Louisiana by parishes, 1952-53¹

Parish	1952	1953	Principal minerals produced in 1953, in order of value
Acadia.....	\$36,385,000	\$42,242,727	Petroleum, natural gas, natural-gas liquids.
Allen.....	942,000	2,107,669	Petroleum, natural-gas liquids, natural gas.
Ascension.....	692,000	622,000	Petroleum, natural gas.
Assumption.....	1,395,000	1,701,000	Do.
Avoyelles.....	5,655,000	4,732,677	Petroleum, natural-gas liquids.
Beauregard.....	11,896,429	10,627,184	Petroleum, natural-gas liquids, natural gas.
Bienville.....	3,257,201	3,630,200	Natural gas, petroleum, clays.
Bossier.....	19,570,000	22,067,945	Petroleum, natural-gas liquids, natural gas.
Caddo.....	20,488,108	22,661,313	Do.
Calcasieu.....	34,505,921	40,698,906	Petroleum, sulfur.
Caldwell.....	265,000	307,000	Natural gas, petroleum.
Cameron.....	23,422,038	28,602,000	Petroleum, natural gas.
Catahoula.....	2,383,000	2,585,470	Petroleum, natural gas, sand and gravel.
Claborne.....	29,793,150	29,869,642	Petroleum, natural gas, natural-gas liquids.
Concordia.....	11,081,000	12,527,000	Petroleum, natural gas.
De Soto.....	3,988,000	5,040,000	Natural gas, petroleum.
East Baton Rouge.....	11,009,090	10,636,453	Petroleum, cement, clays.
East Carroll.....	11,000	5,000	Natural gas.
East Feliciana.....	(2)	(2)	Sand and gravel.
Evangeline.....	12,925,032	13,069,422	Petroleum, natural-gas liquids, natural gas.
Franklin.....	2,522,000	2,648,000	Petroleum, natural gas.
Grant.....	116,000	2,112,000	Petroleum.
Iberia.....	48,077,115	54,749,389	Petroleum, salt, natural gas.
Iberville.....	19,119,979	19,282,053	Do.
Jackson.....	2,53,000	2,98,000	Natural gas.
Jefferson.....	28,243,000	28,792,324	Petroleum, natural-gas liquids, natural gas.
Jefferson Davis.....	13,403,000	14,484,444	Petroleum, natural gas, natural-gas liquids.
Lafayette.....	533,430	291,458	Petroleum, clays, natural gas.
Lafourche.....	63,883,000	73,646,000	Petroleum, natural gas.
La Salle.....	17,129,093	17,669,000	Do.
Lincoln.....	14,398,668	18,876,369	Natural-gas liquids, natural gas, petroleum.
Livingston.....	655,000	559,000	Petroleum.
Madison.....	2,082,000	1,645,000	Do.
Morehouse.....	1,481,000	1,805,000	Natural gas, petroleum.
Natchitoches.....	411,744	392,000	Petroleum.
Orleans.....	5,561,248	5,208,202	Cement, petroleum, sand and gravel.
Ouachita.....	2,764,797	2,521,758	Natural gas, sand and gravel, clays.
Plaquemines.....	120,859,910	142,416,952	Petroleum, sulfur, natural gas.
Pointe Coupee.....	4,729,000	7,955,023	Petroleum, natural gas, clays.
Rapides.....	4,073,237	3,405,263	Petroleum, natural-gas liquids, clays.
Red River.....	963,000	3,768,000	Petroleum, natural gas.
Richland.....	17,687,000	17,040,735	Petroleum, natural-gas liquids, natural gas.
Sabine.....	370,000	321,000	Petroleum.
St. Bernard.....		3,000	Do.
St. Charles.....	23,633,000	24,052,723	Petroleum, natural gas, natural-gas liquids.
St. James.....	3,374,000	5,217,000	Petroleum, natural gas.
St. John the Baptist.....	324,000	262,000	Natural gas, petroleum.
St. Landry.....	16,267,000	19,028,965	Petroleum, natural-gas liquids, natural gas.
St. Martin.....	29,229,000	32,244,592	Petroleum, natural gas, salt.
St. Mary.....	39,070,000	43,471,175	Petroleum, natural gas, natural-gas liquids.
St. Tammany.....	264,115	519,985	Natural-gas liquids, sand and gravel, natural gas.
Tangipahoa.....	435,969	66,794	Sand and gravel, clays.
Tensas.....	8,191,000	6,687,000	Petroleum, natural gas.
Terrebonne.....	55,097,000	72,570,663	Petroleum, natural gas, natural-gas liquids.
Union.....	6,651,000	8,058,000	Natural gas, petroleum.
Vermilion.....	36,621,000	39,435,641	Petroleum, natural-gas liquids, natural gas.
Washington.....	697,326	821,485	Sand and gravel, natural gas, petroleum.
Webster.....	25,348,978	32,222,982	Petroleum, natural-gas liquids, natural gas.
West Baton Rouge.....	768,000	1,408,279	Do.
West Carroll.....	70,000	97,000	Natural gas.
West Feliciana.....	(2)	(2)	Sand and gravel.
Winn.....	1,147,561	1,456,462	Salt, petroleum, gypsum.
Undistributed.....	2,559,907	9,232,173	
Total.....	848,401,000	965,237,000	

¹ Parish distribution of Bureau of Mines data for petroleum, natural gas, and natural-gas liquids based on parish production as reported by the Department of Conservation of Louisiana.

² Included with "Undistributed" to avoid disclosing individual data.

BEAUREGARD

Beauregard Parish produced petroleum, natural gas, and natural-gas liquids. There are two natural-gasoline plants in Beauregard Parish, 1 at Merryville using the absorption process and 2 at Longville using the compression process.

BIENVILLE

Clay was produced by the Norman Brick Co. for use in its brick plant. Petroleum and natural gas were also produced in Bienville Parish; a natural-gasoline plant at Ringgold utilizes the absorption process.

BOSSIER

Petroleum, natural gas, and natural-gas liquids were produced. Bossier Parish Police Jury produced gravel. Bossier Parish has 3 natural-gasoline and cycle plants, 2 at Haughton using the absorption process and 1 at Benton using the cycling process. Expanded perlite was produced at the Shreveport plant of R. S. Allday Clay Products, Inc.

CADDO

The Tri-State Brick & Tile Co. produced clay for use in the manufacture of heavy clay products. Petroleum, natural gas, and natural-gas liquids were produced. Sand and gravel were produced by the Texas & Pacific Railway Co. Natural-gasoline and cycle plants were operated at Shreveport, Rodessa, Gilliam, Myrtis, Trees and Ida.

CALCASIEU

The Mathieson Chemical Corp. produced lime from oystershells near Lake Charles. Sulfur was produced by the Jefferson Lake Sulphur Co. from the Starks dome. The Columbia Southern Chemical Corp. and the Mathieson Chemical Corp. produced salt brine for their own use. Clay for building brick was produced by the Price-Dunham Brick Co. Petroleum, natural gas, and natural-gas liquids were produced. Calcasieu Parish had two natural-gasoline plants at Lake Charles and Iowa, using the absorption process.

CALDWELL

Natural gas and condensate were produced from the Vixen field in Caldwell Parish.

CAMERON

Petroleum and natural gas were produced from 22 fields in Cameron Parish, with Black Bayou, Cameron, Cameron Meadows, Chalkley, E and W Hackberry, Hog Bayou and Grand Lake fields the principal producers.

CATAHOULA

Paving and other gravels were produced from deposits in Catahoula Parish by Glenn Drewett. Petroleum and natural gas were produced in Catahoula Parish.

CLAIBORNE

George H. Owens produced paving gravel in Claiborne Parish. Petroleum, natural gas, and natural-gas liquids were also produced. Claiborne Parish was the fourth largest producer of natural gas in Louisiana and has six natural-gasoline plants. Five plants use the absorption process and one the compression process.

CONCORDIA

Petroleum, natural gas, and natural-gas liquids were produced from 15 fields in Concordia Parish, which has a natural-gasoline cycling plant at Lake St. John. Principal fields were Esperance Point, Fairview, Lake St. John and Ross Bayou.

DE SOTO

Petroleum and natural gas were produced from seven fields in De Soto Parish, with Benton, Logansport and Spider fields the leading producers.

EAST BATON ROUGE

Cement was produced by the Ideal Cement Co. at its plant near Baton Rouge, and the Lone Star Cement Co. produced cement at New Orleans. Clay for the manufacture of brick was produced by the Acme Brick Co. Petroleum and natural gas were produced in East Baton Rouge Parish.

EAST CARROLL

Natural gas was produced in the Epps field in East Carroll Parish.

EAST FELICIANA

Construction sand and gravel were produced by the Flint Sand & Gravel Co.

EVANGELINE

Petroleum, natural gas, and natural-gas liquids were produced in Evangeline Parish. There were four natural-gasoline plants—at Basile, Easton, Mamou, and Ville Platte. All use the absorption process except that at Mamou which uses a combination of processes. Gifford-Hill & Co. produced structural sand and gravel and paving sand and gravel.

FRANKLIN

Petroleum and natural gas were produced in Big Creek and Big Creek (South) fields, Franklin Parish.

GRANT

Petroleum was produced in Aloha and Virgin Bend fields, Grant Parish.

IBERIA

Iberia Parish was the fourth largest producer of petroleum in the State. Natural gas was also produced. Evaporated and rock salt

was produced by the Morton Salt Co., International Salt Co., Inc., and the Jefferson Island Salt Co. Clay for brick and tile was produced by the Conrad Brick & Tile Co. Structural sand was produced by the Iberia Sand & Gravel Co.

IBERVILLE

Petroleum and natural gas were produced in Iberville Parish. The Solvay Process Division, Allied Chemical & Dye Corp., produced salt brine primarily for its own use; a small portion was sold.

JACKSON

Natural gas was produced from the Chatham field, Jackson Parish.

JEFFERSON

Jefferson Parish produced petroleum, natural gas, and natural-gas liquids. A natural-gasoline plant using the absorption process is at Lafitte.

JEFFERSON DAVIS

Petroleum, natural gas, and natural-gas liquids were produced in Jefferson Davis Parish. There is a natural-gasoline plant at Jennings and a cycle plant near South Jennings. Structural and paving sand and gravel were produced by the Witte Gravel Co.

LAFAYETTE

The Mike Baker Brick Co. produced clay for its brick plant in Lafayette Parish. Petroleum and natural gas were produced.

LAFOURCHE

Lafourche Parish was the second largest producer of petroleum in Louisiana, with output reported from 19 fields. Natural gas was also produced.

LA SALLE

Petroleum and natural gas were produced from 15 fields in La Salle Parish, with Catahoula Lake, Catahoula Lake (West), Nebo-Hemphill, Olla, and Saline Lake, the 5 leading producers.

LINCOLN

Lincoln Parish produced petroleum and natural gas and was the third largest producer of natural-gas liquids. There are 2 natural-gasoline plants at Dubach and 1 near Ruston, utilizing the absorption process. The Ruston Brick Works produced clay for use in manufacturing brick, and the Filtrol Corp. produced bentonite.

LIVINGSTON

Petroleum was produced from the Denham Springs and Lake Maurepas fields, Livingston Parish.

MADISON

Madison Parish produced petroleum from the Indian Lake field.

MOREHOUSE

Petroleum and natural gas were produced from the Buckman and Monroe fields, Morehouse Parish.

NATCHITOCHE

The Natchitoches Brick Co. produced clay for its brick plant. Petroleum was produced in Natchitoches Parish.

ORLEANS

The Lone Star Cement Co. operated its cement plant at New Orleans, Louisiana's largest city, which offered markets for important tonnages of cement and sand and gravel. The Jahncke Service Co., Inc., produced molding sand, the United States District Engineers produced paving sand, and some railroad sand and gravel were produced by various concerns. Expanded perlite was produced at the New Orleans plant of Alatec Construction Service, Inc.

OUACHITA

Miscellaneous sand and gravel were produced by the Monroe Sand & Gravel Co., Inc., from its pits in Ouachita Parish. Clay for the manufacture of brick was produced by the Acme Brick Co. Petroleum and natural gas were produced.

PLAQUEMINES

Plaquemines Parish was the largest producer of petroleum in Louisiana. The Freeport Sulphur Co. produced Frasch sulfur from its two mines in Plaquemines Parish. Natural gas was also produced.

POINTE COUPEE

Petroleum and natural gas were produced. Shale was used for the production of lightweight aggregate at the McDearmon Lightweight Aggregate Co., the Nation's largest plant, near Erwinville in Pointe Coupee Parish.

RAPIDES

Petroleum, natural gas, and natural-gas liquids were produced in Rapides Parish. The Rapides Brick Co. produced clay for use in manufacturing brick. Paving and structural sand and gravel were produced in Rapides Parish by the Rapides Gravel Co., Inc., and the Alexandria Gravel Co., Inc. A natural-gasoline plant at Cheneyville uses the absorption process.

RED RIVER

Red River Parish produced petroleum and natural gas from the Gahagen and Lake End fields.

RICHLAND

Petroleum, natural gas, and natural-gas liquids were produced in Richland Parish. One natural-gasoline plant near Delhi in Richland Parish used the absorption process.

SABINE

Sabine Parish produced petroleum from four fields, Blue Lake, Converse, Pleasant Hill, and Zwolle.

ST. BERNARD

Petroleum was produced from Eloi Bay field in St. Bernard Parish.

ST. CHARLES

One natural-gasoline plant employed the absorption process at Paradis, St. Charles Parish. Petroleum, natural gas, and natural-gas liquids were produced.

ST. JAMES

St. James Parish produced petroleum and natural gas from five fields—Burton, College Point-St. James, Convent-Hester, LaPice and Vacherie.

ST. JOHN THE BAPTIST

Petroleum and natural gas were produced from La Place and Reserve fields in St. John the Baptist Parish.

ST. LANDRY

St. Landry Parish produced petroleum, natural gas, and natural-gas liquids. There was one natural-gasoline absorption plant at Opelousas.

ST. MARTIN

Evaporated salt was produced by the Gordy Salt Co., Inc., in St. Martin Parish. Petroleum, natural gas, and natural-gas liquids were produced. There was one natural-gasoline absorption plant near Breaux Bridge.

ST. MARY

Petroleum, natural gas, and natural-gas liquids were produced. St. Mary Parish was the fifth largest producer of petroleum in the State. One cycle plant was in operation at Bateman Lake near Morgan City.

ST. TAMMANY

Natural-gas liquids, natural gas, and petroleum were produced. The Schneider Brick & Tile Co. Inc., and the St. Joe Brick Works, Inc., produced clay for manufacturing brick and tile. Paving gravel, structural gravel, and other sands were produced by Kivett & Reel, Inc., in 1952.

TANGIPAHOA

Paving and structural sand and gravel were produced by the Anderson Gravel Co. and the Independence Sand & Gravel Co. Clay was produced by the Hammond Baton Rouge Co. for use in manufacturing heavy clay products.

TENSAS

Tensas Parish produced petroleum and natural gas from five fields, Helena, Holly Ridge, Lake St. John, Lake St. Joseph, and Rodney Island.

TERREBONNE

Terrebonne Parish ranked first in the production of natural gas, third in the production of petroleum, and fifth in the production of natural-gas liquids in Louisiana.

UNION

Petroleum and natural gas were produced in Union Parish; there was a natural-gasoline absorption plant near Bernice.

VERMILION

Vermilion Parish ranked second in the production of natural-gas liquids in the State. Petroleum and natural gas were produced. A cycle plant was in operation at Erath, Vermilion Parish.

WASHINGTON

Construction sand and gravel were produced in Washington Parish by the Standard Gravel Co., the Washington Sand & Gravel Co., and the Willis Sand & Gravel Co. Petroleum and natural gas were produced.

WEBSTER

Webster Parish was the largest producer of natural-gas liquids in Louisiana. A cycle plant is operated near Cotton Valley. Petroleum and natural gas were produced. Structural and paving sand and gravel were produced by Gifford-Hill & Co., Inc., and Braswell Sand & Gravel Co., Inc. Winford Sand & Gravel Co. produced glass sand.

WEST BATON ROUGE

Petroleum and natural gas were produced in West Baton Rouge Parish from four fields, Erwinville, Grosse Tete, Lobdell, and Port Allen.

WEST CARROLL

Natural gas was produced from the Epps field, West Carroll Parish.

WEST FELICIANA

The Jackson Sand & Gravel Co., Inc., produced paving and structural sands in West Feliciana Parish.

WINN

Rock salt was produced by the Carey Salt Co. in Winn Parish. The Anderson-Dunham Co. was the only gypsum producer in Louisiana.

The Mineral Industry of Maine

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of Maine.

By Richard H. Mote ¹



MAINE mineral production in 1953 reached an alltime high total value of \$10,503,000 and represented a 17-percent rise over the 1952 total of \$8,981,000. This was the fourth consecutive year of advance in mineral output in the State and the first year in which the value exceeded 10 million dollars. Cement manufacturing continued to be the principal factor in the mineral economy and was the chief contributor to the expanded value of mineral output in 1953. Except for lime, slate, feldspar, and stone, the advance in mineral production was general. Sand and gravel, the mining of which is the State's second largest mineral industry on a dollar basis, increased 14 percent in quantity and 19 percent in value. Peat and clays production were the highest since 1950, and substantial gains in output were made in beryllium concentrates and quartz (silica). Mine production of mica increased over eightfold in 1953, principally the result of the General Services Administration (GSA) purchasing program for block, film, and hand-cobbed mica.

Mineral production was reported from every county except Lincoln. The leading counties, in order of decreasing value of output, were Knox, Kennebec, Hancock, Piscataquis, and Aroostook, which together supplied over 91 percent of the total dollar volume of mineral production.

TABLE 1.—Mineral production in Maine, 1952-53 ¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement.....376-pound barrels.....	1,457,250	\$3,750,483	2,001,464	\$5,422,272
Clays.....	26,050	26,050	29,661	27,476
Feldspar (crude).....long tons.....	18,644	147,371	17,637	117,090
Peat.....	1,695	57,541	2,428	73,564
Sand and gravel.....	7,078,078	2,187,531	8,071,937	2,608,386
Stone (except limestone for cement and lime).....	² 316,874	² 1,795,768	² 248,501	² 1,215,439
Undistributed: Beryllium concentrate, lime, mica, quartz from pegmatites or quartzite, slate, stone (crushed limestone), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2).....		1,015,827		1,038,883
Total Maine.....		8,981,000		10,503,000

¹ Production as measured by mine shipments or mine sales (including consumption by producers).

² Excludes certain stone, value for which is included with "Undistributed."

¹ Chief, Mineral Industry Division, Region VIII, Bureau of Mines, Pittsburgh, Pa.

TABLE 2.—Average prices of certain mineral commodities in Maine, 1952-53¹

Commodity	1952	1953
Cement.....376-pound barrel.....	\$2.57	\$2.71
Clays.....short tons.....	1.00	.93
Feldspar (crude).....long tons.....	7.90	6.64
Peat.....short tons.....	33.95	30.30
Sand and gravel (commercial).....do.....	.76	.64

¹ Prices are based on average value f. o. b. mines and mills reported by producers. More detail on prices by grades and markets will be found in the commodity chapter in vol. I of this series.

REVIEW BY MINERAL COMMODITIES

METALS

There has been virtually no metal mining in Maine since 1900. Earlier, principally in the period from 1878 to 1882, mines in Hancock and Piscataquis Counties yielded iron, copper, lead, gold, silver, and zinc.

During 1953 the Bureau of Mines continued its research and investigation of the low-grade manganese deposits of Aroostook County. It also reported on ore-dressing tests of four samples of manganese-bearing ore from deposits on Maple Mountain, Hovey Mountain, the Dudley farm, and the Burnham farm.²

In the southern manganese district from April through most of June the Bureau conducted a limited investigation by contract drilling of magnetic anomalies located by aeromagnetic survey. Ground magnetometer surveys were conducted in the same area by the Federal Geological Survey.

Results of research on the extraction and recovery of manganese from Maine ores indicated that recovery was technically feasible from ores in which a considerable portion of the manganese was in the form of silicates. Ores of this type occur in the Maple Mountain-Hovey Mountain area.

Deposits in Aroostook County were estimated by the Bureau of Mines to contain 28 million tons of metallic manganese in manganiferous-ferruginous slates averaging about 9 percent manganese. Of this quantity, 22.8 million tons of metal was contained in 256 million tons of ore at 1 locality. These deposits have not been mined because of the difficulty in recovering manganese from the ores.

NONMETALS

Beryl.—Beryl was produced at three mines in 1953; the largest was The Beryllium Corp. Scotty mine on Plumbago Mountain, Oxford County. Beryllium concentrate produced at this property was trucked to the depot at Franklin, N. H., for sale under provisions of GSA beryl-purchase program established in October 1952.

In this program, designed primarily for small domestic producers, purchase depots at Franklin, N. H., Spruce Pine, N. C., and Custer, S. Dak., were authorized to accept up to 25 tons of beryl a year from an individual producer. Producers wishing to participate in the program, which would terminate June 30, 1957, or when 1,500 dry

² Lamb, Frank D., Warnke, W. E., and Woodard, D. A., Ore-Dressing Tests of Aroostook County, Maine, Manganese Ores: Bureau of Mines Rept. of Investigations 4951, 1953, 10 pp.

short tons of ore was received, had until June 30, 1955, to notify GSA of their intent.

Specifications for acceptable ore were as follows:

1. It must not contain less than 8 percent beryllium oxide by weight and must be clean crystals cobbled free of waste.
2. Shipments up to 500 pounds each are accepted or rejected on the basis of visual inspection.
3. Ore accepted on visual inspection will be purchased at \$0.20 a pound or \$400 a ton.
4. The price of ore subjected to chemical analysis will be based on the number of short-ton units of beryllium oxide contained in the ore. Ore containing 8.0–8.9 percent BeO will be purchased at \$40 per unit; 9.0–9.9 percent BeO, \$45 per unit; and 10 percent or more BeO, \$50 per unit.

A comprehensive review of beryllium prepared by the Federal Bureau of Mines and the Federal Geological Survey in cooperation with the National Security Resources Board stated that, although beryl resources have not been studied as thoroughly in Maine as elsewhere in New England, large deposits occur in Oxford County, especially in the Main pegmatite on Newry Hill, the Bumpus pegmatite, and the West pegmatite.³ Beryllium resources in Oxford County were estimated in this report to be 2,700 short tons in deposits containing 1.0 percent or more beryl and 3,800 tons in deposits containing 0.1 percent or more beryl.

Cement.—Cement continued in 1953 to be Maine's most important mineral product. The output during the year accounted for over 50 percent of the State's total value of mineral production. As in previous years, the one producer was the Dragon Cement Co., Inc., quarry and 2-million-barrel-per-year wet-process plant at Thomaston, Knox County. The 25th anniversary of the opening of this plant, the only cement plant in the New England States, was celebrated during the year with installation of new equipment designed to expand productive capacity.

Clays.—Although Maine's clay deposits are widespread along most of the coastal area and inland in the major stream valleys, exploitation in 1953 was limited to areas in four counties. In all, 6 pits were worked during the year, 2 in Androscoggin County, 2 in Cumberland County, and 1 each in Franklin and Penobscot Counties. As in previous years, only miscellaneous clays for brick manufacture were mined. Leading producers in 1953 were Moria Brick Co., Danville, Androscoggin County, and Brooks Brick Co., Brewer, Penobscot County.

The clay deposits most economically mined are in the southwestern part of the State. These have very little overburden in contrast to the deposits in the south-central areas, which are covered by a considerable thickness of sand and gravel. Virtually all deposits are of salt-water origin, although some glacial and fresh-water clays are found along the upper reaches of the inland stream valleys. The average thickness of the deposits is about 15 feet.

Feldspar.—Deposits of feldspar occur in two fairly well defined districts in Maine—the Topsham district in the south central part of the State and the Paris-Rumford district largely in Oxford County,

³ Bureau of Mines and Geological Survey, Materials Survey—Beryllium: Compile for National Security Resources Board, September 1953, 178 pp.

in the west central part. In 1953, 17 mines were active—2 in Androscoggin County, 3 in Oxford County, and 12 in Sagadahoc County. All feldspar mined in 1953 was ground locally at the three mills active during the year. Topsham Feldspar Co. operated its mill at Topsham entirely on purchased crude during the year. The Topsham mill of Consolidated Feldspar Dept., International Minerals & Chemical Corp., treated both company-mined and purchased ore, whereas the Bell Minerals Co., West Paris, Oxford County, mill treated company ore only.

The bulk of the ground feldspar produced in the State in 1953 was shipped to consumers in Ohio, New York, Pennsylvania, New Jersey, and Massachusetts for use in manufacturing ceramic tile, electrical porcelain, pottery, and sanitary ware and in soaps and abrasives.

TABLE 3.—Crude feldspar sold or used by producers, 1944-48 (average) and 1949-53

Year	Long tons	Value	
		Total	Average per ton
1944-48 (average).....	14, 716	\$89, 693	\$6. 09
1949.....	18, 286	130, 275	7. 12
1950.....	17, 487	124, 821	7. 14
1951.....	19, 273	154, 695	8. 03
1952.....	18, 644	147, 371	7. 90
1953.....	17, 637	117, 090	6. 64

Lime.—Rockland-Rockport Lime Co. at Rockland, Knox, County, continued in 1953 to be Maine's only producer of lime, largely for chemical uses.

Mica.—Mica produced in Maine was obtained largely as a by-product of feldspar or beryl mining and was predominantly scrap mica, although some output was suitable for use as sheet mica. The largest mica producer was The Beryllium Development Co. Scotty mine on Plumbago Mountain from which scrap mica was recovered as a byproduct of beryl mining. Other leading producers during the year included Stanley E. Perham's BB-1 and 7 properties at Norway and Wm. C. Pechnik's Wardell mine at Albany.

Quartz (Silica).—A small tonnage of silica for use in manufacturing sandpaper was produced in 1953 at a quarry near Brunswick, Sagadahoc County.

Sand and Gravel.—The mining and processing of sand and gravel rank second in value among Maine's mineral industries. Deposits of these materials, virtually all of glacial origin, abound in the State and were worked in almost every county. The quality of the sand and gravel varies, however, depending upon the types of rocks over which the continental glacier rode. Except for deposits in segments of the major valleys in central and eastern Maine, most deposits indicate derivation from crystalline rocks, such as granites, gneisses, and quartzites. Deposits of these durable constituents are generally suitable for concrete aggregate and specialized uses. Locally, in areas underlain by schists, slates, and other foliated rocks, the sand and gravel deposits have limited usefulness because of contamination by these less durable rocks.

In all 29 commercial sand and gravel plants were active in the State in 1953 compared with 22 in 1952. Principal producing counties, in order of decreasing value of output, were Kennebec, Androscoggin, and Penobscot. Material mined during the year was used for highway construction and maintenance, railroad ballast, and building construction.

TABLE 4.—Sand and gravel sold or used by producers, 1952-53, by classes of operations and uses

	1952			1953		
	Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per ton
COMMERCIAL OPERATIONS						
Sand:						
Building.....	37,632	\$17,872	\$0.47	41,490	\$21,512	\$0.52
Paving.....	20,811	22,176	1.07	47,737	58,215	1.22
Engine.....				(¹)	(¹)	
Railroad ballast.....				31	23	.74
Other.....				(¹)	(¹)	
Gravel:						
Building.....	100,267	60,912	.61	99,046	70,907	.72
Paving.....	380,903	335,211	.88	477,577	278,809	.58
Railroad ballast.....	115,014	64,541	.56	97,376	52,328	.54
Other.....	12,207	4,028	.33	8,468	4,308	.51
Undistributed.....				6,840	9,142	1.34
Total commercial sand and gravel.....	666,834	504,740	.76	778,565	495,244	.64
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand:						
Building.....	(¹)	(¹)		68	250	
Paving.....	(¹)	(¹)		300,219	95,080	.32
Gravel:						
Building.....	(¹)	(¹)		7,755	1,264	
Paving.....	(¹)	(¹)		6,985,330	2,016,548	.29
Undistributed.....	6,411,244	1,682,791	.26			.19
Total Government-and-contractor sand and gravel.....	6,411,244	1,682,791	.26	7,293,372	2,113,142	.29
Grand total.....	7,078,078	2,187,531	.31	8,071,937	2,608,386	.32

¹ Figures that may not be shown separately are listed as "Undistributed."

Slate.—The underground slate mines at Monson, Piscataquis County, were the principal domestic source of slate for switchboards, panels, and other electrical installations. Overhead stoping, a mining method in which ore is recovered from the roof of an underground excavation, was used to mine the fine-grained, dense, blue-black slate, which occurs in a bed or layer approximately 10 feet thick. The only producer in 1953 was Portland-Monson Slate Co.

Stone.—Although the quantity and value of stone quarried in Maine in 1953 declined 12 and 25 percent, respectively, from 1952, stone quarrying continued to be the State's third-ranking mineral industry. Active commercial quarries totaled 12 in 1953, a decline of 3 from 1952. The most important producing counties, in order of decreasing value of output, were: Hancock, Knox, Cumberland, and Kennebec. As in 1952, all dimension stone quarried for construction

purpose and memorials was granite. Stone crushed to varying sizes for use in highway and railroad construction, concrete, and as riprap, included limestone, sandstone, and granite.

MINERAL FUELS

Peat.—The principal producing peat bogs in Maine were in Washington and Hancock Counties. Four producers were active during the year, 1 in Hancock County and 3 in Washington County. The largest producer in 1953 was Domestic Peat Co., near Columbia Falls, Washington County. The output during the year was marketed largely in the immediate area for agricultural purposes.

REVIEW BY COUNTIES

ANDROSCOGGIN

Sand and gravel continued in 1953 to rank first among mineral commodities produced in Androscoggin County. The county's largest producer continued to be W. H. Hinman, Inc., with a fixed plant and pit at Leeds. Other large sand and gravel producers were G. A. Peterson Co., which operated a fixed plant and pit on Wilson Road near Auburn; Lewiston Crushed Stone Co., Inc., Lisbon; Philip E. Dunn, Poland; and W. E. Cloutier Co., Inc., Lewiston.

Crude feldspar was quarried during the year at the La Flamme and Sturtevant mines near Center Minot. These properties were leased by Bell Minerals Co. on January 1, 1953, from United Feldspar & Minerals Corp. Feldspar mined in 1953 was trucked to the company mill at West Paris, Oxford County, for grinding. The mill, formerly owned by United Feldspar & Minerals Corp., was purchased by Bell Minerals Co. on January 1, 1953. All feldspar mined in 1953 was crushed and ground for ceramic uses.

Miscellaneous clays for brick manufacture were mined from open pits at Danville and Lewiston by Morin Brick Co. and at Auburn by Joseph F. Dennis & Sons.

TABLE 5.—Value of mineral production in Maine in 1952-53, by counties, and principal minerals produced in 1953

County	1952	1953	Principal minerals produced in 1953, in order of value
Androscoggin.....	\$358,431	\$332,911	Sand and gravel, feldspar, clays.
Aroostook.....	382,749	(1)	Sand and gravel.
Cumberland.....	300,060	296,978	Stone, sand and gravel, clays.
Franklin.....	17,978	8,937	Sand and gravel, clays.
Hancock.....	835,515	519,935	Stone, peat, sand and gravel.
Kennebec.....	1,724,258	2,280,776	Sand and gravel, stone.
Knox.....	4,342,137	5,987,004	Cement, stone, lime.
Oxford.....	82,846	118,489	Beryl, feldspar, sand and gravel.
Penobscot.....	70,310	68,697	Sand and gravel, clays.
Sagadahoc.....	52,364	48,078	Feldspar.
Washington.....	37,173	81,164	Peat, sand and gravel.
Undistributed ²	776,750	760,140	
Total.....	8,981,000	10,503,000	

¹ Value included with "Undistributed." Bureau of Mines not at liberty to publish.

² Includes value of mineral production for the following counties: Piscataquis (slate), Somerset (sand and gravel), Waldo (stone, sand and gravel), York (stone).

AROOSTOOK

Sand and gravel mined near Houlton and Wallagrass by the Bangor & Aroostook Railroad was the only mineral products of Aroostook County in 1953. The railroad used this output for grading tracks, roadways, station grounds, and loading facilities.

CUMBERLAND

Crushed sandstone, sand and gravel, and clays were produced in Cumberland County in 1953. The Blue Rock Quarry at Cumberland Mills yielded sandstone for highway construction, riprap, and railroad ballast. Two commercial sand and gravel plants were active during the year. Fred H. Jordan operated his fixed plant and pit at South Portland and produced building sand and paving and road gravel. Unwashed building gravel was recovered from a pit worked near Brunswick by Mrs. G. H. Morton.

Miscellaneous clays for brick manufacture were produced by Joseph A. Blais, Jr., and Fred S. Liberty & Sons, Inc., from pits at Portland and North Yarmouth, respectively.

FRANKLIN

Miscellaneous clays were mined by Farmington Brick Yard at its pit near Farmington. Two sand and gravel pits were active in Franklin County in 1953. Producers included Thomas A Skolfield and O. C. Marchant, both with pits at Weld.

HANCOCK

Hancock County continued in 1953 to rank first among Maine counties in stone output and third in the total value of mineral production. Stone output consisted almost entirely of rough and dressed dimension granite for building and monument construction. The largest producer was Deer Island Granite Corp., which worked its quarry at Stonington throughout the year. Some of the granite quarried during the year was sold for exterior and interior use in constructing the Diagnostic Building, Mayo Clinic, Rochester, Minn. Other producing quarries worked in 1953 were the Hall quarry at Hall Quarry and Joe's quarry near Mount Desert, worked by Grenco & Sons, Inc., and Joseph Musetti, respectively. The John L. Goss Corp. quarry at Stonington closed on November 10, 1952, as a result of a labor strike and did not reopen in 1953.

Peat continued to be produced from bogs near North Penobscot by the Richland Peat Mines, Inc. The output in 1953 was sold for soil-improvement uses.

T. W. Carlisle worked his gravel pit and fixed plant near Blue Hill during part of the year and produced paving and road gravel for use in the area. A small tonnage of road gravel was produced at East Sullivan by Clarence E. Martin.

KENNEBEC

Virtually all sand and gravel credited to Kennebec County in 1953 consisted of material reported produced by the Maine State Highway Commission for use in constructing and maintaining State highways.

The Donald J. Gurney pit at Waterville yielded building sand and gravel for use in the immediate area.

KNOX

Knox County ranked first among the mineral-producing counties in the State in 1953 accounting for over 57 percent of the total value of mineral output during the year. Mineral products, listed in order of decreasing value, were cement, stone, and lime.

Dragon Cement Co., Inc., continued to work its plant and limestone quarry at Thomaston throughout the year. Installation early in 1953 of a new, 353-foot-long, rotary kiln, a new clinker cooler, and an additional finish grinding mill resulted in increased cement output. Addition of the new facilities boosted the plant's rated annual production capacity from 1.2 million to 2 million barrels. During the latter part of 1953 the company began preparations for opening a new quarry on a nearby 70-acre tract. The existing quarry, which was opened in 1928, will continue to be worked to a depth of 20 feet below its present 140-foot depth. Other raw materials used for manufacture of the cement, including sand, cinders, and gypsum, are imported by the company.

Crushed limestone was produced at the quarry of Rockland-Rockport Lime Co., Inc. This company also produced lime at its plant at Rockland. The output was used primarily for paper manufacture. The company used bituminous coal to fire the 11 shaft kilns at its Rockland plant.

Hocking Granite Industries worked its quarry on Clark Island and produced rough dimension granite for building, construction, and dressed stone for use in buildings, monuments, paving and curbing. Some granite was also prepared for use as riprap.

OXFORD

The mining of pegmatite rocks for recovery of feldspar and beryl continued to be the principal mining industry in Oxford County. Three mines yielded feldspar in 1953 compared with 8 in the previous year, and the county total output dropped 56 percent from the 1952 level. The leading producer was the Foster mine at South Paris, leased and worked by Bell Minerals Co. Other producing properties included Bell Minerals Co. Perham and Tamminen mines near West Paris. Crude feldspar quarried during the year was crushed and ground at the Bell Minerals Co. mill at West Paris. This plant, purchased from United Feldspar & Minerals Corp., January 1, 1953, also treated crude material from the company quarries in Androscoggin County.

The bulk of the mica production was recovered as a byproduct of feldspar mining. As in previous years, most of the output was scrap mica suitable only for grinding, although a small quantity of sheet mica was recovered. The largest producer in the county and the State was The Beryllium Development Co. Scotty mine on Plumbago Mountain, where scrap mica was recovered as a byproduct of beryl mining. Other important producers were the BB-1 and 7 mines at Norway, and the Wardwell mine at Albany.

Beryl concentrates were recovered at the Scotty mine and at the Wardwell and Wentworth mica mines.

Gravel for road construction was produced by W. H. Hinman, Inc., at its pit and portable plant at Rumford. Cloyd Sweet worked his pit at Ridlonville during part of the year and recovered building sand. A small tonnage of paving gravel was produced by Donald E. Wood from a pit near Norway.

PENOBSCOT

Mineral products of Penobscot County in 1953 were sand and gravel and miscellaneous clays. Lane Construction Corp. continued to work its pit and fixed plant at Bangor and recovered paving sand and gravel for use in the immediate area. A small tonnage of bank-run gravel was quarried at the B. J. Striar Estate pit near Orrington. Miscellaneous clays for use in the manufacture of brick were recovered by Brooks Brick Co. at its pit near Brewer.

PISCATAQUIS

Portland-Monson Slate Co. continued to produce slate for electrical switchboards, panels, and similar installations at its underground quarry near Monson. Flaggging and slate flour were also produced.

SAGADAHOC

Feldspar and white quartz were the sole mineral products of Sagadahoc County in 1953. Seven feldspar mines were active at one time or another during the year; the largest continued to be Topsham mine of Consolidated Feldspar Department, International Minerals & Chemical Corp. Other feldspar-producing properties were the Purington, Aldred, and Diamond Match, all near Topsham.

SOMERSET

A. P. Wyman, Inc., worked a pit and portable plant near Jackman during part of the year and recovered paving and road gravel, which was used by the State of Maine for highway construction and maintenance in the area.

WALDO

Grenci & Ellis, Inc., continued to work its Mount Waldo quarry at Frankfort in 1953. Granite produced during the year included rough architectural stone for building construction. Granite for use in road construction was quarried and crushed at a portable plant at Northport operated by A. G. Sargent, Inc. Gravel recovered from a pit at Northport was processed in a portable plant operated by W. H. Hinman, Inc., output being used for highway construction. The Bangor & Aroostook Railroad recovered gravel for use as railroad ballast and other railroad uses from its pit near Frankfort.

WASHINGTON

Peat continued in 1953 to be a major mineral product in Washington County in terms of value. Three producers were active during the year; the largest was the Domestic Peat Co., which worked its property near Columbia Falls. Other producers included Maine Peat Moss, Inc., Jonesport, and American Peat Co., Inc., Deblois. All output during the year was sold for soil-improvement uses. Unwashed bank-run gravel was mined near Harrington and Columbia by A. P. Wyman,

Inc., for use by the State of Maine and highway construction. A gravel pit at East Machias was worked by the Maine Central Railroad for recovery of railroad ballast material.

YORK

Pink dimension granite for curbing and architectural purposes and crushed granite for riprap and concrete and road construction continued to be produced at the High Pine quarry of The John Swenson Granite Co.

The Mineral Industry of Maryland

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Maryland Department of Geology, Mines, and Water Resources.

By Alvin Kaufman ¹



THE VALUE of production of mineral commodities in Maryland in 1953 rose 1 percent compared with 1952. This gain resulted from increased sand and gravel production, which continued to be the principal mineral industry. Cement production ranked second among the mineral industries of Maryland, with stone in third place. The reduced market demand for coal was reflected in a drop in output from Maryland coal properties. Production in 1953 was the lowest since the early part of the Civil War. Mineral production was reported from 18 of Maryland's 24 counties. The principal producing counties, in order of decreasing value of output, were Baltimore, Washington, Carroll, Prince Georges, and Frederick. Mines and quarries in these counties yielded mineral products that exceeded 72 percent of the total value of State mineral output during the year.

TABLE 1.—Mineral production in Maryland, 1952-53 ¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays.....	771, 922	\$1,426, 556	671, 029	\$1, 135, 495
Coal.....	587, 903	2, 694, 842	530, 590	2, 441, 605
Lime (open market).....	72, 885	746, 893	71, 705	707, 736
Natural gas.....million cubic feet..	2, 372	460, 000	1, 408	268, 000
Sand and gravel.....	6, 956, 640	8, 136, 697	7, 379, 511	8, 919, 088
Stone (except limestone for cement and lime).....	² 3, 391, 679	² 6, 330, 443	² 3, 578, 249	² 6, 275, 124
Undistributed: Cement, potassium salts, quartz (1952), slate, stone (dimension limestone and crushed marble), and talc and soapstone. Excludes value of clays used for cement.....		³ 7, 051, 145		7, 337, 486
Total Maryland.....		26, 847, 000		27, 085, 000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

² Excludes certain stone, value for which is included with "Undistributed."

³ Revised figure.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal.—The output of bituminous coal in Maryland, based on reports from 84 mines, dropped 9 percent from 1952 and was at its lowest point since the Civil War. Coal mining, however, continued to rank

¹ Commodity-industry analyst, Region VIII, Bureau of Mines, Pittsburgh, Pa.

as one of the foremost components of the Maryland mining industry, comprising a little better than 9 percent of the total value of mineral production. As in previous years, the output came from mines in Allegany and Garrett Counties in the mountainous western part of the State. A total of 162 mines, mostly small operations yielding less than 1,000 tons annually, were active at one time or another during the year. As a result of the high proportion of small mines, Maryland coal is generally transported from the mine to a central loading point for cleaning and sizing. The principal producing properties, in order of decreasing output, were E. E. Feller Coal Co. Feller No. 2 mine and Earl No. 3 property of Garrett Coal Corp., both in Garrett County; Consolidated Fuel Co. Ocean No. 1 in Allegany County; and Myers Coal Co., Inc., Susanne No. 1 mine in Garrett County.

TABLE 2.—Production of coal, 1944-48 (average) and 1949-53

Year	Short tons	Value		Year	Short tons	Value	
		Total	Average per ton ¹			Total	Average per ton ¹
1944-48 (average)	1,869,639	\$7,926,611	\$4.24	1951.....	588,639	\$2,781,343	\$4.73
1949.....	668,332	3,505,099	5.24	1952.....	587,903	2,694,842	4.59
1950.....	647,923	3,134,704	4.84	1953.....	530,590	2,441,605	4.60

¹ Value received or charged for coal f. o. b. mine, including selling cost. (Includes value for coal not sold but used by producer, such as mine fuel and coal coked as estimated by producer at average prices that might have been received if such coal had been sold commercially.)

Natural Gas.—Natural gas occurs in Maryland in two areas, the Mountain Lake Park field and the Accident field, both in Garrett County. The total marketed production during 1953 declined 41 percent compared with 1952. The discovery well in the Accident field, which was brought in late in 1952, began to produce in the fourth quarter of 1953. Production totaled 43 million cubic feet. Drilling activity had been suspended in the State earlier in the year pending clarification of an oil and gas conservation law that had been enacted by the legislature.

NONMETALS

Cement.—The production of cement, in terms of value, ranked second among the mineral products of Maryland in 1953. Two plants were active during the year. One was operated by North American Cement Corp. near Hagerstown, Washington County, and the other by Lehigh Portland Cement Co., Union Bridge, Carroll County. Virtually all the raw materials used for manufacturing cement at these plants were obtained locally.

Clays.—Ball clay, fire clay, and miscellaneous clays were produced in Maryland in 1953. The total output declined 13 percent in that year compared with 1952. The major drop was in the production of fire clay. Production of fire clay, primarily for preparing firebrick and block, was limited to Allegany, Cecil, Garrett, and Harford Counties, with Garrett County the major producing area. Clays of all types were produced in 12 counties from 21 pits in 1953.

Lime.—Lime production in Maryland declined 2 percent compared with 1952. Six operators produced quicklime and hydrated lime for

a variety of uses. Agricultural lime was the major product, more than 90 percent of the total output being utilized for that purpose.

Potash.—The North American Cement Corp. produced potash as a byproduct of the operation of its Security cement plant near Hagerstown, Washington County. The potash was sold for agricultural uses.

Sand and Gravel.—In terms of both quantity and value, production of sand and gravel was the most important mineral industry in Maryland. Output was reported in 1953 from 10 counties in the State, the foremost being Baltimore, Prince Georges, and Anne Arundel. Pits active in these counties during the year supplied 75 percent of total output. Approximately 52 percent of the State sand and gravel sales in 1953 was for use in highway construction and maintenance and over 45 percent for building construction. Virtually all output was used locally, and production activity was directly related to the tempo of construction in the area. Thirty-three commercial plants were active in 1953. Mason-Dixon Sand & Gravel Co. began operating a new 250-ton-per-hour plant in October 1953. The deposit runs approximately 80 percent sand and 20 percent gravel.

TABLE 3.—Sand and gravel sold or used by producers, 1952-53, by uses

	1952			1953		
	Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per ton
Sand:						
Structural.....	1,542,470	\$1,714,224	\$1.11	1,769,587	\$2,043,842	\$1.15
Paving.....	1,472,749	1,775,368	1.21	1,373,905	1,679,071	1.22
Gravel:						
Structural.....	1,405,260	1,913,499	1.36	1,549,821	2,412,652	1.56
Paving.....	2,466,625	2,636,204	1.07	2,432,112	2,578,608	1.06
Undistributed ¹	69,536	97,402	1.40	284,086	204,915	.81
Total.....	6,956,640	8,136,697	1.17	7,379,511	8,919,088	1.21

¹ Includes glass and engine sand and sand and gravel for miscellaneous purposes that may not be shown separately.

Slate.—Slate-roofing granules continued to be produced by Staso Milling Co. at its mill and quarry near Whiteford, Harford County.

Stone.—The quarrying of stone ranked as the third largest mineral industry in the State in point of value in 1953. Maryland stone output, consisting of limestone, basalt, granite, marble, and miscellaneous stone, remained relatively stable that year compared with 1952. Crushed stone, largely limestone, constituted 94 percent of stone value. Dimension stone, quarried for construction purposes and memorials, was mostly granite but also included some marble and miscellaneous stone. Over half the State's total stone output came from quarries in Baltimore County. Other important producing counties included Frederick, Washington, and Harford.

Talc and Soapstone.—Talc and soapstone, most of which was ground, was produced near Marriottsville, Carroll County, and Dublin, Harford County. Of the two producers active in 1953, Clinchfield Sand & Feldspar Corp. was the larger.

TABLE 4.—Stone sold or used by producers, 1952-53, by kinds and uses

Kind and use	1952		1953	
	Quantity	Value	Quantity	Value
Dimension stone:				
Granite:				
Building stone:				
Rough construction.....short tons..	15, 288	\$166, 350	14, 688	\$159, 600
Rough architectural.....cubic feet..	5, 902	6, 590	5, 902	6, 590
Rubble.....short tons..	27, 530	87, 575	28, 915	92, 393
Curbing.....cubic feet..	20, 732	13, 800	17, 377	13, 050
Total (approximate short tons).....	45, 002	274, 315	45, 512	271, 633
Marble: Building.....short tons..	(1)	(1)	(1)	(1)
Miscellaneous:				
Building:				
Rough and dressed.....do....	11, 002	72, 843	7, 943	45, 864
Rubble.....do....	(2)	(2)	(2)	(2)
Flagging.....do....	(2)	(2)	(2)	(2)
Total.....do....	12, 155	85, 160	9, 580	59, 832
Crushed and broken stone:				
Granite:				
Riprap.....do....	14, 400	50, 400	14, 100	49, 350
Crushed stone.....do....	50, 700	109, 860	49, 667	111, 807
Total.....do....	65, 100	160, 260	63, 767	161, 157
Basalt and related rocks:				
Riprap.....do....	(2)	(2)	(2)	(2)
Crushed stone.....do....	(2)	(2)	(2)	(2)
Total.....do....	776, 936	1, 343, 325	729, 857	1, 248, 214
Marble, all uses.....do....	(1)	(1)	(1)	(1)
Limestone:				
Riprap.....do....	22, 070	38, 600	35, 400	61, 950
Crushed stone.....do....	2, 297, 843	3, 404, 411	2, 541, 846	3, 886, 907
Agriculture.....do....	57, 903	217, 429	56, 737	227, 195
Miscellaneous.....do....	114, 357	806, 630	95, 094	358, 008
Total.....do....	2, 492, 173	4, 467, 070	2, 729, 077	4, 534, 060
Miscellaneous stone: Riprap.....do....	313	313	456	228
Grand total.....do....	³ 3, 391, 679	³ 6, 330, 443	³ 3, 578, 249	³ 6, 275, 124

¹ Figure withheld to avoid disclosure of individual company operations; not included in total.

² Figure withheld to avoid disclosure of individual company operations; included in total.

³ Excludes certain stone; Bureau of Mines not at liberty to publish.

REVIEW BY COUNTIES

ALLEGANY

Output of coal in Allegany County continued in 1953, as in preceding years, to be the leading product of county mines. The principal producing properties in 1953 were, in order of decreasing output, the No. 10 underground and strip mine of Consolidated Fuel Co., Inc., and Ocean No. 1 mine of Consolidated Fuel Co., Inc., both of Frostburg; No. 2 mine of W. & W. Coal Co., Barton; No. 4 mine of Moran Coal Co., Phoenix; and Macaneck mine of Macaneck Coal Co., Knapp Meadow.

In close association with the coal-bearing formations are fire-clay beds. During 1953 the principal fire-clay producers were Mount Savage Refractories Co., Barrelville mine, Barrelville, and Mount Savage Strip mine, Mount Savage. Big Savage Refractories Corp. also produced fire clay from the company mine near Frostburg. Pen-Mar Brick & Supply Co., Cumberland, reported output of miscellaneous clays for heavy clay products, including building tile, drain

tile, and sewer pipe. Cumberland Cement & Supply Co. operated a fixed plant near Cumberland that yielded sand for glass, building, paving, and engine purposes. A substantial amount of gravel was also produced for use in the manufacture of ready-mixed concrete.

G. C. Sensabaugh, Inc., and Frye Coal & Stone Co. operated limestone quarries for producing crushed and broken rock. This material was employed as concrete aggregate and road metal and for agricultural purposes. There was also a small output of rubble.

TABLE 5.—Value of mineral production in Maryland, 1952-53, by counties

County	1952	1953		
		Value	Rank ¹	Principal minerals in order of value
Allegany.....	\$1,684,868	\$1,540,868	8	Coal, clays, sand and gravel, stone.
Anne Arundel.....	1,741,252	1,635,981	7	Clays, sand and gravel.
Baltimore.....	6,451,552	7,232,089	1	Clays, sand and gravel, stone.
Carroll.....	2,553,769	2,777,577	3	Stone, talc, cement.
Cecil.....	272,070	346,936	10	Clays, sand and gravel, stone.
Frederick.....	2,017,594	1,982,907	6	Clays, lime, stone.
Garrett.....	2,448,723	2,124,829	5	Coal, clays, stone, natural gas.
Harford.....	1,270,148	1,132,592	9	Clays, sand and gravel, slate, stone, talc.
Montgomery.....	67,518	50,760	14	Stone.
Prince Georges.....	3,490,060	2,641,726	4	Clays, sand and gravel, stone.
Washington.....	4,702,870	4,971,196	2	Clays, lime, stone, cement, potash.
Undistributed ²	147,052	647,278	-----	Clays, sand and gravel.
Total.....	26,847,000	27,085,000	-----	Sand and gravel, cement, stone.

¹ Ranked by decreasing value including those counties combined under "Undistributed."

² Includes Calvert, Dorchester, Howard, Kent, Talbot, and Wicomico counties.

ANNE ARUNDEL

Sand and gravel and clays constituted the mineral commodities produced in Anne Arundel County in 1953. Brooklyn Corp., Baltimore, and the Arundel Corp. Pasadena, Linthicum, and Patapsco plants were the major producers of sand and gravel. Severn Clay Co. operated an open-pit mine near Glen Burnie to produce fire clay. This commodity was used in manufacturing stoneware. This company also produced miscellaneous clays for sanitary ware.

The lime plant of F. & H. Benning Oyster & Lime Co., Galesville, was closed down in 1953.

BALTIMORE

Stone, clays, and sand and gravel were produced in Baltimore County in 1953. Granite for use as irregular-shaped stone, rubble, and flagging was produced in Baltimore County at the Gwynn Falls, Loch Raven, and Butler quarries of Harry T. Campbell Sons Corp. Part of the output from the Gwynn Falls quarry was crushed for use as riprap and concrete aggregate. Carl B. Temple produced crushed granite for concrete aggregate and road-base material from a quarry near Reckford. National Gypsum Co. produced calcined-gypsum products at its Baltimore plant from crude gypsum rock imported from Canada. Expanded perlite, used primarily as a lightweight plaster aggregate, was produced at the Baltimore plant of Perma Rock Products, Inc., from crude perlite mined in New Mexico. Crushed limestone for a variety of purposes, including concrete aggregate, road base, and agricultural stone, was produced by Harry T.

Campbell Sons Corp. at its Texas limestone quarry and by the Arundel Corp. from the Green Spring quarry. Miscellaneous clays were mined at four localities in the county; the largest was the pit and plant of Champion Brick Co. near Baltimore. Other producers included Baltimore Brick Co., Baltimore and Rossville, and Excelsior Brick Co., Baltimore. The output was used for manufacturing heavy clay products, such as building brick. Ball clay for various uses was mined by United Clay Mines Corp. from a pit near Middle River. Nine commercial sand and gravel pits were active in Baltimore County in 1953; the largest was Harry T. Campbell Sons Corp. White Marsh operation. A substantial portion of the output from this pit was used by the company in preparing ready-mixed concrete. Other large producers of sand and gravel included the Arundel Corp., with pits at Lansdowne, Baltimore City, and Carney; Clark Certified Concrete Co., Baltimore; and Frederick Link Sons, Arbutus.

CARROLL

Mineral products of Carroll County in 1953 included cement, talc, and stone. Lehigh Portland Cement Co. continued to operate its Union Bridge plant on Sams Creek throughout the year. Ivory Pearl Quarries produced stone for building purposes and flagging. There was also a substantial output of soapstone for various uses by Clinchfield Sand & Feldspar Corp. near Marriottsville.

CECIL

Sand and gravel was the principal mineral product of Cecil County in 1953. Four commercial pits were worked during the year, the largest being Charlestown Sand & Gravel Co., Aberdeen. Other producers active during the year included Arthur D. Johnston, Port Deposit; Fred S. Russell, North East; and The Arundel Corp., Whitehall. Port Deposit Quarries Co., Inc., worked its Port Deposit quarry part of the year and produced irregular stone, as well as architectural stone. Plastic fire clay for manufacturing refractories was produced in the county by North East Fire Brick Co. and Fred S. Russell, both of North East.

DORCHESTER

J. Edwin Rosser, Inc., produced a substantial tonnage of sand and gravel for building and paving. This fixed plant was idle for part of the year as a result of bad weather.

FREDERICK

The bulk of the lime produced in Maryland in 1953 originated in Frederick County. During the year six plants were active; the largest was operated by S. W. Barrick & Sons, Inc., Le Gore. Quicklime and hydrated lime were both produced, principally for agricultural purposes. Other major producers in the county were Le Gore Lime Co., Le Gore; M. J. Grove Lime Co., Lime Kiln; and Everett V. Moser, Middletown. A substantial tonnage of crushed limestone for use as road metal, concrete aggregate, railroad ballast, and agricultural stone was produced by M. J. Grove Lime Co., Lime Kiln, and

Farmers Cooperative Association, Inc., New London. A small quantity of shale for use in manufacturing heavy clay products was produced by Hudson Supply & Equipment Co., Buckeystown.

GARRETT

Mineral products of Garrett County in 1953, in order of decreasing value of output, were coal, natural gas, limestone, and clays. The major coal producers in the county and the State were the Feller No. 2 mine of E. E. Feller Coal Co., Inc., and the Earl No. 3 mine of Garrett Coal Corp. Vetter Bros., Inc., operated a limestone quarry near Oakland for producing concrete aggregate, road base, and agricultural stone. William N. Allen produced plastic fire clay for foundry and steelwork construction.

HARFORD

The largest producer of sand and gravel in Harford County was Stancills, Inc., which operated pits and plants at Aberdeen, Edgewood, Joppa, and Mountain Road. Output from these pits was used for building and paving construction in the county. Green serpentine marble was quarried and sold as Maryland verde antique by the Maryland Green Marble Co. near Cardiff. This material was used for building interiors and was also crushed for terrazzo. Plastic fire clay for use in manufacturing heavy clay products was produced by Robinson Clay Products. Slate for the manufacture of roofing granules was produced by Staso Milling Co. at its quarry and plant near Whiteford. Crude talc was mined by Harford Talc & Quartz Co. near Dublin.

HOWARD

Cosca Sand & Gravel Co. produced paving and road gravel from a pit near Jessups, Howard County, in 1953.

KENT

Chestertown Brick Co. operated a clay pit near Chestertown. The output of this pit was used in the manufacture of building brick, paving brick, tile, and sewer pipe.

MONTGOMERY

Stone was the only mineral product of Montgomery County in 1953. Most of this material was mica schist for building and flagging, although there was a small output of crushed and broken stone for riprap. This commodity was produced by Stoneyhurst Quarries, Cabin John; Albert D. Battista, Rockville; and Segreti Bros., Bethesda.

PRINCE GEORGES

Sand and gravel was the principal mineral product of Prince Georges County in 1953. Four producers were active in that year, the largest being Smoot Sand & Gravel Corp., operator of a dredge on the Potomac River. Other large producers included the Silver Hill Sand & Gravel Co., Silver Hill; Landover Sand Co., Bowie; and Uno Excavating Co., Berlin. Miscellaneous clays were produced by Washington Brick Co. and West Bros. Brick Co., near Muirkirk

and Fairmont Heights, respectively. This commodity was used in manufacturing heavy clay products. Expanded perlite, sold primarily for use as a lightweight plaster aggregate, was produced by Atlantic Perlite Co. at its plant near Washington, D. C.

TALBOT

Miscellaneous clays for use in the manufacture of heavy clay products, such as building brick and drain tile, were produced by New Brick & Tile Co., Easton, from an open pit. The clay was crushed and pugged after mining.

WASHINGTON

The mineral economy of Washington County was based primarily on the limestones and shales occurring in the area. The major commodity was cement produced at the North American Cement Corp. Security plant 2 miles east of Hagerstown. The limestone quarry adjacent to the cement plant is in the Conococheague formation. Quarrying is selective; only those horizons suitable for manufacturing cement were used for that purpose. Other stone quarried was crushed and sold for a variety of uses. As in previous years, both portland and masonry cements were produced. Sulfate of potash, an important byproduct of cement manufacture, was collected in cyclones and electric precipitators during the burning of the cement material. This commodity was sold as potash liming material for agricultural purposes. Burnt agricultural lime was produced by Schetromph Lime Co. The only clay producer in the county was Victor Cushwa & Sons, Inc., Williamsport. Limestone was produced by Joseph H. Forsyth, Williamsport. This commodity was crushed and sold for concrete aggregate and road base.

WICOMICO

Salisbury Brick Co., Inc., produced miscellaneous clays for brick manufacture at its pit near Salisbury.

The Mineral Industry of Massachusetts

By Richard H. Mote ¹



OWING primarily to a 4-percent decline in sand and gravel production and a drop in the unit values of stone output, the total value of mineral production in Massachusetts in 1953 decreased 3 percent from the record high level of \$17,812,000 achieved in 1952. As in 1952, all counties except Nantucket contributed to the Commonwealth's mineral economy. Middlesex, Berkshire, and Norfolk Counties continued to be the principal centers of activity and together yielded minerals valued at nearly 60 percent of the State total in 1953. Stone quarrying continued to be Massachusetts' major mineral industry; over 90 percent of the 1953 output was crushed stone. Sand and gravel and lime remained second and third, respectively, in value of output. Mines, pits, and quarries active in 1953 totaled 114 compared with 116 in 1952.

TABLE 1.—Mineral production in Massachusetts, 1952-53 ¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays.....	140, 148	\$160, 371	152, 117	\$195, 809
Lime (open-market).....	132, 135	1, 999, 545	135, 383	2, 156, 205
Peat.....	(²)	(²)	2, 061	15, 962
Quartz from pegmatites and quartzite.....	(²)	(²)	(²)	(²)
Sand and gravel.....	7, 645, 728	6, 128, 744	7, 308, 190	5, 930, 894
Stone (except limestone for lime).....	* 3, 355, 819	* 9, 331, 871	3, 457, 708	8, 821, 108
Undistributed: Ground sand and sandstone, stone (dimension sandstone, 1952), recovered elemental sulfur, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2).....		191, 752		71, 368
Total Massachusetts.....		17, 812, 000		17, 191, 000

¹ Production as measured by mine shipments or mine sales (including consumption by producers).

² Value included with "Undistributed."

³ Excludes certain stone, value for which is included with "Undistributed."

TABLE 2.—Average prices of certain mineral commodities, 1952-53 ¹

Commodity	1952	1953
Clay.....per short ton..	\$1. 14	\$1. 29
Lime.....do.....	15. 13	15. 93
Peat.....do.....	(²)	7. 74
Sand and gravel (commercial).....do.....	. 83	. 88
Stone:		
Dimension.....do.....	40. 18	39. 80
Crushed and miscellaneous.....do.....	1. 68	1. 60

¹ Prices are based on average value f. o. b. mines or mills reported by the producers.

² Figure withheld to avoid disclosure of individual company operations.

¹ Chief, Mineral Industry Division, Region VIII, Bureau of Mines, Pittsburgh, Pa.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Clays.—The leading clay-producing counties in 1953 were Bristol, Plymouth, and Hampden. Production, which was limited to miscellaneous clays, was reported from eight pits during the year. Principal producers, in order of decreasing output, included Stiles & Hart Brick Co., Bristol and Plymouth Counties; Bridgewater Brick Co., Plymouth County; and Westfield Clay Products Co. and Hampshire Brick Co., both in Hampden County.

Lime.—High-purity crystalline limestones and dolomites abound in Berkshire County; for this reason the State lime industry has been centered there. In addition to being utilized for the production of lime, these rocks, which occur in steeply dipping beds, were a source of crushed limestone that was sold for a variety of uses. Nearly two thirds of the lime manufactured in Massachusetts in 1953 was sold or used for chemical processes; the remainder was consumed for building, agricultural, and refractory uses.

TABLE 3.—Lime (quick and hydrated) sold by producers, 1944–48 (average) and 1949–53

Year	Quantity (short tons)	Value		Year	Quantity (short tons)	Value	
		Total	Average per ton			Total	Average per ton
1944–48 (average)	105,039	\$1,055,536	\$10.05	1951.....	143,316	\$1,930,225	\$13.47
1949.....	107,931	1,360,328	12.60	1952.....	132,135	1,999,545	15.13
1950.....	139,357	1,830,625	13.14	1953.....	135,383	2,156,205	15.93

Perlite.—Expanded perlite was produced at the Roslindale, Suffolk County, plant of The Whittemore Co., Permalite Division, from crude perlite mined in New Mexico, Colorado, and Nevada. Nearly four fifths of the plant output was utilized as a lightweight plaster aggregate; the remainder was used in concrete.

Sand and Gravel.—Deposits of sand and gravel are widespread in Massachusetts and are among the State's principal mineral resources. The most important and widely distributed deposits are those of glacial origin, which consist of residual material dropped by the great continental ice sheet that once covered the area. Other types of sand and gravel deposits include river flood plains and terraces and marine beaches and dunes.

Because of the wide variety of rocks contained in the glacial deposits—and in the other types of deposits, inasmuch as they are derived largely from glacial deposits—not all deposits are suitable sources of concrete aggregate and special sands. The deposits of the Connecticut River Valley are predominantly fragments of Triassic conglomerates, red sandstones, and shales. Gravels of the eastern part of the State are largely granitic and other coarsely crystalline rocks. Limestone and dolomite pebbles are prominent in deposits in the western part of the State. Less durable rocks, such as micaeous schists and slates, are locally common in the gravels of central

and western Massachusetts and, where prevalent, limit the suitability of the gravel and sand.

In terms of value of total output, the production of sand and gravel continued to be the Commonwealth's second largest mineral industry. Principal producing counties in 1953, in order of decreasing output, were Norfolk, Worcester, and Middlesex. Sand and gravel were reported mined during the year in every county except Nantucket. The largest producers were Worcester Sand & Gravel Co., Inc., Worcester County; and Highland Sand & Gravel Co., Inc., Boston Sand & Gravel Co., and Glacier Sand & Stone Co., Inc., all in Norfolk County.

A total of 73 commercial plants were active in 1953 compared with 74 in 1952. Virtually all production was consumed locally for highway, railroad, and building construction.

TABLE 4.—Sand and gravel sold or used by producers, 1952-53, by classes of operations and uses

Uses	1952			1953		
	Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per ton
COMMERCIAL OPERATIONS						
Sand:						
Building	1,798,278	\$1,334,299	\$0.74	2,008,038	\$1,635,055	\$0.81
Paving	1,000,309	690,038	.69	778,576	643,658	.83
Filter	40,554	14,290	.35	(1)	(1)	(1)
Other	27,036	17,300	.64	29,930	22,650	.76
Gravel:						
Building	1,799,630	1,934,031	1.07	1,959,185	2,178,423	1.11
Paving	1,389,437	925,236	.67	901,757	661,218	.73
Other	129,253	74,212	.58	661,812	304,476	.46
Undistributed ²	129,050	240,735	1.86	160,073	298,527	1.87
Total commercial sand and gravel	6,313,547	5,230,641	.83	6,499,371	5,744,007	.88
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand:						
Building	66,281	159,867	2.41	11,710	27,701	2.37
Paving	170,630	205,239	1.20	56,464	63,687	1.13
Gravel:						
Building	92,765	162,567	1.75	11,585	23,723	2.05
Paving	1,002,505	370,430	.37	729,060	71,776	.10
Total Government-and-contractor sand and gravel	1,332,181	898,103	.67	808,819	186,887	.23
Grand total	7,645,728	6,128,744	.80	7,308,190	5,930,894	.81

¹ Included with "Undistributed" to avoid disclosure of individual operations.

² Includes molding sand, engine sand (1952), filter sand (1953), fire or furnace sand (1953), and railroad ballast (gravel).

Silica (Quartz).—The Cheshire quartzite, a fine-grained, colorless quartz rock, was quarried and crushed in Berkshire County for use in making glass, plaster, and cleansing and scouring compounds. Two quarries were active in 1953, both at Cheshire.

Stone.—In terms of value, stone quarrying continued in 1953 to be Massachusetts' most important mineral industry. A number of rock types occur within the State boundaries, but the most significant

economically are granite, basalt, and limestone. Crushed and broken stone composed nearly two thirds of the total value of stone quarried during 1953, compared with approximately 58 percent the previous year. Over 90 percent of the crushed stone produced in 1953 was sold for use as a concrete aggregate and for construction and maintenance of highways and railroads. The principal stone-producing counties, in order of decreasing value of output, were Middlesex, Essex, and Hampden. During 1953, 28 commercial quarries were in operation.

TABLE 5.—Stone sold or used by producers, 1952–53, by uses

Use	1952		1953	
	Quantity	Value	Quantity	Value
Dimension stone:				
Building stone:				
Rough construction.....short tons..	7,740	\$97,418	(¹)	(¹)
Cut stone, slabs, and mill blocks.....cubic feet..	² 325,915	² 1,828,134	228,788	\$1,397,309
Rubble.....short tons..	1,226	8,085	(¹)	(¹)
Monumental stone.....cubic feet..	(¹)	(¹)	³ 10,435	³ 52,744
Undistributed ⁴.....short tons..	59,891	1,912,980	66,290	1,972,990
Total dimension stone (quantities approximate in short tons).....	² 95,745	² 3,846,617	86,008	3,423,043
Crushed and broken stone:				
Riprap.....short tons..	44,628	44,866	³ 34,989	³ 33,779
Concrete, roadstone, railroad ballast.....do....	2,990,153	4,372,420	3,052,069	4,337,549
Furnace flux (limestone).....do....	19,010	39,939	(¹)	(¹)
Agricultural (limestone).....do....	116,334	411,151	102,270	366,379
Other uses.....do....	89,949	616,878	152,158	575,420
Undistributed ⁴.....do....			30,214	84,938
Total crushed and broken stone.....do....	3,260,074	5,485,254	3,371,700	5,398,065
Grand total (quantities approximate in short tons).....	² 3,355,819	² 9,331,871	3,457,708	8,821,108

¹ Bureau of Mines not at liberty to publish; included with "Undistributed."

² To avoid disclosure of individual company operations, data are incomplete.

³ Incomplete data, portion not included is combined with "Undistributed."

⁴ Includes paving blocks and curbing and flagging for 1952 and 1953, rough construction (1953), rubble (1953), and monumental stone, dimension stone, and furnace flux (1953) and riprap (1953), crushed and broken stone.

MINERAL FUELS

Peat.—Although peat deposits are numerous in Massachusetts and many have been worked from time to time for over a century, exploitation has never been large due to the limited local market. Virtually all peat produced in the State has been sold at the source of production, the purchaser usually taking delivery of the material at the bog. During 1953, peat was recovered by three producers from bogs in Berkshire, Hampden, and Essex Counties. Output was marketed for agricultural purposes.

REVIEW BY COUNTIES

BARNSTABLE

Mineral products of Barnstable County in 1953 included sand and gravel and crushed granite. Three commercial sand and gravel operations were active in the county in 1953; the largest was the open

pit and fixed plant of Frederick V. Lawrence, Falmouth. Other sand and gravel producers included Whitehead Bros. Co., Provincetown, and Concrete Products Co., Falmouth. Production during the year was utilized for building and paving purposes. Granite riprap was quarried near Falmouth by Turner & Breivogel, Inc.

TABLE 6.—Value of mineral production in Massachusetts, 1952–53, by counties, and principal minerals produced in 1953

County	1952	1953	Principal minerals produced in 1953
Barnstable.....	\$119,452	\$233,875	Sand and gravel, stone.
Berkshire.....	3,389,122	3,399,149	Lime, stone, sand and gravel, silica.
Bristol.....	909,915	945,331	Sand and gravel, stone, clays.
Essex.....	1,199,546	1,435,525	Stone, sand and gravel, peat.
Franklin.....	186,738	233,181	Stone, sand and gravel, clays.
Hampden.....	1,494,323	1,433,346	Stone, sand and gravel, clays, peat.
Middlesex.....	5,195,537	4,655,730	Stone, sand and gravel, clays, recovered sulfur.
Norfolk.....	2,202,353	2,134,398	Sand and gravel, stone.
Plymouth.....	453,992	437,715	Sand and gravel, clays.
Suffolk.....	1,337,759	615,263	Stone, sand and gravel.
Worcester.....	1,179,479	1,313,514	Sand and gravel, stone.
Undistributed ¹	144,452	165,819	Stone, sand and gravel, clays.
Total.....	17,812,000	17,191,000	

¹ Includes value of mineral production and principal minerals produced in 1953 from the following counties: Dukes (sand and gravel) and Hampshire (stone, sand and gravel, clays).

BERKSHIRE

Berkshire County continued in 1953 to rank second among Massachusetts counties in value of mineral output. Products, in order of decreasing value, included lime, stone, sand and gravel, quarts, and peat. Quicklime and hydrated lime were produced from limestone quarried at Lee, West Stockbridge, Adams, and Farnams by the Lee Lime Corp., New England Lime Co., and United States Gypsum Co.

Seven commercial sand and gravel plants were active in the county in 1953; the largest included Berkshire Gravel, Inc., Lenox Dale and Pittsfield; General Sand & Stone Corp., Dalton; Mountain Sand & Gravel Co., Inc., Great Barrington; Hutchinson Sand & Gravel Co., Inc., Pittsfield; and Maxymillian, Inc., Adams. All sand and gravel produced during the year were used for building and highway construction.

Quartz for manufacturing glass, plaster, and cleansing and scouring compounds and for sand blasting was quarried near Cheshire by George E. Emerson, Inc., and Pettinos New England, Inc.

Virtually all the stone produced in the county in 1953 was crushed limestone sold for agricultural purposes. Other uses included fillers for rubber and other products, metallurgical fluxes, whiting, mineral food, poultry grit, and acid neutralizer. Producers of crushed limestone, in order of decreasing output, included Lee Lime Corp., with operations at Lee and West Stockbridge; Shea Chemical Co., Inc., Adams; U. S. Gypsum Co., Farnams; and New England Lime Co., Adams. Otis Chester Granite Co., Inc., worked its Whiting Quarry near Otis during part of the year and produced dimension granite for monumental uses.

A small tonnage of peat was recovered during the year from bogs near Hinsdale by Hinsdale Leafmold Co., Inc.

BRISTOL

Sand and gravel, crushed granite, and clays were mined in Bristol County in 1953. Sand and gravel for building and highway construction were produced by 10 commercial plants in the county during the year; the largest were: Morse Sand & Gravel Co., Attleboro; Joseph Borge & Sons, Inc., Swansea; M. A. Gammino Construction Co.; Chicoine sand pit, South Dartmouth; Thomas Bros. Corp., Raynham; and McCabe Sand & Gravel Co., Taunton.

Stone production during the year, all for use in road construction, was limited to crushed granite quarried near Acushnet by Blue Stone Quarry Division of Warren Bros. Roads Co.

Stiles & Hart Brick Co. continued to work its clay pit at Taunton during the year. Miscellaneous clays produced were used for manufacturing heavy clay products.

DUKES

The only mineral producer in Dukes County in 1953 was the Colby Construction Co., which mined building and paving sand and gravel from its property at Oak Bluffs.

ESSEX

Eight commercial sand and gravel plants were active in the county during the year; the largest were Videtta Construction Co., West Peabody; Essex Sand & Gravel Co., Andover; Yemma Bros., Inc., Haverhill; Topsfield Sand & Gravel Co., Topsfield; and Wright Contracting Co., Danvers. Output during the year was sold principally for building and highway construction purposes and for railroad ballast.

Stone production was limited to crushed basalt produced at the Saugus quarry of Trimount Bituminous Products Co. and the Swampscott quarry of the Lynn Sand & Stone Co. Most of the output was utilized for highway construction. Other uses included railroad ballast, roofing granules, and riprap.

Massachusetts Peat Humus Co. recovered peat for soil-improvement uses from bogs near Lawrence.

FRANKLIN

Mineral products of Franklin County in 1953 included crushed basalt, sand and gravel, and clays. Greenfield Massachusetts Broken Stone Co. continued to quarry and crush basalt for riprap, railroad ballast, and roadstone at its quarry near Greenfield. Building sand was produced during part of the year at the fixed plant of Mackin Sand & Concrete Products Co. near Greenfield. R. E. Pray & Co. recovered miscellaneous clays for use in manufacturing building brick at its pit and plant in Greenfield.

HAMPDEN

Five commercial sand and gravel producers were active in Hampden County in 1953. Principal operations included North Wilbraham Sand & Gravel & Concrete Co., Inc., pit and plant at North Wilbra-

ham; Western Massachusetts Sand & Gravel, Inc., Westfield; Edward N. Christianson Sand Co., Monson; and R. Lavdie Trucking Co., Chicopee. Hampshire Brick Co. and Westfield Clay Products Co. continued to work clay pits at Chicopee and Westfield. Miscellaneous clays produced were used in manufacturing building brick.

Stone production consisted of crushed basalt from quarries operated by John S. Lane & Son, Inc., Westfield, and L. Suzio Traprock Co., Meriden, and dressed architectural sandstone quarried by McCormick Longmeadow Stone Co., Inc., at East Longmeadow. Basalt quarried during the year was utilized for highway and railroad construction and riprap.

Peat for soil-improvement uses was recovered from bogs near Westfield by Roselli Bros. Farms.

HAMPSHIRE

Four commercial sand and gravel producers were active in the county during the year; these were Omasta Bros., Northampton; Bill Willard, Inc., West Farms; Eli Quenneville, South Hadley; and A. Girard & Sons, Inc., Palmer. Stone production consisted of crushed basalt for highway construction from a quarry operated by John S. Lane & Son, Inc. Lynch Brick Co., Inc., produced miscellaneous clays for use in brick manufacture at its open pit near South Hadley Falls.

MIDDLESEX

Stone, sand and gravel, and clays were produced in Middlesex County in 1953. Stone production was reported from four quarries during the year. Granitic gneiss for road construction was produced by John P. Condon Corp. at its quarry at Dracut and B. & M. Crushed Stone Corp., Ashland. Winchester Crushed Stone Co., Winchester, produced basalt and H. E. Fletcher Co. mostly dressed construction and architectural granite, as well as curbing granite, from its quarry at West Chelmsford. A substantial tonnage of crushed granite was sold for agricultural uses.

Eleven commercial sand and gravel producers were active in the county during the year. The largest were Akeson Sand & Gravel Co., with a pit and plant near Woburn; Riverside Sand & Gravel Co., Newton; Acme Sand & Gravel Co., Inc., Woburn; and William P. Cogger, Lowell. All of them produced over 100,000 tons of sand and gravel during the year. Sand and gravel produced during the year were used for highway construction and building. Operators reported an increasing shortage of sand and gravel deposits suitable for exploitation.

A. D. Hews & Co., Inc., continued to produce miscellaneous clays for use in manufacturing flower-pots at its pit near Cambridge. The New England Brick Co. reported that its Boston pit and plant were closed and abandoned in 1953.

NORFOLK

Norfolk County continued in 1953 to be the principal source of sand and gravel in Massachusetts. Nine commercial plants were in operation compared with 11 in 1952. Leading producers during the

year included the Highland Sand & Gravel Co., Inc., with pits at Walpole and Dedham; Boston Sand & Gravel Co., Canton; and Glacier Sand & Stone Co., Inc., Norwood. Most producers reported that demand for sand and gravel was exceptionally good and that plants operated at full capacity throughout the year, weather permitting.

Stone production in 1953 consisted of crushed and broken granite, crushed basalt, and dimension granite. Crushed basalt for local highway construction was quarried by Stoughton Crushed Stone Co., Stoughton. Granite quarries at Quincy, operated by Old Colony Crushed Stone Co. and J. S. Swingle, Inc., reported production of crushed granite for railroad ballast and rough monumental granite for use in monuments and mausoleums.

PLYMOUTH

Sand and gravel and clay were produced in Plymouth County in 1953. Seven commercial sand and gravel plants were active, the largest being Boston Sand & Gravel Co., Greenbush; Thomas Bros., Middleboro; and Whitehead Bros. Co. Common clay for use in manufacturing building brick was mined at pits of Stiles & Hart Brick Co., Bridgewater, and Bridgewater Brick Co., East Bridgewater.

SUFFOLK

West Roxbury Crushed Stone Co. continued to operate its granite quarry at West Roxbury and produced crushed and broken stone for use in highway construction. Crushed stone for highway construction and riprap was also produced by Rowe Contracting Co. The United States Army Corps of Engineers reported sand and gravel output. Expanded perlite was produced at the Roslindale plant of the Whittemore Co.

WORCESTER

The bulk of the stone produced during the year in Worcester County was crushed basalt quarried by the Holden Traprock Co. at its quarry at Holden. Output was used for road building. H. E. Fletcher Co. continued to produce rough and dressed architectural granite at its cutting quarry near Milford. Rough and dressed construction granite was also produced during the year by Uxbridge Granite Co. at Uxbridge. Seven commercial sand and gravel plants were active in the county during the year; the largest were Worcester Sand & Gravel Co., Inc., pit and plant at Shrewsbury; Joseph Rosenfeld plant and pit at Hopedale; De Falco Concrete, Inc., Millbury; and P. J. Keating Co., Lunenburg. The principal uses in 1953 were for building and paving.

The Mineral Industry of Michigan

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of Interior, and the Department of Conservation, State of Michigan.

By Samuel A. Gustavson¹ and Matthew G. Sikich²



MINERAL production in Michigan in 1953 was valued at \$286,487,000—an increase of approximately 13 percent over that in 1952. Substantial increases, chiefly in the production of iron ore, copper, and stone, resulted in a new alltime high in annual value of minerals produced in the State. The previous record was \$258,471,000, established in 1951. Other gains in value of production over the previous year were attained in cement, manganiferous iron ore, marl, bromine and bromine compounds, magnesium compounds, salt, and sand and gravel. Also contributing to the new record value were the higher average price of copper and price increases in iron ore.

Of the total value of the minerals produced in Michigan in 1953, metallic minerals represented 38 percent, nonmetallic minerals (except fuels) 49 percent, and fuels 13 percent of the annual mineral output. The State led the Nation in the output of salt, gypsum, and calcareous

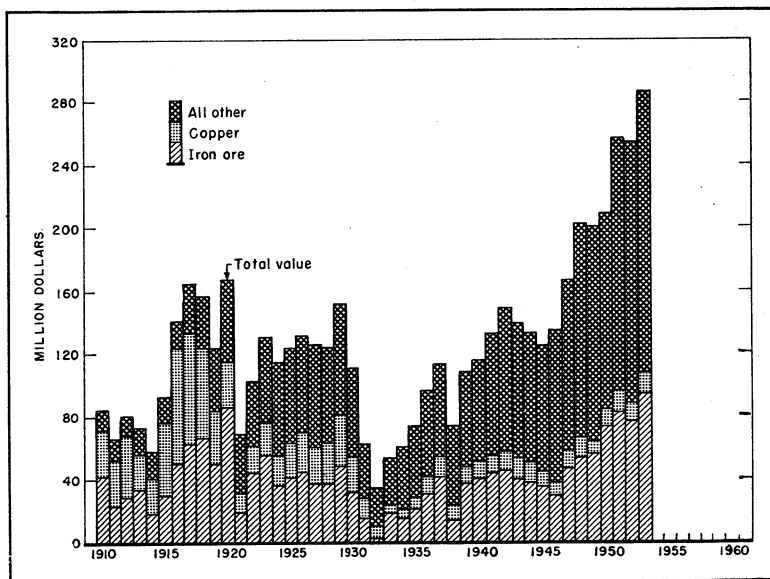


FIGURE 1—Value of copper and iron ore, and total value of all minerals in Michigan, 1910-53.

¹ Chief Mineral Industry Division, Region V, Bureau of Mines, Minneapolis, Minn.

² Commodity-industry analyst, Region V, Bureau of Mines, Minneapolis, Minn.

marl; ranked second in the production of iron ore and sand and gravel; and contributed a notable share of the Nation's supply of limestone and cement, as well as bromine, magnesium, and calcium compounds.

TABLE 1.—Mineral production in Michigan, 1952-53¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement..... 376-pound barrels..	14,760,783	\$36,819,042	15,853,096	\$41,860,464
Clays.....	1,775,917	1,810,916	1,645,804	1,686,113
Copper (recoverable content of ores, etc.).....	21,699	10,502,316	24,097	13,831,678
Gypsum.....	1,487,642	4,200,413	1,446,973	4,091,002
Iron ore (usable)..... long tons, gross weight..	11,779,366	76,088,935	13,312,766	94,691,612
Magnesium compounds from well brines (partly estimated)..... MgO equivalent..	2 38,449	2 3,917,138	43,190	4,591,922
Manganiferous ore (5 to 35 percent Mn)..... gross weight..	22,095	(3)	76,251	(3)
Marl, calcareous (except for cement).....	164,519	86,529	183,685	72,781
Natural gas..... million cubic feet..	9,052	1,322,000	7,774	1,275,000
Peat.....	29,304	419,856	25,439	257,176
Petroleum (crude)..... thousand 42-gallon barrels..	13,251	35,250,000	4 12,285	4 35,870,000
Salt (common).....	4,778,347	21,446,382	5,127,387	22,171,988
Sand and gravel.....	29,193,763	22,400,873	30,459,663	23,170,802
Stone (except limestone for cement and lime).....	17,973,685	15,770,816	21,615,686	17,639,525
Undistributed: Bromine, calcium-magnesium chloride, lime, magnesium chloride for magnesium metal, natural-gas liquids, potassium salts, ground sand and sandstone, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3). Excludes value of clays used for cement.....		2 24,482,809		25,276,772
Total Michigan.....		2 254,518,000		286,487,000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

² Revised figure.

³ Value included with "Undistributed."

⁴ Final figure. Supersedes preliminary figure given in commodity chapter.

REVIEW BY MINERAL COMMODITIES

METALS

Copper.—Production of copper in Michigan in 1953—in terms of recoverable metal from mines and tailing reclamation plants—was 24,100 short tons, an 11-percent increase over the 21,700 tons produced in 1952. The chief reason for the increase in production over the preceding year was the continuous operation, whereas in 1952 there were several work stoppages due to labor strikes.

Producers were Calumet & Hecla, Inc., Copper Range Co., Quincy Mining Co., and White Pine Copper Co., in Houghton, Keweenaw, and Ontonagon Counties.

Exploration at properties of Calumet & Hecla, Inc., under a Defense Minerals Exploration Administration (DMEA) contract, continued. The total cost of the contract was \$568,193, the Government assumed half the cost, to be repaid on a royalty basis if production results from the work.

The average annual weighted price used in calculating the value of copper produced in 1953 was 28.7 cents per pound. In both 1951 and 1952 the ceiling price was 24.2 cents per pound. Price control was terminated February 25, 1953, after which the price rose to about 30 cents per pound and, with slight variations, remained near that level throughout 1953.

Table 2 shows the mine production of copper in Michigan, 1949-53, in terms of recoverable metal.

TABLE 2.—Mine production of copper, 1944-48 (average) and 1949-53, in terms of recoverable metal

Year	Mines producing		Material treated		Copper	
	Lode	Tailing	Ore (short tons)	Tailing (short tons)	Short tons	Value
1944-48 (average).....	10	3	2,028,418	2,961,016	29,239	\$9,778,650
1949.....	9	3	1,503,358	2,039,510	19,506	7,685,364
1950.....	9	3	2,148,919	2,237,555	25,608	10,652,928
1951.....	8	3	2,214,369	2,256,965	24,979	12,089,836
1952.....	8	3	1,879,131	1,991,051	21,699	10,502,316
1953.....	9	2	2,314,420	1,878,297	24,097	13,831,678

TABLE 3.—Mine production of copper in 1953, by months, in terms of recoverable metal

Month	Short tons	Month	Short tons	Month	Short tons
January.....	2,148	June.....	1,974	October.....	2,253
February.....	1,952	July.....	2,244	November.....	1,678
March.....	2,065	August.....	1,920	December.....	2,022
April.....	2,302	September.....	1,805		
May.....	1,734			Total.....	24,097

Copper ore produced in Michigan normally contains a small quantity of silver; however, there was no report of silver being recovered in 1953.

Iron Ore.—Shipments of usable iron ore in 1953, excluding manganese iron ore (5 to 10 percent manganese), were 13,313,000 long tons compared with 11,779,000 long tons in 1952, an increase of approximately 13 percent. Michigan ranked second among the iron-ore-producing States in 1953 and supplied about 12 percent of the total usable iron ore produced in the United States.

Shipments in 1953 consisted of 13,135,000 tons of direct shipping ore and 177,900 tons of concentrate. The average iron content of "usable" iron ore shipped during the year was 50.96 percent, natural. In 1952 the average was 51.06 percent, natural.

During 1953 iron ore was shipped by 11 companies from 30 underground mines, 9 open-pit mines, and 1 concentrator in the State's three iron ranges—Gogebic in Gogebic County, Marquette in Baraga and Marquette Counties, and Menominee in Dickinson and Iron Counties.

Development continued at the Humboldt mine in Marquette County, the first operation designed to concentrate nonmagnetic jasper in the Upper Peninsula. Construction was begun in 1952 by the Cleveland-Cliffs Iron Co. and the Ford Motor Co. in a joint venture. An annual production of 250,000 tons was anticipated. Groundwork was also underway at another Cleveland-Cliffs Iron Co. property—the Republic mine—in Marquette County. This will be the second project to mine and concentrate Michigan's iron-bearing jasper. Production was expected in 1955, with an initial capacity of 550,000 tons a year.

The Michigan Ore Division of the Jones & Laughlin Steel Corp. continued underground development and construction of surface buildings at the Tracy mine at Negaunee. Shipments were expected to begin in 1954.

Development work on the Menominee range in Iron County, continued at the Cannon, Lawrence, Fortune Lake, and Cayia mines. The Davidson mine—a long-time producer in the county—was closed August 11, 1953, by exhaustion of ore; however, another mine in the same county—the Fortune Lake—began shipping ore on the same date.

The average value of iron ore per gross ton, including concentrate, f. o. b. mines, as reported by producing companies in Michigan in 1953, was \$7.11 compared with \$6.46 in 1952. At the end of 1953, Lake Erie base prices were: Mesabi non-Bessemer and High Phosphorus \$9.90 per ton, Mesabi Bessemer \$10.05, Old Range non-Bessemer \$10.15, Old Range Bessemer \$10.30, and open-hearth lump ore \$11.15. Base prices are for ore delivered at lower Lake ports, carrying 51.5 percent natural iron content for non-Bessemer grades, and with an additional 0.045 percent phosphorus (dry) for Bessemer grades. Premiums and penalties are applied for variations in analyses and physical structure. The bulk of the tonnage shipped from mines in Michigan was of the non-Bessemer grade.

The 1953 navigation season for iron-ore shipping from Michigan ports opened officially on March 30 at Escanaba. The final ore cargo from Michigan ports left Escanaba on November 27.

TABLE 4.—Production, shipments, and stocks of crude iron ore in 1953, by counties and ranges, in gross tons¹

County or range	Stocks of crude ore, Jan. 1, 1953	Production in 1953		Shipments in 1953		Stocks of crude ore, Dec. 31, 1953
		Under-ground	Open pit	Direct to consumers	To benefici-ation plants	
County:						
Baraga.....			341, 485		341, 485	
Dickinson.....			43, 814	43, 814		
Gogebic.....	367, 058	2, 823, 067	941, 381	3, 135, 052	371, 054	625, 400
Iron.....	682, 717	4, 236, 808	227, 016	4, 509, 101		689, 440
Marquette.....	966, 644	5, 236, 509	423, 994	5, 446, 886		1, 180, 261
	2, 016, 419	12, 348, 384	1, 977, 690	13, 134, 853	712, 539	2, 495, 101
Range:						
Gogebic.....	367, 058	2, 823, 067	941, 381	3, 135, 052	371, 054	625, 400
Marquette.....	966, 644	5, 236, 509	765, 479	5, 446, 886	341, 485	1, 180, 261
Menominee.....	682, 717	4, 236, 808	270, 830	4, 552, 915		689, 440
	2, 016, 419	12, 348, 384	1, 977, 690	13, 134, 853	712, 539	2, 495, 101

¹ Exclusive of iron ore containing 5 percent or more manganese.

Manganese.—In 1953 Hanna Iron Ore Co. produced and shipped 76,251 short tons of manganiferous iron ore (containing 5 to 10 percent manganese, natural) from its Cannon mine in Iron County. The ore averaged 6.88 percent manganese and was the only manganiferous iron ore reported produced in the State in 1953. In 1952 shipments were 22,095 short tons. Ores containing over 5 percent natural manganese were usually priced as Old Range non-Bessemer on the combined natural iron and manganese content, plus a premium for natural manganese exceeding 5 percent. The Bureau of Mines is not at liberty to publish average mine prices for manganiferous iron ore.

TABLE 5.—Usable iron ore shipped from mines, 1941–53, by ranges, in gross tons ¹

Year	Marquette range	Menominee range (Michigan portion)	Gogebic range (Michigan portion)	Total
1941.....	6,346,165	4,036,486	4,818,968	15,201,619
1942.....	6,540,228	4,897,305	4,691,941	16,129,474
1943.....	5,602,904	4,812,731	4,094,722	14,510,357
1944.....	4,790,179	4,835,317	4,067,881	13,693,377
1945.....	4,585,340	4,239,045	3,008,670	11,833,055
1946.....	3,270,384	2,589,433	2,617,608	8,477,425
1947.....	5,543,124	3,712,501	3,709,857	12,965,482
1948.....	4,896,754	4,085,089	3,914,635	12,896,478
1949.....	4,249,707	3,587,068	3,156,464	10,993,239
1950.....	4,958,674	4,035,347	3,827,323	12,821,344
1951.....	5,647,423	4,767,139	3,197,059	13,611,621
1952.....	4,516,509	4,258,996	3,003,861	11,779,366
1953.....	5,571,501	4,452,915	3,188,350	13,212,766
1941-53.....	66,518,892	54,409,372	47,297,339	168,225,603

¹ Exclusive of iron ore containing 5 percent or more manganese, natural.TABLE 6.—Usable iron ore produced, 1854-1940 total and 1941-53, by ranges, in gross tons ¹

Year	Marquette range	Menominee range (Michigan portion) ²	Gogebic range (Michigan portion) ²	Total
1854-1940.....	206,818,016	174,719,407	180,761,977	562,299,400
1941.....	6,230,612	3,818,451	4,622,129	14,671,192
1942.....	6,324,307	4,808,866	4,490,988	15,624,161
1943.....	5,680,727	5,366,595	4,378,466	15,425,788
1944.....	4,720,253	4,288,830	3,817,157	12,826,240
1945.....	4,664,816	4,140,239	3,027,438	11,832,493
1946.....	3,455,961	2,662,308	2,570,335	8,688,604
1947.....	5,070,631	3,741,217	3,765,614	12,577,462
1948.....	4,830,341	4,259,378	4,012,367	13,102,086
1949.....	4,392,732	3,483,375	3,322,917	11,199,024
1950.....	5,085,500	3,958,408	3,647,193	12,691,101
1951.....	5,617,935	4,986,290	3,099,676	13,703,901
1952.....	4,668,550	4,168,465	2,972,930	11,809,945
1953.....	5,785,118	4,559,638	3,468,585	13,813,341
1854-1953.....	273,345,499	228,961,467	227,957,772	730,264,738

¹ Exclusive of iron ore containing 5 percent or more manganese, natural.² Distribution by range partly estimated before 1906.

TABLE 7.—Manganiferous iron ore (containing 5 to 10 percent manganese, natural) and ferruginous manganese ore (containing 10 to 35 percent manganese, natural) shipped from mines, 1910-53

[Gross tons]

Year	Gross tons	Year	Gross tons	Year	Gross tons
1910-40.....	3,120,797	1945.....	1,500	1950.....	105,017
1941.....		1946.....	1,743	1951.....	162,186
1942.....	30,931	1947.....		1952.....	19,723
1943.....	39,368	1948.....		1953.....	63,081
1944.....	40,794	1949.....		Total.....	3,540,125

¹ Revised figure.

NONMETALS

Cement.—In 1953 shipments of portland cement were reported by 5 companies from 7 plants in Alpena, Bay, Emmet, Lenawee, St. Clair, and Wayne Counties. Shipments during the year were 15,853,000 barrels valued at \$41,860,000, an increase of about 7 per-

cent in quantity over 1952 and also a new alltime high. Michigan's portland-cement shipments have increased each year during 1945-53. The total annual capacity in 1953 for the 7 plants in the State was about 18 million barrels. The average mill value per barrel of portland cement in the State was \$2.64 in 1953 compared with \$2.49 the previous year.

Clays.—Clays sold or used by producers in the State in 1953 totaled 1,645,800 short tons—a decrease of about 7 percent below that reported in 1952. The bulk of this tonnage was used in manufacturing cement. Other uses reported in 1953 were for lightweight aggregate, manufacture of pottery, molding sand, insecticides and fungicides, fertilizers, and rotary-drilling mud.

During the year 13 companies operated in Eaton, Gratiot, Lenawee, Monroe, Oakland, Saginaw, Shiawassee, and Wayne Counties.

Gypsum.—Production of crude gypsum in Michigan in 1953 was 1,447,000 short tons valued at \$4,091,000, a decrease of about 3 percent compared with production in 1952. Michigan still ranked first in the Nation in the production of crude gypsum. Producing companies in 1953 were National Gypsum Co. and United States Gypsum Co. in Iosco County, and Certain-teed Products Corp. and Grand Rapids Plaster Co. in Kent County. The same companies also operated calcining plants in the State, producing plasterboard, lath, exterior sheathing, and plaster. The annual production and value of crude gypsum mined in Michigan in 1952-53 are shown in table 1.

Lime.—Production of lime decreased about 14 percent in 1953 compared with 1952. Dow Chemical Co., Limestone Products Co., and the Monitor Sugar Division of the Robert Gage Coal Co. operated plants in Mason, Menominee, and Bay Counties, respectively. Limestone Products Co. produced both quicklime and hydrated lime, whereas the other two companies produced only quicklime. High-calcium limestone from quarries in northern Michigan served as raw material for the lime industry in the State.

Marl.—Michigan ranked first in the production of calcareous marl in the United States. Marl was produced in Michigan in 1953 from 18 counties, chiefly in the western and southwestern portions of the State, according to reports received from 27 operators. Production in 1953 was 183,700 short tons valued at \$72,800, an increase of about 12 percent over that of 1952. The average value of marl in 1953, f. o. b. mine, was \$0.40 per ton compared with \$0.53 per ton in 1952. All marl was used for agricultural purposes.

Natural Salines.—Bromine and bromine compounds, calcium-magnesium chloride, calcium chloride, magnesium compounds, and potassium salts were recovered from natural brines by chemical plants operated by six different companies in Gratiot, Manistee, Mason, Midland, and Tuscola Counties. The total value of these products in 1953 increased about 4 percent over that reported in 1952, chiefly because of a 17-percent increase in value of bromine production. Decreases in value of the other salines were recorded during the year.

Perlite.—Crude perlite, produced in Western States, was expanded at a plant in Grand Rapids. The expanded product was used mainly as a lightweight aggregate in plaster and concrete.

Salt.—Nine companies operating in Gratiot, Manistee, Midland, St. Clair, and Wayne Counties produced a total of 5,127,000 short tons of salt, an increase of about 7 percent over that in the previous

year. Michigan again led the Nation in the production of salt, with about 25 percent of the tonnage produced. Most of the State production was from artificial brines formed by the solution of rock salt. Mined rock salt from Michigan's only underground salt mine and evaporated salt from natural brines composed the remainder. Salt from Michigan was used chiefly in manufacturing soda ash, chlorine, bleaches, and other chemicals. Other uses included food processing, ice control, livestock, table salt, and water treatment.

Sand and Gravel.—Production of sand and gravel was reported from 75 of Michigan's 83 counties by 137 commercial and 52 Government-and-contractor operators. The total output from both types of operations was 30,460,000 tons valued at \$23,171,000—an increase of 4 percent in quantity and 3 percent in value over 1952. Table 8 shows

TABLE 8.—Sand and gravel sold or used by producers, 1952–53, by classes of operation and uses

Class of operation and use	1952			1953		
	Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per ton
COMMERCIAL OPERATIONS						
Sand:						
Glass.....	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Molding.....	1,932,845	\$1,877,446	\$0.97	1,959,807	\$1,968,065	\$1.00
Building.....	3,297,285	2,575,620	.78	3,655,863	2,610,498	.71
Paving.....	3,276,527	2,659,318	.81	3,150,812	2,537,940	.81
Grinding, polishing, and blast.....	156,913	67,563	.43	246,167	90,441	.37
Engine.....	63,622	45,664	.72	55,845	39,183	.70
Filter.....	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Railroad ballast.....	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)
Other.....	905,282	451,713	.50	196,904	97,108	.49
Undistributed.....	277,312	700,472	2.53	272,000	784,015	2.88
Total commercial sand.....	9,909,786	8,377,796	.85	9,537,398	8,127,250	.85
Gravel:						
Building.....	3,731,275	3,623,918	.97	3,815,209	3,795,671	.99
Paving.....	8,997,827	7,340,453	.82	10,253,572	8,210,413	.80
Railroad ballast.....	485,104	409,833	.84	506,727	349,729	.69
Other.....	63,131	36,221	.57	96,456	65,699	.68
Total commercial gravel.....	13,277,337	11,410,425	.86	14,671,964	12,421,512	.85
Total commercial sand and gravel.....	23,187,123	19,788,221	.85	24,209,362	20,548,762	.85
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand: Paving.....	525,768	112,436	.21	526,827	72,546	.14
Total Government-and-contractor sand.....	525,768	112,436	.21	526,827	72,546	.14
Gravel:						
Building.....	142,913	10,227	.07	-----	-----	.07
Paving.....	5,337,959	2,489,995	.47	5,723,474	2,549,494	.45
Total Government-and-contractor gravel.....	5,480,872	2,500,222	.46	5,723,474	2,549,494	.45
Total Government-and-contractor sand and gravel.....	6,006,640	2,612,658	.43	6,250,301	2,622,040	.42
ALL OPERATIONS						
Sand.....	10,435,554	8,490,232	.81	10,064,225	8,199,796	.81
Gravel.....	18,738,209	13,910,647	.74	20,395,438	14,971,006	.73
Grand total.....	29,193,763	22,400,879	.77	30,459,663	23,170,802	.76

¹ Bureau of Mines not at liberty to publish separate figures for items indicated by footnote reference 1, which are combined and shown as "Undistributed."

the output of sand and gravel, by type of operation and uses, for 1952 and 1953. The 10 largest commercial producers, arranged alphabetically, were: American Aggregates Corp., Greenville, Ohio; Construction Aggregates Corp., Chicago, Ill.; Foley & Beardslee, Clarkston; Great Lakes Foundry Sand Co., Detroit; Grand Rapids Gravel Co., Grand Rapids; Koenig Coal & Supply Co., Detroit; Michigan Silica Co., Rockwood; Nugent Sand & Gravel Co., Muskegon; Harry Pickitt, Allegan; John G. Yerington, Benton Harbor.

Sand and Sandstone, Ground.—Production of ground sand and sandstone (silica) was reported by one company in Wayne County in 1953. The output decreased slightly below that reported in 1952.

Stone.—Production of basalt, granite, limestone, sandstone, and some miscellaneous stone was reported from 21 counties throughout the State in 1953. A total of 21 commercial and 4 Government-and-contractor operators produced 21,615,686 short tons of stone (excluding limestone used in the manufacture of cement and lime) in 1953, an increase of about 20 percent over that reported the previous year. Crushed and broken limestone alone made up 99 percent of Michigan's stone output in 1953.

Dimension limestone used in rough construction, as rubble, sawed stone, and flagging, was produced in Eaton, Huron, and Presque Isle Counties. A small quantity of dimension sandstone was quarried in Jackson County and used as rubble, flagging, and in rough construction. Data on the production and value of dimension stone are shown in table 9 and on crushed and broken stone in table 10.

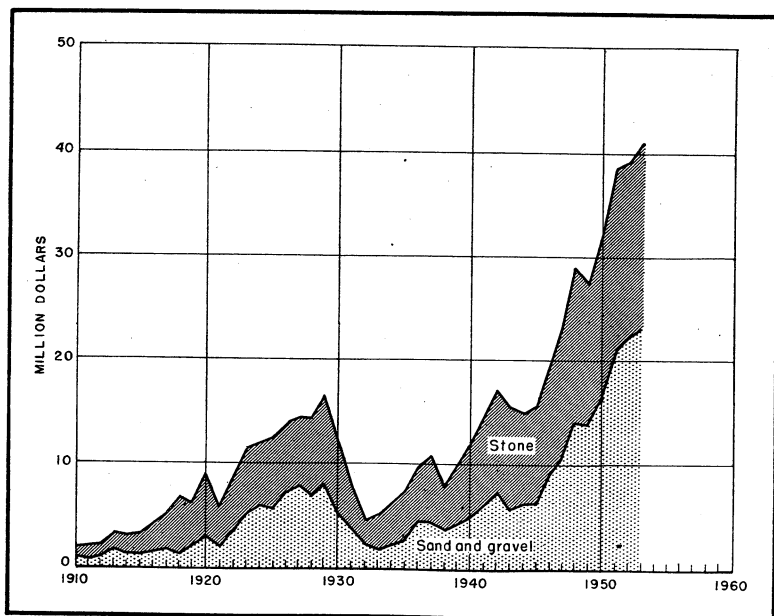


FIGURE 2.—Value of sand and gravel and stone in Michigan, 1910-53.

TABLE 9.—Dimensional stone sold or used by producers, 1949-53, by kinds

Year	Limestone		Sandstone		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1949.....	3,300	\$26,604	(1)	(1)	3,300	\$26,604
1950.....	4,430	43,019	.....	.....	4,430	43,019
1951.....	4,627	43,138	984	\$4,776	5,611	47,914
1952.....	5,322	45,925	908	5,126	6,230	51,051
1953.....	4,849	53,425	369	2,624	5,218	56,049

¹ Figure withheld in order to avoid disclosure of individual company operations.

TABLE 10.—Crushed and broken stone sold or used by producers, 1952-53, by kinds and uses

Kind and use	1952			1953		
	Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per ton
Granite: Road metal: Commercial.....	.....	.....	.....	12,741	\$23,595	\$1.85
Basalt: Concrete, road stone: Non-commercial.....	28,362	\$21,009	\$0.74	26,310	37,586	1.43
Limestone (except for limestone used for cement and lime):	.....	.....	.....	.....	.....	.....
Riprap:	.....	.....	.....	.....	.....	.....
Commercial.....	9,294	19,241	2.07	5,347	9,959	1.86
Noncommercial.....	46,595	69,893	1.50	64,715	89,658	1.39
Flux.....	10,082,920	7,614,149	.76	12,746,549	9,780,588	.77
Concrete, road stone:	.....	.....	.....	.....	.....	.....
Commercial.....	3,120,820	3,347,400	1.07	3,575,506	3,646,897	1.02
Noncommercial.....	72,930	85,866	1.18	38,823	46,588	1.20
Railroad ballast.....	169,929	209,512	1.23	124,580	151,136	1.21
Agriculture.....	722,028	921,084	1.28	624,922	587,623	.94
Other.....	3,674,922	3,379,230	.92	4,315,678	3,118,035	.72
Total commercial.....	17,779,913	15,490,616	.87	21,392,582	17,294,238	.81
Total noncommercial.....	119,525	155,759	1.30	103,538	136,246	1.32
Total limestone.....	17,899,438	15,646,375	.87	21,496,120	17,430,484	.81
Sandstone: Concrete, road stone:	.....	.....	.....	.....	.....	.....
Commercial.....	500	1,000	2.00	187	561	3.00
Noncommercial.....	9,450	10,500	1.11	.....	.....	.....
Total sandstone.....	9,950	11,500	1.16	187	561	3.00
Miscellaneous stone: Concrete, road stone:	.....	.....	.....	.....	.....	.....
Commercial.....	29,705	40,881	1.38	50,110	66,250	1.32
Noncommercial.....	.....	.....	.....	25,000	25,000	1.00
Total miscellaneous stone.....	29,705	40,881	1.38	75,110	91,250	1.21
Total commercial.....	17,810,118	15,532,497	.87	21,455,620	17,384,644	.81
Total noncommercial.....	157,337	187,268	1.19	154,848	198,832	1.28
Grand total.....	17,967,455	15,719,765	.87	21,610,468	17,583,476	.81

MINERAL FUELS

Coal.—Coal has not been produced in Michigan since the Swan Creek Mining Co. abandoned its operation near St. Charles, Saginaw County, in April 1952. According to the Michigan Department of Conservation, Geological Survey Division,³ over 46,200,000 tons of

³ Michigan Department of Conservation, Geological Survey Division, Michigan Mineral Industries, 1952, June 1954, p. 4.

coal was produced in the State from 1860 to 1952. The peak production was 2,035,000 tons in 1907 from 37 mines. In Federal Geological Survey Circular 293, 1954, it was estimated that, as of January 1, 1953, recoverable reserves (assuming 50-percent recovery) were 110,000,000 tons.

Natural Gas.—Natural-gas production declined 14 percent from the 1952 total to 7.7 billion cubic feet. At the end of 1953, 280 wells were producing in the State.

Natural Gasoline.—In 1953 Michigan produced ⁴ from oil-well gas 4,414,371 gallons of natural gasoline and allied products. In 1952 production was 5,330,139 gallons. Of the 7 counties producing natural gasoline, Crawford ranked first, with 62 percent of the total State output.

Peat.—Peat production in 1953 totaled 25,439 tons valued at \$257,176. The largest producer was Michigan Peat, Inc., operating bogs near Capac. Michigan peat was used mostly as a soil conditioner for lawns, golfcourses, gardens, and greenhouses.

Petroleum.—Petroleum ⁵ production in 1953 totaled 12,285,000 barrels compared with 13,251,000 barrels in 1952. At the end of 1953 there were 4,089 producing wells in 38 counties. Approximately 38 percent of the total was from Arenac, Isabella, and Oceana Counties; each produced over 1,000,000 barrels.

REVIEW BY COUNTIES

ALCONA

E. P. Brady & Co. (Flint), and Harry Pickitt (Allegan), produced road gravel. The county road commission produced sand and gravel for road use.

ALGER

Leonard Johnson (Catham), Ed Culver (Kiva), and Olga Winkka (Marquette), produced road gravel. The Duluth, South Shore & Atlantic Railway produced engine sand and the county road commission sand and gravel for road use.

ALLEGAN

Petroleum ranked first in value of minerals produced in the county and natural gas fourth. Marl, chiefly for agricultural use, and sand and gravel for use as a concrete aggregate and in road construction were the minerals produced in Allegan County. L. Z. Arndt, Fennville and Gerald Arnsmann and Emil Pavlak, both of Hopkins, were the producers of marl. Harry Pickitt and Ben Waanders (Allegan), John G. Yerington (Benton Harbor), and Cleo L. Arndt (Fennville) produced sand and gravel for building and road use.

ALPENA

Wyandotte Chemicals Corp., Wyandotte, produced limestone for use in manufacturing alkali and portland cement and for concrete and

⁴ Michigan Department of Conservation, Geological Survey Division, Michigan Mineral Industries 1953: April 1955, p. 7

⁵ Work cited in footnote 4, p. 6.

road use. Cement was manufactured by the Huron Portland Cement Co. Harry Pickitt, Allegan, and E. P. Brady & Co., Flint, produced road gravel.

TABLE 11.—Value of minerals produced in Michigan, 1952-53, by counties,¹ and principal minerals produced in 1953

County	1952	1953	Principal minerals produced in 1953, in order of value
Alcona.....	\$17, 044	\$77, 055	Sand and gravel.
Alger.....	(?)	37, 213	Do.
Allegan.....	136, 657	306, 689	Petroleum, sand and gravel, marl, natural gas.
Alpena.....	(?)	19, 793, 599	Cement, stone, sand and gravel.
Antrim.....	36, 581	(?)	Sand and gravel.
Arenac.....	(?)	94, 619	Petroleum, stone, sand and gravel.
Baraga.....	493, 658	889, 242	Iron ore, sand and gravel.
Barry.....	101, 812	52, 819	Petroleum, sand and gravel, marl.
Benzie.....	18, 511	18, 600	Sand and gravel.
Berrien.....	227, 826	273, 043	Sand and gravel, stone, petroleum.
Branch.....	56, 924	98, 495	Sand and gravel.
Calhoun.....	385, 177	352, 725	Sand and gravel, marl.
Cass.....	122, 481	102, 066	Do.
Charlevoix.....	11, 389	53, 046	Sand and gravel.
Chippewa.....	(?)	3, 103, 029	Stone, sand and gravel.
Clinton.....	247, 364	230, 646	Sand and gravel.
Crawford.....	12, 907	7, 919	Petroleum, natural-gas liquids, natural gas, sand and gravel.
Delta.....	193, 791	157, 418	Do.
Dickinson.....	429, 180	316, 587	Stone, iron ore, sand and gravel.
Eaton.....	353, 407	311, 703	Stone, sand and gravel, clays.
Genesee.....	494, 858	340, 018	Sand and gravel, petroleum.
Gladwin.....	18, 883	15, 750	Petroleum, sand and gravel.
Gogebic.....	19, 277, 115	22, 437, 191	Iron ore, sand and gravel, stone.
Gratiot.....	2, 481, 624	3, 240, 595	Bromine, salt, magnesium compounds (except for metal), calcium-magnesium chloride, sand and gravel, natural gas, clays, petroleum.
Hillsdale.....	130, 610	176, 175	Sand and gravel, marl.
Houghton ²	10, 535, 643	13, 870, 413	Copper, stone, sand and gravel.
Huron.....	(?)	741, 425	Stone, sand and gravel, petroleum.
Ingham.....	1, 065, 474	88, 305	Sand and gravel.
Ionia.....	132, 015	163, 459	Sand and gravel, petroleum, stone.
Iron.....	26, 373, 984	32, 122, 653	Iron ore, manganiferous ore, sand and gravel.
Jackson.....	420, 006	450, 514	Sand and gravel, stone, petroleum.
Kalamazoo.....	565, 243	633, 844	Sand and gravel, marl, peat, petroleum.
Kalkaska.....	6, 587	12, 955	Petroleum, natural-gas liquids, natural gas, sand and gravel.
Kent.....	2, 067, 408	2, 104, 215	Sand and gravel, gypsum, stone, marl, natural gas, petroleum.
Lake.....	10, 281	(?)	Petroleum, sand and gravel.
Lapeer.....	464, 000	(?)	Sand and gravel.
Leelanau.....	14, 281	22, 797	Do.
Lenawee.....	2, 219, 698	3, 428, 062	Cement, sand and gravel, clays.
Luce.....	27, 901	(?)	Sand and gravel.
Mackinac.....	(?)	30, 178	Sand and gravel, stone.
Macomb.....	1, 194, 245	1, 014, 312	Sand and gravel.
Manistee.....	6, 501, 906	7, 780, 243	Salt, magnesium compounds (except for metal), bromine compounds, sand and gravel.
Marquette.....	30, 325, 369	40, 047, 678	Iron ore, sand and gravel, stone.
Mason.....	(?)	1, 406, 094	Lime, magnesium compounds (except for metal), sand and gravel, bromine, petroleum.
Mecosta.....	12, 721	18, 407	Petroleum, natural gas, marl, sand and gravel.
Missaukee.....	1, 358	(?)	Petroleum, natural-gas liquids, natural gas, marl.
Montcalm.....	275, 205	195, 622	Petroleum, sand and gravel, natural gas, marl.
Muskegon.....	673, 324	595, 673	Sand and gravel, petroleum, natural gas, marl.
Newaygo.....	2, 247	41, 312	Petroleum, natural gas, sand and gravel, natural-gas liquids, marl.
Oakland.....	4, 543, 940	4, 507, 606	Sand and gravel, clays.
Oceana.....	4, 063	(?)	Petroleum, sand and gravel, natural gas, natural gas liquids, marl.
Ogemaw.....	48, 012	112, 226	Petroleum, sand and gravel, marl.
Ontonagon.....	(?)	16, 764	Sand and gravel.
Otsego.....	(?)	36, 327	Sand and gravel, natural gas, petroleum.
Ottawa.....	1, 529, 190	1, 545, 623	Sand and gravel, petroleum, marl, natural gas
Presque Isle.....	(?)	8, 358, 698	Stone, sand and gravel.
Saginaw.....	80, 270	71, 746	Clays, petroleum, sand and gravel.
St. Clair.....	8, 047, 757	8, 693, 879	Salt, cement, peat, sand and gravel.
St. Joseph.....	73, 953	164, 564	Sand and gravel, marl.
Sanilac.....	101, 563	89, 175	Sand and gravel.
Shiawassee.....	159, 668	246, 182	Sand and gravel, clays.

See footnotes at end of table.

TABLE 11.—Value of minerals produced in Michigan, 1952–53, by counties,¹ and principal minerals produced in 1953—Continued

County	1952	1953	Principal minerals produced in 1953, in order of value
Tuscola.....	\$967, 932	\$986, 367	Sand and gravel, petroleum, calcium-magnesium chloride.
Van Buren.....	(?)	200, 888	Petroleum, sand and gravel, stone.
Washtenaw.....	653, 989	1, 084, 392	Sand and gravel, natural gas.
Wayne.....	21, 061, 095	22, 759, 490	Cement, salt, sand and gravel, clay, stone, ground sand and sandstone.
Undistributed ⁴	⁵ 109, 099, 909	80, 358, 505	
Total.....	⁵ 254, 518, 000	286, 487, 000	

¹ Except for petroleum, natural gas, natural-gas liquids, and magnesium chloride used for producing metals.

² Included with "Undistributed."

³ Includes value of minerals produced (copper and sand and gravel in 1952; copper in 1953) in Keweenaw County.

⁴ Includes value of mineral production, which the Bureau of Mines is not at liberty to publish, and principal minerals produced as indicated in footnote one and in the following counties: Bay—cement, petroleum, lime; Cheboygan—stone, sand and gravel; Clare—petroleum, natural gas, sand and gravel; Emmet—cement, stone; Iosco—gypsum, sand and gravel; Isabella—petroleum, natural gas, natural-gas liquids, sand and gravel, marl (1953); Livingston—sand and gravel, natural gas; Menominee—lime, sand and gravel; Midland—bromine compounds, calcium-magnesium chloride, magnesium compounds (except for metal), magnesium chloride used for producing metal, salt, potash, petroleum, natural gas, natural gas-liquids, sand and gravel (1952); Monroe—stone, petroleum, clay; Montmorency—sand and gravel, petroleum; Osceola—petroleum, natural gas, marl, sand and gravel; Oscoda—stone (1952), sand and gravel (1953), petroleum; Roscommon—petroleum, sand and gravel (1953), natural gas; Schoolcraft—stone, sand and gravel; Wexford—petroleum.

⁵ Revised figure.

ANTRIM

The Taber Co., Grand Rapids, produced road gravel, and the county road commission produced sand and gravel for road purposes.

ARENAC

Petroleum was the chief mineral product of the county. The Arenac County Road Commission produced limestone for use as riprap. Deep River Block & Sand Co. and Eastman Gravel Pit, Standish, produced building sand and gravel.

BARAGA

Cleveland-Cliffs Iron Co., Cleveland, Ohio, operated the Ohio open-pit iron mine, the most westerly active mine on the Marquette range. During 1953 this company produced 341,485 long tons of crude ore, from which 124,615 tons of concentrate was recovered and shipped. Duluth, South Shore & Atlantic Railway produced gravel for railroad ballast and the county road commission, gravel for road use.

BARRY

Petroleum was the most important mineral commodity produced in the county. The producer of marl for agricultural use was H. A. Carlton Schau, Kalamazoo. John G. Yerington (Benton Harbor), Hawthorn & Steenbock and Lancaster Sand & Gravel Co. (Hastings), A. D. Pennock (Nashville), West Shore Construction Co. (Zeeland), and the county road commission produced sand and gravel. Production was chiefly for building and road purposes.

BAY

The Aétna Portland Cement Co., Bay City, produced portland cement from clay mined in local pits and limestone from Alpena

County. Lime was produced by the Monitor Sugar Division of Robert Gage Coal Co., Bay City. Petroleum was produced in the county.

BENZIE

The county road commission produced road gravel.

BERRIEN

A small quantity of crushed stone was produced by John G. Yerington, Benton Harbor, for use as a concrete aggregate and for road construction. Producers Core Sand Corp. (Michigan City, Ind.), John G. Yerington (Benton Harbor), Harold Keill and Nieb Concrete Products (Niles), and Ireland & Lester Co. (St. Joseph), produced building, engine, molding, and paving sands and gravels for building and road use. Petroleum ranked second in value of minerals produced by the county.

BRANCH

H. Stukey, Coldwater, produced road sand and gravel, and the county road commission produced road gravel.

CALHOUN

Producers of marl in this county include Carl Avery, Athens, and Arnie Delebaugh and Clyde M. Reed, both of Union City. Harry Pickitt (Allegan), Battle Creek Gravel Co. (Battle Creek), John G. Yerington (Benton Harbor), Emil Combs (Tekonsha), and West Shore Construction Co. (Zeeland), produced building and paving sand and gravel.

CASS

Marl was produced by Grant Brizendine, Edwardsburg, and Frank R. Hixon, Marcellus. Harry Pickitt (Allegan), John G. Yerington (Benton Harbor), Heides Sand & Gravel (Niles), and the county road commission produced sand and gravel for building and road purposes.

CHARLEVOIX

Sand and gravel for road use were produced by the county road commission.

CHEBOYGAN

Crushed limestone was produced by the Afton Stone & Lime Co. Hugh M. Mason, Gaylord, produced sand and gravel for building and road use.

CHIPPEWA

Limestone was produced by the Drummond Dolomite, Inc., Sheboygan, Wis., and was sold for use as flux, for agricultural and chemical uses, and for concrete and roadstone. I. L. Whitehead Co., Sault Ste. Marie, and the county road commission produced sand and gravel for road use.

CLARE

Petroleum was the most valuable mineral product of the county. Natural gas was second in value. Fisher Sand & Gravel Co., Midland, produced road gravel.

CLINTON

Harry Pickitt (Allegan), Boichot Concrete Products Corp. (Lansing), Edward Light and the Walling Gravel Co. (St. Johns), and the county road commission produced sand and gravel for building and road use.

CRAWFORD

Petroleum, natural gasoline, and natural gas ranked first, second, and third in order of value of minerals produced in the county. Road gravel was produced by the Crawford County Road Commission, chiefly for road construction.

DELTA

Van Enkevorts Bros. (Bark River), Bichler Bros. (Escanaba), Cloverland Milling-Supply Co. and Days River Sand & Gravel Co. (Gladstone), and the county road commission produced building and road sand and gravel.

DICKINSON

Two companies produced iron ore from open-pit mines near Iron Mountain. During 1953 the Globe Iron Co. shipped 19,797 long tons from the Cornell mine, and the Jackson Iron & Steel Co. shipped 24,017 long tons from the Bradley mine. Superior Rock Products Co., Sagola, and Metro-Nite Co., Milwaukee, produced limestone for use as a concrete aggregate and roadstone. Champion, Inc., and Dickinson County Road Commission, both at Iron Mountain, produced sand and gravel for building and road use and railroad ballast.

EATON

Clays, chiefly for manufacturing vitreous clay pipe and tile, were produced by American Vitrified Products Co., Cleveland, Ohio, and the Grand Ledge Clay Products Co., Grand Ledge. Dimension limestone was produced by the F. G. Cheney Limestone Co., Bellevue, for building use and as crushed limestone for concrete aggregate, as roadstone, and for agricultural purposes. Road gravel was produced by West Shore Construction Co., Zeeland, and for the county road commission.

EMMET

Petoskey Portland Cement Co. produced cement at Petoskey. The company also produced limestone for use as an asphalt filler.

GENESEE

Justus Snellenberger (Burt), A. S. Leffler Gravel Co. (Davison), Hansen Gravel Co. (Genesee), and John Post & Sons (Swartz Creek) produced building and paving sand and gravel. Petroleum was produced in the county.

GLADWIN

Petroleum was the principal mineral in value in the county. Road gravel was produced for the county road commission.

GOGEBIC

Iron ore ranked first in value of the minerals produced in the county. Producing companies during 1953 were: Pickands, Mather & Co. operating the Anvil-Palms-Keweenaw, Newport, Peterson, Plymouth (Loomis) and Sunday Lake mines; Oliver Iron Mining Division, U. S. Steel Corp., the Geneva mine; Republic Steel Corp., the Penokee mine; M. A. Hanna Co., the Wakefield mine; and Zontelli Bros., Inc., concentrating ore from various lean-ore stockpiles near Ironwood. Crushed stone for use as concrete aggregate or for road construction was produced for and by the Gogebic County Road Commission. Emil Piispanen (Bessemer), Charles R. Hemkes Co. (Ironwood), Lake Superior Gravel Co. (Ramsay), and the county road commission produced building and paving sand and gravel.

GRATIOT

Minerals produced in the county include bromine and bromine compounds, calcium chloride, clay, magnesium compounds, salt, natural gas, petroleum, and sand and gravel. The Michigan Chemical Corp., St. Louis, Mich., produced bromine and bromine compounds, calcium chloride, and magnesium compounds (magnesium carbonate, magnesium hydroxide, and caustic-calcined magnesia), and salt. Clays were produced by Clay Products Co., chiefly for manufacturing vitreous clay pipe and tile. The Taber Co. (Grand Rapids), Roy Dayringer and North Star Washed Sand & Gravel Co. (Ithaca), and the county road commission produced sand and gravel. Production was chiefly for building and road purposes.

HILLSDALE

Virgil Kintigh of Jonesville and Barnes-Van Antwerp of Horton produced marl for this county. Elliott Ice & Coal Co. (Hillsdale), Hoover Bros. (Waldron), Northwest Materials Inc., and Southern Michigan Materials, Inc., (Bryan, Ohio), and the county road commission produced building and paving sand and gravel.

HOUGHTON

Copper ranked first in value of the minerals produced in Houghton County. Production in 1953, including that from Keweenaw County, was 11 percent greater than in 1952. Calumet & Hecla, Inc., operated its group of mines, Ahmeek mill, Tamarack reclamation plant, and Hubbell smelter throughout the year. Reclamation of tailing at the company Lake Linden plant was discontinued in 1953, when it finally exhausted the tailing bank upon which it began to operate in 1915. The company continued dewatering operations and rehabilitation of the Osceola group of mines. Production from this operation was expected early in 1955. Exploration was continued, much of the work under DMEA contract totaling \$568,193, with the Government assuming half the cost, to be repaid on a royalty basis if production results. Extracts from the company annual report follow:

The Osceola lode project is about four months behind schedule. Delays in getting the work under way were caused by the 63-day strike in the Calumet Division late in 1952 and by severe weather during the winter of 1952-1953.

Because of increased labor costs, and because charges for materials and equipment have proved to be higher than anticipated, the over-all cost of the project has been rescaled from the original estimate of \$6,500,000 to more than \$8,000,000.

Despite these difficulties, the unwatering is proceeding satisfactorily, and at year's end the water had been lowered more than 1,050 feet vertically in the mines. Shaft rehabilitation has encountered no greater difficulties than were anticipated. Surface construction of change houses, engine houses and shaft houses, as well as the electrical installations, are in step with the revised unwatering schedule.

The grade of ore from the mines dropped from the 1952 grade, which was higher than normal. The final grade in 1953 was 18.05 pounds per ton. This decline is accounted for by the fact that ore reserves in two mines are nearly exhausted, and the Calumet Division is attempting to extract all of the available copper before transferring operations to the Osceola Lode. At a third mine, the rich ore zone was mined out and operations were moved into more normal grade areas. When the Osceola Lode mines are in production, their output is expected to replace production lost through exhaustion of the above-mentioned mines. Consequently the over-all level of production should be maintained.

The Lake Linden reclamation plant finally exhausted the tailings bank upon which it started to operate in 1915. As a result reclamation of tailings at the Lake Linden plant stopped in 1953, but the plant's leaching facilities continue to be used for the recovery of copper from purchased secondary materials.

The smelting and refining of copper scrap, as well as secondary leaching operations, increased considerably. Availability of this type of material was much improved the last half of the year.

* * *

In Michigan, the exploratory drift south of the present workings on the Kearsarge Lode was continued to a distance of 8,696 feet, where it was stopped. Although the lode was still of a character favorable for mineralization, it was believed that further exploration of this area could be more effectively carried on by other drifts at greater depth. The testing of the Ashbed Lode at the Meadow Shaft in Keweenaw County showed it to be far below commercial grade. Testing of the Knowlton Lode in Ontonagon County still reveals fair copper values, and it is being continued.

Copper Range Co. continued production from the Champion mine. A Defense Materials Procurement Agency contract for overceiling price of 33.8 cents per pound terminated February 25, when the Office of Price Stabilization order discontinued the price control of copper and all mill products. A new contract was entered into with General Services Administration in the latter part of 1953 for delivery of up to 7,965,000 pounds of refined copper from the Champion mine at 32 cents per pound, delivered Connecticut Valley, less 1 cent per pound for all deliveries by common carrier to refinery. This contract expires December 31, 1955, or earlier if the production goal is reached. Extracts from the company annual report follow:

The Champion Mine operated throughout the year without interruption, and a total of 381,236 tons of ore were broken and 298,943 tons were hoisted and sent to the mill. This represents a 66 per cent increase in tonnage over 1952. Underground activities of development, preparation and stoping were carried on at an accelerated rate with emphasis on preparation of the developed ore, breaking of ore in stopes and moving ore to final processing. Development work during the year consisted of drifting south of No. 4 shaft on the 14th level and has exposed additional stoping ground in this favorable area. The mineralization on this level has continued to improve in comparison to the 12th level stopes. Broken ore in completed and active stopes was gradually increased during the year to 290,311 tons.

Reactivation of No. 3 shaft for additional hoisting capacity and the betterment of working conditions was started the latter part of the year and has progressed satisfactorily. This work will be completed and the improved hoisting facilities will be in use prior to mid-1954.

The Freda concentrator, operating continuously throughout the year, processed 301,157 tons of ore.

* * *

A Labor Contract was negotiated in October with the United Steelworkers C. I. O. providing for a wage increase to bring our scale into line with the prevailing

wage of the copper mining industry in the Upper Peninsula. Merit salary increases were made for staff personnel and minor classification adjustments were made where justified. Labor relations were good throughout the year and is evident in the increased productive effort throughout the organization.

* * *

Calumet and Hecla, Inc. maintained production throughout the year from the Kearsarge Amygdaloid and Houghton Conglomerate Lodes of the Douglass property.

* * *

A substantial amount of construction work was accomplished at White Pine in accordance with our plans and all phases of the work, including underground development, were well advanced and on schedule by the end of the year. At this time, the Project, in its entirety, was approximately 67 per cent completed.

* * *

Construction and site work in the Townsite area has progressed during the year and the Company now provides housing, utility and other facilities necessary for more than 900 people, thus substantially completing our 1953 program. * * * The Elementary School was completed November 1st and has been used as the Carp Lake Township School since that date.

* * *

The Hospital was completed for partial occupancy of the out-patient wing by mid-August, followed by full use by September 15th under the direction of a medical director and competent staff.

* * *

Substantial progress was made during the year in the construction of our general works facilities. The Administration Building, Vehicle Repair Shop, Mine Change and Transfer House, and Track Scale and Gate House were completed, equipped and are in use.

* * *

The mine portal and tunnel were completed in March and the driving of the three main service entries, each 8 ft. x 24 ft., in the parting shale, has proceeded rapidly and with minimum interruption.

* * *

The Mill Building enclosing 134,194 square feet, was substantially completed during the year.

* * *

The building to house our power plant of 45,000 k. v. a. capacity has been completed with foundations for equipment. The heating boiler, furnishing heat to all buildings in the Works Area, was in operation on December 1st, and the power boilers are nearing completion.

* * *

The water supply required for the processing and power plants as well as for the Townsite, estimated at 17,000 g. p. m., will be taken from Lake Superior and delivered to White Pine through the 36-inch reinforced concrete pipeline now completed.

* * *

The construction of the Pump House, Water Treatment Plant and the installation of equipment, including three 6000 g. p. m. pumps, is now underway.

* * *

Progress on the work was retarded by a regional strike of carpenters. This resulted in a stoppage of the work with the exception of the underground development from May 11 until June 5 when satisfactory labor agreements were completed. Since then the momentum of the work steadily gained and by the year end the deficiencies in our construction program had been overcome.

In November our employees held an election under the auspices of the National Labor Relations Board, and the United Steelworkers C. I. O. were certified as the bargaining union to negotiate contracts with the Company.

The Quincy Mining Co. operated a tailing-reclamation plant on Torch Lake throughout the year. Concentrate was shipped to the company smelter at Hancock, Michigan, which also treated concentrate from the Champion mine of Copper Range Co. Extracts from the company annual report follow:

Operation of our Reclamation Plant during 1953 has continued on a satisfactory and profitable basis. The plant handled a total of 884,297 tons of stamp sands with a copper recovery of 4,306,399 pounds, an average of 4.87 pounds per ton of sands. The reduced production when compared with the average of the past three years, is due entirely to the smaller tonnage of sands handled, the lower copper content, because our operations have now reached the cleaning up stage at our No. 1 stamp sands and also to the interruption of operations, because of accident at the plant during the early months of 1953, as mentioned in our previous annual report. Due to the character of the sands handled there was an increase in the copper content of the waste tailings, discarded after treatment, to 2.01 pounds per ton, the average loss during the previous three years was 1.87 pounds per ton. Considering the character of the sands handled the recovery secured was very satisfactory. Operations, as in previous years, were carried on continuously twenty-four hours per day, including Sundays. The operating profit for the year, as shown by our financial statement, of \$349,511.53, before depreciation and depletion charges, is very good.

Our dredging operations were transferred to our No. 2 stamp mill sands on October 20, 1953; up to that time all of our production came from our No. 1 stamp mill sands. The transfer was made at that time because it was impossible to properly protect our dredging operations at the No. 1 location during the stormy winter months, the dredge has now been returned to our No. 1 stamp mill sands to clean up these sands. It is impossible to estimate as to how long we will be able to continue at the cleaning up operations, but it is probable that the dredge will remain at this location until October.

Our dredging operations were started on November 1, 1943 and since that time the plant has handled over ten million tons of sand and produced 52,047,311 pounds of refined copper from our No. 1 stamp sands. It is estimated that there are sufficient sands in the No. 2 pile to last five years.

Copper continued in good demand at all times during the year, and our copper production for the year was sold at an average price of thirty cents per pound delivered. Copper on hand at the end of the year in the form of concentrates, 1,103,238 pounds, has now been sold at an average of thirty cents per pound, which price is still in effect.

At the smelter the No. 5 furnace has operated very satisfactorily during the year. Due to an increase in the quantity of custom copper handled the furnace has been operated continuously; therefore, the cost of smelting has been on a satisfactory basis.

* * *

From the operations of the past year the Company declared two dividends, thirty cents per share payable July 27, 1953 and one dollar and fifty cents per share payable December 21, 1953, a total of \$237,060 for the year.

* * *

Labor relations between the Company and its employees, who are represented by the Congress of Industrial Organization, continued on a friendly and satisfactory basis at all times during the year, there has been no idleness due to labor difficulties. Friendly relations have continued between the Company and its employees at all times since our plant was organized by the C. I. O. in 1941. Our contract with the Union which expired on June 30, 1953 was renewed for another year with an increase in the wage rate of approximately 11 cents per hour.

Crushed stone was produced by the Houghton County Road Commission for use as road metal. Copper Range Railroad Co. and the Duluth, South Shore & Atlantic Railway produced engine sand and sand for railroad ballast.

HURON

Dimension limestone for use as architectural and building stone and crushed limestone for riprap, flux, concrete, and road metal, railroad ballast, and agricultural use were produced by the Wallace Stone Co., at Bayport. N. Weitzel (Bad Axe), Glenn Comstock (Bay City), E. P. Brady & Co. (Flint), LaCrosse Sand & Gravel Co. (LaCrosse, Wis.), and the county road commission produced sand and gravel for road purposes. Petroleum was produced in the county.

INGHAM

Harry Pickitt (Allegan), Ray Sablain, Inc. (Lansing), Ferris Co. (Mason), City of Lansing, and the Ingham County Road Commission produced sand and gravel, chiefly for building and road purposes.

IONIA

John G. Yerington of Benton Harbor produced crushed limestone, chiefly for use as road construction. Harry Pickitt (Allegan), John G. Yerington (Benton Harbor), H. L. Martin Gravel Co., (Westphalia), and the Ionia County Road Commission produced building and paving sand and gravel. Petroleum ranked second in order of value of minerals produced in the county.

IOSCO

Mineral commodities produced in the county were gypsum, and sand and gravel. Producers of crude gypsum were the National Gypsum Co., Buffalo, N. Y., with an operating plant at National City, and the United States Gypsum Co., Chicago, Ill., operating a calcining plant at Alabaster. Most of the gypsum was for use as calcined products. Detroit & Mackinac Railway Co. produced gravel for railroad ballast.

IRON

Production of iron ore and/or manganiferous iron ore was reported by 6 companies from 15 mines in the county. Producing companies in 1953 were: Cleveland-Cliffs Iron Co., operating the Spies mine; M. A. Hanna Co., the Cannon, Hiawatha 1 and 2, Homer, and Wau-seca mines; Inland Steel Co., the Bristol, Cayia, and Sherwood mines; North Range Mining Co., the Book and Warner mines; Pickands, Mather & Co., the Buck unit, Davidson group, Fortune Lake, and James mines; and Republic Steel Corp., the Tobin-Columbia-Monongahela group.

The Davidson mine, a long-time producer in the county, was closed on August 11, 1953, by exhaustion of ore. This underground mine was opened in 1911 and has shipped ore every year except 1932. Shipments of iron ore from the Fortune Lake open-pit mine were begun in August 1953. During the year development work also continued on the Cannon, Cayia, and Lawrence mines. Champion, Inc., Iron Mountain produced building gravel. Road gravel was produced or the United States Bureau of Public Roads.

ISABELLA

Petroleum, natural gas, and natural gasoline were the three leading mineral products of the county. Leon Burr, Mount Pleasant, was the only producer of marl reported for Isabella County. C. Utterback, Mount Pleasant, produced road gravel.

JACKSON

John C. Jeffrey, Parma, produced limestone for use chiefly as road metal and for agriculture. Ray's Stone Quarry, of Napoleon,

produced dimension sandstone for use in building construction and as flagging. The company also produced crushed sandstone for use as a concrete aggregate or road metal. Harry Pickitt (Allegan), Klumpp Bros. (Chelsea), Edward Palmer & Son and Sager Concrete Products (Jackson), and the Jackson County Road Commission produced sand and gravel for building and road purposes. Petroleum was produced in the county.

KALAMAZOO

Marl was produced in the county chiefly for agricultural use, by Lawrence Hayward, Scotts, and Dan Slack, Kalamazoo. Harry Pickitt (Allegan), John G. Yerington (Benton Harbor), Amos G. Baker, Gravel Producers, Inc., Casper H. Hass Co., and Albert Peters Co. (all of Kalamazoo), and American Aggregates Corp. (Greenville, Ohio) produced sand and gravel. Production was chiefly for building and road purposes and railroad ballast. A small amount of petroleum was produced. Cravens Peat Moss produced peat near Kalamazoo.

KALKASKA

Petroleum, natural gasoline, and natural gas were the principal mineral products of the county. The county road commission produced sand and gravel for road purposes.

KENT

Two companies produced crude gypsum in Kent County—the Certain-teed Products Corp., Ardmore, Pa., and the Grand Rapids Plaster Co., Grand Rapids; both operated calcining plants at Grand Rapids. Marl for agricultural use was produced by Harry H. Olthouse, Caledonia. Gregg Products Co., Grand Rapids, expanded perlite from Nevada for use as a lightweight aggregate. Coit Avenue Gravel Co., Edward DeVries & Sons, Grand Rapids Gravel Co., Pekaar & Van Doorn, Rocks Sand & Gravel Co. (all of Grand Rapids), West Shore Construction Co. (Zeeland), and the Kent County Road Commission produced sand and gravel. Production was chiefly for building and road purposes and for railroad ballast. Natural gas and petroleum were produced in the county.

KEWEENAW

Calumet & Hecla, Inc., operated its group of mines in both Houghton and Keweenaw Counties. For a general discussion concerning the Calumet & Hecla operation, see Houghton County.

LAKE

Petroleum was the leading mineral product of the county. The Taber Co., Grand Rapids, and the Lake County Road Commission produced sand and gravel for road purposes.

LAPEER

E. J. Pine, Lapeer, and the county road commission produced sand and gravel for building and road purposes.

LEELANAU

Road gravel was produced by and for the Leelanau County Road Commission.

LENAWEE

Cement was produced by the Consolidated Cement Corp., operating a cement plant at Cement City. Stamm Bros. Gravel Co. and John Woerner (Adrian), Donald F. Clark (Morenci), Tecumseh Gravel Co. (Tecumseh), and the county road commission produced building and paving sand and gravel.

LIVINGSTON

Harry Pickitt (Allegan), Van E. Bailey (Howell), and American Aggregates Corp. (Greenville, Ohio) produced building and paving sand and gravel. Natural gas ranked second in value of minerals produced in the county.

LUCE

E. P. Brady & Co., Flint, and the county road commission produced road gravel for highway use.

MACKINAC

Fiborn Limestone Co., Sault Ste. Marie, Ontario, Canada, produced limestone, chiefly as an aggregate for concrete and for road metal. E. P. Brady & Co., Flint, and the Duluth, South Shore & Atlantic Railway produced gravel for road use and railroad ballast.

MACOMB

Dachill Trucking Co. and P. O. Underwood & L. A. Berry (Detroit), Maertens Sand & Gravel Co. (Grosse Point), Daniel J. Bollig and Louis Marsack & Sons (Mount Clemens), Ray Industries, Inc. (Oxford), Advance Building Materials Co., Macomb Sand & Gravel, Michigan Sand & Gravel, and Morgan Sand & Gravel Co. (Utica), and the Macomb County Road Commission produced sand and gravel. Production was chiefly for building and road purposes.

MANISTEE

Elemental bromine, bromine compounds, magnesium compounds, salt, and sand and gravel were the mineral products of the county. Morton Salt Co., with a plant at Manistee, produced elemental bromine, bromine compounds, magnesium compounds, and salt from natural brines. Great Lakes Chemical Corp. and the Michigan Chemical Corp. produced elemental bromine from well brines at Filer City and Eastlake, respectively. Standard Lime & Stone Co. produced refractory magnesia at Manistee. Salt from well brines was produced by the Manistee Salt Works, Manistee. Sand Products Corp., Detroit, produced molding and grinding sand. The county road commission produced road gravel.

MARQUETTE

Iron ore was the chief mineral product of the county. Operating companies and producing mines in 1953 were:

Company:

	<i>Mines operated</i>
Pickands, Mather & Co., Cleveland, Ohio-----	Volunteer-Maitland.
M. A. Hanna Co., Cleveland, Ohio-----	Richmond.
Cleveland-Cliffs Iron Co., Cleveland, Ohio-----	Athens, Bunker Hill, Cambria-Jackson, Cliffs Shaft, Lloyd, Maas, Mather and Tilden.
Inland Steel Co., Chicago, Ill-----	Greenwood and Morris.
North Range Mining Co., Negaunee, Mich---	Blueberry and Champion.

Development continued at the Humboldt mine, the first operation designed to concentrate nonmagnetic jasper in Upper Peninsula deposits. Construction was begun in 1952 by the Cleveland-Cliffs Iron Co. and the Ford Motor Co. in a joint venture. The first production unit, with a capacity of 200,000 long tons of concentrates, was scheduled for operation in 1954. Groundwork was also underway at another Cleveland-Cliffs Iron Co. property—the Republic mine, this was to be the second project to mine and concentrate Michigan's iron-bearing jasper. Production was expected in 1955, with an initial capacity of 400,000 tons of concentrate a year. The Michigan Ore Division of the Jones & Laughlin Steel Corp. continued underground development and construction of surface buildings at the Tracy mine at Negaunee. Shipments were expected to begin early in 1955. A. Lindberg & Sons, Inc., Ishpeming, produced miscellaneous stone, chiefly for road purposes.

Champion, Inc. (Iron Mountain), A. Lindberg & Sons, Inc. (Ishpeming), Lake Superior & Ishpeming Railway Co., and the Marquette County Road Commission produced sand and gravel. Production of sands was chiefly for engine, building, and paving uses and of gravel for railroad ballast and building and road purposes.

MASON

Minerals produced in the county include bromine, calcium-magnesium chloride, other magnesium compounds, lime, petroleum, and sand and gravel. The Dow Chemical Co. produced lime, calcium-magnesium chloride, and magnesium compounds at Ludington. Sargent Sand Co., Saginaw, produced molding sand, and the Mason County Road Commission, road gravel.

MECOSTA

The principal mineral products of the county are petroleum and natural gas. Other minerals produced include marl and sand and gravel. Marl was produced by Arthur Bell and Lawrence Truman, both of Mecosta. The county road commission produced gravel for road purposes.

MENOMINEE

The only minerals produced in the county were limestone and gravel. The Limestone Products Co., Menominee, produced lime, chiefly for chemical use, and the county road commission produced road gravel.

MIDLAND

Mineral products include elemental bromine and compounds of bromine, calcium, magnesium, and potassium, and salt brine. Production was by the Dow Chemical Co. at Midland from brine obtained from wells near the plant. Petroleum, natural gas, and natural gasoline were also produced.

MISSAUKEE

Petroleum was the most important mineral commodity produced in the county. Natural gasoline and natural gas were also produced. Marl was produced by C. Stanley Hooker, Cadillac, and Rox Rostad, Lake City, for agricultural use.

MONROE

Clay for heavy clay products was produced by F. W. Ritter Sons Co., Inc., South Rockwood. The France Stone Co., Toledo, Ohio, and Michigan Stone Co., Ottawa Lake, produced limestone for use as riprap, agricultural limestone, concrete and road metal, and railroad ballast. Limestone was also produced by and for the Monroe County Road Commission. Petroleum was also produced in the county.

MONTCALM

The county's principal mineral product was petroleum. A. L. Dyer & Sons (McBrides), Frank H. Stoerk (Pierson), and the county road commission produced sand and gravel for building and road purposes. Leo W. Speese, Morley, produced marl, chiefly for agricultural use. Natural gas was also produced in the county.

MONTMORENCY

E. P. Brady & Co., Flint, and the Montmorency County Road commission produced sand and gravel for road purposes. Petroleum was produced also.

MUSKEGON

Marl, chiefly for agricultural purposes, was produced by Melvin Woolf & Lee Brandow, Ravenna. Sand Products Corp., Detroit, and Nugent Sand Co., Inc., Muskegon, produced molding sand. Petroleum and natural gas were produced.

NEWAYGO

Petroleum and natural gas ranked first and second in value. Some marl was produced by Leo W. Speese of Morley. The Taber Co., Grand Rapids, and West Shore Construction Co., Zeeland, produced road gravel. A small amount of natural gasoline was also produced.

OAKLAND

Heavy clay products were produced in the county by the Natco Corp., Pittsburgh, Pa., at its Birmingham Plant. Sand and gravel production was reported by Foley & Beardslee and F. S. Ward,

Clarkston; Dachill Trucking Co., Koenig Coal & Supply Co., and P. O. Underwood & L. A. Berry, Detroit; M. J. Bowers, Farmington; John R. Sand & Gravel Co., Lake Orion; Lyle J. Walker Sand & Gravel, Oak Park; Mickelson Bros., Oxford; Floyd Beardslee, McLane Bros. Sand & Gravel, and Slaters Bald Mountain, Pontiac; Oakland Sand & Gravel Co., Walled Lake; American Aggregates Corp., Greenville, Ohio; and the Oakland County Road Commission. Production was chiefly for building and road purposes and railroad ballast.

OCEANA

The chief minerals of value were petroleum, natural gas, and natural gasoline. Marl for agricultural use was produced by Beckman Bros., Shelby. West Shore Construction Co., Zeeland, produced road gravel.

OGEMAW

Mineral products include petroleum, sand, gravel, and marl. Marl was produced by Dan Dunn of Alger. Harry Pickitt (Allegan), E. P. Brady & Co. (Flint), The Taber Co. (Grand Rapids), Ehinger Bros. and Walter Rosevear pit (West Branch), and the county road commission produced sand and gravel. Production was chiefly for building and road purposes.

ONTONAGON

White Pine Copper Co., a subsidiary of Copper Range Co., continued underground development and construction of surface facilities (including housing, mill, smelter, and power plant) at the White Pine mine. The entire project was approximately 67 percent completed as of the end of 1953. About 200,000 tons of ore was mined and stockpiled during 1953. Production was expected to begin early in 1955 at a rate of 12,500 tons of ore a day. The White Pine mine is especially unique in the sense that the ore body consists mainly of the sulfide mineral chalcocite, with minor amounts of native copper. Duluth, South Shore & Atlantic Railway produced gravel for railroad ballast, and the county road commission produced sand and gravel for road use.

OSCEOLA

Marl was produced by G. Stanley Hooker of Cadillac, principally for agricultural purposes. Hersey Gravel Co., Hersey, produced gravel for railroad ballast. Petroleum and natural gas were produced.

OSCODA

E. P. Brady & Co., Flint, produced road gravel. A small quantity of petroleum was produced.

OTSEGO

Hutchins Sand & Gravel Co., Gaylord, and the county road commission produced sand and gravel for building and road purposes. Natural gas and petroleum were produced.

OTTAWA

Companies producing marl include: Ralph Meyers, West Olive; Wierenga Bros., Spring Lake; and Vernon C. Harris, Ravenna. Production was chiefly for agricultural uses. Thomas F. Johnston and Standard Sand Co. (Grand Haven), West Shore Construction Co. (Zeeland), and Construction Aggregates Corp. (Chicago, Ill.) produced sand and gravel. Production was chiefly molding sand, engine sand, and sand and gravel for building and road purposes. Petroleum and natural gas were also produced in the county.

PRESQUE ISLE

Michigan Limestone Division of U. S. Steel Corp. produced limestone for flux, road metal, and agricultural, chemical, and industrial uses. The Onaway Stone Co. of Onaway quarried limestone for use as rubble, flagging, sawed stone, and rough building stone. E. P. Brady & Co., Flint, produced paving sand and gravel.

ROSCOMMON

Petroleum was the chief mineral product. The Taber Co., Grand Rapids, produced road gravel for highway purposes. Some natural gas was produced.

SAGINAW

The Saginaw Brick Co., Saginaw, produced building sand. Two companies producing clays were Minco Products Corp. and Saginaw Clay Products Co., both of Saginaw. Production was principally for heavy clay products and was also used for insecticide fillers, fertilizer, refractories, molding sand, and drilling mud. Petroleum was produced in the county.

ST. CLAIR

Cement was produced by Peerless Cement Corp. at Port Huron. Diamond Crystal Salt Co., St. Clair, and Morton Salt Co., Chicago, Ill., produced evaporated salt from well brines. Vern Molesworth, Yale, and the City of Port Huron produced sand and gravel, chiefly for road purposes. Michigan Peat, Inc., produced peat from bogs near Capac.

ST. JOSEPH

Production of marl, principally for agricultural use, was reported by Reed & Wood, Kenneth L. Wood, and Leslie Knox, all of Colon. Harry Pickitt (Allegan), Aggregate Processors, Inc. (White Pigeon), and the county road commission produced sand and gravel. Production was chiefly for building and road use.

SANILAC

The county road commission produced sand and gravel for road purposes.

SCHOOLCRAFT

Inland Lime & Stone Division of the Inland Steel Co. produced limestone for flux, road metal, railroad ballast, riprap, and agricultural use. The Schoolcraft County Road Commission produced road gravel.

SHIAWASSEE

Clays, chiefly for heavy clay products, were produced by Michigan Vitrified Tile Co., Findlay, Ohio. Harry Fuoss and Shenk Gravel Co. (Durand), Ronald Weaver (Owosso), and the Ann Arbor Railroad Co. produced sand and gravel for building and road purposes and railroad ballast.

TUSCOLA

Wilkensen Chemical Co., Mayville, produced calcium-magnesium chloride. C. R. Hunt and E. L. Schwaderer (Cass City), Great Lakes Foundry Sand Co. (Detroit), Berntall Sand & Gravel (Reese), Andersen Sand & Gravel Co. and Sargent Sand Co. (Saginaw), and the county road commission produced sand and gravel. Production was chiefly for building, molding, and road purposes. Petroleum ranked second in value among minerals produced in the county.

VAN BUREN

Petroleum was the chief mineral product of the county. Crushed limestone for roads was produced by John G. Yerington of Benton Harbor. Harry Pickitt (Allegan), John G. Yerington (Benton Harbor), and James B. Mitchell (South Haven) produced sand and gravel for road use.

WASHTENAW

Harry Pickitt (Allegan), E. S. Albertson and Killins Gravel Co. (Ann Arbor), Dexter Gravel Co. (Dexter), Chubb Sand & Gravel Co. (Northville), Salem Gravel Construction Co., Inc. (Salem), Whittaker & Gooding Co. and Youngs Sand & Gravel (Ypsilanti), and the county road commission produced sand and gravel. Most of the production was used for building and road construction. Natural gas was produced in the county.

WAYNE

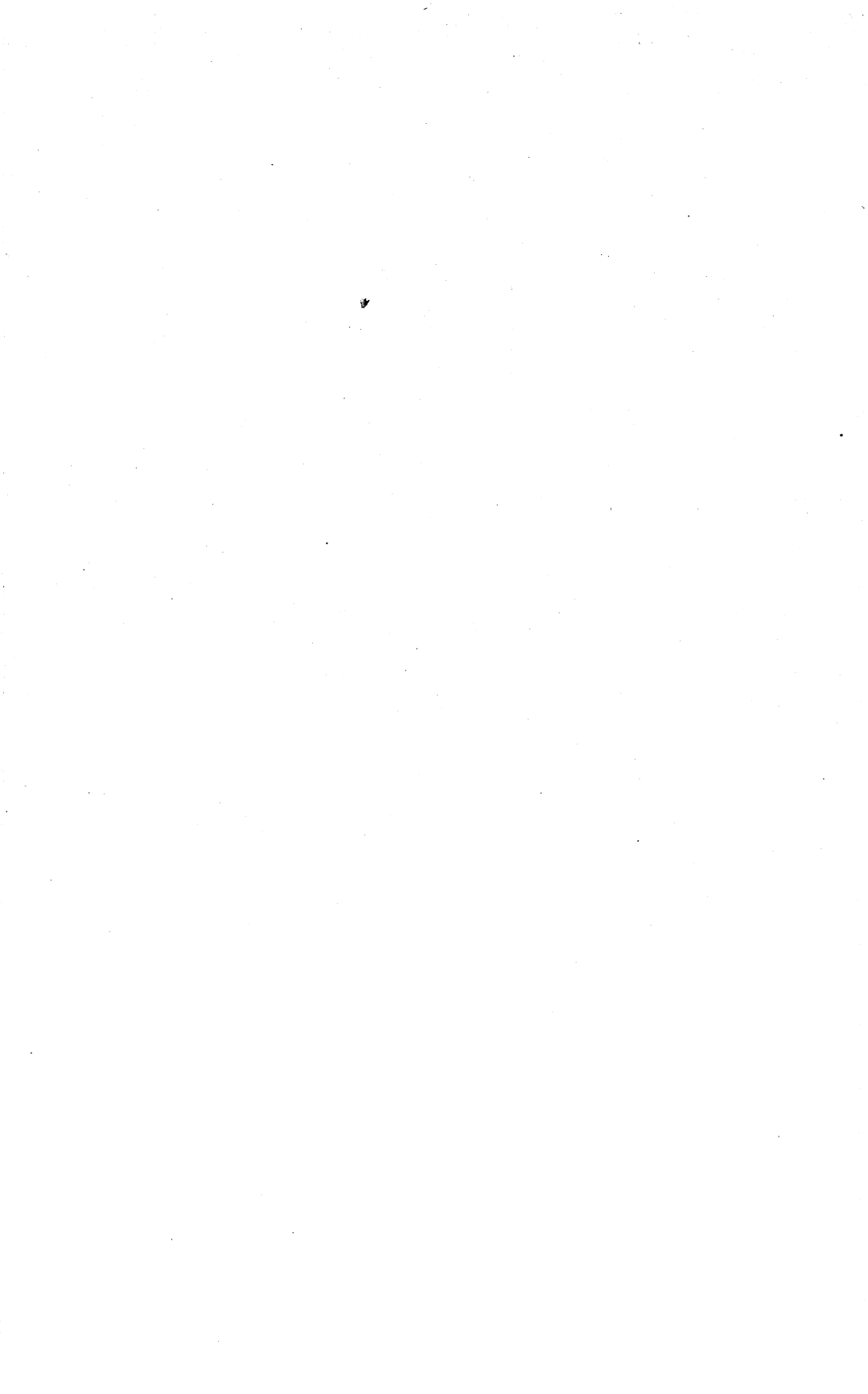
Minerals and mineral products produced in Wayne County in 1953 were cement, clay, gypsum, limestone, salt, sand and gravel, and ground sandstone. Companies producing cement were Huron Portland Cement Co., Wyandotte, and Peerless Cement Corp., Detroit. Limestone used in cement manufacture at both plants was produced chiefly in other counties. Edward Kraemar & Sons, Plain, Wis., and Michigan Foundation Quarry Co., Trenton, produced crushed limestone for road construction. Producers of clay include Clippert Brick Co., Detroit; Flat Rock Clay Products Co., Flat Rock; Daniel Brick Co., Dearborn; and Light Weight Aggregate Corp., Livonia. The products were chiefly common brick and vitreous clay pipe and tile. Companies producing evaporated salt from well brines include: Solvay Process Division, Allied Chemical & Dye Corp., Detroit;

and Pennsylvania Salt Manufacturing Co. and Wyandotte Chemicals Corp., both at Wyandotte. The International Salt Co., operating an underground salt mine at Detroit, was the only producer of rock salt in the State.

Harry Pickitt (Allegan), Dachill Trucking Co. and W. L. Emery Co. (Detroit), Manning & Locklin Gravel Co. and Northville Sand & Gravel Co. (Northville), and Michigan Silica Co. (Rockwood) produced sand and gravel for building and road construction. Glass, molding, and blast sands were also produced. United States Gypsum Co., Chicago, Ill., operated a calcining and gypsum products plant at Detroit.

WEXFORD

A small quantity of petroleum was produced in the county.



The Mineral Industry of Minnesota

by Matthew G. Sikich¹



MINNESOTA'S mineral production in 1953 was valued at \$542,545,000, a new high and an increase of 37 percent over 1952. The previous high of \$432,577,000 (revised figure), was set in 1951.

Substantially greater shipments of iron ore and concentrate, coupled with price increases, were the chief factors in establishment of the record. The value of iron-ore shipments represented approximately 95 percent of the total value of the State mineral output in 1953. Increases in value of production over 1952 were also reported for manganiferous ore, ferruginous manganese ore, stone, cement, and sand and gravel. The values of clays, marl, abrasive stones, and lime produced were less than in 1952.

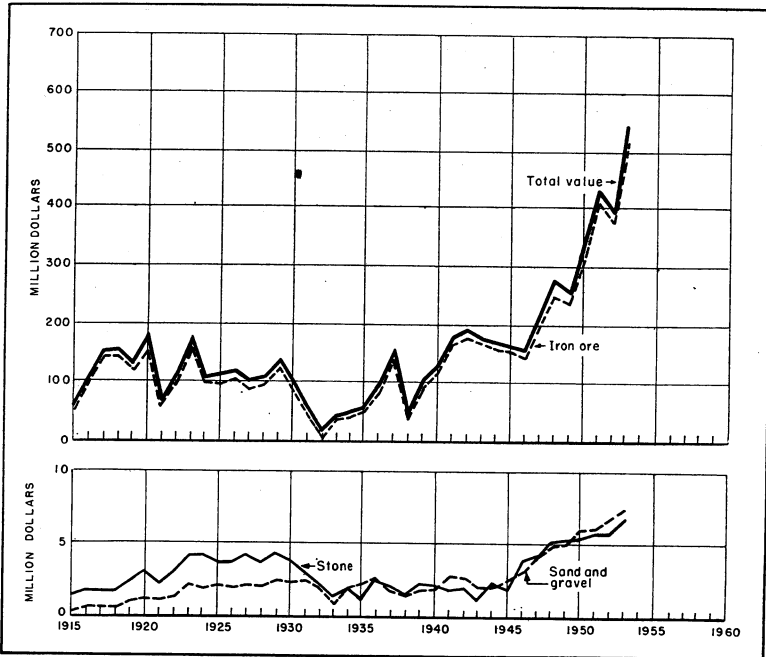


FIGURE 1.—Value of total mineral production, iron-ore shipments, sand and gravel, and stone in Minnesota, 1915-53.

¹ Commodity-industry analyst, Region V, Bureau of Mines, Minneapolis, Minn.

TABLE 1.—Mineral production in Minnesota, 1952-53 ¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays.....	113, 492	\$160, 408	91, 401	\$149, 384
Iron ore (usable).....long tons, gross weight..	63, 906, 069	375, 765, 251	80, 533, 670	517, 850, 509
Manganiferous ore (5-10 percent Mn) and ferruginous manganese ore (10-35 percent Mn).....gross weight..	912, 118	(²)	1, 091, 491	(²)
Marl, calcareous (except for cement).....	1, 449	722	(²)	(²)
Sand and gravel.....	19, 825, 157	6, 808, 763	19, 774, 411	7, 304, 351
Stone (except limestone for cement and lime).....	³ 2, 394, 178	³ 5, 498, 177	2, 270, 528	6, 587, 096
Undistributed: Abrasive stones, cement, lime, stone (crushed basalt 1952), and minerals whose value must be concealed for particular years (indicated in appro- priate column by footnote reference 2).....		4 9, 206, 865		10, 653, 888
Total Minnesota.....		4397, 440, 000		542, 545, 000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

² Value included with "Undistributed."

³ Excludes certain stone, value for which is included with "Undistributed."

⁴ Revised figure.

REVIEW BY MINERAL COMMODITIES

METALS

Iron Ore.—Shipments of usable iron ore in 1953, excluding manganiferous iron ore (5 to 10 percent manganese) and ferruginous manganese ore (10 to 35 percent manganese), were 80,534,000 long tons compared with 63,906,000 tons in 1952, an increase of 26 percent. Minnesota maintained its lead among the iron-ore-producing States and in 1953 supplied 68 percent of the total usable iron ore produced in the United States.

Shipments in 1953 consisted of 54,356,000 tons of direct-shipping ore and 26,178,000 tons of concentrate, 1,080,000 tons of which was agglomerated by pelletizing, nodulizing, or sintering. The average iron content of usable iron ore shipped in 1953 was 50.31 percent, natural, compared with 50.16 percent in 1952.

Iron ore was shipped by 31 different companies operating 182 mines or mine groups during 1953. Operations were chiefly in Crow Wing, Itasca, and St. Louis Counties. However, 1 group of mines was operated in Fillmore County and 1 mine in Morrison County.

In 1953 both the Mesabi and Cuyuna ranges set new records for shipments, surpassing previous highs established in 1951. The Mesabi range alone furnished 94 percent of the State total shipments in 1953.

The 1953 navigation season opened on March 29 at Two Harbors, Minn., and at the Duluth-Superior Harbor. This is the first time in many years that the ore port of Escanaba, Mich., on Lake Michigan, did not have the distinction of shipping the first iron-ore cargo of the season. The final boat to load iron ore for United States ore-shipping ports on the Great Lakes for the 1953 season cleared Two Harbors on November 28.

Shipments of iron ore from the Lake Superior region (including Canada) by lake vessels during 1953 amounted to 95,844,449 gross tons, railroad weights, a new alltime record for movement of iron ore on the Great Lakes, according to the Lake Superior Iron Ore Association, Cleveland, Ohio. The previous record year was 1942, when shipments reached 92,076,781 gross tons. Two important factors in helping to set this new record were the addition of 28 new postwar Canadian and American ore freighters that operated during the 1953 season and the extremely mild autumn in the Lake Superior region.

The average mine value per gross ton of iron ore, including concentrate, as reported by producing companies in the State in 1953, was \$6.43 as compared with \$5.88 in 1952. In the Lake Superior district decontrol of iron-ore prices by the Office of Price Stabilization became effective February 12, 1953, and new base prices effective from that date were: Mesabi non-Bessemer and High-Phosphorus, \$9.70 per long ton; Mesabi Bessemer, \$9.85; Old Range non-Bessemer, \$9.95; Old Range Bessemer, \$10.10; and Lake Superior open-hearth lump ore \$10.95. These prices held until July 1, when a further increase went into effect. At the end of 1953, Lake Erie base prices were: Mesabi non-Bessemer and High-Phosphorus, \$9.90 per ton; Mesabi Bessemer, \$10.05; Old Range non-Bessemer, \$10.15; Old Range Bessemer, \$10.30; and open-hearth lump ore, \$11.15. Base prices were for ore delivered at lower Lake ports, carrying 51.5 percent natural iron content for non-Bessemer grades, and with an additional 0.045 percent phosphorus (dry) for Bessemer grades. Premiums and penalties were applied for variations in analyses and physical structure. The phosphorus content was one of the main determining factors in evaluating an ore because of the difficulty of removing this element, which is undesirable in most iron and steel products. Its presence makes for brittleness in the finished iron or steel. The non-Bessemer grades constituted the bulk of the tonnage shipped from mines in Minnesota.

Development work on Mesabi-range taconite projects was continued during 1953. The Oliver Iron Mining Division of United States Steel Corp. loaded the first car of concentrate on June 9 from its new Pilotac taconite plant near Mountain Iron. Substantial progress was made in constructing Reserve Mining Co. E. W. Davis Works, formerly called the Lakeside Project, near Beaver Bay. Initially, equipment was being installed to provide capacity for 3.75 million long tons of iron ore concentrate per year. Design was aimed toward an eventual annual production capacity of 10 million tons. The Erie Mining Co. continued to develop its mine and to construct processing facilities at Aurora. The commercial plant, with rated capacity of 7.5 million tons of pellets yearly, was to be the largest concentrator ever built as a single initial unit. This company also was constructing dock and harbor facilities at Taconite Harbor, 73 miles by rail from the plant site.

In 1950 and 1951 the Federal Bureau of Mines investigated iron sulfide deposits in Aitkin and Carlton Counties. A report on this investigation was published in 1953.²

² Pennington, James, and Davis, Vernon C., Investigation of Iron Sulfide Deposits in South Central Aitkin County and Carlton County, Minn.: Bureau of Mines Rept. of Investigations 4937, 1953, 33 pp.

TABLE 2.—Total usable iron ore produced (direct-shipping, concentrate, and sinter), 1884–1953,¹ by ranges, in gross tons ²

Year	Cuyuna	Mesabi	Vermillion	Spring Valley district	Total
1884–1940.....	26,777,482	1,118,726,145	68,667,370	-----	1,214,170,997
1941.....	1,209,783	59,688,047	1,853,030	47	62,750,907
1942.....	1,655,485	70,287,664	1,935,125	59,171	73,937,445
1943.....	1,747,304	65,334,939	1,782,237	220,427	69,084,907
1944.....	1,417,256	61,994,023	1,466,816	-----	64,878,095
1945.....	1,784,010	58,355,320	1,481,007	-----	61,620,337
1946.....	1,380,120	46,678,679	1,232,008	-----	49,290,807
1947.....	2,100,846	58,772,404	1,471,879	147,787	62,492,916
1948.....	2,030,281	64,071,983	1,580,497	352,979	68,035,740
1949.....	1,826,711	52,551,346	1,381,327	102,158	55,861,542
1950.....	2,480,843	60,838,025	1,580,217	335,470	65,234,555
1951.....	2,651,724	73,574,908	1,806,818	452,405	78,485,855
1952.....	2,369,180	59,370,538	1,573,748	476,242	63,789,708
1953.....	2,900,579	75,324,236	1,643,039	217,760	80,085,614
Total.....	52,331,604	1,925,568,257	89,455,118	2,364,446	2,069,719,425

¹ Shipments first recorded from the Cuyuna range in 1911, the Mesabi range in 1892, the Vermillion range in 1884, and the Spring Valley district in 1941.

² Exclusive after 1905 of iron ore containing 5 percent or more manganese.

TABLE 3.—Production, shipments, and stocks of crude iron ore, by counties and ranges, in 1953, in gross tons ¹

County or range	Stocks of crude ore, Jan. 1, 1953	Production in 1953		Shipments in 1953		Stocks of crude ore, Dec. 31, 1953
		Under-ground	Open pit	Direct to consumers	To beneficiation plants	
County:						
Crow Wing.....	49,952	259,976	3,709,399	1,025,888	2,811,031	182,408
Fillmore.....	-----	-----	326,012	-----	326,012	-----
Itasca.....	42,906	220,852	32,247,508	1,419,787	31,091,479	-----
Morrison.....	3,800	-----	2,254	5,754	-----	-----
St. Louis.....	354,874	3,444,323	64,132,051	51,904,309	15,695,515	331,424
Total.....	451,232	3,925,151	100,417,224	54,355,738	49,924,037	513,832
Range:						
Cuyuna.....	53,452	259,976	3,711,653	1,031,642	2,811,031	182,408
Mesabi.....	237,601	2,022,136	96,379,559	51,710,941	46,786,994	141,361
Vermillion.....	160,179	1,643,039	-----	1,613,155	-----	190,063
Spring Valley district (Fillmore County).....	-----	-----	326,012	-----	326,012	-----
Total.....	451,232	3,925,151	100,417,224	54,355,738	49,924,037	513,832

¹ Exclusive of ore containing 5 percent or more manganese.

Manganiferous Iron Ore and Ferruginous Manganese Ore.—No high-grade manganese ore for battery or chemical use was produced in Minnesota; however, a considerable quantity of iron ore containing 5 to 10 percent manganese (classified as manganiferous iron ore) was produced in the State. Occasionally iron ore containing 10 to 35 percent manganese (classified as ferruginous manganese ore) is produced and shipped. In 1953 shipments of manganiferous iron ore from 6 mines in Minnesota totaled 890,400 short tons (795,000 long tons) compared with 880,600 short tons (786,300 long tons) the previous year. Not included as production in 1953 is 127 short tons of manganiferous iron ore shipped to the Federal Bureau of Mines for experimental purposes. Shipments of ferruginous manganese ore in 1953 from 2 mines in the State were 201,100 short tons (179,500 long tons), compared with 31,500 short tons (28,100 long tons) in 1952.

TABLE 4.—Iron ore beneficiated at concentration plants, by counties and ranges, in 1953, in gross tons ¹

County or range	Stocks of concentrate and sinter, Jan. 1, 1953	Concentrate and/or sinter produced in 1953	Shipments of beneficiated ore in 1953		Stocks of concentrate and sinter, Dec. 31, 1953
			Concentrate	Sinter	
County:					
Crow Wing.....	210,062	1,748,501	1,529,014	179,443	250,106
Fillmore.....	12,665	217,760	230,425	-----	-----
Itasca.....	1,244,149	14,571,835	15,034,510	-----	781,474
Morrison.....	-----	-----	-----	-----	-----
St. Louis.....	436,121	9,116,896	8,303,570	900,970	348,477
Total.....	1,902,997	25,654,992	25,097,519	1,080,413	1,380,057
Range:					
Cuyuna.....	210,062	1,748,501	1,529,014	179,443	250,106
Mesabi.....	1,680,270	23,688,731	23,338,080	900,970	1,129,951
Vermilion.....	-----	-----	-----	-----	-----
Spring Valley district (Fillmore County).....	12,665	217,760	230,425	-----	-----
Total.....	1,902,997	25,654,992	25,097,519	1,080,413	1,380,057

¹ Exclusive of ore containing 5 percent or more manganese.

The average manganese content of the total manganiferous iron ore and ferruginous manganese ore shipped in 1953 was 6.84 percent. The average iron content was 37.04 percent. In 1952 the average manganese content was 5.94 percent and iron content 38.33 percent. Tonnage shipped in 1953 consisted of 837,000 short tons of direct-shipping grade and 254,400 short tons of concentrates. Statistical data are shown in tables 1 and 5.

Virtually all of the manganiferous iron ore produced in the State has been from mines on the Cuyuna range in Crow Wing County, and in 1953 all output was from this district. All recorded production of ferruginous manganese ore in Minnesota has been from the Cuyuna range.

The companies that produced manganiferous iron ore and ferruginous manganese ore in the State in 1953 were Hanna Coal & Ore Corp., Pickands, Mather & Co., and Zontelli Bros., Inc.

Ores containing over 5 percent natural manganese generally have been priced as Old Range non-Bessemer on the combined natural iron and manganese content, plus a premium for the natural manganese in excess of 5 percent.

TABLE 5.—Usable ¹ manganiferous iron ore (containing 5 to 10 percent manganese, natural) and ferruginous manganese ore (containing 10 to 35 percent manganese, natural) shipped from mines, 1913-53, by ranges, in gross tons

Year	Cuyuna	Mesabi	Vermilion	Total	Year	Cuyuna	Mesabi	Vermilion	Total
1913-40.....	15,018,809	17,196	2,965	15,038,970	1948.....	1,070,110	-----	-----	1,070,110
1941.....	1,185,168	-----	-----	1,185,168	1949.....	884,109	-----	-----	884,109
1942.....	1,378,852	39,862	-----	1,418,714	1950.....	776,641	-----	-----	776,641
1943.....	1,297,184	46,614	-----	1,343,798	1951.....	898,374	3,393	-----	902,367
1944.....	1,087,196	44,547	-----	1,131,743	1952.....	801,387	13,004	-----	814,391
1945.....	1,246,294	9,819	-----	1,256,113	1953.....	974,546	-----	-----	974,546
1946.....	955,977	-----	-----	955,977					
1947.....	930,144	2,857	-----	933,001	Total.....	28,505,391	177,292	2,965	28,685,648

¹ Direct-shipping plus beneficiated ore.

Manganese Chemicals Corp. completed construction of its new manganese-recovery plant near Riverton. The plant was built with the assistance of a loan from the Defense Materials Procurement Agency. An ammonia-leach process to chemically separate manganese from Cuyuna range manganiferous ores was utilized.

The Federal Bureau of Mines completed constructing a pilot plant on its property, formerly part of Fort Snelling. The plant was to be used in conducting research to develop a method of recovering manganese from the low-grade carbonate slates and lean oxidized or partly oxidized formations on the Cuyuna range.

A report was published describing an investigation conducted by the Federal Bureau of Mines in Aitkin County in 1950 to develop substantial reserves of manganese.³

NONMETALS

Abrasives.—Grinding pebbles and tube-mill liners were produced by the Jasper Stone Co. from a quartzite deposit in Rock County. Production in 1953 decreased slightly below that reported in 1952.

Cement.—The State's only producer of cement was the Universal Atlas Cement Co. with a plant at Duluth in St. Louis County. Shipments of portland cement in 1953 increased over the previous year. The company reported production of types I and II (general use and moderate heat), air-entrained cement, and masonry mixes other than special portlands.

Clays.—Clays sold or used by producers in Minnesota during 1953 totaled 91,400 short tons compared with 113,500 short tons in 1952, a decrease of about 9 percent. Clays for building brick and tile and heavy clay products were produced in Brown, Carlton, Goodhue, Ramsey, and Winona Counties. Fire clay for ceramic tile and art pottery was produced in Carlton County.

Lime.—Quicklime and hydrated lime were produced at Duluth by the Cutler-Magner Co. Production decreased slightly in 1953 compared with 1952. The products were sold for building, agricultural, industrial, and chemical uses. Limestone used in manufacturing lime was obtained from quarries in Michigan.

Marl.—Calcareous marl was produced in Chisago and Crow Wing Counties. Production in 1953 was about 20 percent below that in 1952. All the marl produced in 1953 was for agricultural use.

Perlite.—Crude perlite was not produced in Minnesota; however, crude material from Colorado and Nevada was expanded at two plants in Minneapolis for use as a lightweight aggregate in plaster and concrete.

Sand and Gravel.—Production of sand and gravel in 1953 in the State was reported from 68 counties by 88 commercial and 56 Government-and-contractor operators. The total output in 1953 was 19,774,000 short tons valued at \$7,304,000, an increase of about 7 percent in value over 1952. However, production in 1953 actually decreased slightly below that in the previous year. Table 6 gives production and value data for commercial and Government-and-contractor sand and gravel operations in the State, by uses, for 1952-53.

³ Grosh, Wesley A., Pennington, James W., and Wasson, Paul A., Investigation of Scallon-Todd Lease Aitkin County, Minn.: Bureau of Mines Rept. of Investigations 4979, 1953, 24 pp.

The 10 leading commercial producers were: Cemstone Products Co., Great Northern Railway Co., and J. L. Shiely Co., Inc., St. Paul; Fairway Construction Co., Hector; Hedberg-Freidheim & Co., Industrial Aggregates Co., Landers-Norblom-Christenson Co., and Minnesota Sand & Gravel Co., Minneapolis; Munson Construction Co., Cannon Falls; and Winona Sand & Gravel Co., Winona.

TABLE 6.—Sand and gravel sold or used by producers, 1952-53, by classes of operations and uses

Class of operation and use	1952			1953		
	Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per ton
COMMERCIAL OPERATIONS						
Sand:						
Glass.....	(1)	(1)	(1)	6, 254	\$13, 865	\$2. 22
Molding.....	(1)	(1)	(1)	(1)	(1)	(1)
Building.....	1, 938, 027	\$1, 469, 960	\$0. 76	1, 963, 605	1, 551, 800	. 79
Paving.....	691, 850	459, 416	. 66	843, 976	767, 532	. 91
Engine.....	32, 710	30, 892	. 94	(1)	(1)	(1)
Filter.....	(1)	(1)	(1)	(1)	(1)	(1)
Railroad Ballast.....	35, 694	9, 857	. 28	28, 893	8, 297	. 29
Other.....	33, 196	15, 175	. 46	63, 288	37, 306	. 59
Undistributed.....	13, 515	21, 638	1. 60	33, 090	40, 543	1. 23
Total commercial sand.....	2, 744, 992	2, 006, 938	. 73	2, 939, 106	2, 419, 343	. 82
Gravel:						
Building.....	1, 199, 600	1, 705, 354	1. 42	1, 215, 413	1, 735, 049	1. 43
Paving.....	2, 303, 145	1, 504, 613	. 65	2, 214, 272	1, 517, 922	. 69
Railroad Ballast.....	922, 732	387, 122	. 42	1, 101, 877	443, 575	. 41
Other.....	270, 987	62, 382	. 23	181, 387	64, 808	. 36
Total commercial gravel.....	4, 696, 464	3, 659, 471	. 78	4, 712, 949	3, 766, 354	. 80
Total commercial sand and gravel.....	7, 441, 456	5, 666, 409	. 76	7, 652, 055	6, 185, 697	. 81
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand:						
Building.....	595	255	. 43	369	159	. 43
Paving.....	309, 387	44, 951	. 15	184, 167	47, 193	. 26
Total Government-and-contractor sand.....	309, 982	45, 206	. 15	184, 536	47, 352	. 26
Gravel:						
Building.....	293	314	1. 07			
Paving.....	12, 073, 426	1, 096, 834	. 09	11, 937, 820	1, 071, 302	. 09
Total Government-and-contractor gravel.....	12, 073, 719	1, 097, 148	. 09	11, 937, 820	1, 071, 302	. 09
Total Government-and-contractor sand and gravel.....	12, 383, 701	1, 142, 354	. 09	12, 122, 356	1, 118, 654	. 09
ALL OPERATIONS						
Sand.....	3, 054, 974	2, 052, 144	. 67	3, 123, 642	2, 466, 695	. 79
Gravel.....	16, 770, 183	4, 756, 619	. 28	16, 650, 769	4, 837, 656	. 29
Grand total.....	19, 825, 157	6, 808, 763	. 34	19, 774, 411	7, 304, 351	. 37

¹ Bureau of Mines not at liberty to publish separate figures for items indicated by footnote reference 1, which are combined and shown as "Undistributed."

Stone.—Granite, limestone, and marble were produced in 1953. Dimension granite was quarried in Big Stone, Kanabec, Lac qui Parle, Mille Lacs, Renville, St. Louis, and Stearns Counties. The granite, occurring in various shades of gray, pink, red, and mahogany, has been widely used for buildings and monuments. Major producers of dimension granite were Cold Spring Granite Co., Cold Spring; Delano Granite Works, Inc., Delano; and Melrose Granite Co. and North Star Granite Corp., St. Cloud. Crushed granite for riprap, concrete aggregate, road construction, railroad ballast, and poultry grit was produced in Stearns and Yellow Medicine Counties.

TABLE 7.—Dimension stone sold or used by producers, 1952–53, by kinds and uses

Kind and use	1952			1953		
	Quantity	Value		Quantity	Value	
		Total	Average per unit of measure		Total	Average per unit of measure
Granite:						
Building:						
Rubble.....short tons..				12,995	\$29,275	\$2.25
Dressed.....cubic feet..	36,878	\$458,988	\$12.45	39,844	450,744	11.31
Monumental:						
Rough.....do....	24,341	81,921	3.37	16,771	59,263	3.53
Dressed.....do....	126,392	1,420,929	11.24	171,725	2,191,194	12.76
Total granite equivalent short tons ¹ ..	15,572	1,961,838	125.98	31,947	2,730,476	85.47
Marble:						
Building:						
Rough:						
Exterior.....cubic feet..	500	1,000	2.00			
Interior.....do....	500	1,000	2.00			
Dressed:						
Sawed:						
Exterior.....do....	1,694	3,500	2.07			
Interior.....do....	1,694	3,500	2.07			
Cut:						
Exterior.....do....	817	10,000	12.24			
Interior.....do....	816	10,000	12.24	2,350	18,000	7.66
Total marble equivalent short tons ¹ ..	443	29,000	65.46	173	18,000	104.05
Limestone:						
Building:						
Rubble.....short tons..	5,576	22,204	3.98	* 6,729	* 25,535	3.79
Rough architectural.....cubic feet..	58,437	91,000	1.56	123,288	278,050	2.26
Dressed:						
Sawed.....do....	100,478	215,650	2.15	125,199	241,650	1.93
Cut.....do....	51,375	352,500	6.86	56,650	430,000	7.59
Flagging.....do....	16,250	11,500	.71	21,250	15,600	.73
Total limestone equivalent short tons ¹ ..	23,699	692,854	29.24	32,840	990,835	30.17
Total dimension stone.....do¹..	39,714	2,683,692	67.58	64,960	3,739,311	57.56

¹ Following average weights per cubic foot used to convert cubic feet to short tons: Granite, 166 pounds; marble, 147 pounds; limestone, 160 pounds.

² In 1953 figures for stone used in rough construction are combined with rubble to avoid disclosure of individual company operations.

Dimension limestone used for rough and finished building (facings, exterior veneer, interior trim, and flagging) was produced in Blue Earth, Dakota, Le Sueur, and Winona Counties. The principal producers of dimension limestone in 1953 were the Babcock Co.,

Kasota, and Mankato Stone Co., Mankato. Crushed limestone for riprap, concrete aggregate, road construction, agricultural lime, flux, railroad ballast, and other uses was produced in 12 counties in 1953. Producers of crushed limestone during the year included: Bryan Rock Products, Inc., Shakopee; Klemmer Construction Co., Owatonna; Landers-Norblom-Christenson Co., Minneapolis; Lundin Construction Co., Mankato; Mann Construction Co., Red Wing; Osmundson Bros., Adams; Patterson Quarries, St. Charles; Quarve & Anderson Co., Rochester; Roverud Construction Co., Spring Grove; and J. L. Shiely Co., St. Paul.

The stone classed as marble in this chapter actually was a fine-grained, highly polished limestone produced by the Babcock Co. at Kasota. It was used chiefly for interior facings.

TABLE 8.—Crushed and broken stone sold and used by producers, 1952-53, by kinds and uses

Kind and use	1952			1953		
	Short tons	Value	Average value	Short tons	Value	Average value
Basalt.....	(¹)	(¹)	(¹)			
Sandstone.....	680	\$1,082	\$1.59			
Granite:						
Riprap.....	(²)	(²)	(²)	1,600	\$1,600	\$1.00
Concrete, road metal.....	114,560	151,178	1.32	90,235	131,719	1.46
Railroad ballast.....	500,610	553,913	1.11	356,651	362,435	1.02
Other.....	(²)	(²)	(²)	4,100	24,600	6.00
Undistributed.....	200,506	42,194	.21			
Total granite.....	815,676	747,285	.92	452,586	520,354	1.15
Limestone:						
Riprap:						
Commercial.....	119,051	117,592	.99	86,970	78,363	.90
Noncommercial.....				716	800	1.12
Flux.....	1,500	2,625	1.75	1,850	3,675	1.99
Concrete, road metal:						
Commercial.....	1,069,946	1,376,659	1.29	1,230,840	1,547,382	1.26
Noncommercial.....	72,854	86,474	1.19	99,285	102,262	1.03
Railroad ballast.....	2,000	3,500	1.75	2,780	4,501	1.62
Agriculture.....	243,988	364,821	1.50	289,016	435,096	1.51
Other.....	28,769	114,447	3.98	41,525	155,352	3.74
Total limestone.....	1,538,108	2,066,118	1.34	1,752,982	2,327,431	1.33
Total commercial.....	³ 2,281,610	³ 2,728,011	1.20	2,105,567	2,744,723	1.30
Total noncommercial.....	72,854	86,474	1.19	100,001	103,062	1.03
Grand total, crushed stone.....	³ 2,354,464	³ 2,814,485	1.20	2,205,568	2,847,785	1.29

¹ Figure withheld to avoid disclosure of individual company operations.

² Included with "Undistributed."

³ Incomplete total; excludes basalt.

MINERAL FUELS

Peat.—No commercial production of peat has been reported since 1950. Output in that year was 400 short tons valued at \$13,100. Total reserves of peat in Minnesota, estimated on an air-dried basis, amount to approximately 6,835,300,000 net tons.⁴

⁴ Soper, E. K., The Peat Deposits of Minnesota: Minnesota Geol. Survey Bull. 16, 1919.

REVIEW BY COUNTIES

AITKIN

The United States Army Corps of Engineers produced sand and gravel for road purposes.

ANOKA

Sand and gravel for use on roads was produced by the county highway department.

BECKER

The Northern Pacific Railway Co. produced gravel for railroad ballast. Road gravel was produced by and for the county highway department.

BELTRAMI

Ritchie & Tell, Bemidji, and Melvin Samuelson, Kelliher, produced sand and gravel for building and road purposes. Road gravel was produced for the county highway department.

BENTON

Gravel for use on roads was produced by and for the county highway department.

BIG STONE

Cold Spring Granite Co., Cold Spring, and the Delano Granite Works, Inc., Delano, produced granite for architectural and monumental purposes. Roy Werner of Wheaton produced paving and road gravel.

BLUE EARTH

Dimension limestone for building purposes and broken limestone for riprap were produced by the Mankato Stone Co. The Lundin Construction Co., Mankato, produced crushed and broken limestone for road use, agricultural lime, poultry grit, and riprap. Guaranteed Gravel & Sand Co., Ed Lundin, and North Star Concrete Co., Inc., all of Mankato, and Hiniker Gravel & Sand Co., North Mankato, produced sand and gravel, principally for building and road purposes. A small quantity of filter sand was also produced by the Guaranteed Gravel & Sand Co.

BROWN

Carlson Bros., Comfrey, and Wallner Construction Co., New Ulm, produced sand and gravel for building and paving purposes. Road gravel was produced for the county highway department. A. C. Ochs Brick & Tile Co., Springfield, produced clays for use in common brick, and other heavy clay products.

CARLTON

Sand and gravel producers during the year included: White Bros., Cloquet; Albert Obraske, Moose Lake; Great Northern Railway Co.; and Minneapolis, St. Paul & Sault Ste. Marie Railroad Co. Production was chiefly for building and road purposes. Sand and gravel for

TABLE 9.—Value of mineral production in Minnesota, 1952-53, by counties and principal minerals produced in 1953

County	1952	1953	Principal minerals produced in 1953 in order of value
Aitkin.....		\$2,820	Sand and gravel.
Anoka.....	\$2,742	3,260	Do.
Becker.....	35,454	10,759	Do.
Beltrami.....	(1)	18,523	Do.
Benton.....	21,668	21,005	Do.
Big Stone.....	(1)	1,050,484	Stone, sand and gravel.
Blue Earth.....	554,196	692,654	Do.
Brown.....	72,598	172,697	Sand and gravel, clays.
Carlton.....	219,080	90,606	Do.
Cass.....	9,880	2,181	Sand and gravel.
Chippewa.....	(1)	5,100	Do.
Chisago.....	6,485	12,471	Sand and gravel, marl.
Clay.....	90,546	59,453	Sand and gravel.
Cook.....	8,093	11,250	Do.
Cottonwood.....	57,022	57,654	Do.
Crow Wing.....	15,944,243	21,958,807	Iron ore, manganiferous iron ore, ferruginous manganese ore, sand and gravel, marl.
Dakota.....	478,359	434,501	Stone, sand and gravel.
Dodge.....	24,274	32,049	Stone.
Douglas.....	14,214	3,097	Sand and gravel.
Faribault.....	9,021	7,486	Do.
Fillmore.....	3,487,500	1,910,684	Iron ore, stone.
Goodhue.....	679,481	419,868	Stone, sand and gravel, clays.
Hennepin.....	2,054,126	2,072,226	Sand and gravel, stone.
Houston.....	(1)	115,149	Stone.
Isanti.....	3,988	16,646	Sand and gravel.
Itasca.....	75,862,152	110,606,394	Iron ore, sand and gravel.
Jackson.....	9,955	19,552	Sand and gravel.
Kanabec.....	(1)	272,351	Sand and gravel, stone.
Kandiyohi.....	(1)	213,276	Sand and gravel.
Lac qui Parle.....	(1)	265,965	Stone, sand and gravel.
Lake.....	7,376	15,012	Sand and gravel.
Lake of the Woods.....	(1)	3,624	Do.
Le Sueur.....	458,150	474,050	Stone.
Lincoln.....	35,636	23,668	Sand and gravel.
Lyon.....	79,382	(1)	Do.
Mahnomen.....	982	7,866	Do.
Marshall.....	(1)	21,792	Do.
Martin.....	93,040	27,572	Do.
McLeod.....	1,823	10,199	Do.
Morrison.....	265,662	23,407	Iron ore, sand and gravel.
Mower.....	126,447	213,676	Stone, sand and gravel.
Nicollet.....	6,592	6,824	Sand and gravel.
Nobles.....	28,761	13,264	Do.
Norman.....		400	Do.
Olmsted.....	(1)	112,943	Stone, sand and gravel.
Otter Tail.....	50,916	70,927	Sand and gravel.
Pipestone.....		(1)	Do.
Polk.....	212,037	223,942	Do.
Pope.....	79,751	54,687	Do.
Ramsey.....	1,250,941	1,197,518	Sand and gravel, clays.
Redwood.....		21,500	Sand and gravel.
Rice.....	158,604	45,589	Do.
Rock.....	201,955	203,100	Abrasive stones, sand and gravel.
Roseau.....	6,140	6,831	Sand and gravel.
St. Louis.....	290,556,585	394,994,930	Iron ore, cement, sand and gravel, lime, stone.
Scott.....	(1)	304,209	Stone, sand and gravel.
Stearns.....	1,392,299	1,365,282	Do.
Steele.....	169,600	188,544	Sand and gravel, stone.
Swift.....	44,387	6,259	Sand and gravel.
Todd.....	(1)	3,976	Do.
Wabasha.....	3,868	7,832	Do.
Watonwan.....	9,348	17,305	Do.
Winona.....	254,056	413,312	Stone, sand and gravel, clays.
Wright.....	57,869	116,418	Sand and gravel.
Yellow Medicine.....	332,044	197,885	Stone, sand and gravel.
Undistributed ²	1,910,858	1,591,917	
Total.....	³ 397,440,000	542,545,000	

¹ Bureau of Mines not at liberty to publish. Value is included with "Undistributed."

² Revised figure.

³ Includes value of mineral production in counties indicated by footnote reference 1, value of stone, sand and gravel production for which no county breakdown is available, and value of mineral production in the following counties for both 1952 and 1953: Carver (1952 only); Freeborn, sand and gravel; Grant, sand and gravel; Hubbard (1952 only); Mille Lacs, stone, sand and gravel (1953); Pine, sand and gravel; Renville, stone, sand and gravel; Washington, sand and gravel, marl (1952); Wilkin, sand and gravel.

highway use was produced by and for the county highway department. The Nemadji Tile & Pottery Co., Moose Lake, produced fire clay for use in art pottery, and the Wrenshall Brick Co., Duluth, reported clay sold for building brick.

CASS

Northern Pacific Railway Co. produced gravel for railroad ballast. Road gravel was produced by and for the county highway department.

CHIPPEWA

Jay Volden, Milan, produced gravel for use as a concrete aggregate and in road construction.

CHISAGO

Ed Lundin, Mankato, and the county highway department produced road gravel. William Danner, Rush City, produced marl for agricultural use.

CLAY

Sand and gravel for building and road purposes was produced by Melvin Ulven and Maynard Frisk, Hawley; Kost Bros., Inc., and Twin City Sand & Gravel Co., Moorhead; and Rollo Lewis, Fargo, N. Dak. Road gravel was also produced for the county highway department.

COOK

The county highway department produced gravel for road construction. The Erie Mining Co. was constructing harbor and dock facilities at Taconite Harbor, which will be the shipping point for iron-ore pellets produced by the company at its proposed plant near Aurora, 73 miles inland.

COTTONWOOD

Windom Sand & Gravel Co., Windom, produced sand and gravel for building purposes, and the county highway department produced road gravel.

CROW WING

Iron ore was the chief mineral product of this county. In 1953 shipments of iron ore were reported by 6 companies operating 20 mines; 3 of these companies also produced manganiferous iron ore (iron ore containing 5 to 10 percent manganese, natural) and/or ferruginous manganese ore (iron ore containing 10 to 35 percent manganese, natural). Companies producing iron ore in 1953 were:

Company:

	<i>Mines operated</i>
Dates Mining Co.	Pennington.
Inland Steel Co.	Armour No. 1 and No. 2.
M. A. Hanna Co.	Portsmouth Group, Rowe, and South Yawkey.
Hanna Coal & Ore Corp.	Feigh, Huntington, Louise, Mallen, Maroco, Section No. 6, Snowshoe, and South Hillcrest.
Pickands, Mather & Co.	Mahnomen and Rabbit Lake.
Zontelli Bros., Inc.	Mangan-Joan, Manuel, Martin stock-pile, and Virginia.

Shipments of manganiferous iron ore and/or ferruginous manganese ore during the year were reported by Hanna Coal & Ore Corp., from the Alstead group, Mangan-Joan, and Maroco mines; Pickands, Mather & Co., from the Mahnomen, Rabbit Lake, and Sagamore mines; and Zontelli Bros., Inc., from the Mangan-Joan mine and the Merritt stockpile. Not included as production in 1953 are 127 short tons of manganiferous iron ore which was shipped to the Federal Bureau of Mines for experimental purposes.

Construction of a new manganese-recovery plant of the Manganese Chemicals Corp. at Riverton was completed during the year. The plant was operated at a reduced production rate during the latter part of the year while operational problems were being solved. An ammonia-leach process to chemically separate manganese from Cuyuna-range manganiferous ores was utilized. The plant was to have a capacity of about 200 tons of crude-ore input per day, and the annual output was expected to be 7,600 tons of manganese in concentrate form.

The county highway department produced sand and gravel for road use.

Marl was produced by Tweed Bros., Pequot Lakes, for agricultural use.

DAKOTA

Limestone was produced by the Chicago, Milwaukee, St. Paul & Pacific Railroad Co. and J. L. Shiely Co., St. Paul, for use as riprap, rubble, rough building stone, cut stone, flagging, flux, road construction, railroad ballast, and agricultural lime. Standard Building Material Co., South St. Paul, produced sand and gravel for building purposes.

DODGE

Quarve & Anderson Co., Rochester, and the county highway department produced crushed limestone for road use.

DOUGLAS

The county highway department produced road gravel.

FARIBAULT

Road gravel was produced for the county highway department.

FILLMORE

Hanna Coal & Ore Corp. shipped 230,400 long tons of iron-ore concentrate during 1953 from its open-pit operation near Spring Valley. All shipments were by rail to steel mills in Illinois.

Limestone was produced by Hadland & Vreeman, Ostrander; Edwin C. Kappers, Spring Valley; Pederson Bros., Harmony; Quarve & Anderson Co., Rochester; Roverud Construction Co., Spring Grove; and the county highway department. Chief uses were for road construction and agricultural lime.

FREEBORN

Emil Olson & Sons, Albert Lea, produced gravel for railroad ballast and road purposes. Road gravel was also produced for the county highway department.

GOODHUE

Crushed or broken limestone was produced by the Mann Construction Co. (Red Wing), Quarve & Anderson Co. (Rochester), Valley Construction Co. (Zumbrota), and the United States Army Corps of Engineers for use as road material, agricultural lime, rubble, or riprap. Munson Construction Co. (Cannon Falls), Harry M. Berkold and Arthur Mikow (both of Lake City), and Mann Construction Co. (Red Wing) produced sand and gravel for building and road purposes. Road gravel was produced by and for the city of Red Wing and for the United States Army Corps of Engineers. The Red Wing Sewer Pipe Corp. produced clays for use chiefly in making pottery and heavy clay products.

GRANT

Sam Olson, Elbow Lake, produced sand and gravel for building and road use. The Minneapolis, St. Paul & Sault Ste. Marie Railroad produced gravel for railroad ballast.

HENNEPIN

Sand and gravel producers during the year included: Glacier Sand & Gravel Co., Hedberg, Freidheim & Co., Industrial Aggregate Co., Landers-Norblom-Christenson Co., Mapco Sand & Gravel Co., Minnesota Sand & Gravel Co., and Oscar Roberts Co., all of Minneapolis; the Great Northern Railway Co.; and the Hennepin County Road and Bridge Department. Production was chiefly for building and road purposes. Landers-Norblom-Christenson Co. also produced limestone for use as road material, agricultural lime, asphalt filler, and rubble. Western Mineral Products Co. and the Minnesota Perlite Corp., both of Minneapolis, expanded crude perlite for use as a lightweight aggregate in plaster and concrete.

HOUSTON

Botcher Bros., Houston, and Hector Construction Co. and Heintz & Smith, both of Caledonia, produced limestone for road material, agricultural lime, and riprap.

ISANTI

Lindquist & Olson, Cambridge, produced sand and gravel for road use. Road gravel was also produced for the county highway department.

ITASCA

Mineral production in Itasca County consisted chiefly of iron ore. During 1953, 12 companies operated in the county. Producing companies and mines operated were as follows:

Company:	<i>Mines operated</i>
Butler Bros.....	Aromac, Galbraith, Halobe, Harrison, Kevin, MacKillican, North Harrison, Olson, Patrick, Patrick Annex, Patrick Plant Tailings, Quinn, Wyman.
Cleveland-Cliffs Iron Co.....	Canisteo, Hawkins, Hawkins Tailings Plant, Hill-Trumbull, Holman-Cliffs, Sargent.
Hanna Coal & Ore Corp.....	Argonne, Carlz No. 2, Leach, Perry.
M. A. Hanna Co.....	Bray, Buckeye, Gordon, Jennison, Mesabi Chief, Stein.
Jessie H. Mining Co.....	Jessie.
Jones & Laughlin Steel Corp.	Hill Annex.
Missco Mining Co.....	Mississippi No. 1.
W. S. Moore Co	Missouri stockpile.
Oliver Iron Mining Division, U. S. Steel Corp	Arcturus, Gross Marble Group, King Group.
Pacific Isle Mining Co.....	York.
Pickands, Mather & Co.....	Bennett, Danube, West Hill.
Republic Steel Corp.....	St. Paul-Day.

The West Hill mine, one of the most westerly active mines on the Mesabi range, entered the ore-shipping rolls for the first time, making its first shipment of concentrate on July 7. The mine was operated by Pickands, Mather & Co., agent for Western Mining Co.

Development was in progress at the Tioga No. 2 and Plummer mines, operated by Pickands, Mather & Co. and Oliver Iron Mining Division of United States Steel Corp., respectively.

Underground mining ceased at two mines, the Bennett mine, operated by Pickands, Mather & Co., and the Sargent mine, operated by the Cleveland-Cliffs Iron Co.

Road gravel was produced by the Hawkinson Construction Co., Grand Rapids, and by and for the county highway department.

JACKSON

Sand and gravel for road use was produced by and for the county highway department.

KANABEC

The Fairway Construction Co., Hector, produced sand for road use. Road gravel was produced for the county highway department. Granite was produced by the Cold Spring Granite Co., Cold Spring, from the Mora Grey quarry. The stone was used for building and monumental purposes.

KANDIYOHI

Royal Garman (Long Prairie), New London Materials & Construction Co. (New London), and the Great Northern Railway Co. produced sand and gravel, chiefly for road use and railroad ballast. Road gravel was also produced by and for the county highway department.

LAC QUI PARLE

Granite for building and monumental purposes was produced by the Cold Spring Granite Co. and the Unique Granite Co. The latter company operates both a quarry and a sawing and finishing plant at

Bellingham. Sand and gravel for building and road use was produced by W. R. Sisson, Montevideo. Road gravel was produced by and for the county highway department.

LAKE

The county highway department produced gravel for road use.

Work progressed on the E. W. Davis Works, Reserve Mining Co. taconite-processing plant, near Beaver Bay. The plant will have an initial annual capacity of 3.75 million tons of iron-ore pellets, with design aimed toward an eventual annual production capacity of 10 million tons. Taconite mined at the company open-pit mine near Babbitt will be shipped by a 47-mile company-built railroad to the E. W. Davis Works, where it will be further crushed, ground, magnetically separated, and formed into pellets. The plant will be operated year-round. Pellets will be stockpiled during the winter months. The company was also constructing harbor facilities, a power plant, water and sewage systems, and a complete new town.

LAKE OF THE WOODS

Richard Donovan, Baudette, and the county highway department produced road gravel.

LE SUEUR

The Babcock Co., Kasota, produced dimension limestone, chiefly for building purposes. The company also produced a highly polished limestone, which was marketed as "marble" and used chiefly for interior trim and facings.

LINCOLN

Tyler Cement and Tile Works, Tyler, produced sand and gravel for building purposes. The county highway department produced road gravel.

LYON

F. J. Crow & Hubert Deutz and the Marshall Sand & Gravel Co., both of Marshall, produced sand and gravel for building and road purposes.

MAHNOMEN

Road gravel was produced by and for the county highway department.

MARSHALL

Road gravel was produced by Oscar Shenky, Middle River, and for the county highway department. The Minneapolis, St. Paul & Sault Ste. Marie Railroad produced gravel for railroad ballast.

MARTIN

Road gravel was produced by Daniel F. Winter, Ceylon, and for the county highway department.

McLEOD

Road gravel was produced by Clarence Reed, Glencoe, and for the county highway department. The Minneapolis, Northfield & Southern Railway Co. produced gravel for railroad ballast.

MILLE LACS

Granite for building and monumental purposes was produced by The Cold Spring Granite Co. from the Diamond Grey quarry near Isle. The Mann Construction Co. of Red Wing produced road gravel.

MORRISON

Zontelli Bros., Inc., of Ironton shipped 5,754 long tons of iron ore from the Gorman mine near Randall. The Northern Pacific Railway Co. produced sand for railroad ballast. Road gravel was produced by and for the county highway department.

MOWER

Crushed limestone was produced by the Hickok Calcium White Rock Co., Le Roy; Osmundson Bros., Adams; and Quarve & Anderson Co., Rochester. Uses reported were for road material, agricultural lime, flux, mineral food, and poultry grit.

The Austin Ready Mix Concrete Co., Austin, produced sand and gravel for building and road use. Road gravel was produced by and for the county highway department.

NICOLLET

Road gravel was produced by the Wilkinson Estate, St. Peter, and A. H. & J. H. Massopust, Minneapolis, and for the county highway department.

NOBLES

Road gravel was produced for the county highway department.

NORMAN

Road gravel was produced for the United States Army Corps of Engineers.

OLMSTED

Crushed limestone, used chiefly for road construction and agricultural lime, was produced by Patterson Quarries, St. Charles; Quarve & Anderson Co., Rochester; and for the county highway department. Sand and gravel for building and road purposes was produced by the Rochester Sand & Gravel Co., Rochester; W. F. Fuller, Waltham; and by and for the county highway department.

OTTER TAIL

Sand and gravel, used for building and road purposes and railroad ballast, was produced by the Mark Sand & Gravel Co., Fergus Falls; Farrell Contracting Co., St. Paul; Minneapolis, St. Paul & Sault Ste. Marie Railroad; and by and for the city of Fergus Falls and the county highway department.

PINE

Louis Hultgren & Sons, Kerrick, produced molding sand.

PIPESTONE

The Chicago, Milwaukee, St. Paul & Pacific Railroad Co. produced gravel for railroad ballast.

POLK

The Spring Gravel Co. (Crookston), Thorson Gravel Co. (Fertile), and the Great Northern Railway Co. produced sand and gravel for building and road use and railroad ballast.

POPE

The Schmidgall Sand & Ready Mix Co. (Morris), Starbuck Cement Products Co. (Starbuck), Northern Pacific Railway Co., and the county highway department produced sand and gravel for building and road purposes and railroad ballast.

RAMSEY

Sand and gravel was produced by Cemstone Products Co., J. L. Shiely Co., the Twin City glass plant of the Ford Motor Co., and by and for the city of St. Paul. Production was chiefly for building and road purposes and for glass manufacture. The Twin City Brick Co., St. Paul, produced clays, for the manufacture of building brick and heavy clay products.

REDWOOD

Chapman Gravel Co. Echo, produced sand and gravel for road use.

RENVILLE

The Cold Spring Granite Co. and the Melrose Granite Co. produced granite for building and monumental purposes. Sand for road construction was produced for the village of Sacred Heart.

RICE

Faribault Washed Sand & Gravel Co., Faribault, produced sand for building and road purposes. Sand and gravel for road use was produced for the county highway department.

ROCK

The Jasper Stone Co., Jasper, produced grinding pebbles and tube-mill liners from a quartzite deposit near Jasper. Pronk Bros., Edgerton, produced building sand, and the Chicago, St. Paul, Minneapolis & Omaha Railway Co. produced gravel for railroad ballast. Road sand was produced for the county highway department.

ROSEAU

The county highway department produced road gravel.

ST. LOUIS

The mineral output of this county in 1953 included cement, iron ore, lime, sand and gravel, and stone. Iron ore ranked first in value by far. Approximately 76 percent of the total iron-ore shipments in the State was shipped from mines in St. Louis County. Operating companies and mines, mine groups, and plants from which shipments were reported in 1953 were as follows:

Company:	<i>Mines operated</i>
Butler Bros.....	Agnew No. 2, North Eddy (South Agnew Trespass), South Agnew, South Longyear, Weggum.
Charleson Iron Mining Co....	Charleson concentrator.
Cleveland-Cliffs Iron Co.....	Agnew, Alworth, Wanless.
E. W. Coons Co.....	Commodore, Genoa-Sparta, Julia, Lincoln "D," Seville stockpile, Sidney, Victoria.
Haley-Young Mining Co.....	Elbern, Ernie.
M. A. Hanna Co.....	Brunt, Enterprise, Impro, Norpac, Pillsbury Addition, Section No. 18.
Douglas Mining Co.....	Douglas, Duncan.
Hedman Mining Co.....	Croxton-Drew-Syme.
Jones & Laughlin Steel Corp..	Columbia, Graham No. 1, Longyear, Missabe Mountain, Schley, Wentworth.
Junior Mining Co., Inc.....	Hector.
W. S. Moore Co.....	Hanna, Judson, Knox, Margaret, Margaret stockpile, Norman, Pilot, Pilot Annex, Prindle, Prindle stockpile, Stubler, Yawkey.
Oglebay, Norton & Co.....	St. James.
Oliver Iron Mining Division, U. S. Steel Corp.	Canton group, Canton (St. James), Dormer, Fayal, Fraser, Gilbert, Godfrey, Hull-Rust Group, Knox Extension, Kosmerl, Mariska Extension, Midway, Midway No. 2, Monroe Group, Morris, Mountain Iron Group, Niles, Pillsbury, Pillsbury-Brown, Pilotac, Pioneer, Rouchleau Group, Sauntry, Sherman Group, Sibley, Soudan, Spruce.
Pacific Isle Mining Co.....	Cyprus-Rust, Dunwoody LOSP, Emmett, Graham LOSP, Kerr, Lamberton, Minorca, Missabe Mountain South Lease, Nordine, North Shiras, Pacific Fee, Shiras, South Uno (N. P.), Wacootah.
Pickands, Mather & Co.....	Albany, Biwabik, Carmi-Carson Lake, Corsica, Embarrass, Erie Preliminary Taconite plant, Mahoning, Miller-Mohawk, Scranton, Wade, Zenith.
Pioneer Mining Co.....	Mary Ellen.
Pittsburgh Pacific Co.....	Alpena, Chataco, Sliver.
Range Mining & Contracting Co.	Atkins.
Republic Steel Corp.....	Stevenson, Susquehanna.
Reserve Mining Co.....	Babbitt Taconite plant.
Rhude & Fryberger.....	Boeing, Seville, Troy.
Rhude-Gilbert Corp.....	Alworth O. P.
Skubic Bros. Co.....	Ajax, Virginia.
Snyder Mining Co.....	Shenango, Webb & Weggum Trespass, Whiteside.
E. A. Young, Inc.....	Minnewas, Mott stockpile.

Development work on the taconite projects in the county was continued during the year. The Oliver Iron Mining Division of United States Steel Corp. loaded the first car of concentrate on June 9 from its new Pilotac taconite plant near Mountain Iron. The

plant annual capacity was about 500,000 tons of concentrate of high iron content. The concentrate was agglomerated at the company Extaca plant at Virginia, 6 miles distant. The Pilotac mine and mill will operate throughout all seasons of the year.

Reserve Mining Co., owned jointly by Republic Steel Corp. and Armco Steel Co., operated its Babbitt pilot plant producing taconite pellets with a 62-percent iron content. The plant had four shaft-type pelletizing furnaces in operation. The annual capacity of the plant was 300,000 tons of finished product. The ore body at Babbitt was estimated to contain at least 1.5 billion tons of magnetic taconite, which, when beneficiated, will yield concentrate totaling about 500 million tons containing 60 to 63 percent iron. Coarse crushing will be done at the mine for both the Babbitt plant and the E. W. Davis Works, the larger plant now under construction near Beaver Bay in Lake County. Most of the crushed ore will be shipped by a 47-mile company-built railroad to the E. W. Davis Works, where it will be formed into pellets.

The Erie Mining Co. continued development of its mine and construction of processing facilities at Aurora for its new commercial plant, with an annual rated capacity of 7.5 million tons of taconite pellets. The ultimate planned yearly capacity for this plant was 10.5 million tons of finished product. Pellets will be shipped over a 73-mile railroad to Taconite Harbor in Cook County, where the company was constructing harbor and dock facilities.

The Oliver Iron Mining Division of United States Steel Corp. ceased underground mining operations at the Spruce mine near Eveleth; however, the Albany mine near Hibbing, operated by Pickands, Mather & Co., was in the process of gradual change from open-pit to underground mining methods.

The Morton mine near Hibbing, operated by M. A. Hanna Co., has been under an extensive 3-year program of stripping operations. Approximately 20 million cubic yards of overburden has been removed since work began in 1950. Shipments were expected to begin in 1954.

Cement was produced by the Universal Atlas Cement Co. at its plant in Duluth. Shipments of cement increased over 1952.

The Cutler-Magner Co. produced quicklime and hydrated lime at Duluth for building, agricultural, industrial, and chemical uses.

The Mesaba Granite Co. of Hibbing produced rough granite for monumental purposes from a quarry near Mountain Iron.

Sand and gravel producers during the year included: Arrowhead Sand & Gravel Co., Duluth; Biwabik Gravel Co., and Pioneer Mining Co., both of Biwabik; Hawkinson Construction Co., Grand Rapids; E. W. Coons Co., Enrico Ghilardi, and Mesaba Construction Co., all of Hibbing; N. W. Gravel & Excavating Co., Virginia; Great Northern Railway Co.; Northern Pacific Railway Co.; city of Duluth; and the St. Louis County Highway Department. Uses reported were for building and road purposes, railroad ballast, and engine sand.

SCOTT

Bryan Rock Products, Inc., Shakopee, produced limestone for road construction, agricultural lime, railroad ballast, and riprap. Sand

and gravel for building and road purposes was produced by Belle Plaine Sand & Gravel Co., Belle Plaine, and by and for the county highway department.

STEARNS

Dimension granite for building or monumental purposes was produced by the Cold Spring Granite Co., Liberty Granite Co., Melrose Granite Co., North Star Granite Corp., and Royal Granite Co. Shiely-Petters Crushed Stone Co. produced crushed granite for railroad ballast and road purposes. Sand and gravel was produced by Al C. Petters Co., St. Cloud, for building purposes. Osakis Concrete Products Co., Osakis, produced sand for building and road use.

STEELE

George Kohlmier and the Owatonna Aggregates Corp., both of Owatonna, and the Medford Washed Sand-Gravel Co., Medford, produced sand and gravel for building and road purposes. Road gravel was produced for the county highway department. The Klemmer Construction Co. produced crushed limestone for road construction and agricultural use.

SWIFT

The Chicago, Milwaukee, St. Paul & Pacific Railroad Co. and the Great Northern Railway Co. produced gravel for railroad ballast. The county highway department produced road gravel.

TODD

Road gravel was produced by and for the county highway department.

WABASHA

Gravel for road use was produced by and for the county highway department.

WASHINGTON

Certified Concrete Co. of St. Paul produced sand and gravel for building purposes. Sand and gravel for road purposes was produced for the county highway department.

WATONWAN

Road gravel was produced by and for the county highway department.

WILKIN

Behrens Construction Co., Beatrice, Nebr., and D. J. Nichol, Hendrum, produced road gravel.

WINONA

The Biesanz Stone Co., Winona, produced dimension limestone for building use. Crushed limestone for road construction was produced for the county highway department. The Winona Sand & Gravel Co.,

Winona, produced sand and gravel for building and road purposes. The county highway department produced road sand. Clay was produced by the Biesanz Brick Yards, Winona, for the manufacture of common brick.

WRIGHT

Charles and Anna Frank, Delano, and Ed Schram, South Haven, produced sand and gravel for building and road use. Road gravel was produced by and for the county highway department. The Delano Granite Works, Inc., Delano, operated a sawing and finishing plant at Delano.

YELLOW MEDICINE

The Great Northern Railway Co. produced crushed granite for use chiefly as railroad ballast. Road gravel was produced by and for the county highway department.

The Mineral Industry of Mississippi

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of Mississippi.

By J. R. Thoenen¹ and May G. Downey²



THE MINERAL OUTPUT of Mississippi as reported by producers in 1953, including nonmetallic minerals and fuels, increased 6 percent in value compared with 1952. The overall increase is credited to a 5-percent gain in total value of mineral fuels and a 23-percent rise in other minerals.

Cement shipments increased considerably over 1952, as did clay and sand and gravel. Stone production declined materially.

Clay suitable for brick and heavy clay products was reported from 14 operations in 10 counties in 1953. Ball-clay and fuller's-earth output increased and that of bentonite and fire clay decreased slightly. The net result was a 1-percent increase in total clay tonnage but an 18-percent increase in total clay value.

Prentiss and Tunica were added in 1953 to the list of 32 counties that produced nonmetallic minerals in 1952.

TABLE 1.—Mineral production in Mississippi, 1952-53¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays.....	509,099	\$2,681,563	560,047	\$3,158,385
Natural gas.....million cubic feet..	174,100	10,620,000	154,254	12,340,000
Natural-gas liquids:				
Natural gasoline and cycle products				
thousand gallons..	33,726	2,606,000	32,214	2,295,000
do.....	19,614	777,000	17,724	713,000
L.P.-gases.....	36,310	80,970,000	35,620	84,060,000
Petroleum (crude).....thousand 42-gallon barrels..	2,296,577	1,633,306	2,633,046	2,173,871
Sand and gravel.....	90,000	103,500	38,000	43,700
Stone.....				
Undistributed: Nonmetallic minerals. Excludes value of clays used for cement.....		2,283,312		3,083,749
Total.....		101,875,000		107,868,000

¹ Production as measured by mine shipments, mine sales, or marketable production (including consumption by producers).

² Final figure. Supersedes preliminary figure given in commodity chapter.

³ Revised figure.

¹ Chief, Mineral Industry Division, Region VII, Bureau of Mines, Knoxville, Tenn

² Statistical clerk, Region VII, Bureau of Mines, Knoxville, Tenn.

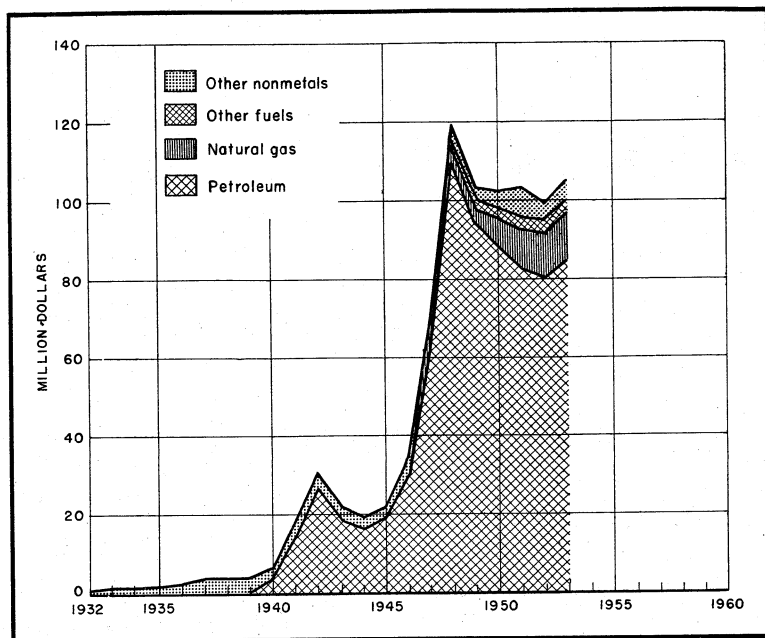


FIGURE 1.—Value of mineral production in Mississippi, 1932–53, in million dollars.

TABLE 2.—Average unit value of mineral commodities produced in Mississippi, 1949–53¹

Commodity	1949	1950	1951	1952	1953
NONMETALS					
Cement..... 376-pound barrel.....				\$2.53	\$2.71
Clays:					
Ball clay..... short ton.....	\$14.48	\$15.25	\$15.01	14.90	14.57
Bentonite..... do.....	4.91	5.68	9.73	7.89	10.72
Fire clay..... do.....	2.58	1.68	1.83	1.61	1.69
Fuller's earth..... do.....	42.76	39.18	41.04	43.65	41.94
Miscellaneous clays..... do.....	.90	.92	1.02	1.08	1.06
For cement manufacture..... do.....			1.00	1.00	1.00
Gravel..... do.....	.73	.81	.81	.85	.87
Sand..... do.....	.59	.55	.64	.66	.71
Stone:					
Limestone (crushed)..... do.....	1.10	1.15	1.15	1.15	1.15
Miscellaneous (crushed)..... do.....			.40		
FUELS					
Natural gas..... per 1,000 cubic feet.....	.06	.06	.06	.06	.08
Petroleum..... 42-gallon barrel.....	2.46	2.31	2.24	2.23	2.36
Natural-gas liquids:					
Natural gasoline and cycle products..... do.....	2.92	2.92	3.43	3.25	2.99
LP-gases..... do.....	1.16	1.62	1.80	1.66	1.69

¹ For greater detail on prices by grades and markets, see vol. I, Minerals Yearbook, 1953.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Clays.—*Ball clay* was reported from 2 operations with an increase of 5 percent in tonnage but only 3 percent in value, due to a drop of 33 cents a ton in average value.

Bentonite came from the same producers as in 1952 but decreased in tonnage although increasing in value, reflecting an increase in value a ton.

Fire-clay tonnage decreased 11 percent and value decreased 7 percent, as a result of an increase of 8 cents a ton.

Fuller's earth sold or used from Tippah County increased in tonnage and value, representing a decrease of \$1.71 per ton in average value.

Miscellaneous clays for brick and heavy clay products as reported showed an increase of 21 percent in tonnage and 19 percent in value, a drop of 2 cents a ton in average value.

TABLE 3.—Miscellaneous clays sold or used by producers, 1949-53¹

Year	Short tons	Value	Year	Short tons	Value
1949.....	281,763	\$252,382	1952.....	207,468	\$224,828
1950.....	268,690	247,467	1953.....	251,901	268,129
1951.....	261,722	266,022			

¹ Excludes clay sold or used for cement.

Sand and Gravel.—Sand and gravel production was reported from 17 counties and 17 commercial and 6 noncommercial operations; in addition, 92,400 tons was reported from noncommercial producers without designation as to county source. The total tonnage sold or used increased 16 percent and the value increased 19 percent over that in 1952, with an increase of 2 cents in the average value a ton. Total sand sold or used increased 43 percent in tonnage and 54 percent in value over 1952, with an average increase of 5 cents a ton. The total value of gravel sold or used increased 9 percent, with an average increase of 2 cents a ton.

TABLE 4.—Sand and gravel sold or used by producers, 1944-48 (average)² and 1949-53

Year	Sand		Gravel		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1944-48 (average).....	(¹)	(¹)	(¹)	(¹)	² 2,188,702	² \$1,227,239
1949 ³	641,704	\$380,723	1,301,237	\$949,690	1,942,941	1,330,413
1950.....	947,127	516,202	1,817,317	1,469,706	2,764,444	1,985,908
1951.....	944,096	607,870	2,068,056	1,671,164	3,012,152	2,279,034
1952.....	604,698	399,769	1,691,879	1,433,537	2,296,577	1,833,306
1953.....	⁴ 863,047	⁴ 612,920	⁴ 1,686,865	⁴ 1,466,054	2,653,646	2,173,871

¹ Figure withheld to avoid disclosure of individual company operation.

² Excludes "noncommercial" sand and gravel, 1947.

³ Excludes "noncommercial" sand and gravel.

⁴ Incomplete figure.

Stone.—Limestone for agricultural use was quarried in Clay County by the Mississippi State Lime Plant Board. This has been the only stone operation in the State reporting continuously in recent years. Production and total value were 58 percent less than in 1952, but the average value per ton remained the same.

MINERAL FUELS

As in previous years, the mineral fuels composed the major portion of the value, or 92 percent, a loss of 1 percent from 1952, although the value of fuels produced in 1953 actually increased 5 percent above that in the previous year.

Of the mineral fuels, petroleum comprised 85 percent of the total value in both 1952 and 1953, but production value in 1953 was 4 percent greater than in 1952.

Natural gas increased its share of total State mineral-production value by 1 percent (from 11 to 12), representing a 16-percent gain over 1952.

Natural gasoline and cycle products and LP-gases decreased in both production and value compared with 1952.

Seventeen new oil fields were opened in Mississippi in 1953. Six were in the Black Warrior basin in the northeastern portion of the State. Ten were in the Wilcox formation in Adams, Wilkinson, Jefferson, and Franklin Counties. One field in Jefferson County obtained production from the lower Tuscaloosa formation.³ See Minerals Yearbook 1953, volume II, for further details.

REVIEW BY COUNTIES

ADAMS

The St. Catherine Gravel Co. was the only mineral producer reporting. Material produced included both sand and gravel for building and paving purposes.

ALCORN

The Corinth Brick & Tile Co. was the only producer reporting. The company production of miscellaneous clays for heavy clay products was slightly below that of 1952 in both tonnage and value.

TABLE 5.—Miscellaneous clays sold or used by producers in Alcorn County, 1949-53

Year	Short tons	Value	Year	Short tons	Value
1949.....	27, 100	\$20, 325	1952.....	34, 464	\$28, 744
1950.....	36, 743	27, 932	1953.....	33, 600	26, 300
1951.....	38, 808	38, 808			

ATTALA

C. C. Bell of Kosciusko was the only mineral producer reporting in 1953. The production of miscellaneous clays was slightly greater than in 1952.

CARROLL

The output of fire clay by Delta Brick & Tile Co., Indianola, was 4 percent less in both tonnage and value than in 1952.

The county engineer of Leflore County reported 99,800 short tons of gravel valued at \$73,900 used by his organization but mined in Carroll County.

³Williams, Neil, Seventeen New Fields Added to State's Total in 1953: Oil and Gas Jour., Jan 25, 1954, p. 249.

TABLE 6.—Fire clay sold or used by producers in Carroll County, 1949–53

Year	Short tons	Value	Year	Short tons	Value
1949.....	2,760	\$7,176	1952.....	14,355	\$26,844
1950.....	9,900	19,800	1953.....	13,800	25,759
1951.....	9,245	27,735			

CLAY

The Mississippi State Lime Plant Board quarried limestone for agricultural purposes, but tonnage and value were 58 percent less than in 1952.

The West Point Gravel Co., West Point, mined and prepared washed sand and gravel for building and paving purposes, but the total output was 4 percent less in tonnage and 6 percent less in value than in 1952. All material was shipped by truck.

COAHOMA

The Coahoma County Highway Department continued mining sand but reported only use of 1,400 tons and no gravel as compared with 75,000 tons of sand and gravel in 1952.

COPIAH

The Crystal Springs Sand & Gravel Co., Crystal Springs, and the Gatesville Sand & Gravel Co., Jackson, both reported sale of gravel for railroad ballast.

DE SOTO

The Memphis Stone & Gravel Co., Memphis, reported production of sand and gravel for structural purposes, as well as paving gravel. The Smiley Sand & Gravel Co., Atlanta, Ga., reported sale of sand and gravel from De Soto County without specifying its ultimate use. The American Sand & Gravel Co. of Hattiesburg also reported the sale or use of sand and gravel.

FORREST

The Hattiesburg Brick Works continued to use miscellaneous clays for heavy clay products at the same rate as in 1952.

HANCOCK

The Coast Gravel Co. reported output of building and other gravel but at only about 35 percent of 1952 activity.

HINDS

The output of miscellaneous clays in 1953 was 48 percent greater in tonnage and 59 percent greater in value than in 1952. Active operators were Jackson Brick Co., Johnson-Cone Brick Co., and Tri-State Brick & Tile Co., all of Jackson.

HOLMES

The Hammett Gravel Co. mined sand for the building, paving, and engine-sand markets, as well as paving gravel. Total sale or use was estimated as somewhat greater than in 1952.

ITAWAMBA

The Filtrol Corp. mined bentonite from its Hodo mine.

JONES

The Laurel Brick Works continued producing miscellaneous clays, but again at a slightly reduced rate.

LAUDERDALE

The output of miscellaneous clays from the Bonito mine of the Meridian Brick Co. dropped to the 1951 production level.

TABLE 7.—Miscellaneous clays sold or used by producers in Lauderdale County, 1949-53

Year	Short tons	Value	Year	Short tons	Value
1949.....	10, 400	\$15, 600	1952.....	12, 258	\$18, 387
1950.....	9, 000	13, 500	1953.....	8, 500	12, 750
1951.....	8, 600	12, 900			

LEE

Output of miscellaneous clays by the Tupelo Brick & Tile Co., Tupelo, increased 5 percent in tonnage and 15 percent in value over 1952.

LINCOLN

The Brookhaven Pressed Brick Co. increased production of miscellaneous clays over 1952 by 4 percent in tonnage and 14 percent in value.

LOWNDES

The Columbus Brick Co. reported resumption of production from its Columbus mine in 1953 after being idle in 1952.

The Columbus Gravel Co. and the Fleming Gravel Co. continued operations at Columbus, but they were joined by the Smith Gravel Co. and the Williams Sand & Gravel Co., also of Columbus. This was the first reported production for the two latter companies. As a result of those new operations, sand output increased 29 percent in tonnage and 73 percent in value. Gravel increased 28 percent in tonnage and 51 percent in value. The total production increased 28 percent in tonnage and 54 percent in value. Material produced entered the building-, paving-, and engine-sand markets, and gravel was sold for building, paving, and railroad ballast.

MARION

The Chancery Court of Marion County reported the use of 41,900 short tons of paving gravel valued at \$2,100.

TABLE 8.—Gravel sold or used by producers in Marion County, 1949-53

Year	Short tons	Value	Year	Short tons	Value
1949.....	106,118	¹ \$3,930	1952.....	108,427	\$30,316
1950.....	90,508	67,043	1953.....	41,917	¹ 2,096
1951.....	108,427	80,316			

¹ As reported by county officials.

MARSHALL

The output of fire clay by the Holly Springs Brick & Tile Co. continued at essentially the same rate and value as in 1952.

MONROE

Production of bentonite was continued by the International Minerals & Chemical Corp. from its Amory mine and by the American Colloid Co. from its Aberdeen mine. Total sale or use increased 23 percent in tonnage and 31 percent in value.

The same three operators as in 1952 continued production of sand and gravel. They were Mattox Gravel Co., Amory Sand & Gravel Corp., and Dee Nash. Mattox produced paving gravel only. Nash produced building and paving sand and building gravel. Amory produced building and paving sand and gravel and also gravel for railroad ballast. Total sale or use of sand decreased 4 percent in tonnage compared with 1952, but the value reported remained the same. Gravel decreased 10 percent in tonnage and 21 percent in value.

PANOLA

The Kentucky-Tennessee Clay Co. mined ball clay from its Crenshaw mine and increased output 3 percent in tonnage and 2 percent in value.

PEARL RIVER

The Pearl River Clay Co. produced 586 short tons of bentonite valued at \$11,200.

PERRY

The Richton Sand & Gravel Co. mined a small quantity of gravel for railroad ballast and other purposes.

PONTOTOC

The Pontotoc Brick Co. mined a small quantity of miscellaneous clays.

PRENTISS

The Baldwyn Brick & Tile Co. sold or used 6,800 short tons of miscellaneous clays valued at \$7,400.

QUITMAN

The Sledge mine of the Old Hickory Clay Co. increased its output of ball clay two-thirds over 1952, with the same unit value.

RANKIN

The Marquette Cement Co. increased shipments of cement at its Brandon mill 28 percent in quantity and 37 percent in value.

SMITH

The output of bentonite from the Chisholm mine of the Filtrol Co. declined perceptibly below 1952 both in tonnage and value.

SUNFLOWER

The Delta Brick & Tile Co. mined 14,000 short tons of miscellaneous clays valued at \$4,200 for use in manufacturing heavy clay products.

TABLE 9.—Miscellaneous clays sold or used by producers in Sunflower County, 1949-53

Year	Short tons	Value	Year	Short tons	Value
1949.....	10,040	\$7,530	1952.....	12,645	\$12,645
1950.....	20,000	15,000	1953.....	13,950	4,185
1951.....	12,750	12,750			

TIPPAH

The Wyondotte Chemicals Corp. mined 12,500 short tons of fuller's earth valued at \$523,000 from its Blue Mountain mine.

TUNICA

The Corps of Engineers, United States Army, mined 154,800 short tons of paving sand valued at \$116,100 from its Tunica County pit.

WASHINGTON

The Greenville Gravel Co., Greenville, mined 69,200 short tons of building sand valued at \$86,500, 25,100 short tons of building gravel valued at \$40,100, and 155,700 short tons of paving gravel valued at \$194,700 from its Greenville pit. In addition, the Corps of Engineers, Vicksburg district, mined a considerable tonnage of building sand.

WINSTON

The Louisville mine of the Stewart Pottery Co. produced a small tonnage of fire clay.

The Mineral Industry of Missouri

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of Missouri.

By F. F. Netzeband,¹ G. A. Muilenburg,² E. S. Smith,²
and W. G. Diamond³



THE VALUE of mineral production in Missouri declined 8 percent in 1953 to \$128 million, owing primarily to a drop in lead and zinc metal prices (table 1). Missouri was the ranking lead-producing State in the Nation for the 46th consecutive year, the second largest producer of barite, and third largest producer of fire clay. Substantial quantities of cement, coal, lime, sand and gravel, stone, and zinc were also produced in the State in 1953. Metal mining centered in the southeastern lead belt of St. Francois and Madison Counties, in the southwestern zinc-lead area of Jasper and Newton Counties, and in south central counties. Nonmetallic mining was widely distributed south of the Missouri River. All nonmetallic minerals except granite were produced from sedimentary deposits, mostly from limestones, sandstones, and shales. Nonmetallic mineral production accounted for 62 percent of the total mineral value, metallic mineral production for 30 percent, and mineral fuels for 8 percent. Mineral production was reported from 96 of the 115 counties in the State with the 5 most productive counties in the order of value: St. Francois, St. Louis, Jackson, Madison, and Cape Girardeau.

CONSUMPTION AND MARKETS

The mineral industries of Missouri processed much of their raw material into finished and semifinished products for both intra- and inter-state consumption. Lead concentrates produced in Missouri were smelted at the lead smelter at Herculanum; silica glass sand was used for making glass; limestone, dolomite, clay, and shales were used for cement, lime, brick, and heavy clay products; stone for building and monuments; and crushed stone, sand, and gravel for concrete, ballast, and road surfacing.

Both furnaces at the Herculanum smelter of St. Joseph Lead Co. were down for repair during August. One furnace was blown in during September, the other in October.

The St. Joseph Lead Co. completed preliminary development and installation of equipment at its new Indian Creek property late in 1953

¹ Commodity-industry analyst, Region VI, Bureau of Mines, Amarillo, Tex.

² Geologist, Missouri Geological Survey, Rolla, Mo.

³ Statistical clerk, Region VI, Bureau of Mines, Amarillo, Tex.

TABLE 1.—Mineral production in Missouri, 1952-53¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Barite.....	304,080	\$2,919,795	330,763	\$3,338,395
Cement..... 376-pound barrels..	10,086,850	25,523,038	9,860,179	26,238,460
Clays.....	2,991,019	12,098,420	2,231,596	11,182,096
Coal.....	2,954,450	12,048,141	2,393,304	9,848,903
Copper (recoverable content of ores, etc.).....	2,576	1,246,784	2,374	1,362,676
Iron ore (usable)..... long tons, gross weight..	268,218	(²)	274,693	(²)
Lead (recoverable content of ores, etc.).....	129,245	41,616,890	125,895	32,984,490
Lime (open-market).....	1,130,970	11,326,941	1,212,107	12,084,130
Natural gas..... million cubic feet..	16	3,000	15	3,000
Petroleum (crude)..... thousand 42-gallon barrels..	21	(²)	³ 39	(²)
Sand and gravel.....	6,790,422	6,122,195	5,792,058	5,233,999
Silver (recoverable content of ores, etc.)..... troy ounces..	517,432	468,302	359,781	325,620
Stone (except limestone for cement and lime).....	15,106,544	20,676,958	413,942,531	4 19,908,540
Zinc (recoverable content of ores, etc.).....	13,986	4,643,352	9,981	2,295,630
Undistributed: Native asphalt, manganese ore (1953), ground sand and sandstone, stone (dimension marble, 1953), tripoli, and minerals whose value must be con- cealed for particular years (indicated in appropriate column by footnote reference 2). Excludes value of clays used for cement.....		⁵ 2,283,550		3,491,361
Total Missouri.....		140,977,000		128,297,000

¹ Production as measured by mine shipments, sales (including consumption by producers), or marketable production.

² Value included with "Undistributed."

³ Final figure. Supersedes preliminary figure given in commodity chapter.

⁴ Excludes certain stone, value for which is included with "Undistributed."

⁵ Revised figure.

and planned to be in production in early 1954. Several operating innovations were new to the area, such as:

1. A circular, three-compartment, concrete-lined shaft. Steel pipe embedded in the concrete wall serves for compressed-air and water lines and electric feeder cables. The service compartment is large enough for lowering shuttle cars, ramps, and other trackless equipment.

2. Electronically operated automatic skip loading from ore pocket.

3. Indexing device on drill jumbos, providing standard drill pattern.

4. Electrically driven, rubber-tired scraper loaders mounted with steel ramps. The company installed a 40-inch impact crusher underground in its Hayden Creek mine, which crushed the ore to minus 4 inches.

Mine Mills, Smelters, and Reduction Works.—Twelve mine mills were operating in Missouri in January 1953—6 in southeastern Missouri and 6 in southwestern Missouri. Four mills in southwestern Missouri closed before the year end because of low metal prices. St. Joseph Lead Co. operated four mills in St. Francois County—Federal, Bonne Terre, Desloge, and Leadwood—and completed construction of its new Indian Creek mill in Washington County. Mine La Motte Corp. operated its Mine La Motte mill in Madison County. National Lead Co. operated its Madison mill all year. Construction continued on the nickel-cobalt recovery plant of National Lead Co., with initial production expected in 1954. This plant will employ a new chemical method for metal recovery.

TABLE 2.—Defense Minerals Exploration Administration contracts active during 1953

Operator	Property	Location	Mineral	Total contract	Actual Government participation	Certification of discovery
National Lead Co.....	Mill Creek, John Newcum, U. S., Castor Creek, Liberty, Higdon, and Turkey Creek areas.	Fredericktown district, Tps. 32, 33, and 34 N., Rs. 6, 7, and 8, E., Madison and Bollinger Counties.	Lead, copper, cobalt, nickel.	1 \$391,540.30	2 \$251,436.76	Nov. 12, 1953.
Dale Mining Co.....	Patterson and Clark tracts.....	North part of sec. 30, T. 25 N., R. 30 W., Newton County.	Zinc, lead.....	15,552	3 6,541.80	Active.

1 Completed June 1953.
 2 Final \$22,826.64 being withheld.
 In progress.

REVIEW BY MINERAL COMMODITIES

METALS

The 1953 mine production of metallic minerals in Missouri, except iron ore, decreased both in output and value compared with 1952. A decline of lead and zinc metal prices was responsible for most of the decrease. Metals were produced in 11 counties of the State in 1953.

Cadmium, Germanium, Indium, and Gallium.—These minor metals occur as trace elements in the lead-zinc ores of Missouri and were recovered as byproducts from flue dusts of the zinc-smelting operations. It was impossible to determine the quantities of these metals recovered from Missouri, since the accumulated flue dusts recovered at smelters were from mixed domestic and imported concentrates, and accurate analyses were not made. Curtailments of zinc-smelting operations in other States during the latter part of 1953 affected the germanium output. The lead and zinc ores of Missouri contain small quantities of germanium, some of which was recovered from flue dusts of zinc smelters in other States that received Missouri concentrates.

Copper.—Missouri output of recoverable copper in 1953 was 2,374 short tons compared with 2,576 short tons in 1952, an 8-percent decrease (table 6). Recovery was limited to the lead-copper ores of Madison County, with a small quantity reported from St. Francois County. National Lead Co. was the major producer; St. Joseph Lead Co. also reported a small quantity. The controlled price of copper on January 1 was 24.5 cents a pound for electrolytic copper delivered Connecticut Valley. Prices were decontrolled late in February and immediately rose to a range of 27.5 to 34.5 cents per pound. By the end of April domestic copper prices had settled to a range of 29.5 to 30 cents. The three leading producers continued to quote 30 cents beyond the end of the year, with other sellers quoting that price or slightly less.

Iron Ore.—Missouri iron-ore mines and pits produced 274,000 long tons of usable ore in 1953, a slight increase over 1952 production. Production originated in eight counties; St. Francois was the leading county and the Ozark Ore Co. the largest producer. The Ozark Ore Co. abandoned its open-pit operations during 1953 because of depleted ore reserves but increased its underground output to compensate for this loss. The open pit had yielded a siliceous ore averaging 30 to 35 percent iron, which was concentrated in a jigging plant to raise the iron content to around 55 percent iron.

Lead.—The mine production of recoverable lead in Missouri in 1953 showed a 3-percent drop in quantity and a 21-percent drop in value compared with 1952 (table 6). As the principal lead-producing State in the Nation, Missouri contributed 125,900 short tons of recoverable lead—37 percent of the 1953 domestic output. St. Joseph Lead Co. was the leading producer, and its Federal mine in St. Francois County had the largest lead output of any mine in the Nation in 1953. South-eastern Missouri supplied over 98 percent of the State recoverable lead output and Southwestern Missouri the remainder. Mine output originated in five counties, with St. Francois producing about 90 percent of the total. The five leading producers in Missouri were: St. Joseph Lead Co., Mine La Motte Corp., National Lead Co., Potter-Sims Mines, Inc., and American Zinc, Lead & Smelting Co.

Lead-metal price varied through a narrow range in 1953, opening at 14.75 cents a pound on January 1, dropping to 14.50 cents on January 7, then fluctuating downward to 12.00 cents in April, and rising to 13.50 cents in September, where it steadied for the rest of the year. Lead concentrate prices on the Joplin, Mo., market varied from a high of \$184.50 per ton in January to a low of \$144.90 in April and closed at \$166.50 (table 13).

National Lead Co. completed a DMEA exploration contract that resulted in a discovery certification.

TABLE 3.—Prices of silver, copper, lead, and zinc, 1949–53

Year	Silver (per fine ounce)	Copper (per pound)	Lead (per pound)	Zinc (per pound)	Year	Silver (per fine ounce)	Copper (per pound)	Lead (per pound)	Zinc (per pound)
1949.....	\$0.905+	\$0.197	\$0.158	\$0.124	1952.....	\$0.905+	\$0.242	\$0.161	\$0.166
1950.....	.905+	.208	.135	.142	1953.....	.905+	.287	.131	.115
1951.....	.905+	.242	.173	.182					

Manganese.—A small quantity of manganese ore was recovered from an exploration project in Shannon County, Mo., in 1953, the first reported production in the State for several years.

Silver.—Silver recovery in Missouri in 1953 was 359,800 troy ounces, which, at the Treasury price of \$0.905+ per ounce, was valued at \$325,600 compared with 517,400 troy ounces valued at \$468,300 in 1952. This silver was recovered from base bullion smelted from lead and lead-copper concentrates of the Southeastern Missouri region.

Zinc.—Mine production of recoverable zinc in Missouri decreased 29 percent in quantity to 10,000 short tons and 51 percent in value to \$2,296,000 in 1953 compared with 1952. The loss, both in quantity and value, was primarily due to reduced zinc-metal prices following decontrol of Government price ceilings. The Southwestern Missouri region accounted for 68 percent of the output, and the Southeastern Missouri region supplied the remainder. American Zinc, Lead & Smelting Co. was the largest producer, followed by St. Joseph Lead Co., Dale Mining Co., and Potter-Sims Mines, Inc. Production originated in 3 counties, with Jasper County responsible for nearly 50 percent of the output.

TABLE 4.—Mine production of silver, copper, lead, and zinc in 1953, by months, in terms of recoverable metals

Month	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)	Month	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January.....	30,107	170	10,535	1,027	August.....	29,495	165	10,321	964
February.....	28,521	223	9,980	1,128	September.....	29,532	225	10,334	766
March.....	31,039	191	10,861	838	October.....	30,758	248	10,763	721
April.....	31,867	185	11,151	920	November.....	28,150	203	9,850	565
May.....	30,284	170	10,597	945	December.....	27,600	192	9,658	516
June.....	30,918	195	10,819	872					
July.....	31,510	207	11,026	719					
					Total: 1953.....	359,781	2,374	125,895	9,981
					1952.....	517,432	2,576	129,245	13,986

TABLE 5.—Mine production of silver, copper, lead, and zinc, 1944-48 (average), 1949-53, and total 1860-1953, in terms of recoverable metals

Year	Mines producing	Material sold or treated		Silver		Copper	
		Crude ore (short tons)	Old tailings (short tons)	Fine ounces	Value	Short tons	Value
1944-48 (average).....		7,057,128	612,176	92,851	\$75,431	2,538	\$835,744
1949.....	60	5,981,312	1,417,098	123,413	11,695	3,670	1,445,980
1950.....	68	6,384,138	1,036,002	236,273	213,839	2,982	1,240,512
1951.....	54	6,499,122	1,574,379	184,424	166,913	2,422	1,172,248
1952.....	67	7,128,550	1,750,818	517,432	468,302	2,576	1,246,784
1953.....	28	6,674,300	1,483,157	359,781	325,620	2,374	1,362,676
1860-1953.....		(1)	(1)	5,791,107	4,380,723	37,827	13,742,062

Year	Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	
1944-48 (average).....	144,981	\$32,670,510	20,914	\$4,945,428	\$38,527,113
1949.....	127,522	40,296,952	5,911	1,465,928	43,320,555
1950.....	134,626	36,349,020	8,189	2,325,676	40,129,047
1951.....	123,702	42,800,892	11,476	4,177,264	48,317,317
1952.....	129,245	41,616,890	13,986	4,643,352	47,975,328
1953.....	125,895	32,984,490	9,981	2,295,630	36,968,416
1860-1953.....	9,075,183	1,206,338,370	3,690,437	488,468,709	1,712,929,864

¹ Data not available.

TABLE 6.—Mine production of silver, copper, lead, and zinc in 1953, by classes of ore or other sources of material, in terms of recoverable metals

Source	Number mines	Material sold or treated (short tons)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
Lead ore ¹	10	7,681,316	359,781	2,374	125,418	3,200
Zinc ore.....	14	438,057	-----	-----	221	6,239
Zinc-lead ore.....	4	38,084	-----	-----	256	542
Total.....	28	8,157,457	359,781	2,374	125,895	9,981

¹ Includes lead-copper ore from one mine; also 1,483,157 tons of old tailing remilled, concentrates from which were mixed with those from crude ore.

The Frost Mining Ventures of Joplin, Mo., planned to erect a 150-ton ore mill in the Alba-Neck City district.

The Alice mine in Howell County, an oldtime zinc producer, was reopened by Mid-Continent Mining Co. Construction of a gravity-float mill was also started.

Zinc-metal prices declined markedly during 1953, resulting in curtailment and shutdowns of many Missouri zinc mines. The metal market opened at 12.5 cents a pound, advanced to 13 cents on January 2, then gradually declined to 10 cents in September, where it held for the rest of the year. Zinc-concentrate price on the Joplin, Mo., market opened at \$84.00 per ton, rose to \$87.00 a ton on January 8, then gradually slumped to \$56.00 a ton on September 11, where it remained through December (table 13).

TRI-STATE DISTRICT

The Tri-State district of southwestern Missouri, Oklahoma, and Kansas produced 3,455,000 short tons of crude ore, which yielded 17,400 short tons of lead concentrate containing 13,300 short tons of recoverable lead valued at \$3,478,000 and 102,800 short tons of zinc concentrate containing 55,700 short tons of recoverable zinc valued at \$12,818,000. District lead-concentrate production in 1953 was down 52 percent and zinc-concentrate output 39 percent from 1952. Southwestern Missouri supplied 5 percent of the lead concentrate and 12 percent of the zinc concentrate produced in the Tri-State district in 1953, Oklahoma 70 percent of the district lead and 60 percent of its zinc concentrate, and Kansas 25 percent of the district lead and 28 percent of its zinc concentrate.

There were 194 mines operating in the Tri-State district in 1953—22 in southwestern Missouri, 120 in Oklahoma, and 52 in Kansas. This number was reduced to 40 mines by late December, as metal prices continued the decline begun in 1952. There were 18 district mine mills operating at the beginning of 1953—6 in southwestern Missouri, 9 in Oklahoma, and 3 in Kansas; but only 8 were active at the close of the year—2 in southwestern Missouri, 5 in Oklahoma, and 1 in Kansas.

TABLE 7.—Mine production of lead and zinc in southeastern and central Missouri, 1944-48 (average), and 1949-53, in terms of concentrates and recoverable metals ¹

Year	Lead concentrate (galena)		Zinc concentrate (sphalerite) ²		Recoverable metal content ³			
	Short tons	Value ⁴	Short tons	Value	Lead		Zinc	
					Short tons	Value	Short tons	Value
1944-48 (average) ----	201,387	\$25,125,236	1,480	\$58,113	141,636	\$31,989,996	⁵ 774	\$186,792
1949-----	179,725	32,665,768	1,074	79,347	126,269	39,901,004	⁶ 749	185,752
1950-----	191,439	28,522,322	2,742	260,600	133,680	36,093,600	⁶ 1,546	439,064
1951-----	176,764	32,484,309	4,475	509,658	122,318	42,322,028	⁷ 2,277	828,828
1952-----	178,746	33,325,589	5,703	637,709	122,942	39,587,324	⁷ 3,872	1,285,504
1953-----	182,418	26,622,152	5,369	347,482	125,273	32,821,526	⁷ 3,180	731,400

¹ Based on southeastern and central Missouri ore ("dirt") and old tailings treated at mills during calendar year indicated.

² Includes zinc-lead carbonate concentrates.

³ In calculating metal content of the ores from assays allowance has been made for smelting losses of both lead and zinc. In comparing the values of concentrate ("ore") and metal it should be borne in mind that the value given for the concentrate is that actually received by the producer, whereas the value of the lead and zinc is calculated from the average price for all grades.

⁴ Values given are to a certain extent arbitrary, as part of the lead concentrate is smelted by the producer.

⁵ Includes zinc recovered from lead-smelter slag.

⁶ Includes zinc recovered from lead-smelter byproducts.

⁷ Includes zinc recovered from byproduct matte from lead smelting as follows: 1951, 138 tons; 1952, 900 tons; 1953, 327 tons.

TABLE 8.—Mine production of lead and zinc in southwestern Missouri, 1944-48 (average) and 1949-53, in terms of concentrates and recoverable metals ¹

Year	Lead concentrate				Zinc concentrate			
	Galena		Carbonate		Sphalerite		Silicate	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1944-48 (average).....	4, 122	\$650, 363	78	\$11, 651	37, 540	\$4, 161, 243	843	\$67, 061
1949.....	1, 574	340, 038	14	1, 618	9, 667	774, 272	20	777
1950.....	1, 199	189, 224	34	3, 623	12, 122	1, 090, 592	100	6, 537
1951.....	1, 767	423, 857	-----	-----	17, 370	2, 074, 867	-----	-----
1952.....	8, 113	1, 701, 121	-----	-----	18, 671	2, 138, 108	-----	-----
1953.....	791	135, 603	-----	-----	12, 257	849, 141	-----	-----

Year	Recoverable metal content ²			
	Lead		Zinc	
	Short tons	Value	Short tons	Value
1944-48 (average).....	3, 145	\$680, 514	20, 140	\$4, 758, 636
1949.....	1, 253	395, 948	5, 162	1, 280, 176
1950.....	944	254, 880	6, 591	1, 871, 844
1951.....	1, 384	478, 864	9, 199	3, 348, 436
1952.....	6, 303	2, 029, 566	10, 114	3, 357, 848
1953.....	622	162, 964	6, 801	1, 564, 230

¹ Based on southwestern Missouri ore ("dirt") and old tailings treated at mills during the calendar year indicated.

² In calculating metal content of the ores from assays allowance has been made for smelting losses of both lead and zinc. In comparing the values of concentrate ("ore") and metal, it should be borne in mind that the value given for the concentrate is that actually received by the producer, whereas the value of the lead and zinc is calculated from the average price for all grades.

TABLE 9.—Tenor of lead and zinc ore, old tailings and slimes milled and concentrates produced in 1952-53, by districts

	Southeastern Missouri		Southwestern Missouri	
	1952	1953	1952	1953
	Crude ore ¹	Crude ore ¹	Crude ore	Crude ore
Total ore, etc., milled.....short tons....	7, 899, 424	7, 674, 491	979, 944	482, 996
Total concentrate produced:				
Lead.....do.....	178, 746	182, 418	8, 113	791
Zinc.....do.....	5, 703	5, 369	18, 671	12, 257
Ratio of concentrate to ore, etc.:				
Lead.....percent.....	2.26	2.38	0.83	0.16
Zinc.....do.....	0.07	0.07	1.91	2.54
Metal content of ore, etc.: ²				
Lead.....do.....	1.56	1.62	0.64	0.13
Zinc.....do.....	0.05	0.04	1.03	1.41
Average lead content of galena concentrate.....do.....	70.21	70.12	79.28	80.03
Average zinc content of sphalerite concentrate.....do.....	57.90	59.04	60.21	61.66
Average value per ton:				
Galena concentrate.....	\$186.44	\$145.94	\$209.68	\$171.43
sphalerite concentrate.....	111.82	64.72	114.51	69.28

¹ Includes lead-copper ore and old tailings remilled: 1952, 1,750,818 tons; 1953, 1,483,157 tons.

² Figures represent metal content of crude ore only insofar as it is recovered in the concentrates; data on tailing losses not available.

TABLE 10.—Mine production of lead and zinc in Southeastern and Southwestern districts in 1953, by months, in terms of recoverable metals

Month	Southeastern Missouri		Southwestern Missouri		Month	Southeastern Missouri		Southwestern Missouri	
	Lead (Short tons)	Zinc (Short tons)	Lead (Short tons)	Zinc (Short tons)		Lead (Short tons)	Zinc (Short tons)	Lead (Short tons)	Zinc (Short tons)
January.....	10, 317	229	218	798	August.....	10, 317	378	4	586
February.....	9, 820	272	160	856	September.....	10, 282	298	52	468
March.....	10, 796	260	65	578	October.....	10, 750	382	13	339
April.....	11, 129	260	22	660	November.....	9, 848	178	2	387
May.....	10, 876	274	21	671	December.....	9, 636	61	22	455
June.....	10, 807	324	12	548	Total.....	125, 273	3, 180	622	6, 801
July.....	10, 995	264	31	455					

TABLE 11.—Mine production of lead and zinc concentrates in the Tri-State district (Kansas, Oklahoma, and southwestern Missouri), 1944-48 (average) and 1949-53

Year	Lead concentrate (galena)		Zinc concentrate (sphalerite)		Recoverable metal content			
					Lead		Zinc	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1944-48 (average)...	33, 459	\$5, 566, 226	247, 357	\$26, 266, 556	25, 224	\$6, 049, 119	132, 552	\$31, 673, 364
1949.....	41, 471	7, 824, 788	147, 178	11, 445, 018	30, 883	9, 759, 028	78, 628	19, 499, 744
1950.....	40, 714	6, 245, 660	150, 019	13, 934, 927	31, 157	8, 412, 390	80, 558	22, 878, 472
1951.....	36, 300	7, 720, 550	170, 263	21, 023, 818	26, 906	9, 309, 476	91, 553	33, 325, 292
1952.....	36, 333	7, 388, 754	167, 474	19, 537, 949	27, 356	8, 808, 632	90, 512	30, 049, 984
1953:								
Kansas.....	4, 399	665, 189	28, 668	2, 064, 783	3, 347	876, 914	15, 515	3, 568, 450
SW. Mo.....	791	135, 603	12, 257	849, 141	622	162, 964	6, 801	1, 564, 230
Oklahoma.....	12, 213	1, 915, 195	61, 896	4, 541, 616	9, 304	2, 437, 648	33, 413	7, 684, 990
Total 1953...	17, 403	2, 715, 987	102, 821	7, 455, 540	13, 273	3, 477, 526	55, 729	12, 817, 670

TABLE 12.—Quoted prices of 60-percent zinc concentrate and 80-percent lead concentrate at Joplin, Mo., in 1953

[E&MJ Metal & Mineral Markets]

Zinc concentrate		Lead concentrate	
Period	Price per short ton	Period	Price per short ton
Jan. 1-Jan. 7.....	\$84.00	Jan. 1-Jan. 7.....	\$184.50
Jan. 8-Jan. 15.....	87.00	Jan. 8-Jan. 29.....	173.70
Jan. 16-Jan. 29.....	84.00	Jan. 30-Apr. 2.....	166.50
Jan. 30-Feb. 5.....	80.00	Apr. 3-Apr. 16.....	159.30
Feb. 6-Mar. 5.....	70.00	Apr. 17-Apr. 30.....	144.90
Mar. 6-Sept. 3.....	65.00	May 1-May 14.....	152.10
Sept. 4-Sept. 10.....	60.00	May 15-May 21.....	159.30
Sept. 11-Dec. 31.....	56.00	May 22-June 18.....	162.90
		June 19-July 16.....	166.50
		July 17-July 23.....	170.10
		July 24-Sept. 17.....	173.70
		Sept. 18-Dec. 31.....	166.50

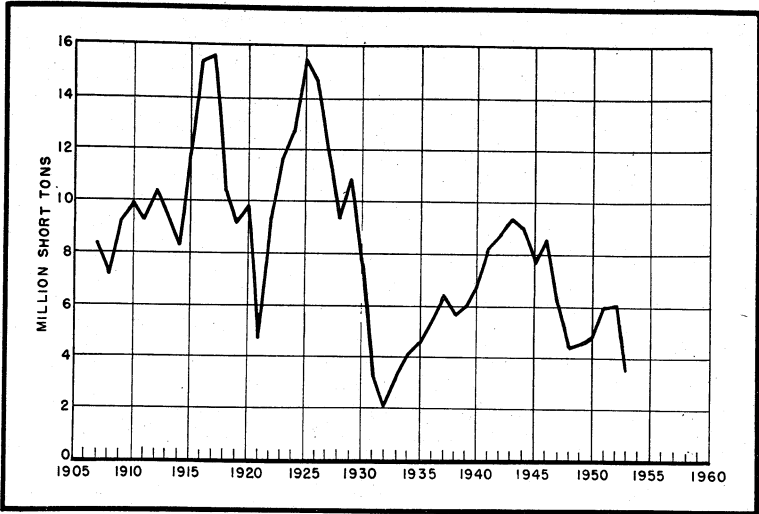


FIGURE 1.—Quantity of crude ore (rock) milled in the Tri-State district, 1907-53.

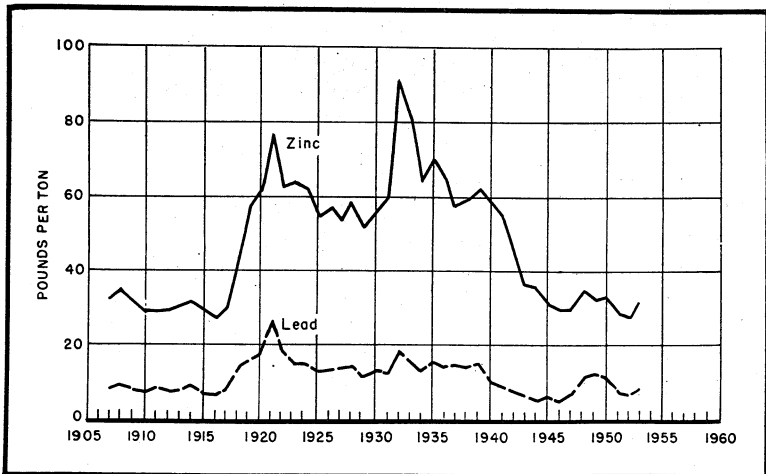


FIGURE 2.—Metal recovered per ton of crude ore (rock) milled in the Tri-State district, 1907-53.

NONMETALS

Missouri was an important source of a number of nonmetallic minerals in 1953. Total value of nonmetals was \$78,132,519, more than 60 percent of the State's total mineral value. Nonmetal mineral production was reported in 92 counties.

Barite.—Crude barite production was reported from Washington, Miller, and Morgan Counties in 1953. Barite washing and grinding plants were active in Washington, Morgan, and St. Louis Counties.

Barite sold or used in 1953 amounted to 330,800 tons with an

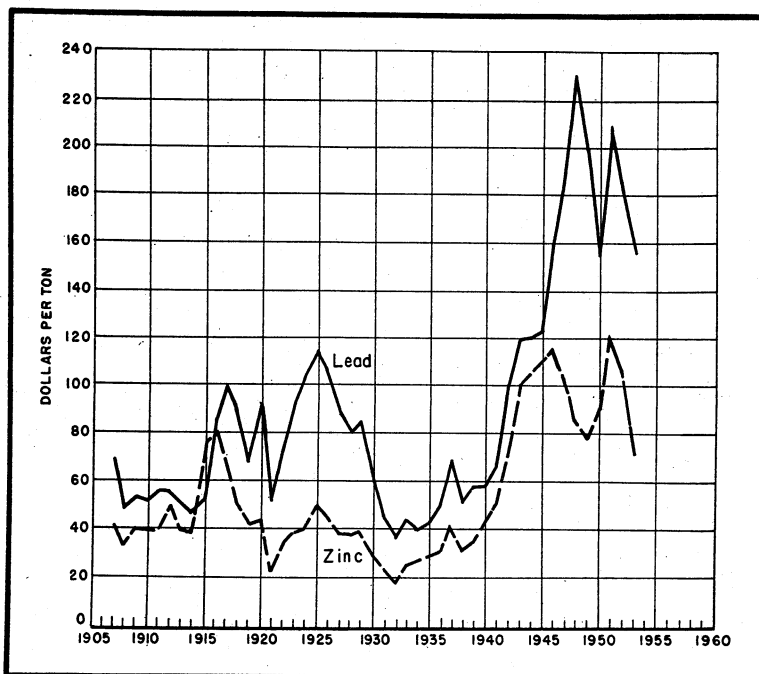


FIGURE 3.—Average prices received by sellers per ton of concentrate in the Tri-State district, 1907-53.

TABLE 13.—Tenor of ore and concentrates in Tri-State district, 1949-53

	1949	1950	1951	1952	1953
Total material milled:					
Crude ore..... short tons.....	4,470,778	4,700,698	5,990,100	6,140,155	3,454,980
Tailings and slimes..... do.....	1,602,620	967,926	746,673	604,350	-----
Ratio of concentrate to material milled:					
Lead..... percent.....	0.68	0.72	0.54	0.54	0.50
Zinc..... do.....	2.42	2.65	2.53	2.48	2.98
Metal content of material milled:					
Lead..... do.....	0.51	0.55	0.40	0.41	0.38
Zinc..... do.....	1.29	1.42	1.36	1.34	1.61
Average lead content of galena concentrate..... percent.....	75.98	78.08	75.62	76.79	77.81
Average zinc content of sphalerite concentrate..... percent.....	59.36	59.66	59.74	60.04	60.22
Average value per ton:					
Galena concentrate.....	\$188.68	\$153.40	\$212.69	\$203.36	\$156.06
Sphalerite concentrate.....	77.76	92.89	123.48	116.66	72.51

estimated value of \$3,338,000. Washington County produced well over 90 percent of the total tonnage.

Barite occurs primarily in residual clays derived from the weathering of the Potosi and Eminence formations in Washington County and in filled sinks in the Jefferson City and Gasconade formations in Miller and Morgan Counties. It was recovered by removing the clay in log washers and then jigging, or passing the washed concentrate through a trommel to separate the barren rock fragments from the barite.

TABLE 14.—Barite sold or used by producers, 1944-48 (average) and 1949-53

Year	Short tons	Value		Year	Short tons	Value	
		Total	Average per ton			Total	Average per ton
1944-48 (average)	243,351	\$1,990,151	\$8.18	1951	281,895	\$2,697,200	\$9.57
1949	186,891	1,497,985	8.02	1952	304,080	2,919,795	9.60
1950	212,736	1,924,520	9.05	1953	330,763	3,338,395	10.09

Cement.—Portland cement was manufactured in St. Louis, Ralls, Cape Girardeau, and Jackson Counties, with production totaling 10,281,000 barrels. Shipments were 9,860,000 barrels valued at \$26,238,000 distributed among 15 States besides Missouri.

Raw materials used in the manufacture of cement included a reported 2,285,000 tons of crushed limestone, 348,300 tons of shale and clay, 34,500 tons of gypsum, and 23,100 tons of flue dust, mill scale, and resin.

TABLE 15.—Production and shipments of portland cement, 1949-53, in 376-pound barrels

Year	Production (barrels)	Shipments			Year	Production (barrels)	Shipments		
		Barrels	Value	Average per barrel			Barrels	Value	Average per barrel
1949	8,791,943	8,518,636	\$19,347,814	\$2.27	1952	10,007,609	10,086,850	\$25,523,038	\$2.53
1950	9,777,855	9,779,657	22,751,226	2.33	1953	10,281,230	9,860,179	26,238,460	2.66
1951	10,203,449	10,217,421	25,760,473	2.52					

Clays.—Missouri has extensive and widely distributed clay deposits. The clays were used principally in manufacturing cement, building, face, and refractory brick, refractory shapes and cement; structural, hollow, and drain tile; sewer pipe; lightweight aggregate; and pottery wares of all types.

Fire clay was produced in the following Missouri counties: Audrain, Boone, Callaway, Montgomery, Monroe, Pike, Cole, Crawford, Franklin, Gasconade, Maries, Miller, Moniteau, Morgan, Osage, Phelps, and St. Louis. Miscellaneous clays and shale were produced in Buchanan, Cape Girardeau, Cass, Jackson, Lafayette, Livingston, Platte, St. Louis, and Vernon Counties.

The total quantity of clay sold and used in 1953 was 2,232,000 tons with an estimated value of \$11,182,000.

Lime.—There were 7 lime plants active in the State in 1953, 2 in Greene County and 1 each in Barry, Marion, Newton, St. Francois, and Ste. Genevieve Counties.

The plant in St. Francois County produced a "dead-burned" dolomite used by the steel industry as a refractory in basic open hearth furnaces; the other five plants produced a high-calcium lime of both the quick and hydrated types.

TABLE 16.—Clays sold or used by producers, 1944-48 (average) and 1949-53, by kinds

Year	Fire clay		Diaspore		Burley	
	Short tons	Value	Short tons	Value	Short tons	Value
1944-48 (average).....	1, 150, 680	\$2, 635, 946	40, 896	\$344, 378	44, 688	\$170, 137
1949.....	1, 133, 357	3, 136, 207	35, 359	398, 885	32, 432	204, 850
1950.....	1, 126, 855	3, 208, 584	40, 750	488, 464	53, 571	334, 299
1951.....	1, 453, 721	8, 249, 535	45, 020	704, 151	73, 781	745, 032
1952.....	1, 734, 612	9, 089, 960	44, 757	705, 269	71, 433	664, 353
1953.....	1, 392, 022	8, 562 318	50, 144	962, 384	53, 971	563, 043

Year	Miscellaneous		Total	
	Short tons	Value	Short tons	Value
1944-48 (average).....	438, 409	\$291, 477	1, 674, 673	\$3, 441, 938
1949.....	618, 914	473, 643	1, 820, 062	4, 213, 585
1950.....	725, 551	624, 921	1, 946, 727	4, 656, 208
1951.....	782, 335	859, 720	2, 354, 857	10, 558, 438
1952.....	1, 140, 217	1, 638, 833	2, 991, 019	12, 098, 420
1953.....	735, 459	1, 094, 351	2, 231, 596	11, 182, 096

Total production for the year was 1,212,000 short tons valued at \$12,084,000. Producers reported shipping their product to 39 States and 2 foreign countries. The raw materials—limestone and dolomite—were obtained from quarries near the plant sites.

TABLE 17.—Lime (quick and hydrated) sold by producers, 1944-48 (average) and 1949-53

Year	Quick-lime (short tons)	Hydrated lime (short tons)	Total lime		Year	Quick-lime (short tons)	Hydrated lime (short tons)	Total lime	
			Short tons	Value				Short tons	Value
1944-48 (average).....	667, 134	205, 085	872, 219	\$6, 557, 570	1951.....	930, 132	192, 167	1, 122, 299	\$11, 285, 877
1949.....	723, 935	154, 626	878, 561	8, 035, 117	1952.....	949, 572	181, 398	1, 130, 970	11, 326, 941
1950.....	853, 728	181, 448	1, 035, 176	9, 447, 669	1953.....	1, 006, 393	205, 714	1, 212, 107	12, 084, 130

Perlite.—Crude perlite is not known to occur in Missouri; however, in 1953 a plant in St. Louis, using crude rock from deposits in the Western States, produced expanded perlite for use mainly as a light-weight aggregate.

Sand and Gravel.—Sand and gravel for building and highway construction was obtained primarily from stream deposits scattered throughout the State. High-purity silica sand, used in the manufacture of glass and for other special purposes, was obtained from the St. Peter formation in Jefferson, St. Charles, and St. Louis Counties. Much of it was produced by underground mining methods.

The total sand and gravel production for the year was 5,792,000 short tons valued at \$5,234,000. This total includes 717,800 tons of high-purity silica sand valued at \$1,696,000 and 859,400 tons of sand and gravel produced by State, county, and municipal crews for use on their own road projects.

TABLE 18.—Sand and gravel sold or used by producers, 1944-48 (average) and 1949-53

Year	Commercial operations		Government-and-contractor operations		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1944-48 (average).....	3,896,819	\$3,360,750	1,452,466	¹ \$202,205	4,349,285	\$3,562,955
1949.....	4,458,246	3,907,405	735,426	439,276	5,193,672	4,346,681
1950.....	5,316,073	4,812,518	916,338	455,421	6,232,411	5,267,939
1951.....	6,027,503	5,419,034	782,354	550,815	6,809,857	5,969,849
1952.....	5,695,296	5,417,628	1,095,126	704,567	6,790,422	6,122,195
1953.....	4,932,617	4,770,451	859,441	463,548	5,792,058	5,233,999

¹ Average of 1944-46, and 1948.

Stone.—Missouri had an important raw commodity in its various types of stone. The stone produced included granite, marble, sandstone, limestone, dolomite, and miscellaneous stone. It was marketed as both crushed and dimension stone.

Of the 115 counties in Missouri, 78 reported some kind of stone production, with 5 counties—Andrew, Clay, Jackson, St. Francois, and St. Louis—producing over 500,000 tons of stone each. This did not include stone quarried for use in cement manufacture and lime burning or chats produced from mining operations. Jackson County led in overall stone production, with 2,237,000 tons valued at \$3,330,000.

TABLE 19.—Stone sold or used by producers in Missouri in 1949-53, by kinds

Year	Granite		Marble		Limestone	
	Short tons	Value	Short tons	Value	Short tons	Value
1949.....	6,910	\$176,902	6,330	\$672,711	8,379,320	\$12,444,046
1950.....	4,490	161,935	13,170	743,135	8,923,470	12,981,437
1951.....	7,834	168,607	(²)	(²)	8,856,795	13,532,757
1952.....	11,618	149,196	(²)	(²)	12,709,705	18,877,717
1953.....	5,882	164,792	(²)	(²)	12,727,029	18,924,418

Year	Sandstone		Miscellaneous stone ¹		Total stone	
	Short tons	Value	Short tons	Value	Short tons	Value
1949.....	92,800	\$241,083	1,077,410	\$434,266	9,562,720	\$13,969,008
1950.....	1,060	20,315	1,358,210	499,805	10,300,400	14,406,627
1951.....	(³)	(³)	2,418,307	909,222	11,294,227	15,255,427
1952.....	(³)	(³)	2,372,812	839,254	15,106,544	20,676,953
1953.....	10,972	23,413	1,191,819	731,423	13,942,531	19,908,540

¹ Chats; also includes small quantity of stone.

³ Figure withheld to avoid disclosing individual company operations.

Granite was quarried, cut, and polished near Graniteville, Iron County, and marketed as monumental and building stone. Limestone was quarried, cut, and polished near Phenix in Greene County and Carthage in Jasper County. It was marketed as marble and widely sold for use in both exterior and interior building construction. Asphaltic sandstone used in surfacing roads, parking lots, school playgrounds, etc., was quarried in Barton County. Jasper, St.

Francois, and Madison Counties produced a considerable tonnage of chats as a byproduct of lead-, zinc-, and iron-mining operations.

Total stone production for the year was reported at 13,943,000 tons valued at \$19,909,000. Of this total 1,889,000 tons valued at \$2,666,000 was crushed limestone and dolomite used for agricultural purposes.

MINERAL FUELS

Coal.—Bituminous-coal production of Missouri in 1953 decreased 19 percent from that in 1952 in quantity and 18 percent in value (table 3). The output—2,393,000 tons valued at \$9,849,000—originated in 19 counties, with Bates, Callaway, Henry, Macon, Randolph, and St. Clair Counties producing 92 percent of the total. Over 90 percent of the output was produced by open-pit methods. The industry worked an average of 158 days in 1953 with an average daily yield of 18,400 tons.

TABLE 20.—Coal production, 1944-48 (average) and 1949-53

Year	Short tons	Value	Year	Short tons	Value
1944-48 (average).....	4,150,621	\$12,570,477	1951.....	3,269,283	\$13,405,436
1949.....	3,647,456	14,919,384	1952.....	2,954,450	12,048,141
1950.....	2,963,081	12,369,000	1953.....	2,393,304	9,848,903

Natural Gas.—The production value of natural gas in 1953 was estimated to be \$3,000—approximately the same as in 1952.

Petroleum.—The volume of crude petroleum produced in Missouri in 1953 was insignificant, however, the output and value nearly doubled that in 1952.

REVIEW BY COUNTIES

Production of metallic and nonmetallic minerals and mineral fuels was reported in 96 of the 115 counties in Missouri in 1953.

ADAIR

Coal was produced in Adair County, the leading producers being the Billy Creek Coal Co., Inc., the Corrigan Coal Co., Inc., and the Blacksmith Coal Co., Inc.

ANDREW

Limestone was quarried and crushed by the G. W. Kerford quarry near Amazonia for agricultural and road-building purposes. Stone was quarried locally under contract to the United States Army Corps of Engineers for use in riprapping the banks of the Missouri River to maintain the proper channel.

AUDRAIN

Audrain County ranked second in the State in the production of clays. Plastic and flint fire clay and fire-clay products were produced in the Mexico, Farber, and Vandalia area. Producers included the

TABLE 21.—Value of mineral production in Missouri, 1952-53, by counties, and principal minerals produced in 1953

County	1952	1953	Principal minerals produced in 1953, in order of value
Adair	372,923	295,712	Coal.
Audrain	2,666,492	2,640,343	Clays, stone.
Barry	42,481	45,082	Lime, stone.
Barton	217,309	94,910	Coal, stone.
Bates	1,178,610	3,029,608	Coal, stone, sand and gravel.
Benton	21,800	35,000	Sand and gravel.
Boone	436,707	561,443	Stone, coal, clays.
Buchanan	296,151	338,555	Stone, sand and gravel, clays.
Butler	140,989	38,954	Sand and gravel, iron ore, stone.
Callaway	3,279,473	2,625,607	Clays, coal, stone.
Cape Girardeau	4,163,441	4,731,292	Cement, stone, sand and gravel.
Cass	250,087	340,363	Stone, clays.
Chariton	10,050	-----	-----
Clay	991,302	783,053	Stone, coal.
Cole	771,368	130,336	Sand and gravel, stone, barite.
Cooper	101,762	33,630	Stone, sand and gravel.
Dade	32,670	134,713	Stone, coal.
Daviess	174,298	141,987	Do.
Franklin	655,576	278,266	Stone, clays, sand and gravel
Gasconade	2,996,526	3,823,549	Clays, stone
Gentry	11,000	-----	-----
Greene	1,516,660	1,645,092	Lime, stone.
Harrison	252,753	224,288	Stone, coal.
Henry	3,010,060	2,795,832	Coal, stone.
Hickory	1,900	-----	-----
Howell	57,187	67,439	Iron ore, stone.
Jackson	6,358,391	6,398,607	Stone, cement, sand and gravel.
Jasper	5,888,599	3,278,556	Stone, zinc, sand and gravel
Jefferson	830,907	857,468	Sand and gravel, stone.
Johnson	258,344	1,095,704	Coal, stone.
Lafayette	229,346	255,962	Stone, coal, sand and gravel.
Lewis	292,083	356,933	Sand and gravel, stone.
Lincoln	317,451	285,680	Stone, clays.
Livingston	203,351	354,934	Stone, sand and gravel, clays.
Macon	2,767,227	2,569,291	Coal, stone.
Madison	6,324,053	5,424,006	Lead, copper, sand and gravel.
Maries	244,336	91,115	Clays.
Marion	533,196	567,837	Lime, stone, sand and gravel.
Miller	39,230	58,702	Sand and gravel, stone, barite.
Monroe	162,897	150,344	Clays, coal, stone.
Montgomery	1,238,710	848,791	Clays, stone, sand, and gravel.
Newton	2,190,321	779,165	Zinc, lime, stone.
Nodaway	25,000	-----	-----
Osage	651,118	539,256	Clays, stone, sand and gravel
Pettis	484,051	358,867	Stone, sand and gravel.
Platte	542,406	644,134	Clays stone.
Pulaski	25,950	-----	-----
Putnam	58,043	63,008	Coal.
Randolph	2,661,862	944,584	Coal, stone.
Ray	199,084	149,196	Stone, coal.
St. Charles	826,450	902,670	Sand and gravel, stone.
St. Clair	1,221,893	845,132	Coal, stone, sand and gravel.
St. Francois	40,293,539	35,228,783	Lead, stone, iron ore.
St. Louis	17,934,481	18,332,962	Cement, stone, sand and gravel.
Shannon	7,000	41,037	Iron ore, manganese, stone.
Vernon	481,131	276,411	Coal, sand and gravel, stone.
Warren	201,317	262,319	Clays, stone, sand and gravel.
Washington	2,955,774	3,293,647	Barite, lead.
Wayne	54,365	94,377	Sand and gravel, iron ore.
Webster	220,213	-----	-----
Various	62,000	561,112	Sand and gravel, barite, oil.
Undistributed ¹	20,543,702	17,551,356	-----
Total	140,977,000	128,297,000	-----

¹ Includes value of mineral production for the following counties: Andrew (stone), Caldwell (stone), Carroll (stone), Cedar (stone), Christian (stone), Clark (stone), Clinton (stone), Crawford (clays), DeKalb (stone), Dent (stone), Douglas (iron ore), Dunklin (sand and gravel), Grundy (stone), Holt (stone), Howard (stone, sand and gravel), Iron (stone), Knox (stone), Lawrence (stone), Linn (stone, coal), Mercer (stone), Moniteau (stone, clays), Morgan (barite, clays), Oregon (stone, iron ore), Ozark (iron ore), Pemiscot (sand and gravel), Perry (stone), Phelps (clays, stone), Pike (stone, clays), Polk (stone), Ralls (cement), Ripley (sand and gravel), St. Louis City (stone), St. Genevieve (lime, stone), Saline (stone), Scotland (stone), Scott (sand and gravel), Shelby (stone), Stoddard (sand and gravel), Sullivan (stone), Texas (stone), and Wright (stone).

A. P. Green Fire Brick Co., the Mexico Refractories Co., and the Laclede-Christy Co. The Molino Lime Co. and the Sulgrave Mining & Quarry Co. produced crushed limestone for agricultural and road-building purposes.

BARRY

Crushed limestone and lime were produced by G. F. Warner in Barry County.

BARTON

Asphaltic sandstone of Pennsylvanian age was mined near Iantha. It was used primarily in resurfacing and maintaining roads. Coal was produced by the Star Coal Co., the Barbero & Mullani coal mine, and the Clinker Coal Co.

BATES

Bates County ranked first in the production of coal in Missouri. Coal was mined by the Hume-Sinclair Coal Mining Co. and the I. E. Mullins Coal Co. Gravel for road construction and maintenance was produced by Clyde S. Miller and Osage T. W. P. Clerk. Limestone was quarried by Arthur R. Alvis, Fuller Lime Co., and Frank Underwood.

BENTON

Gravel was produced by the Junge Gravel Co. from deposits in Benton County.

BOONE

Limestone was quarried and crushed near Columbia and Jefferson City for use as agstone and riprap and in road construction. Producers included the Adrian Materials Co., Boone Quarries, Inc., and N. R. Garrett. Shale and fire clay were produced at several points within the county and then processed locally into such finished products as hollow tile, structural tile, common building brick, and refractory brick. The leading producer was the Columbia Brick & Tile Co. Coal was mined by the Hughes Coal Co., the House coal mine, and the Earl Hussey coal mine.

BUCHANAN

Everett Quarries, Inc., produced crushed limestone for use in road construction and as a soil-conditioning agent. Limestone was also quarried under contract for the United States Army Corps of Engineers for use as riprap and by the Buchanan County Highway Department. Shale was quarried and processed locally into tile and common building brick by the Moorhead Brick & Tile Co. The Pioneer Sand Co. produced sand for use in road surfacing and in building construction.

BUTLER

The Williamsville Stone Co. quarried dimension sandstone for use as flagging and rubble. Pottery clay was mined from deposits near Poplar Bluff by A. D. Willis. Lam & Shropshire produced brown iron ore from property north of Poplar Bluff. Sand and gravel for use in building and road construction was obtained from stream beds by Grobe & Sons and the Ed Kittredge Sand & Gravel Co.

CALDWELL

Crushed limestone for agricultural and road-building purposes was quarried near Kingston and Nettleton by Farmers Rock & Lime quarry and Houghton Stone Co.

CALLAWAY

Flint and plastic fire clay were mined at several points within the county and manufactured locally into various refractories. The principal producers were the A. P. Green Fire Brick Co. and the Harbison-Walker Refractories Co. The Callaway County Highway Department and the city of Fulton produced sand and gravel for road maintenance. Limestone for road building and agricultural purposes was quarried and crushed by the Auxvasse Stone & Gravel Co. Coal was mined by the Marriott-Reed Coal Co.

CAPE GIRARDEAU

Sand for grinding and polishing purposes and building construction was obtained at several points along the Mississippi River by the Cape Girardeau Sand Co. and the Penzel Construction Co. The Farmers Limestone Co. and the Federal Materials Co., Inc., produced crushed limestone for use as riprap, road materials, and agstone. The Marquette Cement Manufacturing Co. mined clay for use in manufacturing cement. The Ceramo Co. and the Kasten Bros. Brick Co. mined common red clay for use in the manufacturing of building brick.

CARROLL

Crushed limestone for road-building purposes was mined by Frank Trager.

CASS

The S & W Quarries produced dimension limestone near Garden City for use as rubble. Limestone was quarried and crushed near Peculiar and Harrisonville for highway construction and soil improvement by several producers, the larger producers being McKee Quarries Co., Emmett Brasnahan, and the Peculiar Rock Co. Clay for the manufacture of brick and tile was mined by the United Brick & Tile Co.

CEDAR

The Sac River Lime Co. produced crushed limestone from sources near Stockton for use as a soil-conditioning agent.

CHRISTIAN

Limestone was quarried near Billings by Joe Howard for use as a soil conditioner.

CLARK

Myron Baker produced crushed limestone near Kahoka for agricultural and road-building purposes.

CLAY

The Clay County Highway Department and the United States Army Corps of Engineers produced crushed limestone for road building. Commercial producers quarried limestone for use in road

construction, as agricultural limestone, and for riprap. Producers included the Mid-West Precote Co. and the Joe H. Oldham Stone Co. Coal was mined by the Mosby Coal Co. and the Perry Rice Coal Co.

CLINTON

The Everett Quarries, Inc., produced crushed limestone near Plattsburg for use in agriculture and road construction and for riprap.

COLE

The Cole County Highway Department, Jefferson City Sand Co., Adrian Materials Co., and Thompson Sand Co. obtained sand and gravel along the Osage and Missouri Rivers in the vicinity of Jefferson City. It was used in building and road construction. Limestone for agricultural purposes and for use as riprap along the banks of the Mississippi River was quarried near Eugene by Franklin Groose and the United States Army Corps of Engineers.

COOPER

The United States Army Corps of Engineers quarried crushed limestone near Boonville for use in bank stabilization along the Missouri River. Paving sand and gravel was produced by J. C. Orender.

CRAWFORD

Diaspore and burley fire clays were mined near Leasburg and Cuba. Leading producers were Dillon Bros., Arthur Nicks, and Laclede-Christy Clay Co.

DADE

George M. Baker quarried limestone for road metal, building concrete, and agricultural purposes. Coal was mined by the Tyler Coal Co.

DAVISS

Limestone was quarried and crushed by Snyder Quarries, Inc. for use as agstone and riprap and in road construction. Coal was mined by Winston Coal Mining Co.

DE KALB

Everett Quarries, Inc., produced crushed limestone near Cameron for use as riprap and agstone and for road construction.

DENT

The Lennox quarry produced crushed limestone for agricultural purposes.

DOUGLAS

Sanders & Valentine mined brown iron ore near Ava.

DUNKLIN

A. W. Wilkey produced sand and gravel from local stream beds for building and paving purposes.

FRANKLIN

The United States Army Corps of Engineers, Oliver L. Taetz, Inc., and Edwin Bebermeyer among other producers quarried dolomite for use in road construction and maintenance and as a soil conditioner. The Washington Special Road District of Franklin County produced crushed sandstone used for riprap and road metal. Clays ranging from flint fire clay to diaspore clay were produced in the county, which ranked first in the State in clay output. Producers included the Rousset Bros. Clay Co., Langenburg Mining Co., and the Laclede-Christy Co. Sand and gravel was produced by the Missouri Illinois Materials Co., Koch Laughlin, and the R & D Excavating Co.

GASCONADE

Dolomite was quarried by Virgil Smith for use for agricultural purposes, as road metal, and in concrete construction. Gasconade County produced both flint and diaspore fire clays in the vicinity of Swiss, Hermann, Bland, and Owensville. A clay-calcining plant near Owensville produced calcined clay used chiefly in manufacturing structural and decorative tiles. The A. P. Green Fire Brick Co. was the largest producer of clay in Gasconade County.

GREENE

Crushed limestone was produced for use in road construction and maintenance and for soil improvement. Among the several producers were James J. Griesemer and the Ash Grove Lime & Portland Cement Co. Limestone, quarried at Galloway and Springfield by the Ash Grove Lime & Portland Cement Co. was converted into quick and hydrated lime at the quarry sites. A quarry near Phenix produced dimensional limestone, which was sawed, polished, and marketed under the trade name of "marble."

GRUNDY

E. E. Trenary and Jay Wilcox produced crushed limestone, which was used for agricultural and road-building purposes.

HARRISON

Crushed limestone was produced near Bethany and Ridgeway for use in concrete, road metal, and soil conditioning. Producers included L. W. Hayes, Inc., Emmett Hayes, and the Interstate Limestone Products Co. Coal was mined in Harrison County by the New Black Diamond Coal Co.

HENRY

Henry County was the second largest coal producer in Missouri. Leading producers of coal were the Windsor Coal Co., the Crowe Coal Co., the Power Coal Co., and the A. J. Pence Coal Co. Limestone for agricultural and road-building purposes was quarried and crushed by Arthur R. Alvis, the Williams Rock Co., the Davis Rock Co., and O. A. Knisley.

HOLT

Garden Quarries and the United States Army Corps of Engineers quarried and crushed limestone for use as road metal and agstone and for bank stabilization along the Missouri River.

HOWARD

Limestone for road-building and agricultural purposes was quarried and crushed by the Howard County Highway Department and the Glasgow Quarries, Inc. Sand for building purposes was produced by the Glasgow Sand Co.

HOWELL

Brown iron ore was mined south of West Plains by Hobert Bowen and Lee Johnson. The Kilkenny Limestone Co. quarried dolomite, which was used for agstone, near West Plains.

IRON

The Duncan Bros. quarried dolomite for use as a soil conditioner. Crushed and dimension granite was quarried near Graniteville for use as riprap and monumental and building stone by the Heyward Granite Co.

JACKSON

Stewart Sand & Material Co. produced building and paving sand from deposits near Kansas City and crushed limestone for building and agricultural purposes. Centropolis Crusher Co. and Beyer Crushed Rock Co. were among other producers who also quarried limestone. Dimension limestone was quarried by the Gerald Hodgins Building Rock Co. The Missouri Portland Cement Co. quarried limestone and shale near Independence for use in manufacturing cement. Shale was also obtained by the United Brick & Tile Co. for use in manufacturing brick.

JASPER

Jasper County was the leading zinc producer in the State. Zinc and lead ores were mined and milled in the Joplin-Webb City district. Producers included the American Zinc, Lead & Smelting Co. and the Big Ike Mining Co. Chats from zinc-lead mining operations were utilized mainly as railroad ballast and paving material. The Independent Gravel Co. produced a variety of sands—glass, molding, grinding, fire, engine, filter, and building. Dimension limestone was quarried near Carthage. It was cut, polished, and marketed over a wide area under the trade name of "marble." Crushed limestone was used for agstone, concrete, and road metal.

JEFFERSON

Limestone and dolomite were quarried by the Kitson Bros. quarry and the Hess Bros. for use in agriculture and concrete and as road metal. High-purity silica sand, obtained from quarries in the St. Peter formation at Festus, Crystal City, and Pacific, was used in manufacturing plate glass near Crystal City and sand-lime brick at Pacific. Producers included the Pittsburgh Plate Glass Co. and the AuBuchon Silica Mining Co. Walter Ficken obtained paving sand and gravel from creek beds.

JOHNSON

Limestone was quarried and crushed by the Dietz Hill Development Co. and the Roop quarries for agricultural purposes and road building. Coal was produced at the Herman Smith coal mine.

KNOX

Crushed limestone for agricultural purposes was produced by the McSorley lime quarry near Edina.

LAFAYETTE

The Higginsville Brick & Tile Co. obtained clay and shale for manufacturing common building brick and structural and drain tile. Limestone for concrete construction and road metal was quarried near Higginsville by the Dietz Hill Development Co. Structural sand was produced by the Corier Road District and the Waverly Sand Co. Coal was mined by Howard S. Peek, Earl Asford, and D. E. Winfrey.

LAWRENCE

E. L. Britain quarried dimension limestone near Chesapeake for rough construction, curbing, and flagging.

LEWIS

Sand and gravel for building purposes, railroad ballast, and road construction were produced by the Missouri Gravel Co. The Hamill Limestone Co. quarried and crushed limestone for road metal and agricultural purposes near Monticello.

LINCOLN

The Columbia Quarry Co., the Watson quarry, Duncan Gessman, and Louis Meister produced crushed limestone for use in agriculture, bank stabilization, and road metal. Tile products were manufactured near Winfield from local clay. Clay producers included the Cecil W. Birkhead tile factory and the Harbison-Walker Refractories Co.

LINN

The Linn County Highway Department produced crushed limestone for use on county road projects. Coal was mined by the Raymond Schaefer Coal Co.

LIVINGSTON

Limestone for riprap, agricultural stone, railroad ballast, concrete, and road metal was quarried and crushed by the Cooper Contracting Co. and Fred MeVey. Building brick and tile were manufactured by the Midland Brick & Tile Co. The raw material—shale—was obtained locally. Sand and gravel for paving and building projects were obtained from local streams by the Cooley Gravel Co.

MACON

Crushed limestone for riprap, road construction, and agricultural purposes was produced by Frank Trager and R. W. Loumaster. Coal was mined by the Bevier Coal Co. and the F. C. Lewellyn coal mine.

MADISON

Ores containing silver, copper, and lead were mined by the Mine La Motte Corp. near Mine La Motte and the National Lead Co. near Fredericktown. Paving gravel was produced by the Madison County Highway Department. Marble was quarried and crushed by the Ginducy Marble & Terrazo Co.

MARIES

Diaspore and burley clays were mined in Maries County. Producers included the Laclede-Christy Co., the A. P. Green Fire Brick Co., and the Wallace Bros.

MARION

Gravel for paving purposes was obtained from local stream beds by Edward B. Cooper. The Marblehead Lime Co. produced quick and hydrated lime at its kiln near Hannibal from limestone quarried nearby. Limestone was also used for agricultural and other purposes.

McDONALD

Gene Haworth produced stream gravel for use in road construction.

MERCER

Gene McClain quarried and crushed limestone used as road metal and soil conditioner.

MILLER

Dimension limestone was quarried near Brumley by Al Elam, Inc., for use in rough building construction, curbing, and flagging. The Eldon Mining Co. mined barite near Eldon. Railroad sand and gravel was produced.

MONITEAU

The Moniteau County Agricultural Association quarried and crushed limestone for riprap and agricultural purposes near California and Tipton.

MONROE

Fire clay, diaspore, and burley clays were mined near Paris and Goss by the Bethlehem Co., the Gilliam Mining Co., and the Fleutsch Bros. The Monroe County Highway Department and Uller Wilkerson produced crushed limestone and gravel for road building and other purposes. Coal was mined in Monroe County by S. D. Pollock & Co. and the Pat Vincent coal mine.

MONTGOMERY

Refractory brick of various types was manufactured from local fire-clay pits. Clay producers included the A. P. Green Fire Brick Co., Forest Johnson, and D. R. Dixon & Co. The Montgomery County Highway Department produced gravel for county road maintenance. Crushed limestone for use as riprap, agstone, and road metal was quarried by the United States Army Corps of Engineers, the Montgomery County Highway Department, and the McClain Lime Quarry.

MORGAN

Barite was mined by L. A. and Carl Campbell near Versailles and by the Versailles Concrete Block Co. near Florence.

NEWTON

The Southwest Lime Co. manufactured quick and hydrated lime near Neosho from limestone quarried nearby. Ores containing zinc and lead were mined by the Dale Mining Co. Tripoli, processed at a plant near Seneca, was used in polishing and buffing compounds. The raw tripoli was obtained chiefly from Ottawa County, Okla., and to a lesser extent from Newton County.

OREGON

Brown iron ore was mined north of Koshkonong by Miller & Reynolds. Dolomite was quarried near Alton by O. O. Mainprize for use in concrete, road metal, and agriculture.

OSAGE

Limestone and dolomite, quarried at several points along the Missouri River, were utilized by the United States Army Corps of Engineers for bank stabilization. Flint, burley, and diaspore clays were produced from pits near Linn and Swiss by Russell Phillips and Staley & Zimmerman. The Osage County Highway Department produced gravel for use in county road maintenance.

OZARK

Brown iron ore was mined by Patillo Bros.

PEMISCOT

Sand and gravel was obtained from deposits along the Mississippi River by the Taylor Sand & Gravel Co. and the Caruthersville Sand & Gravel Co. for building and road construction.

PERRY

Crushed limestone was produced by Gibbar Bros. for use as riprap.

PETTIS

Crushed limestone was produced near Sedalia by the W. J. Menefee Construction Co. and the T-O Lime & Rock Co. Gravel was obtained from local stream beds for use in road construction by the W. J. Menefee Construction Co. and J. C. Orender.

PHELPS

L. H. Bray and Jesse Nivens quarried dolomite for use as a soil conditioner and in building and road construction. Flint, burley, and diaspore clays were mined and shipped to clay refractory plants. Producers included Floyd C. Dillon, Laclede-Christy Co., and the Robinson Clay Co. The Arlington Stone Co. quarried dimension sandstone for use in rough construction.

PIKE

Limestone was quarried by the Magnesium Mining Co. near Bowling Green and the Galloway Limestone Co. near Frankford for use in concrete mix, as road metal, and as agricultural stone.

PLATTE

The United States Army Corps of Engineers used crushed limestone from quarries near Parkville for bank stabilization along the Missouri River. Limestone for use as road metal and agstone was quarried by Everett quarries and Mid-West Precote Co. An artificial light-weight aggregate, haydite, was produced near New Market from shales obtained near the plant site.

POLK

Paul Degraffenreid quarried and crushed limestone for use as a soil conditioner and road metal.

PUTNAM

Coal was mined by several operators in Putnam County. Producers included the W. T. Clark Coal Co. and the E. E. Hayes coal mine.

RALLS

The Universal Atlas Cement Co. manufactured cement near Hasco. Limestone and shale for use in cement manufacture were obtained near the plant.

RANDOLPH

The N. J. Cooksey quarry, the Glasgow Quarries, Inc., the Ralph Potter quarry, and the Van-Skike Lime Co. quarried and crushed limestone for agricultural and road-building purposes. Coal was mined in Randolph County. Producers included the Moberly Fuel Co., the D. L. Bradley Coal Co., and the Nejedley Coal Co.

RAY

Crushed limestone, produced by the Steva Stone Co. near Richmond and the Orrick Stone Co. near Orrick, was used for soil conditioning, road metal, and concrete building construction. Coal was mined by several operators, including the East Side Coal Co., the Smith & Palmer coal mine, and the Little Creek coal mine.

RIPLEY

The T. L. Wright Lumber Co. and the Ripley County Highway Department obtained sand and gravel from deposits in Ripley County for use in building and paving.

ST. CHARLES

Limestone for use in agriculture, concrete building construction, road metal, and riprap was obtained from quarries near Foristell, O'Fallon, Wentzville, and St. Charles. Producers included the Joerling Bros., the St. Charles Quarry Co., the O'Fallon Quarry Supply Co., and the United States Army Corps of Engineers. High-

purity silica sandstone, obtained from quarries in the St. Peter formation in the vicinity of Augusta, was used in manufacturing plate glass and other glass products and for molding and furnace sands. Sand and gravel for building and paving purposes were obtained from deposits along the Missouri River by the Tavern Rock Sand Co., the R & D Excavating Co., and the St. Charles County Highway Department.

ST. CLAIR

The St. Clair Highway Department and Herman Schneider produced gravel for road maintenance and paving purposes. The Hunt Limestone Co. quarried and crushed limestone near Osceola which was used for soil conditioning, road metal, and concrete building construction. Coal was mined by several operators, including the Pioneer Mining Corp. and the Clary Coal Co.

ST. FRANCOIS

Roasted dolomite was produced near Bonne Terre. The source of raw material was the Bonneterre formation, of Cambrian age. Chief consumers were open-hearth furnaces of the steel industry. Iron ore, in the form of specular hematite, was mined at Iron Mountain by the Ozark Ore Co., and brown ore was mined at various mines by the Imperial Mining Co. The ore was shipped to steel furnaces at Granite City, Ill. The Bonne Terre-Desloge-Flat River area produced over 90 percent of the State lead. Ores containing silver, copper, lead, and zinc were milled by the St. Joseph Lead Co. Chats from both lead- and iron-mining operations were used as agstone, railroad ballast, and road metal. The Valley Dolomite Corp. produced lime.

STE. GENEVIEVE

The Mississippi Lime Co. of Missouri, one of the largest producers of high-calcium lime, is located near the town of Ste. Genevieve. Raw material for the limekiln was obtained from the Spergen limestone of Mississippian age.

ST. LOUIS

Rough dimension limestone, quarried by the West Lake Quarry & Materials Co., the F. Ruprecht & Sons quarry, and the Bussen Quarries, Inc., was used as foundation stone and flagging. Limestone quarries near Maplewood, Lemay, and Clayton supplied material for road metal, riprap, and agstone. The leading crushed-limestone producers were the Riverview Stone & Materials Co., the Rock Hill Quarries Co., and the Bussen Quarries, Inc. The Missouri Portland Cement Co. and the Alpha Portland Cement Co. produced cement from limestone and shale. St. Louis County ranked first in cement production. Plastic fire clay and shale were mined for use in manufacturing refractory brick and heavy clay products. Producers included the Alton Brick Co., the Thomas Mining Corp., and the Hydraulic-Press Brick Co. Sand and gravel for molding, engine, road construction, and building purposes were produced by several operators, the three principal producers being George Winter, Jr., Norman Bros., and the St. Charles Sand Co. Silica was produced by the Pioneer Silica Products Co.

ST. LOUIS CITY

Dimension sandstone was quarried by the St. Louis City Workhouse quarry for use as rubble. Crushed limestone for road metal, riprap, and agstone was reported by several producers with the United States Army Corps of Engineers the principal producer (riprap). Refractory brick, common building brick, sewer pipe, and hollow tile were produced from clay and shale. Expanded perlite was produced at the St. Louis plant of Precast Slab & Tile Co., Inc.

SALINE

Crushed limestone for use in riprapping the banks of the Missouri River was obtained by the United States Army Corps of Engineers from quarries near Waverly and Miami.

SCOTLAND

Charles E. Peck produced crushed limestone for use as railroad ballast and for agricultural purposes.

SCOTT

Sand for building purposes was obtained from deposits along the Mississippi River by Sikeston Concrete Products Co., Inc.

SHANNON

Brown iron ore was mined south of Birch Tree by Powell & Bates. Evans & Parker mined manganese ore near Eminence. This was the first production of manganese in the State since 1943. H. N. Harrison quarried and crushed limestone for agricultural purposes.

SHELBY

Limestone was quarried and crushed by the Turner Lime & Rock quarry near Shelbina and the Bethel Rock & Gravel Products Co. near Bethel for road-building and agricultural purposes.

STODDARD

Hill & Stewart, Inc., and the Brown Sand & Gravel Co. obtained sand and gravel from deposits in the vicinity of Dexter for building and paving purposes.

SULLIVAN

Carl Partain quarried limestone for building, paving, and agricultural purposes. Miscellaneous stone was produced by the Milan Special Road District.

TEXAS

Crushed dolomite, produced by the Long Bros., was used for agricultural purposes and road construction.

VERNON

George M. Baker produced crushed limestone for roadbuilding purposes. Clay for pottery manufacture was mined south of Deerfield by Harry Brock. Sand and gravel was produced by county

crews for county road maintenance. Coal producers in Vernon County included the Ellis Coal Co., the Schooley Coal & Construction Co., and the Thornhill Coal Co.

WARREN

Crushed limestone for agricultural uses and for riprap was obtained by the Sprick Bros. near Marthasville and along the Missouri River by the United States Army Corps of Engineers. The Warren County Highway Department obtained gravel from local deposits for use in county road projects. Fire clay, used in the manufacture of refractories, was mined in Warren County. Producers included the Harbison-Walker Refractories Co., Wilcoxon & Long, and John Meyer.

WASHINGTON

Washington County ranked first in the production of barite in Missouri from mines near Richwoods, Potosi, Mineral Point, Cadet, and Palmer. Over 15 barite-washing plants were in operation. Producers included the Baroid Sales Division of the National Lead Co., the J. E. Carter Mining Co., and the De Soto Mining Co. A small quantity of galena was recovered in barite mining and washing operations.

WAYNE

The Scenic Mining Co. mined brown iron ore near Williamsville. Sand for paving and gravel for paving and railroad ballast were obtained from stream deposits by the Kiener Gravel Co., Inc.

WRIGHT

The Thomson Lime Co. quarried dolomite near Norwood for use in soil conditioning and road construction.

The Mineral Industry of Montana

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the United States Bureau of Mines and the Montana Bureau of Mines and Geology.

By Kenneth D. Baber,¹ Frank B. Fulkerson,¹ Albert J. Kauffman, Jr.,² and Paul F. Yopes¹



THE 1952 DECLINE in value of mineral production in Montana was reversed significantly in 1953 as a 9-percent gain (\$11 million) was attained. Two commodities of widely different nature and historical importance in the State, copper and oil, together furnished 53 percent of the total value; sharp rises of nearly 49 percent in the value of copper and 20 percent in that of oil were largely responsible for the overall increase.

Depressed prices and a somewhat reduced output resulted in a 32-percent or nearly \$9-million decrease in the value of zinc produced, and 24 percent in that of lead. A number of small mines were forced to close because of the low lead-zinc prices.

Manganese, chromium, and tungsten mining acquired growing importance as new operations were opened and began producing. Large quantities of the output of these critical materials were placed in the National Strategic Stockpile. There were many reports of occurrences of radioactive minerals.

The principal developments in the metallurgical field were initial production in January from a second furnace at the Victor Chemical Works elemental phosphorus plant at Silver Bow; continuing construction of the multi-million-dollar Anaconda Aluminum Co. reduction plant at Columbia Falls; and enlargement of milling and ore-handling facilities by Anaconda Copper Mining Co. at Anaconda to treat Kelley mine ore.

Oil-exploration activity continued at an alltime high, with as many as 200 geologists and 75 geophysical crews searching for drilling sites. Production of oil, though greatly increased, was handicapped by the lack of pipeline facilities to provide low-cost oil transportation to marketing areas.

Montana mineral resources and industries were summarized in an article appearing during the year.³

Records of the State Unemployment Commission indicated that the mining industry provided direct employment to 11,600 workers in 1953 (exclusive of workers in smelters, refineries, and other mineral-processing plants classed as manufacturing establishments), compared with 11,300 in 1952.

In addition to the valuation of minerals credited to Montana in table I, some are omitted owing to lack of information. Many ores

¹ Commodity-industry analyst, Region II, Bureau of Mines, Albany, Oreg.

² Chief, Mineral Industry Division, Region II, Bureau of Mines, Albany, Oreg.

³ Robertson, Forbes, Camp, H. W., Jr., Johnson, L. H., and Sahinen, U. M., Resources for the Chemical Industry in the United States, Rocky Mountain States, Part I—Montana: Ind. Eng. Chem., vol. 45, No. 11, November 1953, pp. 2435-2443.

contain valuable minor constituents, such as arsenic, bismuth, cadmium, cobalt, nickel, platinum-group metals, selenium, tellurium, and some minor metals, such as gallium and germanium. These quantities sometimes are not known and sometimes, though known by analyses, are not accounted for metallurgically in early processing stages or credited to the mine of origin. These minor constituents are recovered at plants (frequently treating mixtures of materials from many sources, including residues from the refining of such metals as copper, lead, and others) and in other ways. It is impossible in many such instances to distribute the mineral products by States of origin and sometimes it is even difficult to obtain an accurate separation as between domestic and foreign sources. Another mineral product of value, the production of which seldom can be separated as to source, is byproduct sulfuric acid. The value of uranium produced cannot be credited, inasmuch as such information is not available under existing regulations of the Atomic Energy Commission.

TABLE 1.—Mineral production in Montana, 1952-53¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Antimony ore and concentrate.....gross weight.....			(²)	(²)
Chromite.....			26,089	\$869,958
Clays.....	51,304	\$73,601	36,994	38,312
Coal:				
Bituminous.....	2,038,808	5,698,778	1,848,334	4,884,209
Lignite.....	30,550	112,953	24,803	93,551
Copper (recoverable content of ores, etc.).....	61,948	29,982,832	77,617	44,552,158
Fluorspar.....	16,160	(²)	5,932	(²)
Gold (recoverable content of ores, etc.).....troy ounces.....	24,161	845,635	24,768	866,880
Iron ore (usable).....long tons, gross weight.....			6,709	(²)
Lead (recoverable content of ores, etc.).....	21,279	6,851,838	19,949	5,226,638
Manganese ore (35 percent or more Mn).....gross weight.....	100,070	(²)	113,429	(²)
Manganiferous ore (5 to 35 percent Mn).....do.....	9,357	(²)	5,598	(²)
Natural gas.....million cubic feet.....	28,714	1,752,000	27,889	1,645,000
Petroleum (crude).....thousand 42-gallon barrels.....	9,606	21,610,000	11,920	26,020,000
Pumice and pumicite.....			3,000	15,000
Sand and gravel.....	6,785,955	3,579,932	6,203,480	2,993,575
Silver (recoverable content of ores, etc.) troy ounces.....	6,138,185	5,555,367	6,689,556	6,054,386
Stone (except limestone for cement and lime).....	³ 690,081	³ 792,897	³ 802,735	1,124,731
Tungsten concentrate.....60-percent WO ₃ basis.....			14	(²)
Zinc (recoverable content of ores, etc.).....	82,185	27,285,420	80,271	18,462,330
Undistributed: Barite (1953), cement, gypsum, lime, phosphate rock, pyrites, stone (dimension granite, 1952-53), talc, vermiculite, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2).....		\$17,928,016		19,337,712
Total Montana.....		\$122,069,000		132,184,000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

² Value included with "Undistributed."

³ Excludes certain stone, value for which is included with "Undistributed."

⁴ Revised figure.

During 1953 the program of the Defense Minerals Exploration Administration (DMEA) continued to encourage systematic investigation of strategic and critical mineral occurrences. Financial assistance extended under the Government contracts was repayable from royalties on ore discovered and subsequently mined. Table 2 shows the projects active under the program during part or all of 1953.

TABLE 2.—Defense Minerals Exploration Administration contracts active during 1953

County	Name of operator	Name of property	Commodity	Total contract	Government participation (percent)	Contract number
Beaverhead	American Alloy Metals, Inc.	Ivanhoe	Tungsten	\$66, 914	75	E247
	Elkhorn Mining Co.	Last Chance	Thorium	10, 215	90	E144
	Minerals Engineering Co.	Lost Creek	Tungsten	11, 280	75	E300
	Roberta Wegener	Kathol	Lead-copper	17, 600	50	E494
	Edmund E. Pohl et al.	January	Lead-zinc-copper	12, 000	50	E246
Broadwater	Edmund E. Pohl, H. G. and A. R. Kleinschmidt.	Pearl	do.		50	E465
	Sunshine Mining Co.	Tarlach Group	Tungsten	45, 105	75	E698
Deer Lodge and Granite	American Machine & Metals, Inc.	Mullen	Manganese	84, 610	75	E971
	Combination Development Co.	Combination	Tungsten	70, 000	75	E972
Jefferson	Queen Mining Syndicate	Sunrise	Copper	21, 640	75	E866
	Taylor-Knapp Co.	True Fissure	Manganese	107, 160	75	E9
	Western Montana Exploration & Development Co.	Wasa	Lead-zinc	85, 850	50	E36
	Norman Boe	Bulwark	Copper	26, 730	50	E639
	Albert J. Carlson	North Boulder	Lead-zinc	24, 900	50	E313
	A. H. Eiselein et al.	Lone Eagle	Uranium	15, 110	90	E209
	Elkhorn Consolidated Mining Co.	Skyline	Lead-zinc	25, 800	50	E268
	D. A. McNabb	Sylvan	Uranium	22, 907	90	E238
	William Mulcahy	Big Lode, Homestake, and Summit	Lead	5, 092	50	E155
	Neuberg Bros. & Sloan	Eva Mae	Lead-zinc-copper	45, 400	50	E546
Judith Basin	Alberta K. Romero	Hope & Bullion	Lead-zinc	21, 200	50	E220
	White Pine Lead Co.	White Pine	Lead-zinc	28, 700	50	E270
	Hughesville Silver & Lead Mining Co.	Carter	Lead	10, 000	50	E117
	Ottawa Tungsten Co.	Prentice	Tungsten	47, 800	75	E490
	Commonwealth Lead Mining Co.	Calvin	Lead	61, 784	50	E150
	Linton Mines	Blackfall	do.	52, 540	50	E226
	Boulder Ores, Inc.	Snowshoe	Tungsten	33, 800	75	E588
	Golden Anchor Mining & Milling Co.	Golden Anchor	Lead-zinc	34, 716	50	E576
	Western Mines Co.	New Progress	Tungsten	20, 130	75	E414
	Elmer and Jessie Allen	Sepey Creek	Copper	10, 800	50	E423
Sanders	Amador Mining Co. (assignee of Kootenay Copper Co.)	Green Mountain	do.	31, 900	50	E251
	Ambassador Mines Corp.	Ambassador	Lead-zinc	23, 049	50	E118
Silver Bow	J. E. Hall	Revals Creek	Copper	21, 285	50	E162
	Irving G. Irving and Robert H. Nelson	Garibaldi	Manganese	7, 000	75	E464
	Irving G. Irving and Robert H. Nelson	Plutus	do.	25, 830	75	E604
	Standard Ore & Alloys Corp.	Birdie	Tungsten	10, 080	75	E249

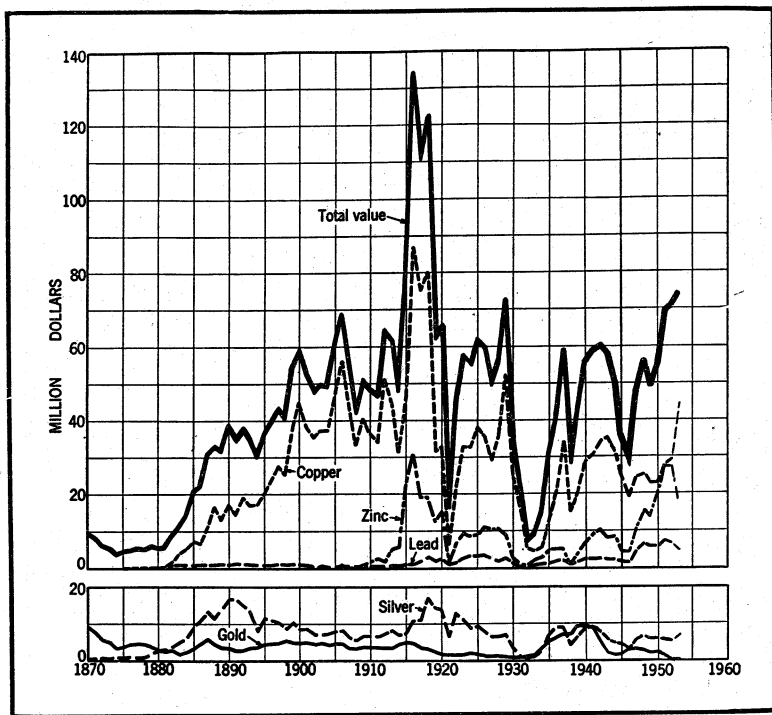


FIGURE 1.—Value of mine production of gold, silver, copper, lead, and zinc in Montana, 1870-1953.

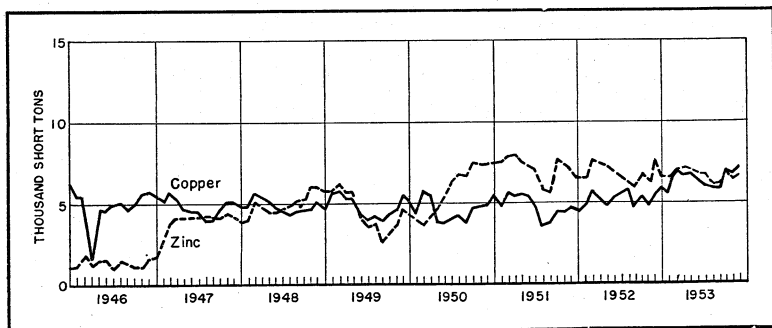


FIGURE 2.—Mine production of copper and zinc in Montana, 1946-53, by months in terms of recoverable metals.

REVIEW BY MINERAL COMMODITIES

METALS

Aluminum.—Construction work on the Anaconda Aluminum Co. reduction plant at Columbia Falls, Flathead County, began early in the summer, and production from the first of the multi-million-dollar plant's two potlines was scheduled for late 1954. Reports

indicated that, at the end of the year, steelwork was about 25 percent completed, and approximately 40 percent of the concrete required had been poured. Employment at the construction site totaled 400 men.

When operating at capacity the plant will supply 54,000 tons of aluminum annually for industrial and defense purposes. Alumina, the basic material from which aluminum is made, is to be obtained from the Reynolds Metals Co. bauxite-processing plant at Corpus Christi, Tex. The power requirement (111,000 kw.) will be supplied under contracts by the Bonneville Power Administration and is to be drawn from that portion of the generating capacity of Hungry Horse Dam reserved by law for use in Montana only.

Aluminum metal in the form of wire bars will be sent for final processing to an aluminum rod and bar manufacturing plant being constructed at Great Falls by the Anaconda Wire & Cable Co.⁴

Production methods to be used at the plant will differ from those employed by most domestic producers. According to an article, the fact that the Anaconda company "obtained the rights and technical data (on a royalty basis) to use the pot design of Pechiney Chemical & Electrometallurgical Products Co. seems to substantiate the French claim to the most advanced techniques in aluminum metallurgy." The article continued, "Both potlines at Columbia Falls will use large Soderberg anodes of the vertical pin type. Presumably, the lines will consist of the 100,000-amp. pots like those used in Pechiney's Saint-Jean plant. Reports from several sources claim that these pots consume only about 7.5 kw.-hr. per pound of aluminum produced, as compared with 10 kw.-hr. required at most reduction plants in North America."⁵

Antimony.—A small quantity of antimony ore was shipped to the National Lead Co. smelter at Laredo, Tex., by B. F. Cooper from the Stibnite Hill mine in Sanders County.

Chromium.—Production of chromite concentrates from the newly reopened Moutat mine in Stillwater County by American Chrome Co., a subsidiary of Goldfield Consolidated Mines Co., exceeded 26,000 short tons. Operations at the property were begun in August under a Government contract to supply 900,000 tons of concentrates over an 8-year period. The Government was to supply \$2,165,000 for mine and mill equipment, while the company provided \$2,250,000 for housing, land purchases, and capital. Scheduled operating levels called for an annual production of 114,000 tons of 38-percent Cr₂O₃ concentrates from 300,000 tons of ore. According to the parent company annual report for 1953, work was being continued looking to further processing of the chrome concentrates that are being produced and stored at the property.

Copper.—Mine production of copper in Montana increased 25 percent to reach the highest level since 1945. This increase was in contrast to declines in output in Arizona, Utah, and New Mexico, the other leading copper-producing States. Montana's production exceeded that of New Mexico for the first time in 5 years; as a result, the State regained third place as a copper producer. This increased output resulted principally from the production of the new Kelley

⁴ Mining Association of Montana, News Letter: July and August 1953, p. 2.

⁵ Engineering and Mining Journal, vol. 154, No. 7, July 1953, p. 127.

mine, Greater Butte project, which completed its first full year of operation after reaching the production stage in April 1952. In October 1953 production of low-grade ore by block caving reached the rate of 12,000 tons per day. Completion of work in progress on the auxiliary (Kelley No. 2) shaft will bring the daily capacity to 15,000 tons. Total production from the Mountain Con, Belmont, Leonard, and Tramway mines at Butte was increased also. These mines, which supply high-grade copper ore, continued to be the main source of Butte's production. Construction of a new crushing plant and conveyor at Anaconda and reconstruction of the west mill was in progress by the Anaconda Copper Mining Co. to handle the increased ore production at Butte. Development at the Mountain View-Rarus and Skyrme copper projects supplied a minor quantity of the metal in 1953. A substantial quantity was recovered from Butte Hill lead-zinc ore and as precipitates from mine water. Near Butte several hundred tons of copper was produced from the Bullwacker, Rabbit, and Sarsfield mines.

TABLE 3.—Mine production of gold, silver, copper, lead, and zinc, 1944-48 (average), 1949-53, and total, 1862-1953, in terms of recoverable metals ¹

Year	Mines producing		Material sold or treated ² (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1944-48 (average).....	207	36	3,864,860	65,668	\$2,298,380	5,913,066	\$4,782,417
1949.....	281	48	2,595,934	52,724	1,845,340	6,327,025	5,726,277
1950.....	245	39	3,608,036	51,764	1,811,740	6,590,747	5,964,959
1951.....	198	16	3,965,875	30,502	1,067,570	6,393,768	5,786,683
1952.....	164	9	4,625,750	24,161	845,635	6,138,185	5,555,367
1953.....	142	7	6,101,348	24,768	866,880	6,689,556	6,054,386
1862-1953.....			(³)	17,399,255	393,427,137	794,546,010	588,161,574

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1944-48.....	76,266	\$24,871,026	13,181	\$3,370,382	35,015	\$8,621,023	\$43,943,228
1949.....	56,611	22,304,734	17,996	5,686,736	54,195	13,440,360	49,003,447
1950.....	54,478	22,662,848	19,617	5,296,590	67,678	19,220,552	54,956,689
1951.....	57,406	27,784,504	21,302	7,370,492	85,551	31,140,564	73,149,813
1952.....	61,948	29,982,832	21,279	6,851,838	82,185	27,285,420	70,521,092
1953.....	77,617	44,552,158	19,949	5,226,638	80,271	18,462,330	75,162,392
1862-1953.....	7,002,565	2,098,687,118	829,662	118,927,172	2,336,942	425,745,656	3,624,948,657

¹ Includes recoverable metal content of gravel washed (placer operations), ore milled, old tailings re-treated, and ore, old slag, and copper precipitates shipped to smelters during calendar year indicated.

² Does not include gravel washed.

³ Figure not available.

TABLE 4.—Gold produced at placer mines, 1944-48 (average) and 1949-53, by classes of mines and methods of recovery

Class and method	Mines producing	Material treated (cubic yards)	Gold recovered		Average value per cubic yard
			Fine ounces	Value	
Surface¹ placers:					
Gravel mechanically handled:					
Becker-Hopkins dredges: ¹					
1944-48 (average).....		1,000	6	\$224	\$0.224
Bucketline dredges:					
1944-48 (average).....	3	3,247,640	14,472	506,506	.156
1949.....	2	2,604,900	7,758	271,530	.104
1950.....	1	1,128,900	2,946	103,110	.091
1951-53.....					
Dragline dredges:					
1944-48 (average).....	2	275,529	1,539	53,851	.195
1949-50.....					
1951.....	3	692,400	996	34,860	.050
1952.....	1	250	46	1,610	6.440
1953.....					
Nonfloating washing plants: ²					
1944-48 (average).....	3	243,150	1,289	45,108	.186
1949.....	13	409,550	1,855	64,925	.159
1950.....	6	93,050	287	10,045	.108
1951-52.....					
1953.....	3	42,500	1,216	42,560	1.001
Gravel hydraulically handled:					
1944-48 (average).....	3	5,510	71	2,478	.450
1949.....	2	1,500	53	1,855	1.237
1950.....	1	500	13	455	.910
1951.....	1	2,500	14	490	.196
1952.....	1	600	9	315	.525
1953.....					
Small-scale hand methods: ³					
1944-48 (average).....	23	6,312	149	5,229	.828
1949.....	29	7,400	152	5,320	.719
1950.....	29	9,800	182	6,370	.650
1951.....	12	3,400	64	2,240	.659
1952.....	7	2,500	23	805	.322
1953.....	4	400	7	245	.613
Underground placers: Drift:					
1944-48 (average).....	1	1,016	49	1,722	1.695
1949.....	2	27	3	105	3.889
1950.....	2	50	6	210	4.200
1951-53.....					
Grand total placers:					
1944-48 (average).....	36	3,780,157	17,575	615,118	.163
1949.....	48	3,023,377	9,821	343,735	.114
1950.....	39	1,232,300	3,434	120,190	.098
1951.....	16	698,300	1,074	37,690	.054
1952.....	9	3,350	78	2,730	.815
1953.....	7	42,900	1,223	42,805	.998

¹ First year for which this method was reported used in Montana was 1946.

² Includes all placer operations using power excavator and washing plant, both on dry land; an outfit with movable washing plant is termed a "dry-land dredge."

³ Includes all operations in which hand labor is principal factor in delivering gravel to sluices, long toms, dip boxes, pans, etc. "Wet" method used exclusively in Montana.

TABLE 5.—Mine production of gold, silver, copper, lead, and zinc in 1953, by counties, in terms of recoverable metals

County	Mines producing		Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer	Fine ounces	Value	Fine ounces	Value
Beaverhead.....	19	1	688	\$24,080	26,728	\$24,190
Broadwater.....	14	-----	651	22,785	15,565	14,087
Granite.....	8	-----	382	13,370	225,615	204,193
Jefferson.....	26	-----	988	34,580	84,644	76,607
Judith Basin.....	3	-----	1	35	662	599
Lewis and Clark.....	13	2	147	5,145	10,659	9,647
Madison.....	15	-----	96	3,360	3,159	2,859
Mineral.....	3	-----	18	630	13,365	12,096
Park.....	4	-----	644	22,540	1,490	1,349
Powell.....	5	-----	41	1,435	420	380
Ravalli.....	1	-----	114	3,990	22	20
Sanders.....	3	1	37	1,295	11,954	10,819
Silver Bow.....	19	-----	19,871	695,485	6,289,415	5,692,238
Undistributed ¹	9	3	1,090	38,150	5,888	5,302
Total.....	142	7	24,768	866,880	6,689,556	6,054,386

County	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
Beaverhead.....	19	\$10,906	511	\$133,882	54	\$12,420	\$205,478
Broadwater.....	4	2,296	113	29,606	60	13,800	82,574
Granite.....	38	21,812	337	88,294	1,304	299,920	627,589
Jefferson.....	11	6,314	479	125,498	115	26,450	269,449
Judith Basin.....	-----	-----	16	4,192	5	1,150	5,976
Lewis and Clark.....	1	574	252	66,024	2,938	675,740	757,130
Madison.....	-----	-----	29	7,598	6	1,380	15,197
Mineral.....	8	4,592	117	30,654	164	37,720	85,692
Park.....	2	1,148	5	1,310	-----	-----	26,347
Powell.....	-----	-----	4	1,048	1	230	3,093
Ravalli.....	-----	-----	-----	-----	-----	-----	4,010
Sanders.....	13	7,462	1,179	308,898	444	102,120	430,594
Silver Bow.....	77,520	44,496,480	16,767	4,392,954	75,170	17,289,100	72,566,257
Undistributed ¹	1	574	140	36,680	10	2,300	83,006
Total.....	77,617	44,552,158	19,949	5,226,638	80,271	18,462,330	75,162,392

¹ Includes values and quantities which cannot be shown separately for Cascade, Fergus, Gallatin, Lincoln, Meagher, Missoula, and Phillips Counties.

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc in 1953, by months, in terms of recoverable metals¹

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January.....	1,674	534,733	5,915	1,628	6,640
February.....	1,810	565,762	5,770	1,570	6,536
March.....	1,914	642,302	7,108	1,800	7,110
April.....	2,165	586,915	6,752	1,630	7,025
May.....	2,710	598,432	6,862	1,643	6,970
June.....	2,420	561,450	6,410	1,653	6,895
July.....	2,270	527,630	6,058	1,760	6,865
August.....	2,090	485,080	5,884	1,570	6,080
September.....	2,010	521,898	5,896	1,630	6,160
October.....	1,975	572,184	6,990	1,715	6,960
November.....	1,810	524,990	6,744	1,630	6,315
December.....	1,920	568,180	7,228	1,720	6,715
Total.....	24,768	6,689,556	77,617	19,949	80,271

¹ Mine production comprises ore, gravel, or other mineral material sold or treated and metal recovered as natural gold or as bullion from cyanidation or amalgamation and the estimated recoverable metal contained in concentrates, ore, tailings, and other mineral materials shipped directly to smelters or sold to ore buyers within the year.

Table 7.—Mine production of gold, silver, copper, lead, and zinc in 1953, by classes of ore or other source material, in terms of recoverable metals

Source	Number of mines ¹	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode ore:							
Dry gold.....	28	1, 474	1, 896	8, 691	5, 560	16, 685	7, 338
Dry gold-silver.....	18	14, 572	780	69, 116	13, 666	760, 968	119, 717
Dry silver.....	6	2, 333	9	20, 875	1, 079	7, 612	43, 434
Total.....	52	18, 379	2, 685	98, 682	20, 305	785, 265	170, 489
Copper.....	17	4, 135, 818	6, 180	2, 088, 054	143, 527, 716		100
Lead.....	39	6, 907	344	42, 445	43, 189	2, 145, 535	193, 552
Lead-zinc.....	29	1, 861, 041	14, 259	4, 449, 340	6, 516, 443	36, 433, 443	154, 108, 215
Zinc.....	1	54		74	632	1, 900	30, 810
Total.....	86	6, 053, 820	20, 783	6, 579, 913	150, 087, 980	38, 630, 938	154, 332, 677
Other "lode" material:							
Dry gold: Old tailings.....	1	2	4	14			
Copper: Precipitates.....	1				5, 123, 337		
Lead: Old slag.....	1	42		146	212	8, 042	1, 862
Lead zinc:							
Mill cleanings.....	1	11	3	272	260	1, 455	1, 443
Old tailings.....	1	1, 005	70	10, 487	1, 906	21, 600	188, 529
Zinc: Old slag.....	1	28, 089				450, 700	5, 847, 000
Total.....	6	29, 149	77	10, 919	5, 125, 715	481, 797	6, 038, 834
Total "lode" material.....	142	6, 101, 348	23, 545	6, 689, 514	155, 234, 000	39, 898, 000	160, 542, 000
Gravel (placer operations).....	7		1, 223	42			
Total, all sources.....	149	6, 101, 348	24, 768	6, 689, 556	155, 234, 000	39, 898, 000	160, 542, 000

¹Detail will not necessarily add to totals because some mines produce more than 1 class of material.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1953, by methods of recovery and types of material processed, in terms of recoverable metals

Type of material processed and method of recovery	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode:					
Amalgamation.....	65	38			
Total recoverable in bullion.....	65	38			
Concentration, and smelting of concentrates:					
Ore.....	18, 805	6, 389, 860	147, 138, 127	36, 003, 070	153, 782, 487
Old tailings.....	70	10, 487	1, 906	21, 600	188, 529
Total.....	18, 875	6, 400, 347	147, 140, 033	36, 024, 670	153, 971, 016
Direct melting:					
Ore.....	3, 956	288, 420	2, 966, 158	3, 413, 133	720, 679
Mill cleanings.....	645	549	4, 260	1, 455	1, 443
Old tailings.....	4	14			
Old slag.....		146	212	458, 742	5, 848, 862
Copper precipitates.....			5, 123, 337		
Total.....	4, 605	289, 129	8, 093, 967	3, 873, 330	6, 570, 984
Placer.....	1, 223	42			
Grand total.....	24, 768	6, 689, 556	155, 234, 000	39, 898, 000	160, 542, 000

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1953, by counties and districts, in terms of recoverable metals

County and district	Mines producing		Material sold or treated (short tons)	Gold (lode and placer) (fine ounces)	Silver (lode and placer) (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
	Lode	Placer							
Beaverhead County:									
Argonia.....	14	1	3,445	682	22,600	37,100	998,200	103,600	\$197,650
Bannock and Blue Wing ¹	5		124	6	4,128	900	23,500	4,400	7,828
Broadwater County:									
Baker, Eureka, and Park or Indian Creek ¹	4		92	170	602	2,400	2,400	1,000	6,924
Beaver.....	6		824	470	14,841	7,300	215,000	86,000	69,570
Cedar Plains.....	3		87	610	12	700	8,600	38,000	5,675
Unorganized.....	1		15	11					366
Granite County:									
Boulder and South Boulder.....	2		1,026	610	300	300	17,800	1,000	3,085
First Chance, Flint Creek, and Henderson ¹	6		33,387	332	225,005	75,700	656,200	2,607,000	624,504
Jefferson County:									
Amazon.....	4		79	916	900	900	10,200	8,200	3,611
Boulder and Elkhorn ¹	3		1,144	38	10,236	1,500	19,000	39,500	31,594
Catawac (basin).....	7		1,019	292	3,992	3,300	12,000	11,600	16,274
Clancy and Lump Gulch.....	3		1,940	17	12,100	2,400	30,000	30,000	15,870
Colorado.....	4		13,367	590	56,630	12,900	798,200	111,400	182,923
Whitehall.....	5		589	74	1,660	2,000	58,000	29,000	19,177
Judith Basin County: Barker and Lost Fork of Judith River ¹	3		80	1	662		32,000	10,000	5,976
Lewis and Clark County:									
Helena.....		1		88	8				2,037
Rimmi.....	7		597	61	4,538	2,000	45,100	15,000	14,449
Scratch Gravel.....	1		729	4	6,058		6,000	12,200	7,794
Smelter.....	1		28,089				466,700	5,847,000	731,447
Madison County:									
McCarthy Mountain, and Norris and Norwegian ¹	3		36	31	194		3,600	200	1,756
Renova.....	1		9	2	3				73
Rochester.....	3		86	24	1,956		51,000	11,400	10,692
Virginia City.....	5		38	21	978		3,400	400	2,111
Mineral County: Cedar or Trout Creek, Iron Mountain, and Keystone ¹	3		6,602	13	13,365	16,000	234,000	328,000	85,692
Park County: New World.....	4		182	644	1,365	4,000	10,000	26,347	26,347
Powell County: Nigger Hill and Ophir Gulch ¹	3		104	13	563		7,700	2,000	2,002
Ravall County: Overwich.....	1	1	21	14					4,010
Sanders County: Eagle.....	3		8,491	11,952	26,000	2,358,000	888,000	430,594	430,594
Silver Bow County: Summit Valley.....	19		5,965,457	19,377	6,289,415	155,040,000	337,534,000	150,340,000	72,669,257
Undistributed ²	18	4	673	1,158	6,018	2,000	282,500	21,800	86,065
Total Montana.....	142	7	6,101,348	24,768	6,689,556	155,234,000	39,898,000	160,542,000	75,162,892

¹ Combined to avoid disclosure of individual output.

² Includes values and quantities that cannot be shown separately for Montana district, Cascade County; Warm Springs district, Ferns County; Deer Park district, Gallatin County; Gould, Lincoln, Marysville, Nelson Gulch, and Stemple-Guld districts, Lewis and Clark County; Libby district, Lincoln County; Pony and South Boulder, and Tidal Wave districts, Madison County; Beaver and Castle Mountain districts, Meagher County; Copper Cliff and Nine Mile districts, Missoula County; Little Rockies district, Phillips County; Big Blackfoot and Yourname Creek districts, Powell County.

Gold.—The quantity of gold recovered from Montana's mines increased 3 percent in 1953 after production dropped in 1952 to the lowest amount since the earliest days of mining in the State. More than 1,200 ounces was produced by placer mines compared with less than 100 ounces in the previous year. The largest production from placers was credited to an operation on Josephine Creek in the Nine Mile mining district, Missoula County. Gold recovered by lode operations, which supplied 95 percent of the total output, decreased slightly (2 percent). A drop in the State production caused by closing of the Estelle mine, Park County, formerly one of the principal producers of gold in the State, more than offset increases from several other lode mines. McLaren Gold Mines, Inc., terminated its operation at the property late in 1952 and sold the mining and milling equipment. Copper and lead-zinc ores mined at Butte by the Anaconda Copper Mining Co. continued to be the principal source of gold produced in the State. The Marget Ann gold-silver-manganese property near Walkerville, north of Butte, ranked second in gold output. In September, Basin Jib Gold Mines, Inc., began open-pit mining of gold ore at a property in Jefferson County.

Iron.—Ralls and Harris Bros. shipped 6,709 long tons of iron ore containing about 50 percent iron to the Ideal Cement Co. plant at Trident for use in making special types of cement. The ore was open-pit-mined from the Iron Cross mine in Broadwater County near Radersburg and trucked to the cement plant.

Lead.—The Butte Hill lead-zinc mines of the Anaconda Copper Mining Co. continued to dominate lead production in the State. The Jack Waite mine, operated in Sanders County by the American Smelting & Refining Co., was the only other property with 1953 output exceeding 500 tons of recoverable lead. Mine production of this metal decreased 6 percent owing largely to the permanent closing in 1952 of the Mike Horse mine in Lewis and Clark County, formerly one of the State's largest producers of lead and zinc. Termination of production at the Blacktail mine, Missoula County, after a curtailment early in 1953 because of rising costs and the low price of lead, also was a factor bringing about the decline. A number of small mines producing lead and zinc were closed because of the depressed market for the two metals. Output of lead and lead-zinc ores was credited to only 66 mines compared with 88 in 1952.

Manganese.—The output of manganese ores and concentrates (35 percent or more Mn) increased 13 percent from 1952 to 113,429 short tons, while the value of production showed a precipitous rise of 32 percent. The bulk of the production was derived from the Emma, Travona, and other mines operated by the Anaconda Copper Mining Co. in the Butte area of Silver Bow County; a smaller quantity of battery-grade manganese oxide from the Trout Mining Division, American Machine & Metals, Inc., Trout-Algonquin Group mines, in Granite County, contributed to the total.

Over half of the Anaconda nodule production was delivered to the company ferromanganese-production plant at Anaconda; smaller quantities were shipped to the Anaconda Copper Mining Co. Great Falls ferromanganese plant and to the General Services Administration; and the remainder was shipped to various eastern firms. According to a report,⁶ a price of \$208 a net ton, f. o. b. Anaconda or

⁶ Mining and Contracting Review, vol. 55, No. 8, August 195 p. 10

Great Falls, was established during the year by the company on ferromanganese in lump form assaying 79 to 81 percent manganese.

Much of the output of battery manganese oxide by the Trout concern in Granite County went to the National Strategic Stockpile. The company also shipped manganese ores and concentrates (10-35 percent Mn) consisting of middlings from the magnetic concentration of the battery-ore product.

Ore shipped to National Stockpile depots at Butte and Philipsburg amounted to 18,157 short dry tons valued at a little over \$541,000. Production was recorded from Beaverhead, Granite, and Silver Bow Counties. The larger producers included the Taylor-Knapp operations in Granite County and the Antonioli, Butte Mines Merger Corp., and Irving and Nelson operations in Silver Bow County. Low-grade stockpile shipments are not included in State production totals until the ore is removed from the stockpile for commercial use.

Silver.—A 9-percent increase was attained in production of silver in Montana, which has the third largest output of the metal, due largely to a gain in the quantity of silver recovered from copper ore produced from the Butte Hill mines. Lead-zinc ore mined at Butte also supplied a greater quantity of silver than in 1952. Lead-zinc ore continued to be the chief source of the State's silver, as it contained 67 percent of the total. Copper ore contributed 31 percent and gold and silver ores most of the remaining 2 percent.

Tungsten.—The first appreciable quantity of tungsten ore produced in the State since 1949 was reported during the year. The ore came from several areas, and a large percentage was produced at the Ivanhoe and Lost Creek mines in Beaverhead County. The Ivanhoe property, owned by American Alloy Metals, Inc., and the Lost Creek property, owned by Minerals Engineering Co., were being developed jointly by the latter company under a leasing arrangement made during the year. Exploration indicated sizable deposits of low-grade ore on the properties; tests at the Ivanhoe mine appeared to be the most favorable. By the end of the year the Ivanhoe mine had been opened, and two open pits were producing ore averaging 0.40 percent WO_3 . A total of 1,200 feet of diamond drilling had been completed at the Lost Creek mine, and the open-pit operation was producing ore averaging 0.20 percent WO_3 .

Ore from the 2 properties was shipped to the new Minerals Engineering Co. 300-ton flotation mill near Glen. Construction of the \$300,000 mill was begun early in September, and it was in operation by the middle of November. Concentrates from the mill were shipped to the new refinery of the Salt Lake Tungsten Co., Salt Lake City, Utah. The refinery is owned jointly by Minerals Engineering Co. and Sylvania Electric Products, Inc.

A substantial quantity of tungsten concentrates was produced by the Henderson Tungsten Co. from the Henderson Creek placer deposit in Granite County and sold to the General Services Administration. Other tungsten activity was reported near Pony, Madison County, by Pony Tungsten Enterprises; at the Storm Lake property in Deer Lodge County by Sunshine Mining Co.; and at the Combination mine, Granite County, by Philipsburg Tungsten Co.

Uranium.—The Government's uranium purchase program continued to stimulate hope that profitable occurrences of uranium minerals

would be found in the State, and considerable exploration activity was noted. According to a report,⁷ A. H. Eiselein and associates shipped a car of uranium ore to the Vitro Chemical Co. at Salt Lake City from the Lone Eagle mine near Clancy in Jefferson County. Exploration activity was carried on at the Water Hole property in Mineral County by Cyprus Mines, Inc.

Zinc.—Decreased production from the Anaconda Copper Mining Co.'s Butte mines, which supplied over 90 percent of the State output of zinc in 1953, and closing of the Mike Horse mine in November 1952 by the American Smelting & Refining Co. resulted in a 2-percent decrease in zinc production in Montana. Despite the decline, the State continued to be the Nation's leading zinc producer. At the East Helena fuming plant of the Anaconda Copper Mining Co., Lewis and Clark County, recovery of zinc from old smelter slag increased slightly in 1953. The Algonquin mine of Trout Mining Division, American Machine & Metals, Inc., at Philipsburg, Granite County, was the only other operation that produced 500 tons or more of recoverable zinc during the year.

Miscellaneous Metals.—Byproducts from metallurgical operations in the State included arsenic, bismuth, cadmium, indium, palladium, platinum, selenium, and vanadium red-cake precipitates. Arsenious oxide was a byproduct of the copper smelter at Anaconda; bismuth was recovered from the slimes of the copper-precipitation tanks at the Great Falls Reduction Works of the Anaconda Copper Mining Co.; cadmium was a byproduct of the zinc plants at Anaconda and Great Falls; indium was recovered at the zinc plant at Great Falls; palladium and platinum were recovered from the slimes of the copper-precipitating cells at Great Falls; and vanadium precipitates were recovered at Anaconda from Idaho phosphate rock.

NONMETALS

Barite.—Greatly increased output of crushed and ground barite from an underground mine near Greenough, Missoula County, was reported by the Finlen & Sheridan Mining Co., sole producer in the State. Sales, which exceeded 16,000 tons valued at nearly \$200,000, consisted of 10,920 tons of ground barite for well drilling and 5,542 tons of crushed material sold to chemical companies and sugar refineries.

Mine development was expanded during the year, and the processing plant's capacity was enlarged to handle the increased output from the mine.

Cement.—The mill of the Ideal Cement Co., Three Forks Portland Cement Division, at Trident, Gallatin County, was the only cement producer in the State. The company quarried limestone at the Trident quarry and obtained gypsum from the company-owned Han-over mine in Fergus County. Sandstone and iron ore were purchased. The principal product was general-use portland cement; appreciable quantities of special-purpose portland cements and masonry cement also were manufactured. The plant operated at about the same rate of output as in 1952; employment at the Trident operations averaged 125 men.

⁷Mining Association of Montana, News Letter: November and December 1953, p. 2.

Clays.—Five structural-clay-products plants were active, and fire clay was mined at two properties in the State. Anaconda Copper Mining Co. utilized the entire output of fire clay. The output of common clay totaled 34,174 tons, and about 2,500 tons of fire clay was mined. Production was obtained in Cascade, Deer Lodge, Fergus, Hill, Lewis and Clark, and Yellowstone Counties.

Fluorspar.—As in 1952, the only production of fluorspar in Montana was from the Crystal Mountain deposit near Darby, Ravalli County, by Cummings-Roberts, Compton, Calif.; however, shipments from this property were reduced drastically owing to lessened demand by the principal consumer, Columbia-Geneva Division, United States Steel Corp., Geneva, Utah. Some shipments were made to consumers in California. The discovery and development of the deposits were described in a magazine article.⁸ Six fluorite outcrops have been found; their sizes vary from about 20 by 60 feet to 180 by 270 feet in lateral dimensions. The ore bodies are nearly pure fluorite masses cut by numerous granitic dikes. Excluding the dike material, the ore is about 95 percent fluorite, with feldspar and biotite the Principal gangue minerals. Rock is mined by open-pit methods; drilling and blasting are required. Broken rock is loaded by power shovels into trucks and hauled 26 miles to the railhead at Darby. The mine is at 7,000 feet elevation and is closed during the winter months because of heavy snowfalls and the prohibitive cost of maintaining access.

Gypsum.—The quantity and value of the gypsum output from the State's two producing mines in Fergus County declined for the second consecutive year owing largely to smaller production at the Hanover mine of Ideal Cement Co. This company reported that the manufacture of plaster was discontinued in 1952 but that rock was mined for use as a cement retarder and as agricultural gypsum.

The United States Gypsum Co. Shoemaker mine and Heath plant near Lewistown were active throughout the year. Pulverized and calcined gypsum was produced, and various types of wallboard were manufactured.

Lime.—The output of lime at plants in Powell and Deer Lodge Counties was increased somewhat in 1953. The Elliston Lime Co. quarried limestone and operated rock-crushing, lime-burning, and hydrating facilities near Elliston, Powell County. The principal product was hydrated lime, of which 3,076 tons was sold for use in chemical works, for water purification, as building lime, and for other purposes. About 240 tons of building quicklime also was sold.

The Anaconda Copper Mining Co. operated a kiln at the metallurgical works at Anaconda and produced quicklime for various uses in the plant, particularly in ore concentration. Limestone was obtained from nearby Brown's quarry.

Production costs were reported to have increased during the year owing to higher wages, freight rates, and fuel costs. Lime prices were raised an average of \$0.30 per ton at one plant, but the increase was not sufficient to compensate for the higher costs.

Phosphate Rock.—The mine output of phosphate rock was increased to a new high level in an effort to fill the demand created by growing processing-plant facilities in Montana and British Columbia.

⁸ Tabor, John W., Montana's Crystal Mountain Fluorite Deposit Is Big and High Grade: *Mining World*, vol. 15, No. 7, June 1953, p. 43 ff.

In the Garrison district, Powell County, Montana Phosphate Products Co., a subsidiary of Consolidated Mining & Smelting Co., Trail, British Columbia, mined the Anderson and Gravelly mines and completed a development program at the Gimlet mine. The nearby Relyea mine was operated by George Relyea, who reported increased output. Rock from these properties was shipped to the Kimberly fertilizer and chemical plant of Consolidated Mining & Smelting Co. New facilities increasing the capacity of the Kimberly plant were put into operation in November.

The Victor Chemical Works began production from a second furnace at the Silver Bow elemental phosphorus plant near Butte in January 1953. Mine production from the company-operated Maiden Rock mine was expanded to meet the plant's requirements, and development of the Canyon Creek mine also yielded some rock.

The Williams Phosphate Corp. marketed a small quantity of phosphate rock in Madison County for use as a fertilizer by direct application to the soil.

Production of treble superphosphate and phosphoric acid at the Anaconda plant of Anaconda Copper Mining Co. was 106,009 tons, compared with 101,199 tons in 1952. Phosphate rock was obtained from the company-owned Conda mine, Caribou County, Idaho. The Anaconda company reported that a new 100-ton sulfuric acid plant, together with a fluo-solids roaster, would be completed late in 1954, enabling the output of larger quantities of phosphate products.

Several of a series of preliminary reports were issued by the Geological Survey⁹ on the results of field and laboratory investigations of the phosphoria formation in Montana. A publication summarizing results of Geological Survey investigations also was issued. It reported the discovery of deposits 4 to 6 feet thick containing 50 million tons or more of phosphate rock with about 31 percent P_2O_5 content in the Centennial Mountains along the Montana-Idaho State line.¹⁰

Pumice.—Pumice was mined and prepared by the Baker Cement Products Co. in Fallon County and used as lightweight-concrete aggregate. The output, valued at \$15,000, represents the first appreciable production reported from the State since 1948.

Pyrite.—Pyrite was obtained as a byproduct of base-metal ores milled by the Anaconda Copper Mining Co. at Anaconda. Production increased slightly over 1952.

Sand and Gravel.—The output of sand and gravel decreased for the second successive year, and the total value was 16 percent less than in 1952. The Montana State Highway Department produced over two-thirds of the output by quantity or over one-half by value, for use on road projects. Virtually all of this was delivered under contract by commercial producers and general road contractors. The value of output reported as sold or used commercially declined from \$1.4 to \$1 million. Sand and gravel was produced in 26 of the 56 counties in the State.

⁹ Swanson, R. W., and others, Stratigraphic Sections of the Phosphoria Formation in Montana, 1947-48: Geol. Survey Circ. 209, 1953, 31 pp.

Klepper, M. R., and others, Stratigraphic Sections of the Phosphoria Formation in Montana, 1948: Geol. Survey Circ. 260, 1953, 39 pp.

Cressman, E. R., and others, Stratigraphic Sections of the Phosphoria Formation in Montana, 1949-50, part 1: Geol. Survey Circ. 302, 1953, 23 pp.

Swanson, R. W., and others, Stratigraphic Sections of the Phosphoria Formation in Montana, part 2, 1949-50: Geol. Survey Circ. 303, 1953, 21 pp.

¹⁰ Swanson, R. W., McKelvey, V. E., and Sheldon, R. P., Progress Report on Investigations of Western Phosphate Deposits: Geol. Survey Circ. 297, 1953, p. 11.

Stone.—The tonnage and value of stone output increased over 1952 owing principally to larger quantities quarried for use as railroad ballast. Substantially greater quantities of limestone were mined also for use at metallurgical plants and sugar refineries. The largest operation in the State was that of Peter Kiewit Sons' Co., which produced 138,000 tons of limestone at the Big Horn Limestone Co. Warren quarry in Carbon County. Other large producers were McClellan Creek limestone quarry in Jefferson County, operated by Edward P. Maronick for the American Smelting & Refining Co.; Spring Gulch quarry, Granite County, operated by Frank H. Norberg Co.; and Brown's quarry, Deer Lodge County, operated by Anaconda Copper Mining Co. to supply limestone for the Anaconda metallurgical works. Quarries were operated for railroad ballast in Lewis and Clark, Park, and Flathead Counties.

Output was reported from 15 counties; limestone, sandstone, basalt, and granite were quarried. Over 50 percent of the output was used by railroad companies.

Talc.—Mine output and shipments of Montana talc from three mines in the Beaverhead-Madison County area were substantially greater than in 1952. Tri-State Minerals Co. operated the Smith-Dillon mine, leading producer, and the Treasure State mine. The Sierra Talc & Clay Co. reported an increased output from the Yellowstone mine. The talc was shipped to out-of-State grinding plants. Prepared products were used principally in the ceramics (38 percent), paint (27 percent), and textile (20 percent) industries. Smaller quantities were used in manufacturing insecticides, paper, and toilet preparations.

Nonmetallics, Inc., Helena, explored talc deposits near Alder and Virginia City, Madison County, and plans to construct a grinding plant in Helena were under consideration.

Vermiculite.—Montana continued to be the principal vermiculite-producing State, due to output by Zonolite Co. at a large open-pit mine 7 miles northeast of Libby in Lincoln County. The rate of production of screened and cleaned vermiculite decreased in 1953 from the high level maintained during 1950-52. Construction of a new processing plant, requiring an expenditure of about \$400,000 and scheduled for completion in 1954, was undertaken during the year. The plant not only will increase capacity but also will utilize new methods that will make profitable the mining and concentrating of lower grade material than was possible in the past. Enormous quantities of such low-grade, vermiculite-bearing rock are available at Libby.

A Bureau of Mines report contained information on the deposit and operation at Libby, as well as a very complete bibliography of published information on vermiculite.¹¹

MINERAL FUELS

Coal.—For the first year since 1908, the combined output of coal and lignite in Montana was less than 2 million tons. Competition from oil and natural gas, coupled with rising costs, closed some mines and limited production at others. Abandonment of rail service to the

¹¹ North, O. S., and Chandler, H. P., Vermiculite: Bureau of Mines Inf. Circ. 7668, 1953, 27 pp.

Red Lodge area in Carbon County by the Montana, Wyoming, & Southern Railway Co. forced closure of several mines in that district. A large strip mine, operated by Foley Bros., Inc., in Rosebud County, supplied about 75 percent of the total State output, compared with 70 percent in 1952. There were 37 mines active; however, only 21 of them produced over 1,000 tons in 1953. The principal producing counties, in order of quantity produced, were Rosebud, 1,421,100; Musselshell, 364,400; Carbon, 54,500; and Sheridan, Richland, Blaine, Custer, Cascade and Dawson, all less than 10,000 tons.

Oil and Gas.—The output of crude oil was increased from 9,606,251 barrels in 1952 to 11,920,187 barrels in 1953, and the value of production advanced 20 percent. Montana ranked 15th in the Nation as an oil-producing State and 13th in reserves, with a total of 180 million barrels. Seven new fields recorded their first commercial production. The new producing areas were in the southern and eastern part of Montana in Big Horn, Carbon, Fallon, Petroleum, Richland, and Roosevelt Counties. In Richland County the newly established Brorson field was producing from a depth of 12,500 feet. Exploration and drilling activity continued at a high level, with about 20 million acres of land under lease.

Natural-gas production declined slightly in both quantity and value in 1953, for the third consecutive year. As in previous years, the greatest output was from fields in the Glacier-Liberty-Toole County area; the Bowdoin field in Phillips County and fields in Blaine, Carbon, and Fallon Counties also were large producers.

A memoir on the oil and gas occurrences in Montana was issued by the Montana School of Mines.¹²

Nine refineries were operating in the State during the year, and the jet-fuel refinery at Mosby, Garfield County, was installing facilities to treble the plant capacity. An oil-products line from Billings to Spokane, under construction, was scheduled for completion in 1954.

REVIEW BY COUNTIES AND DISTRICTS

BEAVERHEAD

Manganese ore was shipped to the National Stockpile Depot at Butte by Ed C. Hughes from the Lulu Bell, Indian Queen, and Alice mines; by A. L. McArthur from the Traderhorn mine; and by Angus McDonald from the Blue Ore group. Production of tungsten ore from the Lost Creek and Ivanhoe mines by Minerals Engineering Co. began in the latter part of the year after 2 years of exploration and development by the company at the Ivanhoe mine and by American Alloy Metals, Inc., at the Lost Creek mine. The latter mine was subleased to Minerals Engineering Co. as initial operations began at the new company mill near Glen. DMEA projects were active at both properties during the year. A similar project for thorium was undertaken at the Last Chance mine by the Elkhorn Mining Co.

Tri-State Minerals Co. shipped talc from the Smith-Dillon mine in Axes Canyon, about 11 miles from Dillon, to a company grinding plant at Ogden, Utah. (See also Madison County.) The Canyon Creek phosphate mine near Melrose was under development

¹² Perry, Eugene S., Oil and Gas in Montana: State of Montana, Bureau of Mines and Geology, Montana School of Mines, Mem. 35, 1953, 54 pp.

by the Victor Chemical Works, Chicago, Ill.; mining was to begin in 1954. The mine is across the Big Hole River from the Victor Chemical Works Maiden Rock mine, in Silver Bow County. Sandstone for railroad ballast was quarried and crushed at Dalys pit near Dillon by Morrison-Knudsen Co., Inc., Boise, Idaho. The company reported that the plant was dismantled in September.

TABLE 10.—Value of mineral production in Montana by counties, 1952–53

County	1952	1953	Minerals produced in 1953, in order of value
Beaverhead.....	\$362, 155	\$434, 050	Lead, talc, sandstone, phosphate rock, tungsten, silver, gold.
Big Horn.....	49, 788	96, 074	Petroleum, sand and gravel.
Blaine.....	1, 116, 331	1, 353, 096	Petroleum, coal, sand and gravel.
Broadwater.....	102, 595	129, 762	Lead, gold, iron, silver, zinc, copper, stone.
Carbon.....	4, 733, 454	4, 594, 629	Petroleum, coal, limestone.
Cascade.....	296, 186	275, 627	Sand and gravel, coal, fire clay, silver, lead, zinc.
Chouteau.....	52, 565	3, 550	Sand and gravel.
Custer.....	47, 673	41, 818	Lignite, sand and gravel.
Dawson & McCone.....	¹ 534, 485	¹ 2, 111, 707	Petroleum, sand and gravel, lignite.
Deer Lodge.....	261, 515	330, 341	Lime, limestone, sand and gravel, fire clay.
Fallon.....	31, 390	245, 611	Petroleum, sand and gravel, pumice.
Flathead.....	312, 643	155, 038	Stone, sand and gravel.
Garfield and Petroleum.....	¹ 717, 499	¹ 556, 843	Petroleum.
Glacier, Liberty and Toole.....	¹ 11, 496, 366	¹ 12, 114, 681	Petroleum, sand and gravel.
Granite.....	(?)	1, 781, 000	Manganese ore, zinc, silver, stone, lead, man ganiferous ore, tungsten, copper, gold.
Hill.....	(?)	62, 044	Sand and gravel, clays.
Jefferson.....	644, 846	397, 294	Stone, lead, silver, gold, zinc, copper.
Judith Basin.....	16, 679	5, 976	Lead, zinc, silver, gold.
Lewis and Clark.....	2, 109, 632	1, 045, 739	Zinc, stone, sand and gravel, lead, silver, gold, clays, copper.
Meagher.....	20, 092	(?)	Lead, silver, zinc, gold.
Mineral.....	150, 601	180, 325	Sand and gravel, zinc, lead, silver, copper, gold.
Missoula.....	433, 887	306, 261	Barite, stone, gold, lead, sand and gravel, zinc, silver.
Musselshell.....	3, 220, 137	2, 428, 622	Coal, petroleum, stone.
Park.....	(?)	169, 307	Stone, gold, sand and gravel, silver, lead, copper.
Phillips.....	235, 622	159, 183	Sand and gravel, silver, gold.
Pondera and Teton.....	¹ 1, 808, 245	¹ 1, 724, 822	Petroleum.
Powell.....	2, 056, 500	2, 354, 331	Phosphate rock, lime, gold, limestone, lead, sand and gravel, silver, zinc.
Richland.....	37, 080	80, 672	Lignite.
Roosevelt.....	659, 710	1, 861, 804	Petroleum.
Rosebud.....	2, 959, 002	3, 700, 502	Coal, petroleum.
Sanders.....	394, 988	438, 979	Lead, zinc, silver, copper, stone, antimony, gold.
Sheridan.....	47, 542	41, 401	Lignite, sand and gravel.
Silver Bow.....	73, 026, 470	82, 035, 158	Copper, zinc, manganese ore, silver, lead, phosphate rock, gold pyrite, stone.
Stillwater.....	4, 703	872, 869	Chromite, petroleum.
Treasure.....	(?)	1, 556	Sand and gravel.
Valley.....	(?)	10, 730	Do.
Wibaux.....	125, 758	400, 310	Petroleum.
Yellowstone.....	416, 393	330, 262	Sand and gravel, petroleum, clays.
Undistributed ²	14, 174, 777	9, 356, 466	
Total.....	122, 069, 000	132, 184, 000	

¹ Dawson and McCone, Garfield and Petroleum, Glacier, Liberty, and Toole, and Pondera and Teton Counties are combined because of joint oil-field production.

² Included with "Undistributed" to avoid disclosure of individual output.

³ Includes value of petroleum, coal, natural gas, and sand and gravel that cannot be assigned to specific counties; and value added to talc production by processing in other States (\$153,668 in 1952). Also includes value of production from the following counties: Fergus (gypsum, clays, silver, lead, copper, zinc), Gallatin (cement, sand and gravel, stone, lead), Lincoln (vermiculite, sand and gravel, stone), Madison (talc, lead, gold, silver, zinc, tungsten), Ravalli (fluorspar, gold, sand and gravel, silver), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2).

Argenta District.—The Maulden (Louis Philipe) mine, 13 miles southwest of Dillon, was the principal metal producer in Beaverhead County during 1953. A total of 2,733 tons of lead ore (4,066 tons in 1952), containing values in gold, silver, copper, lead, and zinc, was

mined and shipped from the property, which is owned and operated by Ida B. Hand. The number of active mines in the Argenta district increased from 10 in 1952 to 14 in 1953, in contrast to the decreased number of active properties in most lead- and zinc-producing districts throughout the State. Mines besides the Maulden property from which some production was reported included Capital, Carbonate (mine and dump), Cave, East End, Elkhorn-Beaverhead, Ferdinand, Jack Group, Last Chance, Midge, Queen Ann, Tuscarora, and Yellow Band.

Blue Wing District.—M. D. Jordan shipped residues and low-grade lead ore from an early smelting operation known as the Stapleton, formerly near the town of Argenta. The Blue Dot Mining Co. did exploratory work on the New Departure group; lead ore was shipped from the Charter Oak mine and silver ore from the Cottontail property.

BIG HORN

First crude-oil production from the Ash Creek field on the Wyoming border combined with increased output from the recently opened Hardin area and the older Soap Creek field resulted in a record oil production of 92,687 barrels valued at \$87,481, compared with a yield of only 16,159 barrels with a value of \$19,229 in 1952. Natural gas also was produced. Sand and gravel were produced by county highway-department crews for use on roads. A small tonnage of coal was mined at the Sarpy mine, 33 miles south of Hysham, by Roy A. and David W. Lilley.

BLAINE

Blaine County was one of the leading oil and natural-gas producers in the State due to output from the Bowes field 6 miles south of Chinook. The value of crude oil yield exceeded \$1.3 million.

Subbituminous coal was mined at the Milk River mine near Chinook. The output decreased from about 8,500 tons in 1952 to 6,400 in 1953. Sand and gravel output for road metal was reported by the County.

BROADWATER

A small crew worked part of the year at the Eustis quarry of the Chicago, Milwaukee, St. Paul & Pacific Railroad Co., quarrying limestone for use as riprap.

Beaver District.—A large proportion of the value of output from metal mines in Broadwater County was supplied from the January group, operated throughout 1953 by Ed Pohl, with production comprising 753 tons of ore (493 tons in 1952) which contained 312 ounces of gold, 14,034 ounces of silver, 8,303 pounds of copper, 218,812 pounds of lead, and 102,732 pounds of zinc. Ray Reynolds and Robert Berndt began development at the Edna mine in September, shipping 29 tons of gold ore by the end of the year. Gold ore was shipped also from the Edna No. 2, by Morris L. Miles. Other active mines were Dome, North Star, and Point Hill.

Cedar Plains District.—Most of the output comprised zinc ore from the North Star group; the Ruby Silver mine was active also.

Park or Indian Creek District.—Gold ore was shipped from the Marietta mine.

Unorganized.—The annual assessment work on the Dakota-Idaho group by Julia A. Ross produced, from surface workings, 15 tons of gold ore containing 11 ounces of gold and 12 of silver. This is an old property that has not been mined intensively since the days of the old smelter at Wickes.

CARBON

The production of broken and crushed limestone was increased substantially at the Warren quarry, owned by the Big Horn Limestone Co., Denver, Colo., and operated by Peter Kiewit Sons' Co., Sheridan, Wyo. Output was used for sugar refining and as railroad ballast. Carbon County was the third-ranking producer of bituminous coal in Montana, the Foster mine of Montana Coal & Iron Co. and Brophy mine of Brophy Coal Co. being the principal producers. The Red Lodge coal-producing area received a severe setback on August 3, 1953, when rail service to the district was discontinued by the Montana, Wyoming & Southern Railway Co. As a result, the Montana Coal & Iron Co. closed both the Foster and Smith No. 3 mines. The Smith No. 3 subsequently was leased by four former company employees. The gross coal output from the county declined to about 57,000 tons, compared with 124,000 tons in 1952. Crude-oil output valued at more than \$4 million was derived largely from the Elk Basin field, 60 miles south of Billings, and also from the Dry Creek, Frannie, Jack Creek, and Golden Dome fields. The Golden Dome field was a new producer. Large quantities of natural gas also were produced in the county.

CASCADE

The electrolytic copper refinery and the electrolytic zinc plant of the Anaconda Copper Mining Co. at Great Falls were operated throughout 1953. The copper refinery processed anodes shipped from the Anaconda Reduction Works, producing wire bars, cakes and slabs, and billets. Zinc concentrates treated at the electrolytic zinc plant totaled more than 200,000 tons, including company material received from Anaconda and toll concentrates shipped by mining companies in several Western States and foreign countries. The Anaconda Wire & Cable Co. fabricated copper wire at its Great Falls plant.

The Great Falls Brick Co. manufactured heavy clay products from buff-firing clay mined at Tracy, 13 miles south of Great Falls. Shale for use at the Anaconda Copper Mining Co. refractory plant at Anaconda was produced at the underground Armington mine. Sand and gravel were mined by commercial producers, the Great Northern Railway Co., and county highway crews. Coal output was only about half as large as in 1952; value declined to approximately \$10,000.

CHOUTEAU

A small quantity of sand and gravel was mined for use on a State highway project.

CUSTER

Lignite was produced at the Storm King mine 12 miles east of Miles City. The Northern Pacific Railway Co. and Chicago, Milwaukee, St. Paul & Pacific Railroad Co. mined sand and gravel, and the county

reported production of sand and gravel by county road crews and contractors for use on road projects.

DAWSON AND McCONE

In July 1951 the first commercial discovery of oil in eastern Montana was made in the Richey field, which spreads across the Dawson-McCone County line 12 miles northwest of Richey. Subsequently, the Glendive field 55 miles to the southeast in Dawson County and the Southwest Richey field in McCone County were discovered and put into production. In 1953 the output from these three fields was increased almost fourfold over 1952 to a total of 1,158,500 barrels valued at \$2,058,369, and the Glendive field ranked sixth in the State in output.

Dawson County also produced sand and gravel, mined by the Northern Pacific Railway Co. and Knoll & Sons, Glendive. The Albrecht strip mine, 4½ miles northeast of Bloomfield, produced 2,100 tons of lignite. A small quantity of lignite also was mined in McCone County.

DEER LODGE

The enlargement program at Anaconda Copper Mining Co. metallurgical facilities, Anaconda, was described in the annual company report to shareholders:

The reconstruction of the West Mill at Anaconda, Montana, and the construction of a new crushing plant and conveyor, which were started in 1952 to take care of the increased production of copper ore from the Kelley mine and additional zinc and manganese ores, are proceeding and will probably be completed by the Fall of 1954. When the crusher at the East Anaconda yards and the conveyor therefrom to the concentrator bins are completed, the cost of crushing ore and delivering the crushed ore to the bins will be substantially reduced.

Two additional furnaces in the sponge iron plant and an enlargement of the leach-precipitation-float plant, required for the treatment of Kelley ore should also be completed in the Summer of 1954. As part of the enlargement a 100-foot Dorr thickener was completed during 1953 and is now in operation.

The new 100-ton sulphuric acid plant, together with a fluo-solids roaster will be completed late in 1954 and will enable the production of a larger tonnage of treble-superphosphate and phosphoric acid, production of which in 1953 amounted to 106,009 tons.

Limestone was produced at Brown's quarry by the Anaconda Copper Mining Co. for use at the Anaconda metallurgical plant as a flux and in the manufacture of lime. Output was increased substantially to meet demands at the plant. Small quantities of the limestone were used as road metal and railroad ballast. Harold Snow reported open-pit mining of fire clay, also for use at the Anaconda plant. Washed sand and gravel were produced near Stuart by the Stuart Sand & Gravel Co. and at the Pioneer spur by Pioneer Concrete & Fuel, Inc.

FALLON

Baker Cement Products Co., Baker, produced sand and crushed and screened pumice for use in manufacturing concrete blocks. Crude-oil output, from Shell Oil Co. wells in the Little Beaver and Cabin Creek fields, increased sharply in 1953. The Cabin Creek field was a new discovery and registered its first output during the

year. A substantial quantity of natural gas also was produced in the county.

FERGUS

Underground gypsum mines of the U. S. Gypsum Co. and the Ideal Cement Co. supplied a large share of the mineral output in Fergus County. Gypsum production was down, largely because the Ideal Cement Co. closed its calcining plant. Clay was mined by the Lewistown Brick & Tile Co. for use in the manufacture of structural clay products. The Chicago, Milwaukee, St. Paul & Pacific Railway Co. produced sand and gravel. Several small coal mines producing less than 1,000 tons of coal a year were active in the county.

Warm Springs District.—Lead ore was shipped from the Silver Dyke mine.

FLATHEAD

Construction of an aluminum-reduction plant on a 750-acre tract near Columbia Falls was begun early in the year by Anaconda Aluminum Co., a subsidiary 95 percent owned by Anaconda Copper Mining Co. Auxiliary construction included housing facilities for plant employees. According to the parent company's annual report for 1953, expenditures on the aluminum plant to December 31, 1953, amounted to \$15,811,015, of which \$9,093,582 was expended in 1953. The total cost of the project is estimated at \$45 million.

Sandstone for ballast was quarried and crushed at the Essex quarry by the Green Co., Spokane, for the Great Northern Railway Co. Sand and gravel were produced by two companies.

GALLATIN

The Ideal Cement Co. quarry and plant at Trident were the principal industrial establishments in the area, employing about 125 men. Sand and gravel were mined by county road crews and contractors, and the Gallatin Sand & Gravel Co. operated a plant at Bozeman. The county also quarried rock for riprap at four different quarry sites.

GARFIELD AND PETROLEUM

The yield of crude oil from the Cat Creek field east of Winnett, a producer since 1920 and the third oil discovery in the State, declined for the sixth consecutive year to 208,576 barrels. About 10 miles southeast of Winnett in Petroleum County, Rattlesnake Butte field made its initial production of 3,599 barrels of crude.

GLACIER, LIBERTY, AND TOOLE

These counties are discussed together, as the principal mineral output was crude oil and natural gas from fields extending across county lines. The total oil production from the area in 1953 was valued at over \$12 million, and the area was the major natural-gas producer in the State. Active fields, in order of magnitude of crude-oil output, were Cut Bank, Kevin-Sunburst, Reagan, Sweet Grass Hills, and Border. The combined output of 4,448,609 barrels was 130,000 barrels greater than in 1952, and the production rate, which has been declining from highs of more than 7 million barrels per year during 1942-44, may be leveling off.

Production of washed sand and gravel was reported by L. Welker and J. Horner, Shelby.

GRANITE

The Spring Gulch limestone quarry near Drummond was operated by Frank H. Norberg Co., Denver, producing limestone for use in sugar refining. Activity, which had been restricted in 1952, was increased, and an average of 16 men was employed throughout most of the year.

Boulder and South Boulder District.—Lucky Lead Mines, Inc., operated the Lucky Lead open-pit mine near Maxwell from July 15 to September 15 and made a test run of approximately 1,000 tons of lead ore in the company 100-ton gravity and flotation mill.

Dunkelberg District.—The Bureau of Mines published the results of its investigation of lead-zinc deposits in the district.¹³

First Chance District.—Gold and silver were recovered from the Gold Leaf mine.

Flint Creek District.—Production from the Trout-Algonquin group of mines of Trout Mining Division, American Machine & Metals, Inc., comprised 26,420 tons of manganese-lead-zinc ore, compared with 27,580 tons in 1952. Of the total, 208 tons was shipped to a smelter and 26,215 tons was milled in the company 100-ton flotation plant, yielding a substantial quantity of battery-grade manganese concentrates, 335 tons of lead concentrates, and 1,703 tons of zinc concentrates. Taylor-Knapp Co. shipped manganese carbonate concentrates to the National Stockpile and lead-zinc ore and old tailings to a smelter from the True Fissure mine. The company discontinued production of battery-grade manganese oxide concentrates when the oxide ore in the True Fissure mine was exhausted. Low lead-zinc prices caused curtailed production at the Scratch Awl mine, operated by Peter Antonioli.

Henderson District.—Philipsburg Tungsten Co., successor to Combination Development Co., shipped dump ore containing lead and tungsten from the Black Pine (Combination) mine to the Lucky Lead mill at Princeton. A quantity of tungsten concentrates was shipped to the National Stockpile by the Henderson Tungsten Co. from the Henderson Creek placers.

HILL

Production of washed and pit-run sand and gravel was reported by Fritz Naber, Havre. Natural gas was withdrawn from the Box Elder field on the Blaine County line.

JEFFERSON

Depressed lead and zinc prices brought about a reduction in the number of active metal mines in Jefferson County from 36 in 1952 to 26 in 1953. The Alta mine of Lahey Leasing Co. continued to be the principal producer, followed by the Basin Jib and Elkhorn Queen properties; the other active mines were, for the most part, small-scale, intermittent operations.

¹³ Popoff, C. C., Lead-Zinc Deposits of the Dunkelberg District, Granite County, Mont.: Bureau of Mines Rept. of Investigations 5014, 1953, 41 pp.

Exploration for uranium mineralization was carried on at the Sylvan mine by D. A. McNabb and at the Lone Eagle mine by A. H. Eiselein and associates, with DMEA assistance. One car of uranium ore was shipped from the Lone Eagle mine.¹⁴

The Maronick Limestone Co. operated the McClellan Creek quarry south of East Helena, producing crushed limerock for use at the East Helena lead smelter of American Smelting & Refining Co. A small quantity of dimension granite for monuments was produced by Louis Dumas.

Amazon District.—H. E. Longmaid leased the Cleveland mine, 13 miles north of Boulder, and operated the property during July, shipping lead-zinc ore to a smelter, the first ore taken from the mine in over 25 years.

Cataract (Basin) District.—Basin Jib Gold Mines, Inc., Toronto, Canada, worked the Basin Jib property, beginning September 1, and shipped 457 tons of gold ore containing 222 ounces of gold and 1,245 of silver by the end of 1953. The operation consists of open-pit mining blocks of ore that were not extracted by previous owners during underground mining.

Colorado District.—At the Alta mine, production of gold-silver ore, containing values in lead and zinc, was about at the same rate as in 1952. Louis Peura shipped gold-silver ore from the Minnesota group dump.

Elkhorn District.—Output of lead ore from the Elkhorn Queen property was reduced greatly compared with 1952.

Whitehall District.—Production comprised gold ore from the Lucky Hit property and lead ore from the Minerva, Parrott, Perhaps, and Whitehall mines.

LEWIS AND CLARK

The lead smelter of American Smelting & Refining Co. at East Helena operated continuously in 1953 and treated chiefly concentrates and crude ore from mines in Montana, Idaho, and Washington and residues from the electrolytic zinc plants at Anaconda and Great Falls. Lead-bearing material from several foreign countries also was treated at East Helena. The quantity of foreign shipments received at East Helena depended upon the quantity of ores and concentrates awaiting treatment at the Selby, Calif., smelter. When the capacity of the Selby plant was exceeded, foreign shipments were routed to East Helena. Adjacent to the lead smelter, the zinc-fuming plant of Anaconda Copper Mining Co. processed 176,922 tons of molten slag from the smelter and 28,089 tons of old slag from the smelter dump and produced 37,017 tons of zinc fume. Most of the product was consigned to the Anaconda Copper Mining Co. electrolytic zinc plant at Great Falls for conversion to slab zinc; the remainder was sold to the American Chemet Corp. plant at East Helena and used to manufacture pigments.

The permanent closing of the Mike Horse mine in the fall of 1952 was the principal factor causing the value of gold, silver, copper, lead, and zinc produced in the county to decrease from \$1,983,366 in 1952 to \$757,130 in 1953. Zinc and lead recovered from old lead blast-

¹⁴ Work cited in footnote, 6, p. 26.

furnace slag at the East Helena fuming plant was credited to current mine-production statistics and supplied most of the value of metal output in the county in 1953.

A DMEA tungsten project was carried on at the Prentice property by Ottawa Tungsten Co.

The Western Clay Manufacturing Co. operated its openpit clay mines at Bossburg, 16 miles west of Helena, and a structural clay product plant and small pottery and terra cotta plant at Helena. Granite riprap was quarried by S. Birch & Sons, Great Falls, at the Wolf Creek quarry for the Great Northern Railway Co. Sand and gravel were produced by the Helena Sand & Gravel Co.

Helena District.—O. A. Barnes operated a dragline excavator and washing plant on the Caswell placer from July 1 to August 18 and recovered 58 ounces of gold and 6 ounces of silver from 2,250 cubic yards of gravel washed.

Rimini District.—Minerals, Inc., shipped lead ore from the Sally Bell mine. Gold-silver dump ore shipped from the Bunker Hill and Lee Mountain properties supplied most of the remaining production of the district in 1953.

LIBERTY

See discussion under Glacier, Liberty, and Toole Counties combined.

LINCOLN

The open-pit mine of Zonolite Co. near Libby was the largest producer of crude vermiculite in the United States. Construction of a new concentration plant was undertaken in 1953. The Great Northern Railway Co. produced a small quantity of sand and gravel.

MADISON

Increased output of talc was reported from both the Yellowstone mine of Sierra Talc & Clay Co. near Cameron and the Treasure State mine of Tri-State Minerals Co. near Dillon. The talc was shipped to out-of-State grinding plants. A small quantity of phosphate rock was marketed for use as a fertilizer by the Williams Phosphate Corp. from a deposit 26 miles southeast of Alder.

Norris and Norwegian District.—Gold ore was shipped to a smelter from the Gold Cup property.

Pony and South Boulder District.—Denzil and Basil Nicholson worked the Ridgeway gold mine for approximately 2½ months; the mine is situated on the east fork of South Boulder River.

Rochester District.—Production from the Commonwealth (Calvin) mine by Commonwealth Mining Co. of Salt Lake City, Utah, comprised 78 tons of lead-zinc ore shipped to a smelter. The property was the principal producer of the small quantity of metal credited to Madison County in 1953.

Tidal Wave District.—Ore treated by amalgamation from the Ace group by Lewis C. Rollins yielded some gold and silver. Production was reported also from the Minnie Lodge mine.

Virginia City District.—Four small gold-silver mines were active—the El Fleeda, Low Ridge, Mountain Flower, and Pony.

McCONE

Discussion combined with Dawson County, because oil output from field extends across the county line.

MEAGHER

A small output of lead and some silver was obtained from the Cumberland and Great Eastern mines in Castle Mountain District.

MINERAL

Sand and gravel were mined and crushed gravel for roads was produced by Federal and county highway agencies.

Iron Mountain District.—E. G. Smith continued to operate the Iron Mountain lead-zinc mine under lease from the American Smelting & Refining Co. The output of crude ore totaled 4,824 tons compared with 7,950 tons in 1952. All ore was processed in the Nancy Lee custom mill near Superior.

Keystone District.—Lead-zinc milling-grade ore was produced from the Nancy Lee lease.

MISSOULA

Barite became the leading mineral commodity produced in the county as a result of increased output by the Finlen & Sheridan Mining Co., Butte, from a mine near Greenough. The Chicago, Milwaukee, St. Paul & Pacific Railroad Co. quarried granite and mined sand and gravel for riprap and ballast. The Lyon Construction Co. quarried and crushed stone near Clinton for the Northern Pacific Railway Co.

Copper Cliff District.—Linton Mines, Inc., terminated operations at the Blacktail lead mine in the fall of 1953 after curtailing production early in the year because of high operating costs and the drop in the price of lead. The company acquired the mine in 1949 and installed a 500-ton sink-float plant. Output from 1949 through 1952 averaged 500 tons of recoverable lead annually.

Nine Mile District.—The Nine Mile gold mine was developed by William Lamon. A considerable quantity of gold was recovered by a placer operation on Josephine Creek, which contributed to the substantial increase in production of placer gold in Montana in 1953.

MUSSELSHELL

Coal was the leading mineral commodity produced in Musselshell County, the second largest coal-producing county in the State. Output was derived principally from the Roundup No. 3 mine of the Sheridan-Wyoming Coal Co., Inc., and the Klein No. 2 mine of the Bair-Collins Co. A number of other smaller mines also were active. The total output of coal decreased about 27 percent from 1952. Crude-oil production in the county also decreased in value by about the same percentage as coal. The Big Wall and Melstone fields were the principal producers. A small output was reported from the newly established Ivanhoe Dome field. A small quantity of stone was quarried by the Chicago, Milwaukee, St. Paul & Pacific Railroad Co.

PARK

The principal mineral production in the county was crushed stone produced at a quarry near Emigrant station by Lyons Construction Co. for the Northern Pacific Railway Co. Egger Bros., Livingston, reported output of washed sand and gravel and county road crews mined pit-run gravel for road material.

New World District.—McLaren Gold Mines Co., reported that it had discontinued operation at the Estelle open-pit gold mine near Cooke and had sold all mining and milling equipment at the property. The mine had been one of the chief producers of gold in the State in recent years. The McLaren mill was dismantled by Machinery Center, Inc., of Salt Lake City, Utah, and mill cleanings were shipped to a smelter. The Woodbine lead mine was worked during part of September and October by C. M. Saler.

PETROLEUM

Oil was produced from the Cat Creek field on the Garfield County line. (See also Garfield County.)

PHILLIPS

A large quantity of sand and gravel was mined by the Great Northern Railway Co. for ballast and other uses. The Bowdoin-Saco area was one of the major natural-gas producers in the State.

Little Rockies District.—A shipment of gold-silver ore was reported from the Little Ben mine.

PONDERA

The Pondera oil field in Pondera and Teton Counties was the seventh ranking field in the State in quantity of output, with a production of 753,172 barrels valued at \$1,723,382. A small quantity of oil also was obtained from the Brady field.

POWELL

The principal mineral industry in Powell County was the mining of phosphate rock. Three mines operated by the Montana Phosphate Products Co. and the George Relyea mine were active, and production was increased over 1952. The Elliston Lime Co. quarried limestone near Elliston from May through November and produced crushed limestone, quicklime, and hydrated lime. A small output of sand and gravel for railroad ballast was reported by the Chicago, Milwaukee, St. Paul & Pacific Railroad Co.

Nigger Hill District.—The Charter Oak Mining Co. reported beginning construction of a 50-ton flotation plant, although no ore was produced from the Charter Oak mine during 1953. John F. Hopkins operated the Negros mine from September 15 to December 31 and shipped 74 tons of gold-silver ore.

Yourname Creek District.—Production of gold and silver from the Neversweat property was reported.

Zozell (Emery) District.—The results of a survey of the geology and mineral deposits in the Zozell (Emery) gold-silver-lead mining district were published.¹⁵

RAVALLI

Shipping-grade fluorspar was open-pit-mined at the Crystal Mountain mine east of Darby by Cummings-Roberts Engineering Co., Compton, Calif., and was the principal mineral commodity produced in the county. The county road department mined sand and gravel for use on roads.

Overwich District.—The Hughes Creek Dredging Co. operated from May 15 to October 1 at the Hughes Creek placer location. Approximately 3,000 cubic yards of gravel were moved to sluice boxes by a bulldozer.

RICHLAND

Discovery by the Sun Oil Co. of the Brorson oilfield a few miles northwest of Sidney heralded the first production of crude oil from Richland County. Output of 30,316 barrels, from a depth of 12,500 feet, was made by the new producer in 1953, and geophysical and well drilling crews were searching actively for oil occurrences in other areas in the county.

Lignite was produced from several small mines; the Jennison mine near Culbertson, Roosevelt County, was the principal producer.

ROOSEVELT

The Poplar Area oilfield northeast of Poplar, discovered in early 1952, became the fourth largest producing field in Montana in 1953, with an output of 1,154,987 barrels. The Wolf Creek field, a new discovery in the western part of the county, recorded its first production of about 2,000 barrels.

ROSEBUD

One of the largest strip-coal mines in the world was operated by Foley Bros., Inc., at Colstrip. Producing at the high rate of nearly 100 tons per man-shift, it furnished a preponderant portion of Montana's total production. The output of crude oil from the Sumatra field has increased steadily since its discovery in 1949; the yield in 1953 was 424,927 barrels valued at \$858,352.

SANDERS

B. F. Cooper reported shipment of a small amount of antimony ore from the Stibnite Hill mine in the Burns district.

Stone for riprap was quarried near Knowles station by the Northern Pacific Railway Co.

Eagle District.—Ore production from the Jack Waite mine, operated since 1934 by the American Smelting & Refining Co. under a profit-sharing agreement, decreased 7 percent compared with 1952, but smelter shipments of concentrates advanced substantially. Most of the ore was milled in the 250-ton flotation plant at the property; 414

¹⁵ Robertson, Forbes, Geology and Mineral Deposits of the Zozell (Emery) Mining District, Powell County, Mont.: State of Montana, Bureau of Mines and Geology, Montana School of Mines, Mem. 34, 1953, 29 pp.

tons shipped crude to a smelter averaged 77.37 percent lead, 4.11 percent zinc, and 5.58 ounces of silver per ton, according to the annual shareholders' report of the Jack Waite Mining Co. Lead concentrates totaling 1,557 tons assayed 75.76 percent lead, 3.82 percent zinc, and 6.93 ounces of silver per ton, and 895 tons of zinc concentrates assayed 52.98 percent zinc, 1.43 percent lead, and 1.44 ounces of silver per ton. Employment was maintained at an average of 22 men, and labor turnover at the isolated mine was the lowest in many years. The only other active metal mines in Sanders County were the Mary Ann (silver ore) and the Mascot (copper ore), both of which were operated for brief periods on a small scale.

TABLE 11.—Production of gold, silver, copper, lead, and zinc in Silver Bow County 1949–53, and total, 1882–1953, in terms of recoverable metals

Year	Mines producing	Material sold or treated (short tons)	Gold (lode and placer) (fine ounces)	Silver (lode and placer) (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
1949.....	15	2,297,584	15,757	5,636,112	111,890,500	22,979,600	95,963,100	\$43,225,091
1950.....	21	3,387,270	23,163	6,123,549	107,793,300	31,358,800	127,021,000	51,044,252
1951.....	15	3,780,943	15,674	5,950,647	113,652,000	33,260,000	161,000,000	68,493,990
1952.....	21	4,425,605	16,930	5,518,197	123,118,000	32,324,000	151,936,000	65,806,893
1953.....	19	5,993,457	19,871	6,289,415	155,040,000	33,534,000	150,340,000	72,566,257
1882-1953.....	-----	(¹)	2,156,556	586,655,142	² 6,964,465	² 335,449	² 2,007,237	2,992,899,705

¹ Figure not available.

² Short tons.

SHERIDAN

Lignite was produced at the Acme mine near Coalridge and at the Lagerquist strip mine about 8 miles southwest of Westby. Sand and gravel were mined for county road construction and for railroad ballast.

SILVER BOW

Silver Bow County produced 80 percent of the gold, 94 percent of the silver, over 99 percent of the copper, 84 percent of the lead, and 94 percent of the zinc supplied by Montana's mines in 1953. Nearly all of the metals came from Anaconda Copper Mining Co. Butte mines. The Marget Ann gold-silver and the Bullwacker, Rabbit, and Sarsfield copper mines were active also. Owing to a 49-percent advance in the value of copper production, the total value of output of the 5 metals increased 10 percent, despite a sharp drop in the value supplied by zinc. A decline in the value of lead output was offset by a combined increase of approximately equal magnitude in silver and gold production. Silver Bow County's share of the value of production of the 5 metals increased from slightly more than 93 percent in 1952 to nearly 97 percent in 1953. The county also was a major producer of manganese ore and phosphate rock.

A second electric furnace was put into operation at the Victor Chemical Works Silver Bow elemental phosphorus plant near Butte, doubling the plant capacity. Mine output at the company-owned Maiden Rock underground mine near Melrose was increased to meet the plant demands, and development of the Canyon Creek mine in

adjoining Beaverhead County was continued. A small quantity of stone was quarried near Janey station for railroad riprap.

Summit Valley District.—Mine output of copper ore through the Kelley shaft of the Greater Butte block-caving project amounted to 2,899,565 tons compared with 1,095,015 in 1952, the first year of production. Of the total, 2,899,226 tons was concentrating ore and 339 tons was smelting ore. Production averaged 7,000 tons per day during the first part of the year but was increased to 12,000 tons by October. Work on the Kelley No. 2 shaft to handle men and supplies was in progress during 1953; completion of this shaft will provide the facilities needed to raise daily capacity to a maximum rate of 15,000 tons. Shaft connections from the 2,000 level to the surface were completed, and shaft enlargement and concrete lining were begun. The areas tapped by the Greater Butte project contain an estimated 130 million tons of low-grade ore, averaging 1 percent copper.

Higher grade copper ore extracted by conventional mining methods from the Mountain Con, Belmont, and Leonard mines totaled 1,103,242 tons of milling ore and 3,860 tons of smelting ore (959,255 tons and 1,230 tons, respectively, in 1952). Special waste concentrating ore amounted to 94,771 tons, compared with 67,323 tons in the previous year. The copper-precipitating plant produced 5,760 tons of mine-water precipitates, whereas 6,338 tons was recovered in 1952. Other copper-bearing material shipped from the Butte mines to the Anaconda Reduction Works at Anaconda were 10,708 tons of ore from the Mountain View-Rarus development project and 999 tons from the Skyrme low-grade development project.

The tonnage of ore mined from the Butte Hill zinc-lead mines (Alice, Anselmo, Badger State, Lexington, Original, and Orphan Girl) decreased from 1,333,385 tons in 1952 to 1,290,907 in 1953. Ore haulage through the Alice-Lexington tunnel was begun in 1953; the tunnel was completed late in 1952 to provide increased haulage facilities at the Alice and Lexington mines and tributary areas. Manganese ore from the Emma, Travona, and other Butte mines also supplied large quantities of lead and zinc.

East of Butte, Norman Rogers operated the Bullwacker and Rabbit open-pit copper mines, producing 11,665 tons from the Bullwacker (3,250 tons in 1952) and 28,049 tons from the Rabbit (23,250 tons in 1952). The gross copper content of the ore was 1,568,501 pounds. Mitchell Mining Co. operated the Marget Ann gold-silver mine at Walkerville continuously in 1953. Ted Farrow operated the Sarsfield copper mine.

The Anaconda Copper Mining Co. purchased the properties of the North Butte Mining Co. in January. A history of the early smelters at Butte was published.¹⁶

According to the Anaconda Copper Mining Co. annual report for 1953, the production of manganese nodules amounted to 94,120 long tons, 16.33-percent increase over 1952, while output of ferromanganese established a high record of 40,764 long tons. A total of 452,857 tons of ore from the Emma, Travona, and other Butte-area mines was processed in the concentrating and sintering plant at Anaconda,

¹⁶ Smith, Ralph I., *History of the Early Reduction Plants of Butte, Mont.*: Bureau of Mines and Geology, State of Montana, Repr. 2, 1953, 17 pp.; repr. from periodical, *De Re Metallica*, vol. 18, Nos. 2 and 3.

Deer Lodge County. Part of the nodules produced from the plant was used to make ferromanganese in plants at Anaconda and at Great Falls, Cascade County. Producers shipping manganese ore to the National Stockpile Depot at Butte included Peter Antonioli and associates (Contact, Eagle Bird, Independence, and Tzarena mines), Lorin Bice (Dry Range Group), Lloyd Brynie (Nettie-Hibernia mine), Tony Bubany (Fredonia mine), Butte Mines Merger Corp. (Minnie Jane mine), and Hugh Handlin (Chief Joseph mine), and I. G. Irving and R. H. Nelson (Norwich-Plutus mine).

STILLWATER

Production of chrome concentrates from the Mouat mine near Nye began during the summer. By the year's end, 26,089 short tons of concentrates, averaging about 37.4 percent Cr_2O_3 and valued at \$869,958, was produced. Other activity included construction of housing facilities for employees.

The Lake Basin oil field yielded 1,082 barrels of oil.

TETON

The Pondera oil field, extending over the Teton-Pondera county line, was a large crude oil producer. (See Pondera County.)

TOOLE

The principal mineral output was crude oil from fields extending across Toole County borders into Glacier and Liberty Counties. The three counties are discussed together under Glacier County.

TREASURE

Sand and gravel for road work was mined by county highway-department crews.

VALLEY

Sand and gravel was mined and prepared at Glasgow by the Tampico Gravel Co. Natural gas was produced from the Bowdoin field, which extends across the Valley-Phillips county line.

YELLOWSTONE

The Lovell Clay Products Co., Billings, manufactured structural clay products from locally mined clay. Sand and gravel production was reported by three companies and by the county. The output of crude oil from the Mosser field increased to 16,369 barrels compared with 12,214 barrels in 1952.

The Mineral Industry of Nebraska

By Donald F. Klyce¹



NEBRASKA'S total 1953 mineral output was valued at \$33,281,000, a record high for the State and a 62-percent increase over 1952. Most of the gain resulted from increased output of crude petroleum; production was about two and a half times greater than in 1952. Also contributing to the greater value in 1953 were increases in both production and value of cement, clays, natural gas, natural-gas liquids, sand and gravel, and stone.

TABLE 1.—Mineral production in Nebraska, 1952-53¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays.....	167, 228	\$167, 703	175, 856	\$186, 893
Natural gas.....million cubic feet...	5, 568	740, 000	6, 748	911, 000
Petroleum (crude).....thousand 42-gallon barrels...	2, 660	6, 490, 000	2 6, 344	2 17, 190, 000
Sand and gravel.....	5, 436, 540	3, 874, 106	5, 969, 858	4, 340, 163
Stone (except limestone for cement).....	1, 245, 106	1, 946, 448	1, 407, 158	2, 069, 984
Undistributed: Cement, natural-gas liquids, pumice and pumicite. Excludes value of clays used for cement.	-----	\$7, 378, 888	-----	8, 582, 904
Total Nebraska.....	-----	20, 597, 000	-----	33, 281, 000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

² Final figure. Supersedes preliminary figure given in commodity chapter.

³ Revised figure.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Cement.—Portland cement was produced in Nebraska by two companies. The Ideal Portland Cement Co., Denver, Colo., operated a plant at Superior, Nuckolls County, and the Ash Grove Lime & Portland Cement Co., Kansas City, Mo., operated a plant at Louisville in Cass County. Both companies also produced masonry cement. Limestone and clay used in the manufacturing of cement were mined locally and from nearby quarries in Kansas. The value of portland-cement shipments in 1953 was 17 percent greater than in 1952.

Clays.—Clays were produced in six counties in 1953. Virtually all of the clay was produced and used by manufacturers of building brick and tile and other heavy clay products. The 1953 output was 175,856 tons, valued at \$186,893, a 5-percent increase in quantity and an 11-percent rise in value over 1952. Because most of the clay mined was used by the producer to manufacture brick or cement, there was no established market value for the raw clay.

¹ Commodity-industry economist, Region V, Bureau of Mines, Minneapolis, Minn.

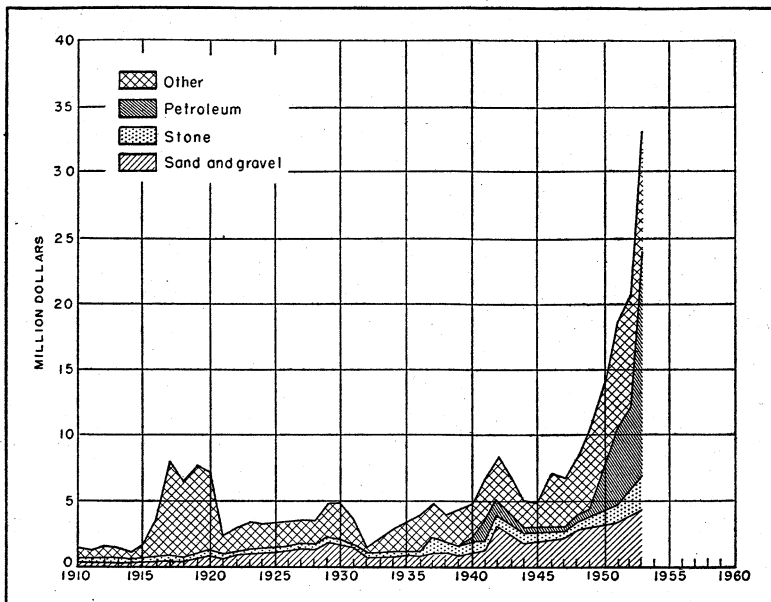


FIGURE 1.—Value of petroleum, sand and gravel, and stone, and total value of mineral production, in Nebraska, 1910-53.

Perlite.—Perlite does not occur in Nebraska, but crude material from New Mexico was expanded by the Richlite Perlite Co. at Omaha, Nebr. The expanded product was used as a lightweight aggregate in plaster and concrete.

Pumice and Pumicite.—Pumice and pumicite occurrences are widespread in western Nebraska. Most of them, however, are too small, or do not have the necessary characteristics, to be commercially important. Production has been reported from Banner, Custer, Frontier, Furnas, Harlan, Lincoln, and Morrill Counties. Current production has been by the LaRue-Axtell Pumice Co. at Calloway in Custer County. The pumicite in Nebraska deposits varies in color from white or cream to bluish gray and is used primarily in cleansing powders and soaps. The pumicite has good cleansing qualities but darkens when wet and is being replaced in many products by other materials. Production in 1953 was 20 percent less in value than in 1952.

Sand and Gravel.—Sand and gravel were produced in 46 Nebraska counties, the greater proportion from the alluvial deposits in the valleys of the Platte River and the Republican River and their major tributaries. Most of the material produced was used by the building- and road-construction industries. In 1953 production of sand and gravel was 10 percent greater than in 1952. Commercial production increased 13 percent, while noncommercial operations declined 22 percent from 1952 levels.

The 10 largest producers of sand and gravel in Nebraska were: Christensen Sand and Gravel Co., Fremont; Gerhold Co., Columbus; Hartford Sand & Gravel Co., Waterloo; H. Kirkpatrick, Lexington;

Lyman Richey Sand & Gravel Corp., Omaha; Schnellberg Sand & Gravel Co., Lincoln; Steele Bros., Dorchester; Melvin Thomas, Ashland; Western Sand & Gravel Co., Lincoln; Wolf Sand & Gravel Co., Morse Bluffs.

TABLE 2.—Sand and gravel sold or used by producers, 1952-53, by classes of operations and uses

	1952			1953		
	Short tons	Value		Short tons	Value	
		Total	Average		Total	Average
COMMERCIAL OPERATIONS						
Sand:						
Glass.....	1,507	\$1,300	\$0.86			
Molding.....	10,796	11,485	1.06	20,476	\$27,857	\$1.36
Building.....	763,404	575,472	.75	923,944	661,949	.72
Paving.....	647,758	465,131	.72	747,397	533,948	.71
Engine.....	101,716	55,954	.55	106,648	69,286	.65
Filter.....	(1)	(1)		(1)	(1)	
Railroad ballast.....	(1)	(1)		(1)	(1)	
Other.....	12,649	2,488	.20	39,500	15,625	.40
Gravel:						
Building.....	854,715	605,227	.71	938,932	710,947	.76
Paving.....	2,480,365	1,815,199	.73	2,734,073	2,078,800	.76
Railroad ballast.....	8	21	2.63	(1)	(1)	
Other.....	(1)	(1)		7,447	4,725	.63
Undistributed.....	19,368	10,562	.55	29,385	10,984	.37
Total commercial sand and gravel.....	4,892,286	3,542,839	.72	5,547,802	4,114,121	.74
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand:						
Building.....	892	331	.37			
Paving.....				3,991	829	.21
Gravel:						
Building.....	9	7	.78	770	516	.67
Paving.....	543,353	330,929	.61	417,295	224,697	.54
Total Government-and-contractor sand and gravel.....	544,254	331,267	.61	422,056	226,042	.54
Grand total.....	5,436,540	3,874,106	.71	5,969,858	4,340,163	.73

¹ Included with "Undistributed" to avoid disclosure of individual company operations.

Stone.—The production of stone in Nebraska consisted entirely of limestone, all of which was crushed for use as riprap, concrete aggregate and road building, railroad ballast, and agriculture. Dimension stone processed in Nebraska was obtained from neighboring States. Crushed limestone in 1953 totaled 1,407,000 tons valued at \$2,070,000, a 7-percent increase in value over 1952. These figures do not include the limestone used in the manufacture of cement. The quantity and value of limestone so used are reflected in the quantity and value of the cement produced. The principal producers, listed in order of size, were Cass Contractors, Cedar Creek; Olsen Quarries, Weeping Water; Nelson Quarry, Auburn; Heebner Quarries, Nebraska City (operating quarries in Cass and Nemaha Counties); Hopper Bros. Quarries, Pawnee City; and Western Limestone Products Co., Weeping Water.

MINERAL FUELS

Petroleum and Natural Gas.—Petroleum was first in value among the minerals produced in the State. Development of fields in western Nebraska accounted for most of the increased output of crude petro-

leum. Rates of output from fields in the southeastern part of the State were about the same in both 1952 and 1953. Marketed natural-gas production in 1953 was over 20 percent greater than in 1952.

REVIEW BY COUNTIES

ADAMS

Western Brick & Supply Co., Lincoln, produced building brick and tile at its Hastings plant from local clay deposits. M. M. Lippincott of Hastings and the Adams County Highway Department produced road gravel.

BANNER

The Banner County Highway Department produced road gravel.

BOONE

St. Edward Sand & Gravel Co. of St. Edward produced building sand and gravel for road purposes.

BOYD

The Boyd County Highway Department produced road gravel.

BROWN

Alvin A. Quinn, Ainsworth, produced paving sand and building gravel, and the Chicago & Northwestern Railroad produced sand for ballast.

BUFFALO

Companies producing gravel include Bruner Bros., Shelton; Harry Johnson, C. H. Luther, Don Luther, and Carl Whitney, all of Kearney; and the Buffalo County Highway Department. Production was for road purposes, railroad ballast, and use in building construction.

BUTLER

Gerhold Co. of Columbus produced building sand and road gravel.

CASS

Kahler Pottery Co., Inc., Louisville, produced art pottery and flowerpots.

Ash Grove Lime & Portland Cement Co., Louisville, produced portland and masonry cements.

Crushed limestone, used principally for riprap, railroad ballast, road rock, and mineral feed, and for agricultural purposes, was produced by Cass Contractors, Heebner Quarries, Hopper Bros. Quarries, Olson Quarries, United Mineral Products Co., Western Limestone Products Co., and Chicago, Burlington & Quincy Railroad.

Lyman Richey Sand & Gravel Corp., Omaha, and Western Sand & Gravel Co., Lincoln, produced molding and engine sands as well as sand and gravel for building and road purposes.

CEDAR

H. W. Johnson, Hastings, and Einung Sand & Gravel Co., Wayne, produced building and paving sand and gravel for roads.

TABLE 3.—Value of mineral production in Nebraska, 1952-53, by counties (except for petroleum, natural gas, and natural gas liquids¹)

County	1952	1953	Minerals produced in 1953 in order of value
Adams.....	34,168	53,876	Sand and gravel, clays.
Banner.....	450	150	Sand and gravel.
Boone.....	(²)	5,059	Do.
Boyd.....	5,000	5,182	Do.
Buffalo.....	34,622	40,550	Do.
Burt.....	6	-----	-----
Butler.....	41,000	41,486	Sand and gravel.
Cass.....	5,678,308	7,588,253	Cement, stone, sand and gravel, clays.
Cedar.....	35,260	33,728	Sand and gravel.
Clay.....	59,467	25,337	Do.
Cuming.....	92,231	82,946	Do.
Dodge.....	619,093	515,636	Do.
Douglas.....	557,324	754,080	Sand and gravel, clays.
Fillmore.....	19,356	-----	-----
Franklin.....	331	-----	-----
Furnas.....	2,389	-----	-----
Gage.....	110,804	73,644	Stone.
Garden.....	655	9,356	Sand and gravel.
Hall.....	125,792	160,586	Do.
Hamilton.....	38,095	4,760	Do.
Harlan.....	12,804	12,952	Do.
Hayes.....	(²)	17,060	Do.
Holt.....	7,881	10,700	Do.
Keith.....	-----	8,727	Do.
Knox.....	34,944	11,302	Do.
Lancaster.....	186,809	72,626	Clays, stone.
Loup.....	(²)	15,241	Sand and gravel.
Madison.....	26,000	26,308	Do.
Morrill.....	79,622	90,464	Do.
Otoe.....	(²)	289,975	Stone, clays.
Perkins.....	3,795	22,201	Sand and gravel.
Phelps.....	(²)	139,824	Do.
Pierce.....	42,800	(³)	Do.
Platte.....	206,282	232,320	Do.
Richardson.....	-----	33,853	Do.
Saline.....	(²)	162,215	Do.
Sarpy.....	(²)	675,445	Do.
Scotts Bluff.....	(²)	27,320	Do.
Sioux.....	2,716	10,841	Do.
Stanton.....	33,750	34,150	Do.
Thayer.....	22,500	24,627	Do.
Thomas.....	-----	33	Do.
Wayne.....	-----	9,087	Do.
York.....	16,500	24,477	Do.
Undistributed ¹	*12,466,391	*21,934,567	-----
Total.....	20,597,000	33,281,000	-----

¹ Value of petroleum, natural gas, and natural-gas liquids included with "Undistributed;" data by county not available.

² Includes value of mineral production for the following counties: Boone, Brown, Custer, Dawes, Dawson, Dundy, Hayes, Howard, Jefferson, Loup, Merrick, Nemaha, Nuckolls, Otoe, Phelps, Red Willow, Saline, Sarpy, Saunders, Scotts Bluff.

³ Includes value of mineral production and principal minerals produced in the following counties: Brown, sand and gravel; Chase, sand and gravel; Custer, pumice; Dawson, sand and gravel; Dundy, sand and gravel; Howard, sand and gravel; Jefferson, clay; Merrick, sand and gravel; Nemaha, stone; Nuckolls, cement, sand and gravel; Pierce, sand and gravel; Red Willow, sand and gravel; Saunders, sand and gravel.

CHASE

Bruce Peak and the Chase County Highway Department produced sand and gravel for roads.

CLAY

George K. Werner, Clay Center, produced sand and gravel for road use.

CUMING

Christensen Sand & Gravel Co., Fremont, and West Point Gravel Co., West Point, produced building sand and road gravel.

CUSTER

LaRue-Axtell Pumice Co., Calloway, produced crude and prepared pumicite.

DAWSON

Cleo Hunt, Cozad, and H. Kirkpatrick, Lexington, produced building and paving sand and gravel.

DODGE

Sand and gravel were produced by Christensen Sand & Gravel Co., Fremont; Lyman Richey Sand & Gravel Corp., Omaha; and Schellberg Sand & Gravel Co., Lincoln. Lyman Richey Sand & Gravel Corp., Omaha, also produced engine sand, in addition to sand and gravel for building and road purposes.

DOUGLAS

Omaha Brick Works, Ralston, produced building brick and heavy clay products.

Richlite Perlite Co., Omaha, expanded perlite for plaster and concrete aggregate.

Lyman Richey Sand & Gravel Corp., Omaha; J. W. McCann Co., Valley; Hartford Sand & Gravel Co., Waterloo; and the Douglas County Highway Department produced sand and gravel. These were used for engine and filter sands as well as for building and road construction.

DUNDY

Guy Douglass of Haigler produced gravel for building and road construction.

GAGE

The Gage County Highway Department, Beatrice, produced crushed limestone for riprap and road work.

GARDEN

The Garden County Highway Department produced road gravel.

HALL

Sand and gravel, chiefly for building and road construction, were produced by Dean Camp, Gibbon; H. & M. Equipment Co., M. M. Lippincott, and E. H. Johnson, all of Hastings; Lilley Sand & Gravel Co., Prosser; and Western Brick & Supply Co., Lincoln. The Sierra Talc & Clay Co. grinds talc in its plant at Grand Island. Crude talc is from mines in California, Nevada, and Montana.

HAMILTON

The Hamilton County Highway Department produced building and paving sand.

HARLAN

Cecil V. Olson, Huntley, produced sand for road use.

HAYES

Krotter Bros., Palisade, produced gravel for building and road use. Sand for road use was produced for the Hayes County Highway Department.

HOLT

Producers of sand and gravel include Atkinson Sand & Gravel Co., Atkinson; and William Krotter & Son, Stuart.

HOWARD

St. Paul Sand & Gravel Co., St. Paul, produced gravel for building and road purposes.

JEFFERSON

Endicott Brick & Tile Co., Endicott, and Western Brick & Supply Co., Lincoln, produced clays for manufacturing building brick and tile.

KEITH

Frank Struckman and the Keith County Highway Department produced sand and gravel for road use.

KNOX

J. P. Jundt, Creighton, produced paving sand.

LANCASTER

Yankee Hill Brick Mfg. Co., Lincoln, produced clay for building brick and drain tile. The Lancaster County Highway Department, Lincoln, produced crushed limestone for road use.

LOUP

Clays Sand & Gravel, Taylor, and C. G. Gunnerson, Sargent, produced sand and gravel.

MADISON

Gerhold Co., Columbus, produced sand and gravel.

MERRICK

C. G. Fleming, Chapman, and Overland Sand & Gravel Co., Stromsburg, produced sand and gravel for building and road use.

MORRILL

Lyman Richey Sand & Gravel Corp., Omaha, produced engine sand and sand and gravel for building and road construction.

NEMAHA

Limestone for riprap, road stone, and agricultural use was produced by Heebner Quarries, Nebraska City, and the Nelson Quarry, Auburn.

NUCKOLLS

Nebraska Cement Division, Ideal Cement Co., Denver, Colo., produced portland cement from a plant at Superior. Gravel for road use was produced by C. F. Bondegard, Ruskin, and for the Nuckolls County Highway Department.

OTOE

Western Brick & Supply Co., Lincoln, produced clay for building brick and tile at its Nebraska City plant. Limestone was produced for the United States Army Engineers at Nebraska City.

PERKINS

Bertha C. Eppler, Grant, Elmer Holst, and the Perkins County Highway Department produced sand and gravel for building and road use.

PHELPS

Sand and gravel were produced by F. C. Conn & L. E. Johnson, Holdredge, and for the Phelps County Highway Department, chiefly for building and road construction.

PIERCE

Haas & Son, Pierce, and Einung Sand & Gravel Co., Wayne, produced sand and gravel for building and road purposes.

PLATTE

Gerhold Co., Columbus, and Lyman Richey Sand & Gravel Corp., Omaha, produced engine sand and sand and gravel for building and road purposes.

REDWILLOW

A. L. Davidson, Indianola, and Frank Gillen, McCook, produced sand and gravel for building and road purposes.

RICHARDSON

Road gravel was produced by and for the Richardson County Highway Department.

SALINE

Vlasak & Cawley, Crete; Steele Bros., Dorchester; and Edward Kohel, Wilder, produced molding and paving sand and road gravel. Gravel for road use was produced by and for the Saline County Highway Department.

SARPY

Lyman Richey Sand & Gravel Corp., Omaha, produced engine sand and building and paving sand and gravel.

SAUNDERS

Melvin Thomas, Ashland, and Wolf Sand & Gravel Co., Morse Bluffs, produced sand and gravel for building and road purposes.

SCOTTS BLUFF

Platte Valley Cement & Tile Co., Scotts Bluff, produced building and paving sand.

SIoux

The Sioux County Highway Department produced gravel.

STANTON

O'Brien Sand & Gravel Co., Stanton, produced sand and gravel for building and road construction.

THAYER

Samuel Simmons, Chester, and Shearer Construction Co., Hebron, produced sand and gravel.

THOMAS

Sand for road use was produced for the Bureau of Public Roads, United States Department of Commerce.

WAYNE

Mrs. Clara Wright produced road gravel.

YORK

York Gravel Co., York, produced sand and gravel for building and road use.

The Mineral Industry of Nevada

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Federal Bureau of Mines and the Nevada Bureau of Mines.

By R. B. Maurer¹ and Robert E. Wallace²



NEVADA'S mineral production in 1953 was valued at \$73,523,000, a new high for the State and a 14-percent increase over the 1952 total of \$64,231,000. This was the fourth consecutive year of advance in value of the State mineral output. Metals contributed \$61,649,000 or 84 percent of the total value of minerals produced in 1953 and \$54,229,000 or 84 percent in 1952. Copper production, bolstered by favorable prices and good demand, had the highest value for the metal of any year in the history of Nevada mineral production, although the tonnage produced was short of the peak output (83,663 tons) in 1942. It led other Nevada minerals in value in 1953 and increased moderately over 1952. The output of tungsten concentrates, in second place among Nevada minerals, rose compared with 1952, aided by the Government purchase program. Also, the noteworthy rise in manganese ore and concentrates production from the State mines and mills was due largely to Government purchases. The yield of molybdenum concentrates, a byproduct of porphyry-copper-ore beneficiation, reflected the increased copper output.

Low average prices for lead and zinc in 1953 caused declines in production of both metals; the output of zinc was the lowest since 1932, and the quantity of lead produced reached the lowest point since 1939. Mercury output declined moderately, largely the result of the slightly lower average price in 1953. There was no production of antimony from antimony ore and concentrates, but antimonial lead and gold ores shipped to smelters from Nevada mines contained recoverable antimony.

Iron-ore output declined noticeably, owing principally to the termination of several contracts with Japanese interests.

Gold, still the third-ranking mineral product in value in Nevada, largely by virtue of byproduct gold from copper ore, declined in output compared with 1952 owing mainly to lower productivity of placer mines and the smaller quantity of byproduct gold from lead and zinc ores. Silver yield in 1953, principally the byproduct of base-metal ores, was the lowest in the period of recorded production (1880-1953).

Nonmetallic mineral production amounted to \$11,872,000 or 16 percent of Nevada's total mineral value in 1953 and \$10,006,000 or 16 percent in 1952. Lime was the chief commodity in this group, and it increased substantially over 1952, both in quantity shipped and value. The quantities sold and used by producers of the following

¹ Chief, Division of Mineral Industries, Region III, Bureau of Mines, San Francisco, Calif.

² Commodity-industry analyst.

TABLE 1.—Mineral production in Nevada, 1952-53¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Antimony ore and concentrate.....gross weight..	152	(?)	20	(?)
Barite.....	68,062	\$391,242	99,525	\$614,686
Clays.....	3,958	36,278	(?)	(?)
Copper (recoverable content of ores, etc.).....	57,537	27,847,908	61,850	35,501,900
Gold (recoverable content of ores, etc.).....troy ounces..	117,203	4,102,105	101,799	3,562,965
Gypsum (crude).....	608,284	1,666,938	701,584	1,975,053
Iron ore (usable).....long tons, gross weight..	911,657	3,991,970	444,081	2,647,859
Lead (recoverable content of ores, etc.).....	6,790	2,186,380	4,371	1,145,202
Manganese ore (35 percent or more Mn).....gross weight..	695	(?)	20,150	\$1,684,555
Manganiferous ore (5 to 35 percent Mn).....do.....	7,947	(?)	25,064	\$431,559
Mercury.....76-pound flasks..	3,523	701,429	3,254	628,120
Pumice and pumicite and volcanic cinders.....	(?)	(?)	21,269	86,366
Sand and gravel.....	2,098,211	2,380,419	2,266,064	2,088,948
Silver (recoverable content of ores, etc.).....troy ounces..	941,195	851,829	697,086	630,898
Stone (except limestone for lime).....	830,712	1,158,608	1,035,568	1,399,529
Talc and soapstone.....	47,580	180,328	10,906	72,971
Tungsten concentrate.....60-percent WO ₃ basis..	2,329	8,820,598	3,683	13,824,238
Zinc (recoverable content of ores, etc.).....	15,357	5,098,524	5,812	1,336,760
Undistributed: Barite, diatomite, fluorspar, lime, magnesite, calcareous marl, molybdenum, perlite, salt, sulfur ore, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2).....				
		4,816,659		5,891,368
Total Nevada.....		64,231,000		73,523,000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

² Value included with "Undistributed."

³ Shipments to Government low-grade depots and custom mills not included but quantity and value for this material are as follows: Manganese ore, 360 short tons, \$17,350; and manganiferous ore, 8,777 short tons, \$166,615.

⁴ Sold or used by producers. Quantity and value of ground material included.

⁵ Mine production of crude material.

TABLE 2.—Average prices of selected mineral commodities, 1944-48 (average) and 1949-53 produced in Nevada in 1953¹

Commodity	1944-48 (average)	1949	1950	1951	1952	1953
Antimony ².....cents per pound..	23.82	38.7	29.4	44.2	44.0	35.9
Antimony ore, 50-55 percent Sb dollars per short-ton unit Sb.....	3.02-3.14	3.74-3.93	2.92-3.05	5.57-5.82	4.08-4.34	2.45-2.70
Copper ³.....cents per pound..	16.1	19.7	20.8	24.2	24.2	28.7
Fluorspar (average, all types) dollars per ton.....	32.19	34.92	35.22	41.41	46.35	49.48
Gold ⁴.....dollars per troy ounce..	35.00	35.00	35.00	35.00	35.00	35.00
Iron ore (average value at mine) dollars per long ton.....	3.18	4.50	4.99	5.46	6.09	6.76
Lead ⁵.....cents per pound..	10.8	15.8	13.5	17.3	16.1	13.1
Mercury ⁶.....dollars per 76-pound flask..	102.34	79.46	81.26	210.13	199.10	193.03
Molybdenum concentrate, 90-percent MoS ₃ concentrate cents per pound MoS ₂	45.0	54.0	59.0	60.0	60.0	60.0
Silver ⁶.....cents per troy ounce..	80.8+	90.5+	90.5+	90.5+	90.5+	90.5+
Tungsten concentrate dollars per short-ton unit WO ₃	23.15	26.38	28.25	61.02	63.44	762.46
Zinc ⁷.....cents per pound..	9.86	12.4	14.2	18.2	16.6	11.5

¹ Prices are discussed in detail in the commodity chapters of volume I, Minerals Yearbook.

² Price quoted based on American Metal Market figures.

³ Yearly average weighted price of all grades of primary metal sold by producers. Price in 1946-47 includes bonus payments by office of Metals Reserve for overquota production.

⁴ Price under authority of Gold Reserve Act of Jan. 31, 1934.

⁵ Average quoted price at New York.

⁶ Treasury buying price for newly mined silver 1943 to June 30, 1946—\$0.71111111; July 1, 1946, to Dec. 31 1947—\$0.905; 1948-52—\$0.9050505.

⁷ Based on average of GSA purchases.

mineral commodities also increased in 1953 compared with 1952: Sand and gravel, stone, diatomite, fluorspar, barite (crude), perlite (crude), and clay; and there were corresponding increases in the values of all except sand and gravel and clay, which fell below 1952. The mine production and value of gypsum and magnesite was greater than in 1952, and the mine output of brucite and mine sales of talc and soapstone in 1953 rose over the previous year. The mine value of brucite was slightly lower in 1953 than 1952. The value of crude talc and soapstone was not ascertained for 1952; therefore no direct comparison can be made between 1953 and 1952.

The advance in nonmetallic mineral production was not general, however, and the outputs of marl, pumice (volcanic cinders excluded), and salt showed slight declines from 1952, whereas sulfur-ore production, usually sporadic in Nevada, slumped noticeably in 1953.

Exploratory oil well drilling was in progress in Nye, Elko, and Clark Counties, but no petroleum was produced in Nevada in 1953.

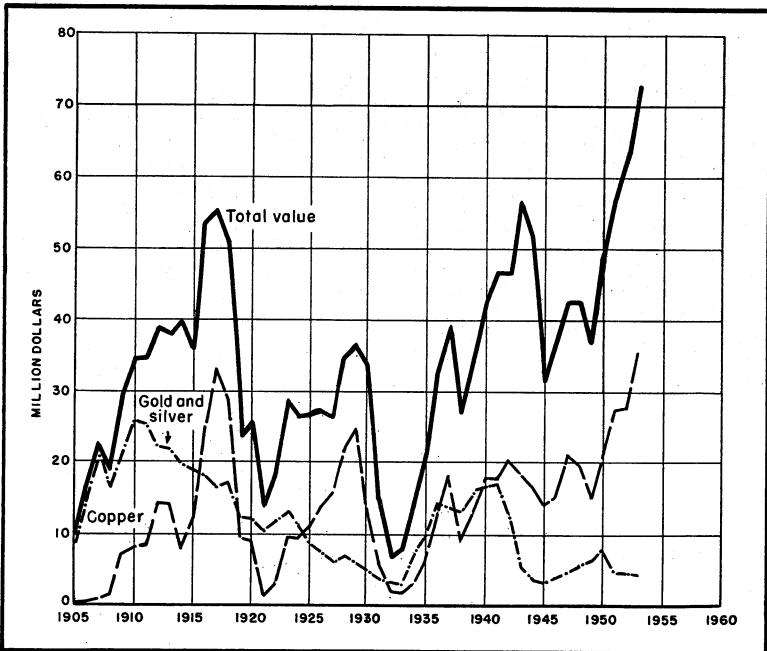


FIGURE 1.—Trends in Nevada total value of mineral production, and value of gold, silver, and copper production, 1905-53.

CONSUMPTION AND MARKETS

Nevada ranked 28th among the 48 States, Alaska, and the District of Columbia in mineral production. As a consumer of minerals Nevada is in the Nation's lower category due to its small population and limited industrial activities. However, its proximity to smelting and manufacturing centers, particularly in Utah and California,

placed it in the position of a supplier of minerals to expanding western economy.

Minerals produced in Nevada, of which all or part were consumed or further processed within the State, include: Iron ore, manganese ore and concentrate, diatomite, mercury, clay, gypsum, limestone, magnesite, pumice, pumicite, volcanic cinders, sand and gravel, expanded perlite, stone, and salt.

Marketing minerals produced in the State offered a wide variety of problems to mine operators. Nevada's principal copper producer (incidentally its largest individual industrial establishment) converted the raw mineral into blister copper which was shipped to eastern refineries. Producers of gold sold directly to the United States Mint, and mercury mines usually marketed the metal to consumers and distributors. Other metal mines merely produced the ore and either sold it directly to smelters or marketed it at custom mills. Mills in turn disposed of their products; lead concentrates for example, were marketed at smelters, whereas tungsten concentrates were sold largely to the General Services Administration. Some producers of non-metallic minerals disposed of the raw material to grinding mills, and other producers had a product (sulfur ore, for instance), which was sold directly to agriculturists after preliminary crushing. Raw materials were converted into a finished product by other operators, such as a manufacturer of wallboard who also mined and processed gypsum.

Custom Mills and Smelters.—As Nevada tungsten mining expanded it became difficult for many small mines to find operating mills with enough capacity to treat ore and upgrade low-grade concentrates on a custom basis. The situation was alleviated to a large extent by the construction of new mills and expansion of existing plants to accommodate the production of company-operated mines and some custom ore. The principal mills in Nevada that accepted custom-tungsten material were: Getchell Mines, Inc., Red House, Humboldt County; Metallurgical Development Co., Inc., Gardnerville, Douglas County; Nevada Scheelite, Division of Kennametal, Inc., at Rawhide, Nevada Tungsten Corp. at Sodaville, and Kinkead Milling Co., at Hawthorne, all in Mineral County; The Wolfram Co., Toulon, Pershing County; Baltimore Camas Mines, Inc., plants at Cherry Creek and Ely, White Pine County; and Sunnyside Milling Co., Austin, Lander County.

Combined Metals Reduction Co. received manganese and manganese ores, some containing lead and zinc, for custom milling at its Caselton mill in Lincoln County. Kennecott Copper Corp., Nevada Mines Division, treated the Consolidated Coppermines Corp. copper ore under contract at the McGill concentrator and smelted custom fluxing ores containing gold, silver, and copper, and shipped from various mining districts in Nevada, at its McGill copper smelter in White Pine County.

Mineral Brokers.—Much of the iron ore shipped to Japan from Nevada mines was consigned by brokers and traders through their California establishments in coastal cities. A noteworthy tonnage of tungsten concentrate, largely an accumulation of small-lot purchases, was marketed through brokers in California tungsten-milling areas, Bishop in particular. Gold and silver bullion and mercury purchases by Nevada brokers or bullion buyers were small and infrequent.

Defense Minerals Exploration Administration Program.—The Defense Minerals Exploration Administration (DMEA) program, activated to provide Government aid in locating new sources of strategic and critical minerals in the United States, certified 10 projects in Nevada in 1953. Two contracts were amendments to agreements originally initiated before 1953, and 8 contracts covered new projects. The Government agreed to advance \$473,000 toward these projects, which had an approved total cost of \$740,000. Of these, 5 were tungsten deposits, 1 lead-zinc, 1 copper, 1 lead, and 2 manganese. A total of 16 projects initiated before 1953 also were active either for all or part of that year.

Other Government Assistance Activities.—Under authority of the Defense Production Act of 1950, the Defense Materials Procurement Agency used several instruments in achieving expansion of Nevada mineral facilities. The purchase contracts negotiated by DMPA with Nevada companies, in effect in 1953, which assisted in maintaining continuity of strategic mineral production, are listed in table 4. A contract with Eureka Corp., Ltd., drawn in 1952 to provide financial assistance for dewatering the company Fad shaft which opened a lead-zinc ore body in Eureka County, was terminated in April 1953, as the company planned a new shaft.

The Bureau of Public Roads, which expended funds to construct access roads to Nevada mines in 1952, resumed the project in 1953 only for work authorized by the Atomic Energy Commission.

General Services Administration Purchase Depots.—The General Services Administration did not maintain purchase depots in Nevada for its stockpiles of strategic minerals. In lieu of established depots within the State carlots of manganese ore for high-grade stockpiles were received by the Government at railheads, and tungsten concentrate was purchased at designated shipping points in the tungsten-producing districts. Shipments of Nevada manganese and manganese-ferrous ores were accepted by the Government at Arizona, Montana, and New Mexico low-grade depots.

New Plants or Projects.—In addition to the expansion of Nevada titanium facilities there was increased output of titanium tetrachloride, the basic material consumed in producing titanium sponge. Actual operation of the manganese-ore-concentrating units and concentrate-nodulizing kiln at Pioche, did much to increase Nevada's manganese-ore production, and the ferromanganese plant at Henderson contributed to the State's industrial expansion. The Yerington-mine development continued on schedule in 1953; and copper production from the project began in November 1953, when the first shipments of precipitates were made to a smelter. Construction of the 11,000-ton-a-day-capacity crushers, leaching and precipitation plants, and the acid plant, rated at 450 tons of sulfuric acid a day, with its fluosolids reactors and auxiliary facilities, were substantially completed by the year end. Operation of a new grinding mill and drying plant at Fernley, Nev., increased the State's capacity to produce prepared diatomaceous earth. Experiments on converting Nevada oxidized zinc ore to zinc salts by an acid process were in progress at Wells.

TABLE 3.—Defense Minerals Exploration Administration projects in Nevada either initiated or still active in 1953

Operator	Status ¹	Property	County	District	Commodity	Government participation	Total contract
Marshall Mining Co.	C	Marshall (Nevada-Bellevue)	Elko	Contact (Salmon River)	Copper	\$37,311	\$74,621
Garnet Tungsten Mining Co.	A	Garnet No. 1 & 2	do	Alder	Tungsten	16,320	21,760
United Minerals Corp.	B	Rip Van Winkle	do	Merrimac	Lead-zinc	26,750	53,500
Frank Bullock	B	Lucky Boy-Jackson	do	Delano	do	10,350	20,700
W. F. Dummigan	B	Red Rock	Esmeralda	Fish Lake Valley	Mercury	6,694	8,925
Consolidated Eureka Mining Co.	A	Diamond	Eureka	Eureka	Lead	28,525	57,050
Aubrey Minney	B	McAdoo	Humoldt	Bottle Creek	Mercury	13,200	17,600
G. W. Snyder & G. W. Snyder, Jr.	B	Lucky Strike	Lander	Battle Mountain	Lead-zinc	13,897	27,794
Pennsylvania Mine (E. H. Smith)	B	Pennsylvania	Lander	Battle Mountain	Copper	12,896	25,792
Bristol Silver Mines Co.	C	Bristol	Lincoln	Jack Rabbit (Bristol)	Copper	97,899	195,797
Idamie Mines, Inc.	A	Lucky Star	do	do	Lead-zinc	16,620	22,160
Comet Mines, Inc.	B	Comet	do	Comet	Manganese	95,000	190,000
Ely Valley Mines, Inc.	B	Ely Valley	do	Piöche (Ely)	Lead-zinc	43,100	86,200
Raymond-Combined Mines Co.	B	Lode, Doris	do	do	do	54,233	108,466
Coranda Corp.	B	Green Tail and Bismark	Mineral	Gills	Corundum-andalusite	32,400	36,000
H. P. Newman	B	Copper King	Nye-Pershing	Union	Copper	1,890	3,780
S. F. O'Leary (deceased) and F. M. Anderson.	A	Stormy Day	Pershing	Hooker	Tungsten	10,680	14,240
Nevada Uranium Co.	B	Staln's Present	do	Rocky Canyon	Uranium	8,231	9,145
Hamilton Consolidated Mines Corp.	B	Rocco-Homestake	White Pine	White Pine	Lead-zinc	13,370	26,740
Walker Corp.	B	Ward	do	Ward	Lead-zinc-copper	66,155	132,310
Cherry Creek Tungsten Mining Co.	B	Cherry Creek	do	Cherry Creek	Tungsten	56,250	75,000
Metallies Unlimited	A	Pine Nut	do	do	do	10,650	14,200
Graham Development Corp.	B	Gold King	do	Black Horse	do	12,840	17,120
M. I. A. Mines Co.	A	Minerva	do	Shoshone	do	128,550	171,400
Mount Wheeler Mines, Inc.	C	Mount Wheeler	do	Mount Washington	do	105,807	141,076
Cavigliola & Parodi	A	Essex	do	Nevada	Manganese	20,475	27,300

¹ A, initiated in 1953; B, initiated before but active in 1953; C, initiated before and amended in 1953.

TABLE 4.—Contracts for purchase of minerals under the Defense Production Act, as amended, as of Dec. 31, 1953

Contractor	County	Commodity	Contingent purchase commitment, short tons	Financing	
				Amount	Type
Anaconda Copper Mining Co.	Lyon.....	Copper.....	128,000	\$15,000,000	Advance..
Titanium Metals Corp. of America.	Clark....	Titanium.....	1,500		
Manganese, Inc.....	Clark....	Manganese conc.....	3 830,000		

Contractor	Tax amortization, percent	Approximate term of contract	Date production starts	Commitment purchase price
Anaconda Copper Mining Co.	75	6 years.....	Dec. 6, 1953	\$0.255 or market a pound. ¹
Titanium Metals Corp. of America.	90	5 years.....	May 1, 1952	\$5.00 or market a pound. ²
Manganese, Inc.....		9 years.....	Jan. 1, 1952	\$1.50 a long unit of contained Mn. ⁴

¹ Contracted at over ceiling price (ceiling price was 24½ cents a pound for most producers).

² Sponge metal. Contract has clause to allow for differential between ingot and sponge purchased.

³ Long tons.

⁴ Includes escalator clause.

FLOW OF MINERALS

Domestic Shipments.—Interstate movement of mineral commodities in 1953 was predominantly exports from Nevada. Shipments of metallic ores, concentrates, and precipitates, blister copper, mercury, ferromanganese, titanium sponge, barite, fluorspar, gypsum, industrial sand, lime, limestone, brucite, magnesium compounds, crude perlite, and diatomite comprised a large percentage of the tonnage of outgoing materials. Mineral fuels, cement and sulfur ore, and coke and magnesium for titanium plants, were the main imports. Railroads transported the greater tonnage of minerals in interstate movements, although motortrucks were the carriers hauling California sulfur ore to Nevada. Trucks were used frequently in transporting prepared nonmetallic minerals, petroleum products, and tungsten concentrates. The relatively incomplete coverage of Nevada by railroads often required transportation of some minerals to railroads by truck. Nevada's largest intrastate individual movement of mineral material in 1953—the transporting of porphyry copper ore from the White Pine County open pits to the McGill, Nev., concentrator, about 15 miles—was by rail. In contrast, the copper ore mined at the new Yerington project, Lyon County, was trucked about 1 mile to the beneficiation plant.

Foreign Imports and Exports.—Iron ore and magnesium compounds were the principal mineral products entering international trade in 1953. These materials were transported by rail to coastal ports and thus also were involved in interstate flow of minerals. The basic material for Nevada's titanium production was largely imported rutile.

EMPLOYMENT IN MINERAL INDUSTRIES

Employment.—Data released by the State inspector of mines³ in 1953 indicated that the total number of persons employed for wages or contracting in Nevada mines, mills, and smelters as of June 30, 1953 was 5,763 at 155 installations whereas 5,054 persons were employed at 169 facilities as of June 30, 1952, and 4,167 persons as of June 30, 1951. The heaviest gain in 1953 was made in Clark County, where 1,346 persons were employed compared with 650 in 1952. The Bureau of Labor Statistics reported an estimated average of 4,400 persons employed exclusively at Nevada mines in 1953 compared with an estimated average of 4,300 in 1952 and 3,500 in 1951.

Accidents.—Although fires at Nevada mineral establishments in 1953 resulted in serious losses of material, no major disaster was reported. The number of fatalities at mineral establishments rose in 1953 compared with 1952; however, the number of nonfatal accidents dropped about 21 percent in 1953.

Wages.—The average weekly earnings in Nevada mines in 1953, as reported by the Bureau of Labor Statistics, was \$92.77 compared with \$88.13 in 1952 and \$81.63 in 1951.

REVIEW BY MINERAL COMMODITIES

METALS

Antimony.—Activity in antimony mining was at a low ebb in 1953, and no shipment of antimony ore or concentrate was recorded. The Last Chance Mining Co., which operated a reduction plant intermittently in Wall Canyon, Nye County, during 1952 did some experimental work at the plant in 1953, but closed the operation in June. The Tes-Oro Development projected a plan to mill antimony ore from claims in the Big Creek district of Lander County at Austin. This did not materialize beyond installation of milling equipment. Considerable direct-smelting antimony-bearing material was shipped to smelters, particularly lead ore and tailings from the Candelaria district, Mineral County, and the Wild Horse district, Pershing County, and gold ore from the Manhattan district, Nye County. The quantity of antimony recovered from Nevada ores at smelters was not determined.

Cadmium.—Cadmium was a constituent of the zinc concentrates produced in the Pioche district, Lincoln County, but the quantity of cadmium recovered from these concentrates at zinc smelters in 1953 was not recorded.

Copper.—Nevada copper production increased 7 percent in quantity and 27 percent in value compared with 1952. The Robinson district, White Pine County, in 1953 supplied 98 percent of the recoverable copper produced in Nevada. The district copper yield exceeded the 1952 output by 6 percent. A preponderant percentage of this production was from the Kennecott Copper Corp. Nevada Mines Division Ruth (Liberty) and Kimbley pits; the Consolidated Coppermines Corp. Morris Brooks pit; and the Ruth (Liberty) pit extension, which was operated for the Consolidated Coppermines

³ Nevada State Inspector of Mines, 27th Report.

Corp. account by Kennecott Copper Corp. Milling ore from these mines was beneficiated at the Kennecott Copper Corp. McGill concentrator. The copper concentrates, some direct smelting copper ore from the foregoing mines and from dumps in the district, and copper precipitates recovered from mine water, were reduced at Kennecott's McGill smelter, Nevada's only copper smelter. Continuity of production in the district was insured by the extensive development programs underway at Kennecott's Deep Ruth project, and the Veteran pit, owned jointly by Kennecott Copper Corp. and Consolidated Coppermines Corp.; and the expansion of the Morris-Brooks pit by Consolidated Coppermines Corp. The handling of difficult water conditions encountered in the Deep Ruth development was described in an article.⁴ The potential of the Anaconda Copper Mining Co. Yerington mine and leaching plant was made evident by the noteworthy contribution to the State copper output in the 1 month (December 1953) of production, which was the culmination of intensive development and construction. Development progress at this mine was described in a journal.⁵ The high average price of copper in 1954 stimulated the search for copper ore. Consolidated Coppermines Corp. explored the Dixie Valley area of Churchill County but abandoned the project later in the year. Shipments of copper ore were recorded from small properties in Clark, Elko, Eureka, Lander, Mineral, and Nye Counties. The more consistent shippers in this group were: The Marshall Mining Co. Marshall mine, Contact district, Elko County, which developed ore discovered under a DMEA exploration project; and lessees of the Copper Canyon Mining Co. in the Copper Basin section of the Battle Mountain district, Lander County. The Bureau of Mines published data on treating oxidized copper ores from Douglas, Elko, Eureka, Lander, Lyon, and Nye Counties.⁶ The output of byproduct copper fell considerably below the 1952 yield, owing to the sharp drop in production of lead-zinc ores, normally the principal source in Nevada.

Gold.—Because the fixed Treasury price for gold remained in effect during 1953 and operating costs continued high, the metal was produced largely as a byproduct of base-metal ores. However, there was a slight resurgence in the output of gold from straight gold ore. Of the State total gold produced in 1953, 63 percent was derived from base-metal ores (60 percent from copper ore alone), 20 percent from precious-metal ores, 16 percent from alluvium, and 1 percent from tailings and miscellaneous lode material. The 13-percent decrease in production of gold compared with 1952 is attributed largely to the decline of placer mining. Less byproduct gold from lead and zinc ores was a contributing factor. Of the 9 placer mines that reported gold production in 1953, 1 was worked by bucketline dredge, 5 by mechanical excavators delivering gravel to nonfloating washing plants, and 3 by small-scale hand methods. Kennecott Copper Corp. (Nevada Mines Division) and Consolidated Coppermines Corp., both operating copper properties in the Robinson district, White Pine County, were the leading producers of gold in Nevada. Following in order were: The London Extension Mining Co. Goldacres mine,

⁴ Engineering and Mining Journal, vol. 154, No. 11, November 1953, p. 94

⁵ Mining World, vol. 15, No. 8, July 1953, p. 33.

⁶ Engel, A. L., Preliminary Tests of Nevada Oxidized Copper Ores: Bureau of Mines Rept. of Investigations 4952, 1953, 6 pp.

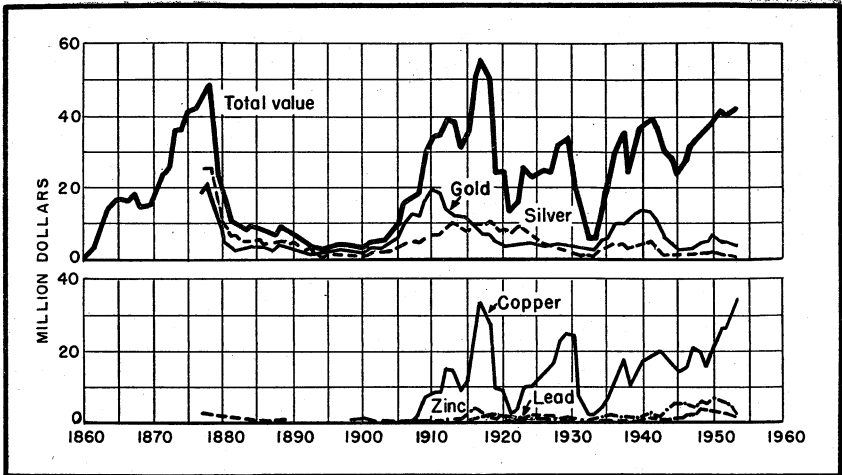


FIGURE 2.—Value of mine production of gold, silver, copper, lead, and zinc in Nevada, 1860-1953.

Bullion district, Lander County (gold ore), and the Natomas Co. bucketline dredge, Nevada's only major placer operation in 1953, at Greenan Placers in the Battle Mountain district, Lander County. Among the small gold mines, largely sporadic producers, the Atlanta Gold & Uranium Co., Atlanta district, Lincoln County, and the Dayton Dredging Co. dryland dredge at Dayton, Lyon County, had noteworthy outputs. Summit King Mines, Ltd., Special Account, continued to develop the Tonopah Development Co. gold-silver property at Tonopah, Nye County.

Iron Ore.—Most of the contracts with Japanese interests for delivery of Nevada iron ore to the Orient were terminated early in 1953, with the net result that the State iron-ore output declined 51 percent in quantity and 34 percent in value compared with 1952. Approximately 60 percent of the State iron ore produced was shipped for export. The demand for lump ore at domestic steel furnaces held up well; and these shipments, with a minor tonnage used in heavy aggregate and at Nevada dead-burned magnesite plants, composed about 40 percent of the State output.

All of Nevada's iron-ore output, from 8 properties in 7 counties, was mined by open-pit methods; in 1952, 12 open-pit mines were worked. Magnetite was produced at 7 mines, and hematite was shipped from 1 property. Shipments of usable iron ore in 1953 averaged 63.1 percent iron compared with 59.4 percent iron in 1952.

The three leading producers of iron ore in Nevada were: Dodge Construction, Inc., Segerstrom and Heizer mine, Mineral Basin district, Pershing County; A & B Mining Co. Iron King (DeLong) mine, Jungo district, Humboldt County; and Parker Bros. Thomas-pit extension, Antelope district, Pershing County.

TABLE 5.—Mine production of gold, silver, copper, lead, and zinc, 1944-48 (average), 1949-53, and total, 1859-1953, in terms of recoverable metals¹

Year	Mines producing ²		Material sold or treated ³ (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1944-48 (average).....	226	25	6,335,646	100,519	\$3,518,165	1,326,253	\$1,102,999
1949.....	332	37	5,987,013	130,399	4,563,965	1,800,209	1,629,280
1950.....	325	27	7,745,119	178,447	6,245,645	1,537,217	1,391,259
1951.....	199	12	7,183,733	121,036	4,236,260	981,669	888,460
1952.....	114	11	7,313,697	117,203	4,102,105	941,195	851,829
1953.....	125	9	8,027,402	101,799	3,562,965	697,086	630,898
1859-1953 ⁴	-----	-----	(⁵)	26,366,480	601,388,476	598,728,687	548,985,095

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1944-48 (average).....	51,458	\$17,390,632	7,399	\$1,852,577	20,413	\$4,936,837	\$28,801,210
1949.....	38,058	14,994,852	10,626	3,357,816	20,443	5,069,864	29,615,777
1950.....	52,569	21,868,704	9,408	2,540,160	21,606	6,136,104	38,181,872
1951.....	56,474	27,333,416	7,148	2,473,208	17,443	6,349,252	41,280,596
1952.....	57,537	27,847,908	6,790	2,186,380	15,357	5,098,524	40,086,746
1953.....	61,850	35,501,900	4,371	1,145,202	5,812	1,336,760	42,177,725
1859-1953 ⁴	2,144,001	673,718,590	602,461	77,512,817	465,407	88,982,368	1,990,587,346

¹ Includes recoverable metal content of gravel, washed (placer operations); ore milled; old tailings or slimes re-treated; and ore, old tailings, and slag shipped to smelters during calendar year indicated.

² Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.

³ Does not include gravel washed.

⁴ From 1904 (when first satisfactory annual canvass of mine production was made) to 1953, inclusive, the output was as follows: Gold, 14,539,604 ounces valued at \$356,905,243; silver, 310,315,838 ounces, \$211,826,872; copper 2,142,075 tons, \$673,071,962; lead, 364,670 tons, \$54,876,255; zinc, 465,407 tons, \$88,982,368; total value, \$1,385,662,700.

⁵ Figure not available.

Lead.—Low lead prices, and to some extent depressed zinc prices, which continued throughout 1953, had an adverse effect on Nevada lead output. The Pioche district, Lincoln County, where lead, zinc, and manganese were associated minerals in a large percentage of the ore milled, supplied 76 percent of Nevada's recoverable lead yield. Combined Metals Reduction Co., operator of the Caselton mine and mill in that district, was the State's principal producer of the metal from lead-zinc and manganese ore treated. A few small mines shipped direct-smelting lead ore and complex ores containing lead throughout 1953, but the majority of the properties in this category were operated sporadically. The more consistent shippers included: Ala & Daz, Delno mine, Delano district, Elko County (lead ore); Bristol Silver Mines Co. Bristol mine, Jack Rabbit district, Lincoln County (copper-lead-zinc ore) and G. A. Peterson and others, New Potosi mine, Candelaria district, Mineral County (antimonial lead ore). Exploration for new lead- and lead-zinc-ore bodies was pursued principally in the Eureka district, Eureka County; the Jack Rabbit, Pioche, and Comet districts, Lincoln County, and the White Pine district, White Pine County. The Lippincott Lead Co. produced lead bullion for use at a California battery plant from lead ore (mined at the company property in California) and lead scrap reduced at its Bonnie Clare, Nye County, sintering plant-furnace.

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc in 1953, by counties, in terms of recoverable metals

County	Mines producing ¹		Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer	Fine ounces	Value	Fine ounces	Value
Churchill.....	5		15	\$525	10,827	\$9,799
Clark.....	6		126	4,410	410	371
Elko.....	13		108	3,780	47,696	43,167
Esmeralda.....	3		12	420	1,383	1,252
Eureka.....	3	1	66	2,310	1,961	1,775
Humboldt.....	1		9	315	2	2
Lander.....	15	1	² 34,396	³ 1,203,860	³ 6,225	³ 5,634
Lincoln.....	18		3,900	136,500	366,376	331,589
Lyon.....	2	1	556	19,460	340	308
Mineral.....	10	2	³ 696	³ 24,360	³ 52,334	³ 47,365
Nye.....	13	1	³ 310	³ 10,850	³ 2,737	³ 2,477
Pershing.....	5	3	158	5,530	779	705
Storey.....	3		143	5,005	143	129
Washoe.....	5	(²)	103	3,605	2,407	2,178
White Pine.....	23		61,201	2,142,035	203,466	184,147
Total.....	125	9	101,799	3,562,965	697,086	630,898

County	Copper		Lead		Zinc		Total value
	Pounds	Value	Pounds	Value	Pounds	Value	
Churchill.....	200	\$57	6,100	\$799	100	\$12	\$11,192
Clark.....	14,500	4,162	161,100	21,104			30,407
Elko.....	497,300	142,725	596,600	78,155	174,000	20,010	287,837
Esmeralda.....			16,000	2,096	2,200	253	4,021
Eureka.....	2,200	631	6,300	825			5,541
Humboldt.....							317
Lander.....	80,700	23,161	4,500	590			³ 1,233,245
Lincoln.....	208,700	59,897	7,123,000	933,113	10,981,200	1,262,838	2,723,937
Lyon.....	(⁴)	(⁴)					⁴ 19,768
Mineral.....	3,500	1,005	635,300	83,224	179,400	20,631	³ 176,585
Nye.....	1,600	459	34,400	4,506	5,900	678	³ 18,970
Pershing.....			2,200	288	400	46	6,569
Storey.....							5,134
Washoe.....	800	230	20,500	2,686	1,600	184	8,883
White Pine.....	⁴ 122,890,500	⁴ 35,269,573	136,000	17,816	279,200	32,108	⁴ 37,645,679
Total.....	123,700,000	35,501,900	8,742,000	1,145,202	11,624,000	1,336,760	42,177,725

¹ Excludes itinerant prospectors, "sniper," "high-graders," and others who gave no evidence of legal right to property.

² From property not classified as a mine.

³ Mineral and Nye County placers combined with that of Lander County to avoid disclosure of individual output.

⁴ Lyon County copper combined with that of White Pine County to avoid disclosure of individual output.

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in Nevada in 1953, by months, in terms of recoverable metals ¹

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January.....	8,250	67,953	5,262	490	839
February.....	7,001	68,521	4,714	381	655
March.....	8,521	57,451	5,269	412	603
April.....	8,300	46,032	5,230	309	640
May.....	8,745	45,277	5,217	262	554
June.....	7,393	46,851	5,108	259	626
July.....	7,903	47,306	4,869	304	647
August.....	9,512	65,192	5,287	358	576
September.....	9,045	52,673	4,979	364	250
October.....	10,064	71,121	5,715	402	172
November.....	8,491	64,209	4,977	443	151
December.....	8,574	64,500	5,223	387	99
Total.....	101,799	697,086	61,850	4,371	5,812

¹ Mine production comprises ore, gravel, or other mineral material sold or treated and metal recovered as natural gold or as bullion from cyanidation or amalgamation and the estimated recoverable metals contained in concentrates, ores, tailings, and other mineral materials shipped directly to smelters or sold to ore buyers within the year.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1953, by classes of ore or other source materials, in terms of recoverable metals

Source	Number of mines ¹	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Ore:							
Dry gold.....	32	153,220	20,084	4,896	100	300	-----
Dry gold-silver.....	9	1,832	244	9,120	-----	900	-----
Dry silver.....	20	2,231	44	28,534	900	11,000	1,500
Total.....	61	157,283	20,372	42,550	1,000	12,200	1,500
Copper-lead-zinc:							
Copper.....	25	7,758,298	60,859	187,801	123,235,700	100	-----
Copper-lead-zinc.....	1	1,241	14	34,142	112,800	308,500	234,300
Lead.....	26	4,947	588	62,922	19,800	872,300	79,000
Lead-zinc.....	8	95,498	2,239	241,420	115,100	5,480,600	8,263,200
Zinc.....	1	326	-----	-----	-----	-----	275,500
Total.....	61	7,860,310	63,700	526,285	123,483,400	6,661,500	8,852,000
Other "loose" material:							
Old tailings ²	9	9,293	283	33,595	900	433,000	179,100
Copper precipitates and manganese ore ^{3 4}	9	269	1,043	92,208	214,300	1,487,200	2,591,400
Old slag.....	2	6	91	12	-----	100	-----
Lead residue.....	1	241	-----	24	400	148,000	-----
Total.....	21	9,809	1,417	125,839	215,600	2,068,300	2,770,500
Total "loose" material.....	125	8,027,402	85,489	694,674	123,700,000	8,742,000	11,624,000
Gravel (placer operations).....	9	(⁵)	16,310	2,412	-----	-----	-----
Total, all sources.....	134	-----	101,799	697,086	123,700,000	8,742,000	11,624,000

¹ Details will not necessarily add to totals because some mines produce more than one class of material.
² Metal recovered, by class of old tailings, as follows: gold, 2,769 tons—143 ounces of gold, 399 ounces of silver; silver, 336 tons—6 ounces of gold, 1,945 ounces silver, 400 pounds copper, 6,300 pounds lead; lead, 6,188 tons—134 ounces gold, 31,251 ounces silver, 500 pounds copper, 426,700 pounds lead, 179,100 pounds zinc.
³ Combined to avoid disclosure of individual output.
⁴ Manganese ore tonnage not included.
⁵ 2,670,110 cubic yards.

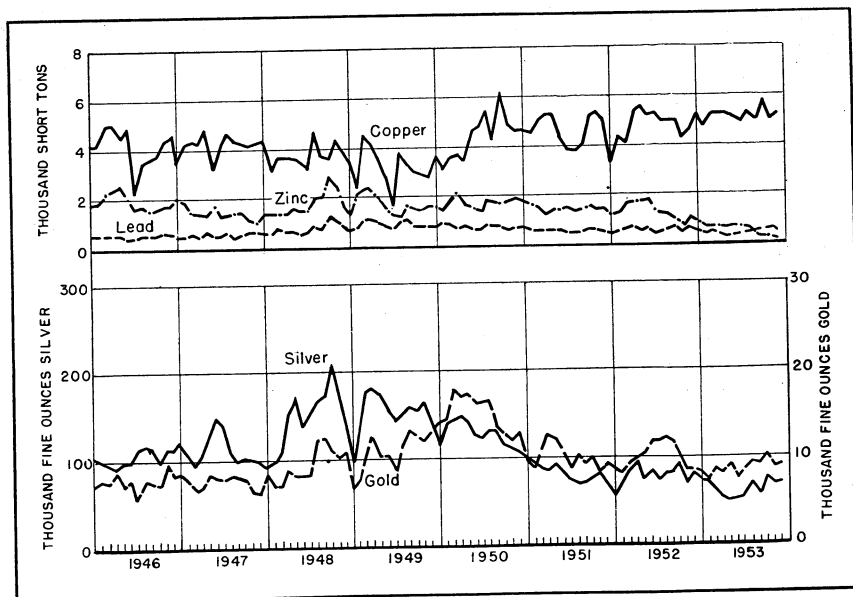


FIGURE 3.—Mine production of gold, silver, copper, lead, and zinc, 1946-53, by months, in terms of recoverable metals.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1953, by methods of recovery (except placer) and classes of material processed, in terms of gross metal content

Class of material	Material shipped or treated (short tons)	Gross metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
CONCENTRATE SHIPPED TO SMELTERS						
Dry gold.....	89	13	5,158	37	837	380
Copper and copper precipitates ¹	270,801	60,405	186,008	123,119,267		
Lead.....	11,397	2,775	264,752	43,156	6,447,956	995,879
Lead-zinc.....	13	57	7,639		80,249	110,767
Zinc.....	9,090	498	58,196	60,866	392,851	10,013,487
Total: 1953.....	291,390	63,748	521,753	123,223,326	6,921,893	11,120,513
1952.....	265,012	63,954	796,318	113,951,934	11,553,638	27,949,627
ORE, ETC., SHIPPED DIRECTLY TO SMELTERS						
Dry gold:						
Crude ore.....	2,938	937	3,350	279	486	
Old tailings.....	1	1	4			
Slag.....	4	91	10		129	
Dry gold-silver: Crude ore.....	1,727	242	9,624	3		
Dry silver:						
Crude ore.....	666	27	13,555	772	3,994	1,781
Old tailings.....	336	6	1,945	456	10,537	
Slag.....	2		2			
Copper: Crude ore and precipitates ¹	91,649	1,693	16,179	2,887,859	228	117
Copper-lead-zinc: Crude ore.....	1,241	14	34,142	132,652	313,882	296,551
Lead:						
Crude ore.....	3,659	588	61,590	25,786	814,193	124,772
Old tailings.....	6,188	134	31,251	675	431,032	210,533
Residue.....	241		24	482	150,588	
Lead-zinc: Crude ore.....	878	23	22,163	27,031	270,714	228,225
Zinc: Crude ore.....	326					306,122
Total: 1953.....	109,856	3,756	193,839	3,075,995	1,995,713	1,168,101
1952.....	110,597	2,696	153,605	2,582,066	2,341,782	5,206,194

¹ Combined to avoid disclosure of individual output.

Manganese.—The marked increase in output of Nevada manganese ore and concentrates in 1953 was the culmination of intensive ore development and plant preparation in 1952. Combined Metals Reduction Co. produced manganese concentrates at the Caselton differential flotation mill in Lincoln County, largely from manganese ores (some containing lead and zinc) mined in that county. Pioche Manganese Co., an affiliate, nodulized concentrates at Pioche and utilized the nodules at its Henderson ferromanganese plant. Manganese, Inc., operated the Three Kids mine and concentrator in the Las Vegas district, Clark County, and prepared manganese nodules. A kiln failure and a plant fire seriously hampered the efforts of this company to reach maximum production. Western Electrochemical Co. produced synthetic battery ore at Henderson, treating Nevada and Utah crude manganese ore and Nevada manganese concentrate. In addition to this major production there were intermittent shipments of manganese and manganiferous ores from Nevada mines to Government stockpiles and to Utah steel furnaces.

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1953, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals

A. For material treated at mills

	Material treated (short tons)	Recoverable in bullion		Concentrate shipped to smelters ¹ and recoverable metal					
		Gold (fine ounces)	Silver (fine ounces)	Concentrate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES									
Churchill.....	639	2	7	8	5	9,783		4,200	100
Clark.....	4,133	123	379	11			14,100		
Elko.....	75			21		55		18,600	5,400
Esmeralda.....	220	4	1	14	1	1,145		10,000	1,700
Humboldt, Mineral, and Storey ¹	1,162	163	106	89	13	4,832		800	300
Lander.....	149,092	(²)	(²)	7	6	518	300	2,900	
Lincoln.....	95,543			20,431	3,273	315,343	95,400	6,736,400	10,655,900
Lyon.....	279,189	³ 18,517	³ 1,455	(⁴)			(⁴)		
Nye.....	637	290	121						
Pershing.....	252	107	66						
Washoe.....	243	99	42	19		615	300	15,900	400
White Pine.....	7,386,356			⁴ 270,790	59,197	172,057	¹ 120,606,500		
Total: 1953.....	7,917,546	19,305	2,177	291,390	62,495	504,348	120,716,600	6,788,800	10,663,800
1952.....	7,203,100	18,733	3,697	265,012	62,769	782,143	112,615,900	11,304,100	26,690,200
BY CLASSES OF MATERIAL TREATED									
Dry gold:									
Crude ore.....	150,282	19,163	1,782						
Old tailings.....	2,768	142	395						
Dry gold-silver.....	105			2	7	215		900	
Dry silver.....	1,565			103	18	15,685	300	7,500	400
Copper & copper precipitates ²	7,666,918			270,801	59,197	172,057	120,620,600		
Lead.....	1,288			79		1,332	800	79,600	2,100
Lead-zinc.....	94,620			20,405	3,273	315,059	94,900	6,700,800	10,661,300
Total 1953.....	7,917,546	19,305	2,177	291,390	62,495	504,348	120,716,600	6,788,800	10,663,800
BY CLASSES OF CONCENTRATE SHIPPED TO SMELTERS ¹									
Dry silver.....				89	13	4,832		800	300
Copper and copper precipitates ²				270,801	59,197	172,057	120,620,600		
Lead.....				11,397	2,775	264,752	36,400	6,336,200	785,600
Lead-zinc.....				13	12	4,511		78,700	94,300
Zinc.....				9,090	498	58,196	59,600	373,100	9,783,600
Total 1953.....				291,390	62,495	504,348	120,716,600	6,788,800	10,663,800

For footnotes, see end of table.

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1953, by methods of recovery (except placer) and classes of material processed, in terms of recoverable metals—Continued

B. For materials shipped directly to smelters

	Material shipped (short tons)	Recoverable metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES						
Churchill.....	38	8	1,037	200	1,900	-----
Clark.....	263	3	31	400	161,100	-----
Elko.....	7,721	108	47,641	497,300	578,000	168,600
Esmeralda.....	22	7	237	-----	6,000	500
Eureka.....	390	56	1,960	2,200	6,300	-----
Lander.....	1,362	180	2,197	80,400	1,600	-----
Lincoln.....	3,906	627	51,033	113,300	386,600	325,300
Mineral.....	7,567	671	47,500	3,500	634,500	179,100
Nye.....	232	20	2,616	1,600	34,400	5,900
Pershing.....	30	1	697	-----	2,200	400
Storey.....	1	1	41	-----	-----	-----
Washoe.....	20	3	1,750	500	4,600	1,200
White Pine.....	88,304	2,004	31,409	2,284,000	136,000	279,200
Total: 1953.....	109,856	3,689	188,149	2,983,400	1,953,200	960,200
1952.....	110,597	2,622	144,344	2,458,100	2,275,900	4,023,800
BY CLASSES OF MATERIAL						
Dry gold:						
Crude ore.....	2,938	921	3,114	100	300	-----
Old tailings.....	1	1	4	-----	-----	-----
Slag.....	4	91	10	-----	100	-----
Dry gold-silver: Crude ore.....	1,727	237	8,905	-----	-----	-----
Dry silver:						
Crude ore.....	666	26	12,849	600	3,500	1,100
Old tailings.....	336	6	1,945	400	6,300	-----
Slag.....	2	-----	2	-----	-----	-----
Copper: Crude ore and precipitates ²	91,649	1,662	15,744	2,829,400	100	-----
Copper-lead-zinc: Crude ore.....	1,241	14	34,142	112,800	308,500	234,300
Lead:						
Crude ore.....	3,659	588	61,590	19,000	792,700	76,900
Old tailings.....	6,183	134	31,251	500	426,700	179,100
Residue.....	241	-----	24	400	148,000	-----
Lead-zinc: Crude ore.....	878	9	18,569	20,200	267,000	193,300
Zinc: Crude ore.....	326	-----	-----	-----	-----	275,500
Total 1953.....	109,856	3,689	188,149	2,983,400	1,953,200	960,200

¹ Excludes concentrate treated only by amalgamation and/or cyanidation.

² Combined to avoid disclosure of individual output.

³ Lander County gold and silver combined with Lyon County to avoid disclosure of individual output.

⁴ Lyon County combined with White Pine County to avoid disclosure of individual output.

In all, 33 mines in 7 Nevada counties produced manganese ore. Details of the products marketed follow: 20,150 short tons of manganese ore and concentrate averaging 47.5 percent manganese and 25,064 short tons of manganiferous ore and concentrate averaging 20.7 percent manganese were shipped for consumption; and 360 tons of manganese ore and concentrate averaging 39.6 percent manganese and 8,777 tons of manganiferous ore and concentrate averaging 21 percent manganese were sold and stockpiled for future beneficiation. The Bureau of Mines published data on concentrating Nevada manganese ore.⁷

⁷ Engel, A. L., Concentration Tests of Manganese Ores: Bureau of Mines Rept. of Investigations 4985, 1953, 14 pp.

TABLE 11.—Gold and silver produced at placer mines, 1944-48 (average) and 1949-53, in fine ounces, in terms of recoverable metals

Year	Material handled (cubic yards)	Gold (fine ounces)	Silver (fine ounces)	Total value	Average gold value per cubic yard
1944-48 (average).....	1,336,300	9,376	3,379	\$330,828	\$0.246
1949.....	1,382,140	7,942	1,676	279,487	0.201
1950.....	5,243,450	36,378	9,800	1,282,099	0.243
1951.....	6,165,850	30,509	14,017	1,080,501	0.173
1952.....	5,625,620	33,079	11,011	1,167,730	0.206
1953.....	2,670,110	16,310	2,412	573,033	0.214

TABLE 12.—Mine production of gold, silver, copper, lead, and zinc in 1953, by methods of recovery and types of material processed, in terms of recoverable metals

Method of recovery and type of material processed	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode:					
Amalgamation and cyanidation:					
Ore.....	19,163	1,782			
Old tailings.....	142	395			
Total recoverable in bullion.....	19,305	2,177			
Concentration, and smelting of concentrates: Ore¹.....	62,495	504,348	120,716,600	6,788,800	10,663,800
Total.....	62,495	504,348	120,716,600	6,788,800	10,663,800
Direct smelting:					
Ore ¹	3,357	154,913	2,982,100	1,372,100	781,000
Old tailings.....	141	33,200	900	433,000	179,100
Slag.....	91	12		100	
Lead residue.....		24	400	148,000	
Total.....	3,689	188,149	2,983,400	1,953,200	960,200
Placer.....	16,310	2,412			
Grand total.....	101,799	697,086	123,700,000	8,742,000	11,624,000

¹ Includes copper precipitates to prevent disclosure of individual output.

Mercury.—Production of Nevada mercury declined 8 percent compared with 1952; however, the State retained No. 2 position in the Nation behind California, the first ranking State. Humboldt County was the principal source of production, by virtue of the output from the Cordero Mining Co. Cordero mine in the McDermitt district. This property, Nevada's chief source of mercury, was the second largest producer of the metal in the United States in 1953. Shipments of mercury, all relatively small, were recorded from Nye, Pershing, and Mineral Counties. A new mercury prospect was developed in the Humboldt Range, Pershing County.

Molybdenum.—Molybdenum concentrate was recovered at the McGill concentrator as a byproduct of Kennecott Copper Corp. Nevada Mines Division and Consolidated Coppermines Corp. porphyry copper ore. The production of molybdenum concentrates in 1953 increased 45 percent over 1952.

Nickel and Platinum.—Ore from the Bunkerville district, Clark County, leached for its copper content, contained small quantities of nickel and platinum, but none was recovered in 1953.

TABLE 13.—Mine production of gold, silver, copper, lead, and zinc in 1953, by counties and districts, in terms of recoverable metals ¹

County and district	Mines producing ²		Lode material (short tons)	Gold (fine ounces)			Silver (lode and placer, fine ounces) ³	Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
	Lode	Placer		Lode	Placer	Total					
Churchill County:											
Esage 36	1		14	2		2	7				\$76
Fly Cross	2		626	5		5	10,646		4,600	100	10,425
Clark County:											
Buckhorn	1		1,430					14,100			4,047
Charleston Mountains	1		15						13,100		1,720
Searchlight	1		2,703	123		123	379				4,645
Yellow Pine (Goodsprings)	1		6	2		2	1				71
Elko County:											
Condit	1		5,308	90		90	9,697	468,400	338,200	67,800	146,857
Delano	1		1,413	8		8	24,380	3,200			76,864
Mountain City (Cope)	1		10				3	1,200			947
Mind Springs	1		8				69		10,300		1,412
Railroad (Holliston)	1		756	4		4	12,945	20,000	166,100	90,200	46,728
Ruby Range	1		30				6		1,700		225
Truscadero	2		5				123				111
Esmeralda County:											
Gold Crater	1		20	7		7	157		4,500		977
Klamyke	(⁴)			4		4	1				141
Eureka County:											
Cortez	1		336	6		6					2,911
Lyon	1		14	50		60	1,945	400	6,800		2,108
Humboldt County: Disaster	1		35	4		4					140
Lander County:											
Battle Mountain	10		1,335	59	(⁵)	59	1,153	80,400	1,800		28,381
New Pass	1		708	160		160	26				5,624
Lincoln County:											
Atlanta	1		2,093	499		499	2,248				19,500
Chief (Caliente)	1		61	54		54	66		200		1,076
Ely Springs (Lone Mountain)	1		206	6		6	5,200				4,899
Groom	1		688	5		5	333				4,899
Jack Rabbit	3		1,200	15		15	40,372	500	52,500		97,376
Piocche	8		94,761	3,287		3,287	317,628	113,000	387,000	322,600	153,806
Viola (Pennsylvania)	1		41	39		39	330	95,100	6,712,800	10,756,600	2,534,806
Lyon County: Silver City	1		57	43		566	340				1,655
Mineral County:											
Candelaria	5		5,388	598		598	36,118	900	398,600	69,200	114,051
Pilot Mountain	1		3,041	82		82	16,208	300	236,700	110,200	61,306
Rawhide	2			75		73	66				2,806

Nye County:	4	676	282	282	93	100	9,967
Manhattan.....	1	10	4	60	9	---	2,108
Round Mountain.....	3	12	---	---	339	800	728
Union.....	---	---	---	---	---	---	---
Pershing County:	1	212	80	80	50	---	2,845
Wild Horse.....	1	27	1	1	271	---	529
Willow Creek.....	1	---	1	3	2	1,900	107
Storey County: Comstock.....	3	204	143	143	143	---	5,134
Washoe County:	1	1	9	9	6	---	320
Honey Lake.....	1	157	90	91	36	---	3,218
Olinghouse (White Horse).....	1	---	---	---	---	---	---
White Pine County:	1	13	---	---	---	9,900	1,913
Aurum.....	3	100	29	29	681	---	1,682
Cherry Creek.....	2	33	29	---	797	---	611
Newark.....	10	7,473,623	61,093	61,093	184,716	1,000	37,093,226
Robinson.....	1	475	24	24	14,485	2,400	27,965
Ward.....	3	---	2	---	1,494	75,000	7,694
White Pine.....	37	429,092	18,581	34,240	13,159	47,700	1,765,505
Undistributed ¹	---	---	15,659	---	---	299,100	---
Total Nevada.....	125	8,027,402	85,439	101,799	697,086	8,742,000	42,177,725

¹ Only those districts are shown separately for which Bureau of Mines is at liberty to publish figures; other producing districts are listed in footnote and their output grouped as "Undistributed."

² Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.

³ Source of silver as follows: 694,674 ounces from lode mines and 2,412 ounces from placers.

⁴ From property not classed as a mine.

⁵ Included with "Undistributed" to avoid disclosure of individual company operations.

⁶ Exclusive of placer output which is included with "Undistributed."

⁷ Includes the following: Desert and I. X. L. in Churchill County; Crescent and Las Vegas in Clark County; Edgemont, Ferguson Spring, Lucin, Ruby Valley, and Tecoma in Elko County; Silver Peak and Sylvania in Esmeralda County; Maggie Creek in Eureka County; Awakening in Humboldt County; Bullion, Kingston, and Reese River in Lander County; Eagle Valley and Fahramagat in Lincoln County; Yerington in Lyon County; Eagleville, Silver Star, and Walker Lake in Mineral County; Danville, Pancake Range, Quartz Mountain, Tonopah, and Tybo in Nye County; Humboldt (Imlay), Rabbit Hole, Rochester, Seven Troughs, and Star in Pershing County; Galena and Peavine in Washoe County; Osceola, Piermont, and Taylor in White Pine County.

TABLE 14.—Mercury production by methods of recovery, 1944-48 (average) and 1949-53

Year	Direct furnished		Retorted		Unclassified ¹	Total		Operating mines
	Ore (short tons)	Flasks of 76 pounds	Ore (short tons)	Flasks of 76 pounds	Flasks of 76 pounds	Flasks of 76 pounds	Value ²	
1944-48 (average)	17, 199	3, 245	282	45	1	3, 291	\$348, 445	9
1949	} 37, 688	} 6, 210	} 270	} 34	} 6	4, 170	331, 348	5
1950						680	55, 257	1
1951						1, 400	294, 182	12
1952						3, 523	701, 429	9
1953						3, 254	628, 120	12

¹ Includes mercury recovered from miscellaneous dump material.

² Value calculated at average price at New York.

Silver.—The sharp drop in output of lead and zinc was reflected in the total production of Nevada silver in 1953 as the base-metal ores have been the principal source of the State silver since the decline of precious metal ore mining. In 1953 base-metal ores and manganese ore containing base metals together yielded 89 percent of the silver produced, whereas 4 percent of the silver was derived from straight silver ores.

Combined Metals Reduction Co. Caselton mine, Pioche district, Lincoln County, was by far the chief producer of silver in Nevada. The origin was lead concentrates and zinc concentrates produced from lead-zinc ore and manganese ore. Kennecott Copper Corp. Nevada Mines Division and Consolidated Coppermines Corp. followed in order, producing silver from copper ore mined in the Robinson district, White Pine County. The three principal producers contributed 77 percent of the State's total silver.

Titanium.—Titanium-sponge metal was produced at the expanded facilities of Titanium Metals Corp. of America at Henderson. The Bureau of Mines also produced the metal at its Boulder City experimental plant. Titanium tetrachloride was reduced with magnesium at both facilities; rutile was the principal titanium mineral used to prepare titanium tetrachloride, but none was mined in Nevada.

Although Nevada's titanium-sponge production figures are not available for publication, the State output was an important contribution to the Nation's commercial titanium-sponge output of 2,241 short tons in 1953. In 1952 the United States production was 1,075 tons.

Tungsten.—Nevada led the Nation in output of tungsten concentrate and the 1953 production was substantially greater than in 1952. Improved statistical coverage of Nevada mines permitted a more complete follow-up of the ore and concentrate shipped for milling, up-grading, or chemical digestion in States other than Nevada. The 1953 figures are based on the ultimate value of concentrate produced from Nevada ore, whereas in 1952 it is likely that some of Nevada's mine production was credited to States where beneficiation was done.

Table 15 shows the distribution of tungsten output in the State. Virtually all the concentrate produced in 1953 was scheelite, but some hübnerite was shipped from White Pine County.

The following five leading producers supplied 72 percent of Nevada's total tungsten concentrate: Nevada Massachusetts Co. Tungsten mines, Mill City district, Pershing County; United States Vanadium Co. Riley mine, and Getchell Mine, Inc., Getchell mine, both in the Potosi district, Humboldt County; Nevada Scheelite Division of Kennametal, Inc., Leonard mine, Rawhide district, Mineral County; and Black Rock Mining Corp. Lincoln mine, Tem Piute district, Lincoln County.

TABLE 15—A.—Tungsten concentrate produced from Nevada ore in 1953, by counties ¹

County	Producing mines and prospects	Ore ²			Concentrates produced (pounds)	Contained WO ₃ ² units
		Mined (short tons)	To mills (short tons)	Milled ³ (short tons)		
Churchill.....	2	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)
Clark.....	2	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)
Douglas.....	9	10,438	10,438	10,222	96,117	3,084
Elko.....	7	496	361	10	195	7
Esmeralda.....	5	66	66	26,431	206,004	5,852
Humboldt.....	7	226,855	226,355	229,744	2,524,919	85,025
Lander.....	8	2,583	2,568	907	5,253	156
Lincoln.....	1	58,044	58,044	58,044	547,059	16,539
Mineral.....	40	65,472	65,472	38,594	832,550	32,869
Nye.....	14	34,470	33,537	26,397	382,543	12,118
Pershing.....	19	203,055	203,055	202,373	1,471,687	53,198
Washoe.....	3	447	447	377	2,117	66
White Pine.....	16	10,844	⁵ 15,944	⁵ 14,667	189,004	5,471
Undistributed.....		296	296	⁶ 8,817	⁶ 372,257	⁶ 13,364
Total.....	133	613,000	617,000	617,000	6,630,000	227,700

B.—Shipments of tungsten concentrate in 1953 credited to Nevada Counties in which ore was mined

County	Pounds	Contained WO ₃ units	Value
Douglas.....	101,819	3,288	\$205,664
Elko.....	9,036	293	18,327
Esmeralda.....	586	19	1,139
Humboldt.....	2,434,270	82,172	5,139,859
Lander.....	49,555	1,465	91,635
Lincoln.....	540,859	16,352	1,022,818
Mineral.....	949,400	32,592	2,038,630
Nye.....	728,123	24,517	1,533,538
Pershing.....	1,485,393	53,651	3,355,869
Washoe.....	2,202	69	4,316
White Pine.....	219,731	6,475	405,011
Undistributed ⁷	3,287	118	7,382
Total.....	6,524,000	221,011	13,824,238

¹ Corrected figures.

² Partly estimated.

³ Ore actually milled in county.

⁴ Included with "Undistributed" to avoid disclosure of individual output.

⁵ Includes 1,000 tons of dump ore and 3,000 tons of tailings.

⁶ Includes 8,521 tons of ore, which yielded 368,970 pounds of concentrates containing 13,246 units of WO₃, milled in California.

⁷ Includes Churchill and Clark Counties.

Uranium.—Prospecting for uranium was active in practically all sections of Nevada in 1953. Although the production of uranium in the State is not available for publication, shipments of uranium ore were reported from the Kings River area of Humboldt County. Data

on the occurrence of uranium in the East Walker River area, Lyon County, were published.⁸

Zinc.—Zinc output was reduced drastically because Combined Metals Reduction Co., Nevada's only producer of zinc concentrate in 1953, treated less lead-zinc ore and stressed the milling of manganese ore, which contained lead and zinc. This material yielded less zinc per ton than the lead-zinc ore of the Pioche and Comet districts of Lincoln County, which in the previous years of more favorable base-metal prices were the principal source of Nevada zinc. The Willard Leasing Co. shipped zinc silicate to an Illinois zinc plant from the Willard mine, a Consolidated Coppermines Corp. property in the Robinson district, White Pine County; and zinc was recovered from ores shipped from several mines to lead smelters equipped with slag fuming plants. Exploration for zinc ores was confined largely to the districts mentioned in the paragraph on lead.

SECONDARY METALS

Iron and Steel Scrap.—Leaching copper ore by Anaconda Copper Mining Co. at Yerington, Lyon County, consumed about 1.25 pounds of ferrous scrap in the form of light-gage sheet steel (detinned cans) for each pound of cement copper precipitated. This sizable scrap requirement was filled largely by California shippers. Scrap iron was used in producing cement copper from mine water in White Pine County and from leaching ore in Clark County.

NONMETALS

Andalusite.—No production of andalusite has been reported from Nevada since 1949. Coranda Corp. terminated exploration of the corundum-andalusite deposits in the Gillis Range, Mineral County, early in 1953. This work was begun in 1952 under a DMEA assistance contract. Tests of this material indicate that it has possible use in refractories.

Barite.—Crude barite output rose to 98,500 tons in 1953, and 99,500 tons was sold or used by producers. Stocks on hand were reduced 999 tons. In 1952, 94,200 tons was produced, of which 68,100 tons was sold or used. Lander and Elko Counties together supplied a large percentage of the State yield; a lesser tonnage was produced in Nye County. Virtually all of the crude barite was shipped to California grinding plants; but Magnet Cove Barium Co., a Texas firm, contracted for the quarrying of barite in Lander County and for milling the crude material at Beowawe, Eureka County, late in 1953. Most of the Nevada barite, after crushing and grinding, was utilized in rotary-drilling mud, chemicals, paints, and glass.

Brucite.—Basic Refractories, Inc., operating in Nye County, was the only producer of brucite in Nevada. The crude material was utilized in combination with dolomite for dead-burned magnesia at the company Ohio plant.

Clays.—Clay output in 1953 was relatively small, and the material produced was used largely in Nevada; fire clay and miscellaneous clays dug in Washoe County were utilized at a brick plant, and fire

⁸ Staatz, M. H. and Bauer, H. L., Jr., Uranium in the East Walker River Area, Lyon Co.: Geol. Survey Bull. 988-C, 43 pp.

clay produced in White Pine County was used for furnace mortar. Fuller's earth from Lyon County was shipped to a Berkeley, Calif., grinding plant. Research on Nevada bentonite as a moisture retainer in certain soils continued in 1953, but none of the material was produced.

Diatomite.—Nevada diatomite sold or used increased 2 percent in quantity and value compared with 1952. Churchill, Esmeralda, and Storey Counties supplied the 1953 output, which was utilized as fillers and abrasives, and in miscellaneous materials, including poultry feed, fertilizer, paper, lightweight aggregate, insulation, paint, and insecticides. Aquafil Co. began operation of the Aquafil plant, which included a Raymond mill and drying equipment, at Fernley, Lyon County, to process the Chick Bed Co. diatomite produced in Churchill County.

Fluorspar.—Operation of the Kaiser Aluminum & Chemical Corp. fluorspar flotation concentrator near Fallon, Churchill County, stimulated interest in several Nevada fluorspar deposits, which had been worked sporadically in past years, depending upon the requirements of the Pacific coast steel, ceramic, and cement industries. An acid-grade concentrate was produced at the plant from crude fluorspar mined in Churchill, Lander, Mineral, Nye, and Pershing Counties. This product was shipped to a chemical plant at Nichols, Calif., for conversion into aluminum fluoride, used in Kaiser Aluminum & Chemical Corp. potlines. J. Irving Crowell continued to supply Pacific coast plants with metallurgical-grade fluorspar from his Nye County property. Comparing 1953 with 1952, Nevada crude fluorspar output increased 61 percent, and fluorspar marketed (including material from stocks) rose 114 percent in quantity and 195 percent in value.

Gem Stones.—The Virgin Valley district, Humboldt County, was a source of opal in 1953. Turquoise was mined in Lander County in the Battle Mountain district and developed in the Weepah (Lone Mountain) district, Nye County. Collectors reportedly showed interest in specimen copper ores at the McConnell mine, Lyon County.

Gypsum.—Crude gypsum was produced in Clark, Mineral, and Pershing Counties in 1953. Output was up 15 percent in quantity and 18 percent in value compared with 1952. A large percentage of the crude gypsum was calcined, and a considerable quantity was utilized for wallboard at Nevada plants. The remainder was shipped out of the State, principally to California, where its main use was in portland cement and building materials. Western Neco, Inc., opened a quarry in Mineral County and prepared agricultural gypsum near Schurz.

Lime.—Seven limekilns for producing lime used either as quicklime or in hydrated form were operated in Clark and White Pine Counties in 1953. United States Lime Products Corp. (quicklime and hydrated lime) and Kennecott Copper Corp. Nevada Mines Division (quicklime) utilized Clark County dolomite and limestone and White Pine County limestone and were the State's only producing companies. The 1953 output exceeded the 1952 yield 25 percent in quantity and 39 percent in value.

Magnesite.—Basic Refractories, Inc., and Standard Slag Co. supplied the Nevada output of magnesite from their Nye County

mines. From the magnesite Basic Refractories, Inc., produced caustic-calcined magnesia used in turn to process dead-burned magnesia, and The Standard Slag Co. produced magnesium oxychloride and prepared refractory magnesia.

TABLE 16.—Crude gypsum mined 1944-48 (average) and 1949-53

Year	Active mines	Production (short tons)	Value
1944-48 (average).....	5	459, 554	\$1, 037, 731
1949.....	5	495, 229	1, 347, 666
1950.....	4	604, 604	1, 614, 107
1951.....	5	643, 637	1, 811, 757
1952.....	4	608, 284	1, 666, 938
1953.....	4	701, 584	1, 975, 053

Marl, Calcareous.—The entire 1953 output of Nevada calcareous marl was produced near the northwest shore of Pyramid Lake in Washoe County. The material was used as an ingredient of poultry and livestock feeds and for soil aid. The 1953 production dropped 11 percent both in quantity and value compared with 1952.

Perlite.—Crude perlite production rose 36 percent in quantity and 26 percent in value over 1952. The material was quarried in Clark, Lincoln, and Pershing Counties, and expanding plants were operated in Washoe and Clark Counties. A large percentage of Nevada crude perlite was crushed and sized and shipped out of State for expanding. Increased use of expanded perlite in plaster stimulated production of the crude material.

Pumice and Pumicite.—Very minor tonnages of pumice and pumicite were produced in Churchill and Mineral Counties for lightweight concrete aggregates.

Salt.—Salt (sodium chloride) output in Nevada in 1953 was the small yield from one operation in Churchill County. The salt (recovered from a dry lake bed by solar evaporation) was used principally for local hide curing, livestock, and deicing highways.

Sand and Gravel.—Sand and gravel was produced commercially in Clark and Washoe Counties, and State, municipal, and Federal agencies and their contractors prepared sand and gravel for non-commercial use in all Nevada counties. The sand deposits worked in Clark County were the most important commercially, yielding industrial sands (used largely by the glass and foundry industries) and building sand. A prolonged labor strike at one of the industrial sand plants in 1953 contributed to the decline in output of glass sand in Clark County. Other deposits of sand and gravel were worked at convenient localities in the State to provide aggregate for building and road construction. Details of the 1952 and 1953 production are shown in table 17. In 1951, 2,617,000 short tons of sand and gravel valued at \$2,658,000 were produced, compared with 2,617,000 tons valued at \$2,253,000 in 1950; 1,347,000 tons valued at \$1,212,000 in 1949; and an annual average of 1,183,000 tons valued at \$1,210,000 for the years 1944-48, inclusive.

TABLE 17.—Sand and gravel sold or used by producers, 1952-53, by classes of operations and uses

	1952			1953		
	Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per ton
COMMERCIAL OPERATIONS						
Sand:						
Glass.....	(1)	(1)	(1)	(1)	(1)	(1)
Molding.....	72,444	\$156,958	\$2.17	79,876	\$191,897	\$2.40
Building.....	117,205	227,797	1.94	161,059	237,672	1.48
Paving.....						
Other.....	(1)	(1)	(1)	(1)	(1)	(1)
Gravel:						
Building.....	119,910	224,684	1.87	148,345	222,001	1.50
Paving.....	(1)	(1)	(1)	1,269	2,610	2.06
Railroad ballast.....	2,565	281	.11			
Other.....	719	359	.50			
Undistributed sand and gravel ¹	257,261	918,205	3.57	143,036	460,187	3.22
Total commercial sand and gravel.....	570,104	1,528,284	2.68	533,585	1,114,367	2.09
GOVERNMENT-AND-CONTRACTOR OPERATIONS ²						
Sand:						
Building.....	1,366	4,005	2.93			
Paving.....	23,210	16,816	.72	21,160	5,598	.26
Total Government-and-contractor sand.....	24,576	20,821	.85	21,160	5,598	.26
Gravel:						
Building.....	41	12	.29			
Paving.....	1,503,490	831,302	.55	1,711,319	968,983	.57
Total Government-and-contractor gravel.....	1,503,531	831,314	.55	1,711,319	968,983	.57
Total Government-and-contractor sand and gravel.....	1,528,107	852,135	.56	1,732,479	974,581	.56
ALL OPERATIONS						
Sand.....	446,904	1,281,992	2.87	373,456	841,506	2.25
Gravel.....	1,651,307	1,098,427	.67	1,892,608	1,247,442	.66
Grand total.....	2,098,211	2,380,419	1.13	2,266,064	2,088,948	.92

¹ Included with "Undistributed" to prevent disclosure of individual output.

² Includes figures for State, counties, municipalities, and other Government agencies.

Stone.—Nevada stone production increased 25 percent in quantity and 21 percent in value compared with 1952. The greatest increase was in limestone (including dolomite) produced in Clark and White Pine Counties and used principally for lime and at metallurgical and chemical plants. The tonnage of sandstone quarried in Humboldt and Clark Counties for cut stone and flagging increased 36 percent over the tonnage for flagging and rough architectural and sawed stone in 1952. Basalt was crushed in Washoe County for commercial aggregate, and miscellaneous stone was quarried for railroad ballast, riprap, and concrete aggregate in Eureka County; the combined tonnages of basalt and miscellaneous stone increased 29 percent compared with 1952. Miscellaneous stone was quarried noncommercially in Clark, Washoe, Mineral, and Lyon Counties for riprap in highway construction.

Sulfur.—A minor tonnage of sulfur ore was shipped from Humboldt County to neighboring States, largely for soil-improvement purposes.

TABLE 18.—Stone, commercial and noncommercial, sold or used by producers, 1952-53, by uses

Use	1952		1953	
	Quantity	Value	Quantity	Value
Dimension stone:				
Building stone:				
Sawed stone and cut blocks..... cubic feet...	19, 577	\$33, 850	29, 133	\$64, 372
Approximate equivalent in short tons.....	1, 527		2, 253	
Flagging..... cubic feet.....	6, 410	12, 500	6, 494	10, 000
Approximate equivalent in short tons.....	500		500	
Total dimension stone (quantities approximate, in short tons).....	2, 027	46, 350	2, 753	74, 372
Crushed and broken stone..... short tons.....	828, 685	1, 112, 258	1, 032, 815	1, 325, 157
Grand total (quantities approximate, in short tons).....	830, 712	1, 158, 608	1, 035, 568	1, 399, 529

Talc and Soapstone.—The production of talc and soapstone in Nevada in 1953 increased 44 percent compared with 1952. This output, which included some steatite talc, was shipped to California grinding plants from Esmeralda County mines.

Volcanic Cinders.—Volcanic cinders, which differ from pumice both in composition and appearance, were quarried in Nye County for concrete aggregate, principally in building blocks. The quantity and value of volcanic cinders produced in 1953 are included with pumice and pumicite in table 1.

REVIEW BY COUNTIES

CHURCHILL

Fallon Concrete Products Co. utilized pumice from the Crow No. 1 and Mike No. 1 claims 20 miles east of Fallon at its Fallon concrete block plant. Kaiser Aluminum & Chemical Corp. produced acid-grade fluorspar at the company 100-ton-a-day flotation mill 1 mile west of Fallon, Nev. The fluorspar milled was supplied by the company Kaiser mine in Mineral County and custom shippers in Churchill (including the Keller Bros. & T. B. McDowell, Dixie mine, in Dixie Valley), Lander, Nye, and Pershing Counties. The plant was described in an article.⁹ The Chick Bed Co. operated the Chick Bed open-pit mine 22 miles northeast of Fernley, Nev. The diatomaceous earth produced was shipped to the Aquafil mill at Fernley, Lyon County, for grinding. The Nevada Highway Department and contractors produced sand and gravel at various locations for highway construction.

Desert District.—The Lang Mining Co. shipped gold-silver ore to a smelter from the Desert Queen mine.

Eastgate District.—L. P. Burch worked the Gold Ledge group of claims and recovered gold and silver by amalgamation.

⁹ Mining World, vol. 15, No. 12, November 1953, p. 39.

TABLE 19.—Value of mineral production in Nevada in 1953, by counties

County	Value ¹	Minerals produced in order of value
Churchill.....	\$158, 357	Diatomite, iron ore, sand and gravel, silver, fluorspar, salt, lead, gold, tungsten concentrates, pumice, copper, zinc.
Clark.....	6, 669, 485	Lime, manganese ore, gypsum, sand and gravel, stone, perlite, lead, gold, copper, tungsten concentrates, silver.
Douglas.....	278, 117	Tungsten concentrates, iron ore, sand and gravel.
Elko.....	761, 968	Sand and gravel, barite, copper, lead, silver, zinc, tungsten concentrates, gold.
Esmeralda.....	463, 206	Diatomite, talc and soapstone, tungsten concentrates, sand and gravel, lead, silver, gold, zinc.
Eureka.....	297, 234	Stone, iron ore, sand and gravel, gold, manganiferous ore, silver, lead, copper.
Humboldt.....	6, 440, 045	Tungsten concentrates, mercury, iron ore, stone, sand and gravel, manganiferous ore, manganese ore, sulfur ore, gold, silver.
Lander.....	1, 779, 522	Gold, barite, tungsten concentrates, manganiferous ore, copper, silver, fluorspar, sand and gravel, manganese ore, lead.
Lincoln.....	4, 494, 790	Zinc, tungsten concentrates, lead, manganiferous ore, silver, perlite, gold, copper, sand and gravel, manganese ore.
Lyon.....	551, 477	Copper, gold, sand and gravel, clays, silver, stone.
Mineral.....	2, 851, 010	Tungsten concentrates, fluorspar, lead, silver, sand and gravel, gold, zinc, gypsum, copper, mercury, stone, pumice.
Nye.....	2, 789, 125	Tungsten concentrates, magnesite, fluorspar, iron ore, sand and gravel, volcanic cinder, brucite, barite, gold, mercury, lead, silver, antimony, zinc, copper.
Ormsby.....	2, 378	Iron ore, sand and gravel.
Pershing.....	6, 105, 054	Tungsten concentrates, iron ore, gypsum, perlite, manganiferous ore, gold, mercury, fluorspar, sand and gravel, silver, lead, zinc.
Storey.....	857, 749	Diatomite, gold, sand and gravel, silver.
Washoe.....	630, 728	Sand and gravel, stone, marl, clays, tungsten concentrates, gold, lead, silver, copper, zinc.
White Pine.....	38, 323, 102	Copper, gold, tungsten concentrates, lime, molybdenum concentrates, silver, sand and gravel, stone, zinc, manganese ore, lead, clays, manganiferous ore.
Undistributed.....	69, 630	Gem stones, tungsten concentrates, sand and gravel.
Total.....	73, 523, 000	

¹ Value of manganese and manganiferous ores sold to custom mills for eventual concentration and manganese material blended at Government low-grade depot stockpiles for future beneficiation not included, but value for this material for respective counties is as follows: Clark, \$711; Eureka, \$2,018; Lander, \$3,740; Lincoln, \$162,270; Pershing, \$1,618; and White Pine, \$13,608.

Holy Cross District.—Clark C. Shaw milled 100 tons of gold-silver ore from the Camp Terrell group of claims and produced lead concentrates containing silver, gold, zinc, and copper. Erb, Goff & Portis recovered concentrates containing silver, lead, and some gold, zinc, and copper from silver ore mined at the Pyramid mine. Lead ore containing silver and some zinc was shipped to a smelter.

I. X. L. (Pike Hollow) District.—Charles Cirac shipped fluorspar from the Cirac-Revenue group of claims, 23 miles northeast of Stillwater, Nev., to a custom mill. Emery, Yost & Sizemore shipped lead ore, containing copper and silver, to a smelter from the Creore claim.

Mineral Basin (Buena Vista) District.—Mineral Materials Co. operated the Buena Vista (Black Horse) open-pit mine and shipped 9,015 long tons of magnetite, which averaged 57 percent iron. The ore was destined largely for export to Japan.

Sand Springs District.—Al Derrick produced 116 pounds of tungsten concentrates, which averaged 78 percent WO_3 , from Corona-mine ore, a new discovery in 1953. The Leslie Salt Co. produced a small tonnage of salt (sodium chloride) from the Fallon Development Co. deposits by surface mining.

Table Mountain District.—Consolidated Coppermines Corp. explored showings of copper ore in the Dixie Valley but abandoned the project.

CLARK

More-Lite Co. and Nu-Lite Insulated Homes, Inc. quarried crude perlite in the Castle Mountains west of Searchlight, Nev. The material was shipped to the companies' expanding plants at Crestmore and Fontana, Calif., respectively. Tri-State Metals, Inc., operated the Silver Leaf-Rocking Chair-Tungsten King group of claims in Cabin Canyon 15 miles southeast of Mesquite, Nev. The ore was milled at Mesquite, and tungsten concentrates were shipped to an ore buyer. The National Park Service and the Nevada Highway Department and contractors produced sand and gravel and crushed miscellaneous stone at several localities for highway construction. ColoRock Sales Co. developed a building-stone quarry 9 miles east of Cyrstal, Nev.

Apex District.—United States Lime Products Corp. operated the Apex limestone quarry and crushing plant 18 miles north of Las Vegas, Nev.

Arden District.—Cindrlite, Inc., manufactured building blocks 9 miles southwest of Las Vegas, using Nye County volcanic cinders for aggregate.

Blue Diamond District.—Blue Diamond Corp. worked its open pit and underground gypsum mine 28 miles southwest of Las Vegas, Nev. The company calcined gypsum and operated a plaster mill and gypsum lath and board plant near the mine.

Bunkerville District.—Key West Nickel & Copper Corp. operated a 40-ton-a-day leaching plant at the Key West mine and produced some copper precipitates from the oxide ore, which were shipped to a smelter. The company continued experimental work on the recovery of nickel, platinum, and gold in the ore.

Charleston Mountains District.—J. H. Caldwell and I. W. Padgett shipped 15 tons of lead ore containing a trace of gold, 5 ounces of silver, 28 pounds of copper, 13,659 pounds of lead, and 204 pounds of zinc to a smelter from the J & S group of claims in Lee Canyon.

Crescent District.—Crescent Lead Mining Co., Inc., developed the Golden Eagle mine 17 miles west of Searchlight for a short period in 1953. The ore contains gold, silver, copper, lead, and zinc.

Las Vegas-Boulder City District.—Nevada Panacalite, Inc., did experimental work on expanding perlite at Henderson. Titanium Metals Corp. of America produced titanium sponge at its Henderson plant; and the Bureau of Mines, in addition to its titanium research, operated a pilot plant at Boulder City for the production of titanium sponge as called for under Defense Minerals Procurement Agency Contract DMP-76. The Bureau production was to supplement, but not to compete with, private production. Stauffer Chemical Co. prepared chlorine, utilizing California salt, at Henderson. United States Lime Products Corp. operated a lime hydrating and pulverizing plant 1 mile south of Henderson on Clark County limestone. Manganese, Inc., operated the Three Kids open-pit mine. Manganese ore was milled at the company flotation plant 6 miles northeast of Henderson, Nev., and manganese concentrates were nodulized at the plant kiln. Nodules shipped during 1953 averaged about 47 percent manganese. Some manganese concentrates were shipped to a synthetic battery-ore plant. Production was stopped on 2 occasions—

the nodulizing kiln suffered a break in February, and a fire destroyed the flotation section of the 1,200-ton mill in June. The mill was rebuilt, and shipping of nodules was resumed in November 1953. Residue from the kiln operation contained lead, copper, and silver, which were recovered at a smelter. Western Electrochemical Corp. prepared electrolytic manganese dioxide (synthetic battery ore) at its plant near Henderson. Manganese ore and concentrates treated at the plant were produced in Nevada and Utah. At Henderson the Pioche Manganese Co. produced ferromanganese, using manganese nodules, concentrates, and some crushed manganese ore, which was shipped from the company kiln and the Combined Metals Reduction Co. mill in Lincoln County. Two open-top electric furnaces, designed to produce 1,500 tons of ferromanganese each a month, were operated. Pabco Products, Inc., operated the White Eagle pit and company mill 8 miles north of Henderson, Nev. The gypsum produced was shipped largely to the company California plasterboard plant. Sand and gravel was produced by Las Vegas Building Materials at Whitney and by Stocks Mill & Supply Co. at Las Vegas.

Overton District.—Molding sand was produced by Fred Morledge at the Red Gorge mine 4 miles west of Logandale and the Moapa Placer claim 2 miles south of Overton. Snoreen & Son operated a sand pit 4 miles south of Overton and shipped molding sand. Glass sand was produced at the Nunn Co. pit and mill 6 miles southwest and 1½ miles south of Overton, respectively; a labor strike had an adverse effect on production in 1953. Nevada Silica Sands, Inc., produced a variety of industrial sands at its pit and plant 7 miles south and 1 mile west of Overton, respectively.

Searchlight District.—Crude perlite produced and sized at the Perlite Ridge mine near Searchlight was expanded at the Searchlight Insulation Products Co. plant at Searchlight. Desert Milling Co. cyanided 2,703 tons of the Quartette and Duplex mines tailings and recovered 123 ounces of gold and 379 ounces of silver. The plant was closed from October through December.

Sloan District.—United States Lime Products Corp. operated the Sloan dolomite quarry and limekilns at Sloan, 18 miles south of Las Vegas.

Yellow Pine District.—Chris Stubbe shipped 6 tons of ore containing 2 ounces of gold, 1 ounce of silver, and 17 pounds of copper to a smelter from the Red Cloud mine 4 miles west of Goodsprings. Nevada Flagstone Quarries, Inc., prepared dressed stone and flagging from sandstone quarried at the Red Bluff pit 8 miles north of Goodsprings. Diamond Gold Mining Co. operated the Simon Rainbow quarries 7½ miles north of Goodsprings. The stone was dressed at Jean.

DOUGLAS

The Bureau of Public Roads and the Nevada Highway Department and contractors produced sand and gravel at various sites for highway construction.

Brunswick District.—Carson Tungsten Co. shipped tungsten concentrates derived from ore produced at the Old Discovery mine 16 miles east of Carson City. A portion of this property is in Ormsby County.

Buckeye District.—Scanlan Gold Mining Corp. developed the Artful Dodger-Golden Top group of claims in Titus Canyon 20 miles north of Minden. The ore contains gold and silver.

Buckskin District.—The Standard Slag Co. shipped 9,394 long tons of magnetite, which averaged 61.5 percent iron, from the Minnesota open-pit mine. The ore was exported to Japan.

Gardnerville (Pine Nut) District.—C. B. Lovestedt worked the L & N mines 10 miles southeast of Gardnerville and shipped 862 tons of tungsten ore, which averaged 1 percent WO_3 , from the Divide claims to a custom mill. Metallurgical Development Co. operated the 50-ton-a-day Alpine flotation mill 12 miles southeast of Gardnerville on tungsten ore from mines in the district, including the Owl and Last Laugh.

ELKO

Baroid Sales Division, National Lead Co., shipped barite from the Rossi open-pit mine to the company grinding plant at Merced, Calif., and to a southern California grinding plant. The Elko County Highway Department and the Nevada Highway Department and contractors prepared sand and gravel for highway construction at several localities.

Alder District.—Garnet Tungsten Mining Co. and its successor, Sunshine Mining Co., explored the Garnet tungsten claims 18 miles east of Mountain City.

Contact District.—The Marshall Mining Co. explored the Marshall (Nevada-Bellevue) mine under a DMEA loan and shipped 5,308 tons of copper ore, with a gross metal content of 90 ounces of gold, 9,697 ounces of silver, and 447,966 pounds of copper, to a smelter.

Delano District.—J. F. Ala and Lucy Daz operated the Delno mine throughout 1953 and shipped lead ore containing silver, zinc, copper, and gold to smelters. Frank Bullock explored the Lucky Boy-Jackson claims for lead zinc ore under a DMEA loan.

Edgemont (Centennial) District.—Boyce Bros. developed the Elko Canyon mine and shipped a small quantity of lead ore to a smelter. Blue Jacket Mining Co. shipped tungsten ore from the Burns mine 39 miles southwest of Mountain City, to a custom mill.

Ferguson Springs District.—Copper Valley Mining Co. made a small shipment of copper ore from the Copper Valley mine to a smelter.

Mountain City (Cope) District.—H. C. Bieroth shipped copper ore from the Rio Tinto mine dump to a smelter, and L. E. Whitney did some development in the underground workings. Golden Ensign Mining Co. developed the Golden Ensign claims throughout 1953. The ore contains gold, silver, and traces of tungsten and molybdenum. Copper Mountain Mining Co. rehabilitated the Mill Creek copper mine.

Mud Springs District.—E. V. Storey rehabilitated and explored the Rainbow group of claims; 8 tons of ore shipped to a smelter contained 10,693 pounds of lead, 69 ounces of silver, and a trace of gold.

Railroad (Bullion) District.—New World Exploration, Research & Development Corp., and John Uhalde operated the Aladdin mine and shipped lead-zinc ore containing silver, copper, and gold to a smelter-fuming plant.

Rock Creek District.—Louis Salet developed the Tea Pot-Boston group of mercury claims on Dry Creek.

Ruby Range District.—Long Canyon Mining Co. shipped lead concentrates, containing zinc and silver, from the Knob Hill mine to a smelter. E. F. Richie & Felix Fong shipped tungsten ore from the Lakeview mine near Harrison Pass to a custom mill.

Ruby Valley District.—Noonday Mines, Ltd., developed the Noonday (Friday) group of claims and shipped lead-zinc ore containing gold, silver, and copper to a concentrator-smelter. There were showings of scheelite in the mine. Shipments of tungsten ore were made to custom mills by James Stinnett (Climax mine) and G. F. Ogilvie & A. F. Francis (Star mine).

Tecoma District.—Frank Bullock developed the Jackson group of claims and shipped lead ore containing silver, zinc, and copper to a smelter-fuming plant.

Tuscarora District.—Gilliam Z. Lawrence made a small shipment of silver ore to a smelter from the Original Nevada mine.

Warm Creek District.—Hadsel Products Co. experimented with zinc carbonate ore from the Polar Star mine at its Wells plant, which was designed to produce zinc salts.

ESMERALDA

The Nevada Highway Department produced gravel for road construction at various localities.

Columbus Marsh District.—Argentum Mining Co. of Nevada operated a flotation mill in conjunction with the Northern Belle silver mine at Candelaria, Mineral County.

Fish Lake Valley District.—W. F. Dunnigan explored the Red Rock mine for mercury ore in 1953 under a DMEA loan. Lessees of the J. E. King Estate shipped talc from the White King mine, and A. A. Goehring produced talc at the C. C. mine. The material was ground at California mills.

Gold Crater District.—Pius Kaelin and John Koshi shipped gold ore from the Gold Hill claim to a smelter.

Miller Mountain District.—Great Lakes Carbon Corp., Dicalite Division, operated the Basalt open-pit mine and mill at Basalt and produced diatomaceous earth. Don Burgner shipped tungsten ore from the Black Horse mine to a custom mill. V. C. Holmes produced tungsten ore from the Swanson mine, and the ore was milled at a custom plant.

Palmetto District.—James Bias shipped 68 pounds of tungsten concentrates, averaging 56 percent WO_3 , recovered from 12 tons of ore at the Two Deuces mine. H. N. Stewart shipped talc from the Hideout No. 1 (Gates) open-pit mine to a California grinding plant.

Pilot Mountain District.—Lindsay Mining Co. operated the Gunmetal gravity-concentration tungsten mill in 1953. The company Gunmetal tungsten mine is in the portion of the district that lies in Mineral County.

Silver Peak (Red Mountain) (Argentite) District.—Sunshine Mining Co. explored the Mohawk silver mine held on option but relinquished the property in November 1953. Argentite Development Corp. ex-

plored the Bumblebee group of claims 21 miles southwest of Silver Peak for silver ore.

Sylvania District.—Don H. Clair shipped lead-zinc concentrates and lead-zinc ore, both containing silver, from the Four Aces (Sylvania) mine to a smelter-fuming plant. He also shipped tungsten concentrates derived from tungsten ore mined on the property. Sierra Talc & Clay Co. operated the Oasis mine, and Huntley Industrial Minerals, Inc., worked the Sundown mine near Oasis, Calif. Talc from both properties was ground in California. H. N. Stewart shipped soapstone from the Lone Springs (Louise) mine to a California grinding plant.

Weepah (Lone Mountain) District.—The American Gem Co. Lone Mountain mine 16 miles southwest of Tonopah, Nev., was developed for turquoise.

EUREKA

Magnet Cove Barium Co. constructed a mill at Beowawe to prepare the crude barite quarried in Lander County for that company. Louis Gibellini shipped manganese ore to a custom mill from the Gibellini (Black Iron) group of claims 27.5 miles south of Eureka in the Fish Creek Mountains. The complex ore also contained nickel and zinc. The Nevada Highway Department and contractors produced sand and gravel for highway-construction projects.

Amarilla District.—Simplot Iron Mines, Inc., operated the Modarelli open-pit mine for a short time early in 1953 and shipped hematite for export to Japan.

Cortez District.—McFarland & Hullinger shipped material from the Cortez mine dump that contained silver, lead, copper, and gold.

Eureka District.—Consolidated Eureka Mining Co. developed the Diamond-Excelsior mine throughout 1953; a DMEA loan was granted the company late in the year. The ore contains principally lead and silver, with zinc, gold, and copper the accessory minerals. Eureka Corp., Ltd., explored the Richmond-Eureka lead-zinc ore body, largely by rotary drilling. The mine drainage and drilling programs were described in articles.¹⁰

Lone Mountain District.—M. I. A. Mines Co. developed oxidized zinc ore at the Lone Mountain-Mountain View group of claims during January and February 1953.

Lynn District.—W. W. Bleazard and A. W. Kelly developed the Lynn Big Six mine and shipped 14 tons of ore containing 50 ounces of gold, 8 ounces of silver, 65 pounds of copper, and 18 pounds of lead to smelters.

Maggie Creek District.—Irving Walters shipped copper ore containing silver from the Copper King mine.

HUMBOLDT

Uranium Metals, Inc., developed uranium ore in the Kings River area 75 miles north of Winnemucca. The Humboldt County Highway Department and the Nevada Highway Department and contractors produced gravel for highway construction at various sites.

¹⁰ Mitchell, Geo. W., Mine Drainage at Eureka, Corp., Ltd., Eureka, Nev.: Min. Eng., vol. 5, No. 8, August 1953, p. 812; Mining World, vol. 15, No. 9, August 1953, p. 40.

Bottle Creek District.—F. E. Hummel recovered 2 flasks of mercury from 2 tons of selected ore retorted at the Red Ore open-pit mine. Aubrey Minney explored the McAdoo mine for mercury under a DMEA loan.

Cove Meadows District.—Golden Scheelite Mining & Milling Co. operated the Lincoln-Greenhorn groups of claims, one-half mile south of Bartlett Peak. Some ore was stockpiled, and a small tonnage averaging 0.7 percent WO_3 was shipped to a custom mill.

Disaster District.—Leonard D. Simpson recovered gold and silver by amalgamating development ore and dump material at the Wide Awake-Brown Betty group of claims on Horse Creek. A 3-ton Gibson mill was operated.

Golconda District.—The K & K mine was operated on a small scale by H. E. Ingersoll, and some mercury was produced.

Jungo District.—A & B mining Co. shipped 73,675 long tons of magnetite, which averaged 63 percent iron, from the Iron King (DeLong) open-pit mine to steel furnaces in Midwestern States. The property is 32 miles north of Jungo in the Jackson Mountains.

McDermitt District.—The Cordero Mining Co., principal producers of mercury in Nevada and second in the Nation, operated the Cordero mine and a Herreschoff furnace in 1953.

Paradise Valley (Dutch Flat) District.—T. A. Cowan produced mercury at the Dutch Flat mine by retorting cinnabar.

Potosi District.—United States Vanadium Co. operated the Riley mine under contract and shipped the tungsten ore to a custom mill, and Getchell Mine, Inc., worked the Getchell group of mines and the enlarged 1,500-ton-a-day mill. Both custom and company tungsten ores (229,246 tons) were treated at the Getchell flotation plant. These properties ranked second and third in order of tungsten concentrates output in Nevada in 1953. T. N. T. Lease operated the Mountain King mine and shipped 4,557 tons of ore, which averaged 0.47 percent WO_3 , to a custom mill. Valley View Mining Co. worked the Valley View mine and shipped 13,437 tons of ore containing 0.51 percent WO_3 to a custom mill.

Poverty Peak District.—T. C. Hapgood recovered a small quantity of mercury from cinnabar in the Hapgood (Grayson)-mine dump by retort.

Sulfur District.—Black Rock Soil Aid Co. leased the Peterson sulfur pit 2 miles east of Sulfur and operated a crushing plant at Sulfur. A relatively small tonnage of sulfur ore was shipped from the district for soil conditioning.

Varyville (Leonard Creek) District.—Mahan Machinery Co. installed a dragline and Judson-Pacific nonfloating washing plant at the Eureka-Hamburg placer-gold property. No production was reported in 1953.

Virgin Valley District.—Owyhee Stone Co., Inc., prepared dressed sandstone at the Zeb Turner quarry 32 miles west of Denio, Oreg. Opal was produced at the Rainbow Ridge mine.

Warm Springs (Vicksburg) District.—Nevada Sonora Mineras Co. worked the Defense mine near Denio and shipped tungsten concentrate derived from ore treated at the Ashdown mill.

LANDER

Barium Products, Ltd., operated the Mound Springs (Mountain Springs) open-pit mine and crushing plant 26 miles south of Battle Mountain and shipped barite to the company grinding plant at Modesto, Calif. Magnet Cove Barium Co. contracted for operation of the Big Four and Standard groups of barite claims, a new operation 35 miles south of Battle Mountain. Some barite was shipped to the company mill at Beowawe. The Nevada Highway Department produced gravel for miscellaneous highway projects.

Argenta District.—California Nevada Barytes Mines (division of the Glidden Co.) Barium King mine was idle in 1953. Metals Disintegrating Co., Inc., operated the Baryte No. 1 (Shelton) open-pit mine 16 miles east of Battle Mountain and shipped barite to the Yuba Milling Co. grinding plant at Emeryville, Calif.

Battle Mountain District.—The Natomas Co., fourth largest producer of gold in Nevada in 1953, operated its bucketline dredge at Greenan Placers throughout the year. According to the company annual report to stockholders for the fiscal year ended September 30, 1953, the dredge encountered an area of low-value gravels during the first 6 months of the fiscal year. The 9-month period of 1953 showed both a decrease in yardage handled and a 20-percent reduction in average value per cubic yard compared with the first 9 months of 1952. However, values were considerably higher at the end of the period than in earlier months. G. A. Hinman shipped 202 tons of ore containing 5 ounces of gold, 301 ounces of silver, 17,506 pounds of copper, and 228 pounds of lead to a smelter from the Extension mine. The Copper Canyon Mining Co. and lessees operated several Copper Basin claims, including the Contention, Pedro, Henrietta, Chase, Carissa, and Sweet Maria. A total of 747 tons of direct-smelting ore, containing principally copper, with some gold and silver, was shipped. A. R. Hider shipped gold ore containing silver and copper from the Puddstone mine. Raring, Walters & Miller operated the Western Lock claim and shipped 137 tons of ore containing 2 ounces of gold, 108 ounces of silver, and 12,289 pounds of copper to a smelter. Glenn Johnson made a small shipment of tungsten ore to a custom mill from his claim near Copper Basin. E. H. Potter shipped manganese and manganiferous ores from the Black Rock mine 19 miles south of Valmy to steel furnaces.

Big Creek District.—Tes Oro Development prepared the Hard Luck and Dry Canyon group of claims for production of antimony ore. Flotation and gravity concentration units were assembled at Austin; however, no ore was milled.

Birch Creek District.—Sunnyside Milling Co. operated the Birch Creek open-pit tungsten mine about 20 miles southeast of Austin.

Bullion District.—The London Extension Mining Co., third largest producers of gold in Nevada in 1953, cyanided ore at its 350-ton-a-day mill from the Goldacres open-pit mine throughout the year. Silver also was recovered. The Grey Eagle Development Co. developed the Grey Eagle group of claims during 1953. Ore mined in previous years contained principally silver, gold, and lead, with copper and zinc the accessory metals.

Iowa Canyon District.—Keller Bros. and T. B. McDowell shipped fluorspar from the Iowa mine about 37 miles northeast of Austin to a custom mill.

Lewis (Pittsburg) District.—Cole, Dolezal & Layton developed the Aztec-Hercules-Monte Carlo group of claims. Silver ore containing some antimony was mined in prior years.

New Pass District.—Hugh Cameron shipped manganese ore from the Black Rock mine to Government low-grade stockpiles. Cooley Mining Co. operated the Thomas W. mine and recovered gold and silver by amalgamation at its 10-stamp mill.

Spencer Hot Springs District.—G. G. Peer worked the Conquest mine and shipped tungsten ore to custom mills. Uranium Mines of America, Inc., developed the Linka tungsten property 20 miles east of Austin. Sunnyside Milling Co. operated the Sunnyside mill, situated 22 miles east of Austin, on company and custom tungsten ore.

LINCOLN

The Nevada Highway Department and contractors produced gravel at several localities for highway purposes.

Atlanta District.—Atlanta Gold & Uranium Co. reopened the Atlanta mine 51 miles northeast of Pioche, inactive since 1948, and prospected for new ore bodies, including uranium; gold ore was shipped to a smelter (2,093 tons containing 509 ounces of gold and 2,430 ounces of silver).

Chief District.—Caliente Cobalt Mining Co. and lessee operated the Caliente Cobalt mine; 61 tons of ore containing 55 ounces of gold, 68 ounces of silver, and minor quantities of copper and lead was shipped to smelters.

Comet District.—Combined Metals Reduction Co. developed ore, which contained zinc, lead, silver, gold, and some tungsten, at the Comet mine. The mine was explored on a DMEA loan.

Ely Springs (Lone Mountain) District.—John A. Hedman shipped 206 tons of ore containing 5 ounces of gold and 5,472 ounces of silver from the Silver Queen and He-Ro (Hedman) claims to a smelter.

Ferguson (Delamar) District.—Delamar Perlite Co. shipped crude perlite from the Delamar pit principally to California expanding plants.

Groom District.—Dan Sheahan operated the Groom mine sporadically and shipped lead concentrates containing silver, recovered from 968 tons of ore milled at the 50-ton-a-day gravity-flotation plant.

Jack Rabbit (Bristol) District.—Manganese ore containing gold, silver, lead, and zinc was shipped to the Caselton mill from the Black Metal mine, a joint venture of Combined Metals Reduction Co. and lessees. Bristol Silver Mines Co. developed the Bristol mine on a DMEA loan in 1953 and shipped 1,241 tons of ore containing 14 ounces of gold, 34,142 ounces of silver, 132,652 pounds of copper, 313,882 pounds of lead, and 296,551 pounds of zinc to a smelter. In addition, manganese ore containing gold, silver, lead, and zinc was shipped to a custom mill. Heidenrich, Munson & Edwards operated the Monarch claims and shipped 49 tons of ore containing 239 ounces of silver, 233 pounds of copper, 11,075 pounds of lead, and a trace of

gold to a smelter. Idamic Mines shipped manganese ore to the Caselton mill from the Lucky Star, Rubber Dollar, and Hurley groups of claims. The Lucky Star-mine ore also contained gold, silver, lead, and zinc and was explored on a DMEA loan. Combined Metals Reduction Co. shipped manganese ore to the Caselton mill from the Gusset Patch mine.

Pahranaगत District.—Lovell & Olson shipped silver ore containing lead, copper, and gold to a smelter from the Illinois and Fifth of July claims. Lessees of Combined Metals Reduction Co. shipped manganese ore to Government stockpiles from the South Paw mine near Mount Irish.

Pioche District.—Combined Metals Reduction Co. cut back its activity in lead-zinc ore and stressed production of manganese concentrates at its Caselton mill, which has a daily capacity of 2,500 tons of ore. Lead-zinc ore delivered to the mill in 1953 was the production of the company No. 1 and No. 2 mine. This mine and the Black Prince mine supplied the company-produced manganese ore, which also contained gold, silver, lead, and zinc. Substantial tonnages of custom manganese ore were accepted at the mill, either for crushing or concentrating. Some of this ore contained gold, silver, lead, and zinc. Sources of custom manganese ore in the district included: Ely Valley Mines, Inc., Ely Valley mine; the Salt Lake-Pioche Mining Co. lessee, Apex and Financier mines; and the Pioche Mines Consolidated, Inc., Telephone claim. Products of the Caselton flotation mill were lead concentrates, zinc concentrates, and manganese concentrates. The lead and zinc concentrates, which contained gold and silver and an undetermined quantity of cadmium, were shipped to smelters. The manganese concentrates were either nodulized at the Pioche Manganese Co. kiln 3 miles southwest of Pioche or shipped direct to that company's Henderson ferromanganese plant. The nodules and some manganese ore crushed at Caselton also were shipped to the Henderson plant. Pioche Mines Consolidated, Inc., and lessees shipped lead ore containing silver, gold, and copper from the Poor-man mine to a smelter. This company also shipped silver ore from the Telephone mine (previously mentioned as a source of manganese ore) and lead ore containing gold, silver, copper, and zinc from the West End claims. L. H. Scott shipped 8 tons of ore containing 4 ounces of gold, 77 ounces of silver, 21 pounds of copper, 3,265 pounds of lead, and 107 pounds of zinc to a smelter from the True Racket (Old Timer) group of claims. Combined Metals Reduction Co. produced crude perlite at the Hollinger pit 17 miles northeast of Pioche and operated the Panacalite perlite-sizing mill at Caselton. The sized material was shipped to various expanding plants in the United States. Exploration for lead and zinc ores under DMEA loans was pursued by Ely Valley Mines, Inc., and Raymond-Combined Mines Co.

Tem Piute District.—The Black Rock Mining Corp., fifth largest producers of tungsten concentrates in Nevada in 1953, operated the Lincoln mine and flotation mill. Tungsten ore treated averaged 0.48 percent WO_3 .

Viola (Pennsylvania) District.—Orpha Johnson and H. H. Phelps explored the Sure Shot-Jumbo-Owl group of claims 8 miles east of

Elgin and shipped 41 tons of ore containing 40 ounces of gold and 346 ounces of silver to a smelter. E. H. Smith explored the Pennsylvania mine for copper ore under a DMEA loan.

LYON

Aquafil Co., an affiliate of Chick Bed Co., operated the Aquafil mill (Raymond mill and drying plant) at Fernley, processing diatomite produced at the Chick Bed mine in Churchill County. The Nevada Highway Department and contractors produced sand and gravel and crushed miscellaneous stone at different localities for highway construction.

Churchill District.—Industrial Minerals & Chemical Co. shipped fuller's earth from an open pit 2 miles south of Weeks to its Berkeley, Calif., grinding plant.

Silver City District.—Dayton Dredging Co. operated its dragline and stationary washing plant at Dayton. A substantial quantity of gold containing some silver was recovered from the gravel. Steve Brighenti recovered gold and silver from Dayton-mine ore by amalgamation.

Yerington District.—Anaconda Copper Mining Co. made the first shipment of copper precipitates from the Yerington mine to the Anaconda, Mont., smelter in November 1953. According to the company 1953 annual report to the stockholders, material removed from the mine by the end of 1953 amounted to 20,210,617 tons, consisting of 18,028,261 tons of overburden, 331,550 tons of ore to plant, and 1,850,806 tons of segregated plant-grade ore. Expenditures for construction and development of this project amounted to \$34,879,360 to December 31, 1953, of which \$20,489,283 was made in 1953.

MINERAL

C. W. Cooper produced a small tonnage of pumice at the Pumco mine near Mina for concrete aggregate. W. J. Hefler and C. L. Birks shipped tungsten ore from the Hillside-Hilltop group of claims, 3 miles southeast of Masonic, Calif. Waddel & Martin and Earl Buffington shipped tungsten ore to custom mills from the Buffington mine about 3 miles north of Mina. The Nevada Highway Department and contractors prepared sand and gravel and crushed miscellaneous stone for highway construction at various localities.

Broken Hills District.—Kaiser Aluminum & Chemical Corp. trucked fluorspar from the Kaiser (Baxter) mine 19 miles north of Gabbs to the company mill at Fallon.

Candelaria (Belleville) (Columbus) District.—L. D. Foreman & Co. shipped tailings containing gold, silver, copper, lead, zinc, and antimony to a smelter-fuming plant from the Belleville and Columbus dumps. G. A. Peterson operated the New Potosi mine throughout 1953 and shipped 1,312 tons of antimonial lead ore containing 529 ounces of gold, 16,295 ounces of silver, 890 pounds of copper, 217,085 pounds of lead, 4,810 pounds of zinc, and 138,276 pounds of antimony to smelters. Argentum Mining Co. of Nevada operated the Northern Belle mine at Candelaria and a flotation mill 8 miles south of Candelaria in Esmeralda County. Silver concentrates, containing gold, cop-

per, lead, and zinc, were shipped to a smelter-fuming plant. Candelaria Exploration Co. shipped silver ore containing gold to a smelter from the Petrel mine.

Cedar Mountain District.—K. W. Dunham shipped 57 tons of tungsten ore averaging 0.38 percent WO_3 from the Cedar Summit mine to custom mills.

Eagleville District.—R. E. Shupe shipped gold ore to a smelter from the Rita mine 3 miles south of Wedell Hot Springs.

Fitting District.—Rudy Paloski worked the Apache mine and shipped 282 tons of tungsten ore averaging 0.8 percent WO_3 to custom mills. Kinkead Milling Co. and Barney Dennison operated the Kinkead mill on custom and company tungsten ore produced in neighboring districts.

Gillis District.—Broken Hills Mining & Milling Co. shipped tungsten ore from the Blue Vein mine to a custom mill. Cabanne & More and W. E. Slater & Associates together milled 15 tons of tungsten ore averaging 1.6 percent WO_3 , produced at the Hayward group of claims. Coranda Corp. explored the Green Talc and Bismarck claims for corundum-andalusite on a DMEA loan.

Hawthorne (Whisky Flat) District.—Barney Dennison and C. W. Churchill shipped tungsten ore from the Babcock (Flying Cloud) mine, and W. A. Oliver produced a small tonnage of tungsten ore from the Lucky Boy mine for custom milling. Kinkead Milling Co. and M. H. McConnell shipped tungsten concentrates derived from ore produced at the Smokey claim. A. D. Robinson and E. W. Femons shipped tungsten concentrates produced at the Gopher Hole mine.

Mountain View District.—Western Neco, Inc., worked the Regan open-pit gypsum mine 14 miles east of Yerington, Nev. A crushing and pulverizing mill was operated 6 miles northwest of Schurz.

Pilot Mountain District.—L. D. Foreman & Co. shipped tailings containing gold, silver, copper, lead, zinc, and antimony from the Nelson dump at Sodaville to a smelter-fuming plant. R. J. Canavan recovered 5 flasks of mercury from 5 tons of selected ore retorted at the Red Top mine. Lindsay Mining Co. produced 24,180 tons of tungsten ore averaging 0.5 percent WO_3 from the Gunmetal mine 23 miles east of Mina. The ore was concentrated at the company mill in Esmeralda County. R. C. Armstrong shipped tungsten ore from the Desert Scheelite mine to a custom mill.

Rawhide (Regent) District.—Audrey Lee Mining Corp. operated the Rawhide placers, and Sylvia D. Mining Co. worked the Sylvia D. placer property. Both companies used mechanical equipment to move the gravel. Gold and some silver were recovered. Nevada Scheelite, Division of Kennametal, Inc., one of Nevada's principal tungsten producers, operated the Leonard mine and Nevada Scheelite flotation mill 50 miles southeast of Fallon. Company and purchased tungsten ore treated totaled 29,987 tons, averaging 1 percent WO_3 . The operation was described in an article.¹¹ Gabbs Lake Mining & Milling Co. shipped tungsten concentrates derived from the Dead Horse Wells tailings (Old Nevada Scheelite mill). Other producers of tungsten ore included: Corwin & Rysch (Scheelite Extension mine);

¹¹ Mining World, vol. 15, No. 13, December 1953, p. 54.

Kenyon Scheelite (Kenyon mine); C. W. Churchill (Crystal claims of the Kenyon mine); and J. L. Carver (Star claim).

Santa Fe (Luning) District.—Eagle Tungsten mine (Jay A. Carpenter, receiver) and H. W. Pilkington shipped tungsten ore to custom mills from the Eagle mine. Other shippers of tungsten ore to custom mills included: The Fallon Star Mining Co. (Fallon Star mine); A. E. Basset (Tungsten Dike mine); Bernard York (York claim); and Garfield Associates and J. J. Mathews (Noble claims). Louis and John Paloski shipped 24 tons of tungsten ore containing 0.5 percent WO_3 from the Beacon mine.

Silver Star District.—Copper Producers, Inc., made test shipments of copper ore from the Dunlap and Pine Tree claims and abandoned the project December 30, 1953. Chauncey Florey worked the Silver Dyke mine in the Gold Range section and shipped tungsten ore to various mills. He operated a pilot mill on tungsten ore at Mina. Geo. Baker and others shipped tungsten ore to custom mills from the Defender mine in the Marietta section. Nevada Tungsten Corp. operated a tungsten-custom mill 3 miles south of Mina. Gravity concentration was used.

Walker Lake District.—W. J. Gritton, John Burney, and Wm. Choate developed the Sunny Slope group of claims on Bald Mountain. An amalgamation test run on the mine ore yielded gold and silver.

NYE

L. O. Warfield recovered mercury at the Horse Creek mine in Horse Creek Canyon 14 miles northwest of Manhattan during the first 3 months of 1953. W. F. Swanson & Son leased the property later in the year and shipped mercury. The Nevada Highway Department and contractors produced gravel from several sites for highway use.

Bonnie Clare District.—The Lippincott Lead Co. operated a sintering plant and blast furnace at Bonnie Clare. Some lead ore from the Death Valley area in California and lead scrap were reduced. The lead bullion was used at a California storage battery plant.

Danville District.—Ekstrom Danville, Inc., shipped silver ore from the Ekstrom Danville (Montana-Richmond) group of claims to a smelter.

Ellendale District.—California-Nevada Barytes Mines (Division of Glidden Co.) produced barite at the Jumbo Lode mine. The barite was utilized at the company Oakland, Calif., paint plant.

Fairplay District.—In 1953 Hancock-Baxter Mines operated the Big Top mine 25 miles southeast of Gabbs. This mine was the locale of an important scheelite discovery in 1952. Tungsten ore was concentrated at a custom plant, and an ore stockpile was started at the company new 50-ton-a-day Toiyabe mill project near Gabbs. Other producers of tungsten ore included: Roy Rohlin (Horseshoe mine) and Gordon Lathrom (White Diamond mine).

Fluorine District.—Cindrlite, Inc., produced volcanic cinders at the Cinder Cone mine located 20 miles south of Beatty; J. Irving Crowell operated the Crowell (Daisy) mine 5 miles east of Beatty and shipped metallurgical-grade fluorspar to California markets.

Lodi (Mammoth) District.—The Standard Slag Co. shipped 43,646 long tons of magnetite, which averaged 59.8 percent iron, from the Phelps Stokes (Iron Mountain) open-pit mine. Most of the ore was for export to Japan; lesser tonnages were used for heavy aggregate and in the preparation of dead-burned magnesia at Gabbs. Tungsten operations in the near vicinity of Gabbs included: The Gabbs Exploration Co. Victory mine and 100-ton-a-day mill; the El Capitan Tungsten Co. (Smith Bros.) El Capitan mine and mill; the Inca Development Corp. Commodore mine; and the Nevada Pacific Development Corp. Ray Ricketts mine. The Inca Development Corp. operated the El Capitan mill after it was relinquished by the El Capitan Tungsten Co. Basic Refractories, Inc., produced magnesite and brucite at its open-pit mines 2 miles west of Gabbs. The company treated magnesite at a plant 1 mile east of Gabbs, producing caustic-calcined magnesia in Herreshoff furnaces. This material was used in processing dead-burned magnesia in a rotary kiln. The crude brucite, some of which is recovered by heavy-medium separation of ore was shipped to the eastern United States and was utilized in preparing magnesia. Standard Slag Co. quarried magnesite from the Greenstone Addition pit and operated the Gabbs plant 4 and 3 miles, respectively, east of Gabbs. Magnesium oxychloride was produced from the magnesite in a flash furnace, and a rotary kiln was used to prepare refractory magnesia.

Manhattan District.—Nathan Blake operated the Blue Bell mine and 10-stamp mill, and 100 tons of ore and tailings amalgamated yielded gold and silver. Robert Selig recovered gold and silver from the Sunshine-mine ore. A 25-ton flotation mill was operated. Lead Belt Metals, Inc., shipped antimonial gold ore to a smelter from the White Caps mine.

Millett District.—W. H. Thomas made a small shipment of tungsten ore from his project.

Pancake Range District.—Ina Tognoni Conway made a small shipment of silver ore to a smelter from the Silverton claim 7 miles west of Locke Ranch.

Quartz Mountain District.—Hill, Frank & Douglas and others worked the San Rafael mine and shipped lead ore containing gold, silver, copper, and zinc to a smelter-fuming plant.

Round Mountain District.—A. C. Albrecht and E. J. Arnold recovered gold and silver from the Deer Run mine ore by amalgamation. Ed Critchfield recovered 6 ounces of gold and 3 ounces of silver from 600 cubic yards of gravel sluiced at the Shoshone Fraction-Mary McLain group of claims. Boni Bros. made a small shipment of tungsten ore from its prospect near Round Mountain.

Smokey Valley District.—Uranium Mines of America, Inc., developed the Meyers tungsten mine 52 miles south of Austin.

Tonopah District.—Gold-silver ore at the Tonopah Development Co. property (also referred to as the Summit King [Tonopah King] mine) 1½ miles north of Tonopah was developed throughout 1953. Summit King Mines, Ltd., Special Account was the operating company. The Griffith Oil Co. prospected for gold-silver ore at the Silver Pick mine by diamond drill.

Twin River (Millet) District.—August Streshley and Frank Rogers developed the Moomba mine and prospected for tungsten ore. Lead

ore containing silver, copper, and zinc was shipped from the mine in prior years.

Tybo District (Hot Creek).—V. J. Barndt shipped lead-zinc ore containing gold, silver, and copper from the Rescue prospect. Joe Clifford & Sons recovered mercury from the A & B mine ore by retorting. M. F. & Lorena Peterson operated the M & M mine and retorts; some mercury was produced.

Union District.—L. O. Warfield made a small shipment of copper ore containing gold and silver from the Sue claim to a smelter. He also operated the San Pedro mine during 4 months of 1953 and recovered mercury by retort. R. L. Tiefel & C. J. Smith shipped fluor spar from the Sea Bee group of claims in Venice Canyon near Ione, Nev., to a custom mill. R. C. Ames developed his Allied group of fluor spar claims situated 1½ miles south of Grantsville. H. P. Newman explored the Copper King mine for copper ore on a DMEA loan.

ORMSBY

The Nevada Highway Department produced gravel for miscellaneous highway-construction projects.

Delaware District.—Continental Nevada Iron Mining Co. operated the Iron King open-pit mine in Brunswick Canyon for a short time in 1953. Some iron ore was shipped for export to Japan.

PERSHING

United States Gypsum Co. contracted for operation of its perlite quarry 12 miles northwest of Lovelock. The crude material was sized at the Kodak mill 4 miles northeast of Lovelock, and some of the sized perlite was expanded at the Empire plant in Washoe County. The Nevada Highway Department produced gravel for various highway projects. Nevada Uranium Co. explored for uranium in Rocky Canyon on a DMEA loan.

Antelope District.—Nevada Iron Ore Co. shipped 13,721 long tons of magnetite which averaged 60 percent iron, principally to Pacific coast steel furnaces, from the Thomas (Blair and Thomas) open-pit mine. Parker Bros. operated the southern extension of the Thomas mine and shipped 70,497 long tons of magnetite containing 64 percent iron to steel furnaces in Midwestern States.

Blue Lead District.—C. R. Blossom and Golden Centuries Industries Corp. shipped manganiferous ore from the Black Eagle mine to steel furnaces.

Buffalo Valley District.—J. B. Blossom made a small shipment of tungsten concentrates from the True American mine in Buffalo Valley.

Goldbanks District.—F. A. Smith, T. L. Nye, and Sonoma Mines shipped low-grade manganese ore from the Pollard Canyon claim to steel furnaces and a Government low-grade stockpile.

Hooker District.—F. M. Anderson and others explored the Stormy Day tungsten mine under a DMEA loan. United States Gypsum Co. operated the Empire gypsum quarry 12 miles south of Gerlach. The crude material was processed at the company plant in Washoe County.

Humboldt (Imlay) District.—Schwabrow & Schendel shipped fluor spar from the Fluorine (Valery) group of claims to a custom mill.

Mill City (Central) District.—Nevada Massachusetts Co., largest producer of tungsten concentrates in Nevada in 1953, operated the Tungsten group of mines and flotation-gravity concentrating mill at Tungsten; 157,577 tons of ore averaging 0.3 percent WO_3 was milled. F. V. Rueckl shipped 278 tons of tungsten ore, containing 0.8 percent WO_3 , to a custom mill from the Tungsten Lead mine 14 miles northeast of Mill City.

Mineral Basin District.—Dodge Construction, Inc., the largest producer of iron ore in Nevada in 1953, shipped magnetite, largely for export to Japan, from the Segerstrom and Heizer mine.

Nightingale District.—The Wolfram Co. worked the Star-Nightingale group of tungsten claims and shipped ore to its Toulon mill at Toulon. The company concentrated 41,158 tons of company and purchased tungsten ore, including the Alpine-mine production in this district. Hugh F. Cameron shipped tungsten ore from the Western Soldier mine to custom mills. H. W. Anderson operated the M. G. L. mine and produced tungsten ore, which was concentrated at a custom mill.

Rabbit Hole District.—Constant Minerals Separation Process, Inc., recovered gold and silver from gravel washed at the Monkota (Barrel Spring) mine.

Ragged Top District.—J. F. DeLaMare shipped tungsten ore from the Ragged Top mine to a custom mill. Trojan Mining & Milling Co. developed the Sheba-Elenor-Trojan group of tungsten claims and produced 200 tons of tungsten ore averaging 0.9 percent WO_3 .

Rochester District.—Bert Godwin recovered gold and silver from Limerick-mine ore by amalgamation. T. A. Cowan produced mercury by retorting ore at the Little Linda claim.

Rose Creek District.—Tungsten ore was shipped to custom mills by Duane Devine (Gold Spell mine) and Leo K. Johnson (Rose Creek mine).

Seven Troughs District.—Clinn E. Lamb worked the Annie claim intermittently and recovered gold and silver by amalgamating the ore.

Sierra District.—Nevada Mine Developers, Inc., operated the Little Jupiter mine during the first 6 months of 1953 and recovered gold and silver by amalgamation.

Spring Valley District.—The W. Erle Simpson Co. recovered some mercury by retorting ore at the Hillside mine.

Star District.—Pitt Mill & Elevator Co. made a small shipment of lead-zinc ore containing gold, silver, and copper from the DeSota mine to a smelter-fuming plant. Winnemucca Mountain Mines Co. operated the Star mine and shipped 1,939 pounds of tungsten concentrates, averaging 57.9 percent WO_3 , derived from 150 tons of ore milled.

Unionville District.—Walter Bain produced a small tonnage of tungsten concentrates from ore mined at the Arizona mine. This property was formerly a producer of silver.

Wild Horse District.—Ernie Shoemaker and W. Welton shipped antimonial silver ore containing gold, lead, and zinc from the Green mine to a smelter.

Willow Creek District.—Wallace Calder worked the Wadley placer mine during 1 month of 1953, using a power shovel and a nonfloating washing plant. Gold and silver were recovered. He disposed of the mine later in the year.

STOREY

Tuffstone Products Corp. closed its volcanic tuff quarry 6 miles east of Sparks after a short period of operation in 1953. The Nevada Highway Department and contractors prepared sand and gravel for miscellaneous highway projects.

Clark District.—The Eagle-Picher Co. operated the Celatom open-pit mine about 20 miles east of Sparks. Diatomaceous earth produced was crushed and calcined at the company plant east of Sparks. On June 26, 1953, a fire at the mill destroyed the secondary crushing plant, but operations were not seriously interrupted.

Comstock District.—Earl Evans worked the Bald Eagle mine on a small scale and recovered gold and silver by amalgamating the ore. J. C. Turner explored the Consolidated Virginia Mining Co. California and Ophir claims by trenching and sampling underground. A pilot shipment of ore to a smelter contained gold and silver. Willis F. Wilson amalgamated Keystone-mine ore and produced some gold and silver.

Ramsey District.—The J. D. Martin Estate developed the Gooseberry mine 15 miles from Fernley. Gold and silver have been produced from the property.

WASHOE

Reno Press Brick Co. utilized fire clay and miscellaneous clays at its Reno plant. The clay was produced at pits 10 miles south and 12 miles east, respectively, of the city. Also at Reno, Sno-Lite Products Co. closed its perlite-expanding plant early in 1953, and Smith Peterson & Co. produced sand and gravel and Isbell Construction Co. crushed basalt for aggregate. The Nevada Highway Department and contractors prepared sand and gravel and crushed miscellaneous stone for several highway-construction projects.

Galena District.—Constant Minerals Separation Process, Inc., made a small shipment of lead ore containing gold, silver, copper, and zinc from the Galena Hill mine to a smelter-fuming plant. Imperial Operating Co. worked the Union Lead (Commonwealth) mine and shipped lead concentrate containing gold, silver, copper, and zinc to a smelter-fuming plant. A fire at the mine portal in 1953 caused considerable damage to the surface facilities.

Honey Lake District.—Vernon Swisher developed the Vernon mine, a new prospect 15 miles east of Doyle, Calif. Experimental milling of the ore yielded gold and silver.

Hooker District.—United States Gypsum Co. calcined gypsum produced in Pershing County at the company 500-ton-a-day-capacity Empire plant. In addition, some perlite produced in Pershing County was expanded at the plant.

Olinghouse (White Horse) District.—Emile Cabanne and others worked the Texas No. 2 claim and recovered gold and silver from the ore by amalgamation.

Peavine District.—Citation Mining Co. made a shipment of silver ore containing gold, copper, lead, and zinc from the Paymaster mine to a smelter-fuming plant.

Pyramid District.—Calcareous marl was produced by Double Check Products Co. at the Double Check mine near Flanigan and by Pacific Fertilizer Co., Inc.

Squaw Valley District.—Modoc Mines & Exploration Co. operated the Nash claims on a test basis. Some tungsten concentrates were shipped.

WHITE PINE

The Nevada Highway Department and contractors produced sand and gravel from several sites for highway construction.

Aurum District.—Garrett Pierce shipped lead ore containing gold, silver, and copper from the Last Chance mine to a smelter. Combined Metals Reduction Co. explored the Lucky Deposit mine in Silver Canyon, which has a history of silver and copper output.

Black Horse District.—Graham Development Co. shipped tungsten ore from the Gold King mine to a custom mill. The mine was explored on a DMEA loan.

Cherry Creek District.—C. L. Johnson shipped gold ore containing silver from the Black Sheep claim to a smelter. Gold-silver ore was shipped to a smelter from the Gray Eagle mine (R. L. Bankson) and the Star mine (Alan Campbell). Baltimore-Camas Mines, Inc., operated the Cherry Creek gravity-flotation tungsten mill 1 mile west of Cherry Creek and the Cherry Creek (Ticup) and Cooley (Blue Bell) mines 3 miles northwest and 5 miles west, respectively, of Cherry Creek. The Cherry Creek mine was explored on a DMEA loan. Cherry Creek Mining Corp. milled 400 tons of tungsten ore averaging 1 percent WO_3 , produced at the Fillmore mine, and shipped tungsten concentrates. Baltimore-Camas Mines, Inc., milled 1,100 tons of dump ore averaging 0.5 percent WO_3 from the Schafer mine; E. L. Dennison shipped ore to a custom mill from the same property. Other tungsten operations included: Leo F. Schmitt (Only Chance mine) 165 tons of ore, averaging 1.7 percent WO_3 , shipped; Schafer and Duval (Shoestring No. 1 claim), 16 tons of ore, averaging 1.26 percent WO_3 , shipped; Robert Salvi (Valley View mine); and Metallics Unlimited (Pine Nut mine), exploration only, on a DMEA loan.

Cleve Creek District.—L. K. Requa developed a new ore body at the Kolchek mine and shipped 32 tons of tungsten ore averaging 3.15 percent WO_3 . The property was sold to Cleve Creek Mines, Inc., in December 1953.

Duck Creek (Success) District.—Jeanette Bigger produced fire clay in Mosier Canyon east of Ely for furnace mortar.

Granite (Steptoe) District.—Piedmont Mining Co. made a small shipment of gold ore containing silver from the Piedmont mine to a smelter.

Mount Washington District.—Mount Wheeler Mines, Inc., explored on a DMEA loan and developed the Mount Wheeler group of claims 40 miles southeast of Ely and produced 424 tons of tungsten ore averaging 0.95 percent WO_3 .

Nevada District.—Manganese Mining Co. (Caviglia & Parodi) shipped 213 long tons of manganese ore, which assayed 42.2 percent manganese and 4 percent silica, from the Essex claim to a Government purchase depot. They explored the property under a DMEA loan.

Newark District.—A. R. Laird and J. T. Stinnett and others operated the Bay State mine. Silver ore was shipped to a smelter, and tungsten ore from the same mine was shipped to custom mills. E. M. Thayer operated the Glyndon mine during 5 months of 1953

and shipped lead ore, containing gold, silver, copper, and zinc, to a smelter-fuming plant.

Osceola District.—Hemet Milling & Processing Co. shipped dump material containing gold and silver from the Gilded Age mine to a smelter for flux.

Robinson District.—Kennecott Copper Corp., Nevada Mines Division, Nevada's largest producer of copper and gold and second largest in output of silver in 1953, operated its copper smelter at McGill. Materials reduced were copper concentrates produced at the company 21,000-ton-daily-capacity mill; copper precipitates recovered from mine water; direct-smelting copper ore, both from the Ruth dump and custom shippers; and custom gold and silver ores, used primarily for their fluxing properties. The smelter product was blister copper, which was refined at Baltimore, Md., and Carteret, N. J., respectively, by American Smelting & Refining Co. and United States Metal Refining Co. in the eastern United States. The concentrator feed was copper ore from the company-operated Ruth pit at Copper Flat and the Kimbley pit in Ingersoll Canyon and the nearby Consolidated Coppermines Corp. mines. In addition to copper concentrates containing gold and silver, molybdenum concentrates were a byproduct of the milling operation. Kennecott continued to develop the Deep Ruth mine from the Deep Ruth and Kellinske shafts. Because future mining operations probably would result in surface subsidence the townsite of Ruth was abandoned and relocated a distance from the project. A new pit also was under development at the site of the Veteran claims west of Ruth and owned jointly with Consolidated Coppermines Corp. The quarrying of limestone near McGill, used as a flux material and as a source for the lime prepared at the company kilns at McGill, was an integral part of the Nevada Mines Division copper operation.

Consolidated Coppermines Corp., Nevada's second largest producer of copper and gold and third-ranking silver producer in 1953, contracted for operation and expansion of the Morris Brooks pit at Kimberly and worked the Ruth (Liberty)-pit extension under agreement with Kennecott Copper Corp. In addition to mill ore shipped from these properties, some copper ore and copper precipitates were direct-smelted at McGill. Other company claims, which were operated independently of the copper pits and produced direct-smelting ore, included: The Willard (C. Caviglia, lessee), gold ore and zinc ore; the Union (Ivan Lewis, lessee), gold-silver ore; and the Napoleon (J. Zunino, lessee), copper ore. The Cuba claim, leased by W. J. Franklin, was the source of manganese ore shipped to a custom mill.

J. D. Hill shipped 1,021 tons of ore containing 152 ounces of gold and 6,255 ounces of silver to a smelter from the Sunnyside mine one-half mile west of Ely. Robinson & Moore shipped lead ore containing gold, silver, copper, and zinc to a smelter-fuming plant from the same property. Fred Farnsworth operated the Tipple mine and shipped lead and silver ores to smelters.

Baltimore-Camas Mines, Inc., operated a gravity-flotation mill on tungsten ore from mines outside the district at Lackawana Springs 3 miles north of Ely. Sam Robison produced 43 long tons of manganese ore containing 39 percent manganese and 200 long tons of

manganiferous ore which assayed 33.9 percent manganese and 10 percent silica from the Columbia and Keystone claims. The ore was consigned to a Government low-grade stockpile.

Shoshone District.—Minerva Scheelite Mining Co., and successor, M. I. A. Mines Co., operated the Minerva (Canary Yellow) tungsten mine and gravity mill 51 and 49 miles, respectively, southeast of Ely. Tungsten concentrates were shipped. The mine was explored on a DMEA loan.

Taylor District.—Imperial Nevada shipped silver ore from the Taylor mine to a smelter.

Tungsten District.—L. T. Tilford produced scheelite-hübnerite concentrates from 1,000 tons of dump ore, averaging 0.5 percent WO_3 , at the Hub Basin mine. Hub Basin Mining Co. also operated the property in 1953.

Ward District.—The Walker Corp. and Orphan Bros., lessee, developed the Ward mine throughout 1953 and shipped 468 tons of lead ore containing gold, silver, copper, and zinc and 7 tons of silver ore to smelters. The mine was explored on a DMEA loan.

White Pine District.—Belmont Mine & Mill Co. shipped 1 car of direct-smelting lead ore, containing gold, silver, and copper, from the Belmont mine. Fred Farnsworth shipped silver ore to a smelter from the Hoppe Canyon claim in the Monte Cristo area. A. S. Hawkins & Ermy Dusharm produced and shipped a small tonnage of high-grade lead-zinc ore from the Lucky Larry claim. Newmont Exploration, Ltd., explored the Seligman mine, a producer of lead-zinc ore in past years. The property was returned to the owner late in 1953. Hamilton Consolidated Mines Corp. explored the Rocco-Homestake mine for lead ore on a DMEA loan.

The Mineral Industry of New Hampshire

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the New Hampshire State Planning and Development Commission.

By Alvin Kaufman¹



THE VALUE of New Hampshire mineral production in 1953 dropped 7 percent compared with the record set in 1952, primarily because of a 49-percent decline in the value of sand and gravel output. Every county in the State, except Carroll, contributed to the mineral economy. Merrimack, Cheshire, and Grafton Counties, in order of decreasing value of output, continued to be centers of the greatest activity and together produced minerals valued at 82 percent of the State total for 1953. Stone production became the leading mineral industry, followed by output of sand and gravel. Mica and feldspar ranked third and fourth, respectively.

TABLE 1.—Mineral production in New Hampshire, 1952-53¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Beryllium concentrate.....	(2)	(2)	57	\$32,640
Clays.....	30,135	\$30,135	45,198	41,427
Columbium-tantalum concentrate				
pounds, gross weight.....			770	1,309
Feldspar.....	(2)	(2)	28,961	286,069
Mica (sheet and scrap).....	187	\$ 51,865	\$ 90,716	\$ 382,680
Sand and gravel.....	3,200,232	1,001,591	2,249,001	806,156
Stone.....	69,850	546,177	76,701	538,897
Undistributed: Abrasive stones, scrap mica (1953), and peat.....		314,732		15,617
Total New Hampshire.....		\$ 1,945,000		1,805,000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

² Included with "Undistributed."

³ Revised figure.

⁴ Excludes scrap mica.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Abrasives (Scythestones).—The Norton Pike Co. quarries at Pike, Grafton County, continued to produce scythestones in 1953.

¹ Commodity-industry analyst, Region VIII, Bureau of Mines, Pittsburgh, Pa.

Beryl.—Beryl concentrates were produced as byproducts of feldspar and mica mining in Grafton and Cheshire Counties. The principal operating mines in 1953 were the Palermo mine near Groton; Osborne mine, Alstead; and the Ruggles mine, Grafton.

Clays.—During 1953 there were 4 clay pits in operation, 1 each in Grafton and Strafford Counties and 2 in Rockingham County. Production was limited to miscellaneous clays used in manufacturing building brick and other heavy clay products.

Feldspar.—Feldspar was produced in five mines in Cheshire, Grafton, and Sullivan Counties, listed in order of decreasing output. The principal producers during the year were Golding-Keene Co., Cheshire and Grafton Counties; The Whitehall Co., Inc., Grafton County; and J. F. Morton, Inc., Sullivan County.

Mica.—During 1953, 23 mines were active at one time or another. The General Services Administration continued to operate the Materials Purchase Depot at Franklin, Merrimack County. Mica purchases at this depot under the Government Domestic Mica Purchase Program represented 32 percent of the total sheet mica produced in the State. Output from 20 individual mica mines was sold to the depot during the year. The remaining sheet mica was sold to industry. Although purchases by the GSA represented a relatively minor percentage of total output, they composed 94 percent of the value.

Sand and Gravel.—The production of sand and gravel ranked as the second most important mineral industry in New Hampshire in 1953. This industry dropped from first place because of a 30-percent decline in output in 1953 compared with the previous year. Two commercial sand and gravel plants were in operation—1 in Belknap County and 1 in Cheshire County. However, over 91 percent of New Hampshire's total output was produced from pits worked by the State highway department.

Stone.—The stone industry ranked first in value of total output in New Hampshire in 1953. Production was reported from Merrimack, Rockingham, Coos, and Hillsboro Counties, listed in order of decreasing value of output. Dimension stone—all granite—was quarried in Merrimack, Coos, and Hillsboro Counties and represented 74 percent of the aggregate value of stone produced in the State during the year. Although some granite was crushed for use as concrete aggregate and in road construction, most of the crushed stone produced consisted of miscellaneous stone from a quarry near Portsmouth, Rockingham County. Four commercial quarries were active during the year.

REVIEW BY COUNTIES

BELKNAP

Mineral production in Belknap County in 1953 was limited to sand and gravel. Tilton Sand & Gravel, Inc., produced building- and road-construction material from its pit and fixed plant near Tilton.

CHESHIRE

Cheshire County ranked second among New Hampshire counties in value of mineral output in 1953. Products, in order of decreasing value, included feldspar, sand and gravel, beryllium concentrate, and

mica. Building and paving sand and gravel, which composed 43 percent of the total value, was produced by Keene Sand & Gravel, Inc., from its pit and plant at Swanzey. Feldspar for use in pottery manufacture was produced by Golding-Keene Co. at its Colony mine and mill near Alstead. L. H. Congdon mined feldspar, mica, and byproduct beryl at the Osborne mine. J. F. Morton, Inc., operated the Cold River feldspar mill on ore from the Morton mine in Sullivan County.

COOS

Rough dimension granite for use in building construction was quarried at Berlin by Henry A. St. Laurent.

GRAFTON

Feldspar, mica, clays, beryl, and abrasive stones were produced in Grafton County in 1953. Crude feldspar was produced at the Whitehall Co., Inc., Ruggles mine 1½ miles northwest of Grafton Center. Sheet and scrap mica was also recovered at the Ruggles mine. Beryl was produced as a byproduct of mica mining at the McInnis mine, Wentworth; Valencia mine, Groton; Palermo mine, Groton; and Ruggles mine, Grafton. The Ashley Mining Co. Palermo mine was the major producer of this commodity. All production was sold to the GSA Materials Purchase Depot, Franklin. Dinsmore Brick Co. mined miscellaneous clays for use in brick manufacture at its open pit near Lebanon. Norton Pike Co. continued to quarry natural abrasive stone at its quarry at Pike.

HILLSBORO

The City of Manchester Highway Department produced sand and gravel for road construction and maintenance. Granite for monumental and building purposes was quarried during the year by New Westerly Granite Co. of New Hampshire, Inc., at its quarry 2¼ miles northwest of Milford.

MERRIMACK

Sand and gravel production credited to Merrimack County in 1953 was largely output reported by the New Hampshire State Highway Department. The John Swenson Granite Co. operated its quarry at Concord throughout the year and produced rough dimension stone for wall construction and dressed stone for use in building construction, monuments, and curbing and flagging. A small tonnage of crushed and broken granite for use in concrete and road construction was also produced.

ROCKINGHAM

Clay open pits of Enos Bros. Brick Co. and W. S. Goodrich, Inc., at Exeter and Epping, respectively, yielded miscellaneous clays for brick manufacture. Crushed and broken miscellaneous stone was quarried near Portsmouth by Iafolla Crushed Stone Co. for use as road metal and concrete aggregate.

STRAFFORD

Miscellaneous clays for brick and heavy clay products was mined by New England Brick Co. from its open pit at Gonic.

SULLIVAN

Crude feldspar was produced at the Morton mine of J. F. Morton, Inc., near Alstead.

The Mineral Industry of New Jersey

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the New Jersey Department of Conservation and Development, Bureau of Geology and Topography.

By Richard H. Mote¹ and Alvin Kaufman²



STONE, sand and gravel, iron ore, and zinc were the major mineral commodities produced in New Jersey in 1953. The value of mineral output dropped 10 percent compared with 1952 despite substantial increases in the dollar output of iron ore, sand and gravel, and stone. The decline was due largely to a 33-percent drop in zinc-market prices, with a resultant curtailment of production.

Mineral output was reported from every county in the State except Hudson. The major producing counties were Sussex, Morris, Cumberland, Passaic, and Somerset. The first 3 were responsible for 60 percent of the State total value.

TABLE 1.—Mineral production in New Jersey, 1952-53¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays.....	598, 775	\$1, 962, 599	532, 185	\$1, 326, 297
Iron ore (usable).....long tons, gross weight..	685, 466	6, 760, 467	815, 905	10, 114, 970
Manganiferous residuum.....gross weight..	215, 255	(²)	293, 753	(²)
Marl (greensand).....	4, 600	177, 847	6, 821	193, 404
Peat.....	21, 800	191, 664	21, 706	(²)
Sand and gravel.....	7, 060, 074	9, 473, 428	7, 361, 935	10, 835, 948
Sand and sandstone (ground).....	138, 434	1, 011, 844	127, 921	918, 534
Stone (except limestone for lime).....	6, 102, 324	12, 307, 430	6, 036, 259	13, 307, 856
Zinc (recoverable content of ore, etc.) ³	59, 190	21, 520, 612	45, 700	9, 922, 990
Undistributed: Lime, magnesium compounds, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2).....		4, 061, 840		5, 325, 148
Total New Jersey.....		\$7, 468, 000		51, 945, 000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

² Value included with "Undistributed."

³ Value reported for zinc in New Jersey in 1952 is estimated smelting value of recoverable zinc content of ore after freight, haulage, smelting, and manufacturing charges are added. In 1953 the recoverable zinc is valued at the yearly average price of Prime Western slab zinc, East St. Louis market.

⁴ Revised figure.

¹ Chief, Mineral Industry Division, Region VIII, Bureau of Mines, Pittsburgh, Pa.

² Commodity-industry analyst, Region VIII, Bureau of Mines, Pittsburgh, Pa.

REVIEW BY MINERAL COMMODITIES

METALS

Iron Ore.—Crude iron-ore production in New Jersey, all from underground mines, increased 18 percent compared with 1952. The ore was of variable grade, and most of it required concentration. Shipments of ore and concentrates rose 19 percent compared with 1952; concentrates comprised 78 percent of shipments.

The number of active mines (five) remained the same as in 1952; the Scrub Oaks mine of Alan Wood Steel Co. in Morris County remained the largest producing property. Other mines, in order of decreasing output, were Colorado Fuel & Iron Coop, Richard mine and the Mount Hope mine of Warren Foundry & Pipe Co., both in Morris County; the Washington mine of Alan Wood Steel Co., Warren County; and the Peters mine of Ringwood Iron Mines Co., Inc., Passaic County. Ringwood Iron Mines Co., Inc., announced during the year that it expected to open three additional operating levels in its Peters mine. This operation, which furnished iron ore for manufacturing George Washington's cannon during the Revolution and the gundecks of *Old Ironsides*, was down to the 2,700-foot level.

TABLE 2.—Production and shipments of iron ore, 1944–48 (average) and 1949–53, by uses, in long tons

Year	Number of mines	Crude ore mined	Shipments of usable ore						Total shipments	Value
			Direct shipping ore	Concentrates	Cement	Paint	Miscellaneous			
1944–48 (average).....	4	914, 158	129, 025	312, 336	5, 702	292	3, 062	450, 417	\$3, 378, 874	
1949.....	4	921, 422	108, 612	327, 847	12, 170	-----	360	448, 489	4, 468, 575	
1950.....	4	1, 080, 826	138, 451	435, 096	14, 125	56	471	588, 199	5, 651, 563	
1951.....	4	1, 166, 495	193, 143	454, 555	9, 967	74	191	657, 930	7, 810, 776	
1952.....	5	1, 318, 599	166, 962	505, 136	13, 272	96	-----	685, 466	6, 760, 467	
1953.....	5	1, 558, 384	177, 475	633, 128	5, 302	-----	-----	815, 905	10, 114, 970	

Manganiferous Residuum.—Manganese, for use in preparing spiegeleisen, and iron-manganese alloy consumed by the steel industry continued to be recovered by The New Jersey Zinc Co. as a byproduct of zinc mining in Sussex County.

Zinc.—Zinc has been produced in New Jersey from the Mine Hill and Sterling Hill mines at Franklin and Ogdensburg, respectively, for over 100 years. The ore bodies at these locations are unlike any other known zinc deposits in the world. Zinc, manganese, and iron, the principal metals, are present in the minerals franklinite (oxide of zinc, iron and manganese), willemite (zinc silicate), and zincite (red oxide of zinc). Portions of the ore deposits contain all three of these minerals in intimate mixture, while other sections consist of separate minerals uncontaminated.

Primarily as a result of declining ore reserves at the Franklin operation, the total State output of recoverable zinc in 1953 dropped to the lowest level of any year since the beginning of Bureau of Mines annual records in 1907.

To put New Jersey on a comparable basis with other States, zinc output in 1953 was evaluated on the basis of the yearly average price

for Prime Western slab zinc at East St. Louis, whereas in preceding years it was based on an estimated smelting value of recoverable zinc content of ore after freight, haulage, smelting, and manufacturing charges were added.

TABLE 3.—Mine production of recoverable zinc, 1907-53

Year	Short tons	Year	Short tons	Year	Short tons	Year	Short tons
1907.....	62, 435	1919.....	92, 516	1931.....	94, 285	1943.....	92, 864
1908.....	66, 703	1920.....	78, 511	1932.....	81, 460	1944.....	80, 288
1909.....	79, 460	1921.....	56, 447	1933.....	75, 125	1945.....	81, 392
1910.....	65, 410	1922.....	73, 657	1934.....	76, 503	1946.....	64, 454
1911.....	63, 700	1923.....	75, 227	1935.....	85, 708	1947.....	76, 871
1912.....	76, 560	1924.....	84, 370	1936.....	89, 883	1948.....	76, 332
1913.....	79, 564	1925.....	89, 261	1937.....	101, 408	1949.....	50, 984
1914.....	83, 068	1926.....	80, 629	1938.....	85, 839	1950.....	55, 029
1915.....	118, 187	1927.....	95, 695	1939.....	88, 716	1951.....	62, 917
1916.....	111, 872	1928.....	99, 871	1940.....	91, 406	1952.....	59, 190
1917.....	121, 043	1929.....	103, 740	1941.....	93, 781	1953.....	45, 700
1918.....	102, 318	1930.....	97, 626	1942.....	94, 040	Total..	3, 862, 045

NONMETALS

Clays.—Clay production declined 11 percent in 1953 compared with 1952. Twenty-six percent of New Jersey output in 1953 was fire clay, most of which was used in the manufacture of refractory products. A substantial quantity was also sold for use as linoleum filler. Miscellaneous clays were utilized almost entirely in manufacturing heavy clay products, such as building brick, and drain tile.

The clay industry was centered in Middlesex County, which in 1953 produced over 60 percent of the total State output. Production was also reported from Burlington, Camden, Cumberland, Monmouth, Morris, Passiac, Salem, and Warren Counties. Of the 23 clay pits active in 1953, the major producers were Sayre & Fisher Brick Co., Sayreville; Natco Corp., Keasbey and New Brunswick; and Valentine Fire Brick Co., Division of A. P. Green Fire Brick Co., Perth Amboy and Woodbridge.

Greensand Marl.—The output of greensand marl in New Jersey increased 48 percent in 1953 compared with the previous year. The majority of production was sold crude for agricultural purposes; the output of refined greensand for water-softening uses declined. This trend away from natural materials for water conditioning was a result of stiff competition from synthetic materials. The synthetics were used principally for very hard water, because they are not quite as durable and are more susceptible to pore clogging than the greensands or zeolites.

In 1953, as in the previous year, output was obtained from the open-pit operations of Zeolite Chemical Co., Reeve's Station; Inversand Co., Sewell; and The Permutit Co., Birmingham.

TABLE 4.—Greensand marl sold or used by producers, 1944-48 (average) and 1949-53

Year	Short tons	Value	Year	Short tons	Value
1944-48 (average).....	6, 128	\$46, 882	1951.....	5, 067	\$263, 944
1949.....	6, 128	276, 564	1952.....	4, 600	177, 847
1950.....	3, 935	304, 321	1953.....	6, 821	193, 404

Lime.—The Limecrest plant of Limestone Products Corp. of America in Sussex County was the major producer of burnt lime in New Jersey in 1953. A small tonnage of hydrated lime for agricultural use was also obtained from Somerset County.

Magnesium Compounds.—New Jersey was 1 of 3 States in the Nation in which magnesium compounds were produced from raw sea water, but the only producer was Northwest Magnesite Co., Cape May County. Magnesium compounds were also produced by this company from dolomite and purchased magnesium carbonate, as well as by J. T. Baker Chemical Co. and Johns-Manville Corp., Warren and Somerset Counties, respectively. To avoid duplication of output data only the magnesia produced from raw sea water is included in the mineral output of the State.

Sand and Gravel.—Production of sand and gravel in New Jersey rose 4 percent in 1953 compared with 1952. The principal sand-and-gravel-producing counties in 1953, listed in order of decreasing output, were Cumberland, Bergen, Monmouth, Middlesex, and Camden. The aggregate output of these counties supplied 73 percent of the State production during the year. Of the 55 commercial plants active, New Jersey Silica Sand Co., Millville, Cumberland County, and Bennett Sand & Gravel Co., Manasquan, Monmouth County, were the major producers.

TABLE 5.—Sand and gravel sold or used by producers, 1952-53, by classes of operations and uses

	1952			1953		
	Short tons	Value		Short tons	Value	
		Total	Average		Total	Average
COMMERCIAL OPERATIONS						
Sand:						
Glass.....	426,498	\$774,026	\$1.81	845,893	\$2,073,653	\$2.45
Molding.....	1,463,832	3,491,675	2.39	1,460,431	3,706,154	2.54
Structural.....	1,663,132	1,431,268	.86	1,685,347	1,319,946	.78
Paving.....	1,401,746	1,096,088	.78	1,181,939	1,067,014	.90
Blast sand.....	81,803	286,229	3.50	59,310	206,555	3.48
Fire or furnace.....	24,164	42,081	1.74	16,742	28,859	1.72
Engine.....	23,726	16,382	.69	12,230	8,101	.66
Filter.....	45,629	140,143	3.07	92,277	137,603	1.49
Other sand.....	290,597	258,325	.89	382,257	389,521	1.02
Gravel:						
Structural.....	847,674	1,094,787	1.29	1,003,602	1,168,799	1.16
Paving.....	671,271	687,233	1.02	563,157	660,588	1.17
Railroad ballast.....	18,000	24,000	1.33	(1)	(1)	-----
Other.....	66,842	127,293	1.90	(1)	(1)	-----
Undistributed.....				27,901	53,911	1.93
Total commercial sand and gravel.....	7,024,914	9,469,530	1.35	7,331,086	10,820,704	1.48
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand: Paving.....	502	47	.09	2,159	899	.04
Gravel: Paving.....	34,658	3,851	.11	28,690	14,345	.05
Total Government-and-contractor sand and gravel.....	35,160	3,898	.11	30,849	15,244	.05
Grand total.....	7,060,074	9,473,428	1.34	7,361,935	10,835,948	1.47

¹ Included with "Undistributed."

Sand (Ground).—Industrial sand was pulverized in Cumberland, Middlesex, and Ocean Counties to meet the specifications of consumers in the foundry, glass, and pottery industries.

Stone.—Although stone production in New Jersey declined 1 percent in 1953 compared with 1952, the value of production increased 8 percent because of higher unit values for crushed stone used for concrete aggregate, road building and maintenance, and railroad ballast. Basalt, limestone, granite, and serpentine were produced by 24 quarries. Of these, 17 produced crushed basalt, 3 limestone, 3 granite, and 1 serpentine. The most important variety of stone, by far, was crushed basalt for concrete aggregate, road base, railroad ballast, and riprap. This commodity was responsible for 88 percent of the stone tonnage and 83 percent of the value. The largest stone producer, on a value basis, was the Limestone Products Corp. of America, Newton, Sussex County. Leading tonnage producers, all reporting output of crushed basalt, in order of decreasing output, were the Bound Brook quarry of North Jersey Quarry Co. and Kingston Trap Rock Co., Kingston, both in Somerset County; Hawthorne Division quarry of Samuel Braen's Sons, Passaic County; the Summit quarry of North Jersey Quarry Co., Union County; Somerset Crushed Stone Co., Inc., Bernardsville, Somerset County; and Fanwood Stone Crushing & Quarry Co., Watchung, Somerset County.

TABLE 6.—Stone sold or used by producers, 1952-53, by uses

Use	1952		1953	
	Quantity	Value	Quantity	Value
Dimension stone: Building stone: Rough architectural cubic feet..	8,688	\$8,340	-----	-----
Approximate equivalent in short tons.....	695	-----	-----	-----
Total dimension stone (quantities approximate in short tons).....	695	8,340	-----	-----
Crushed and broken stone:				
Riprap.....short tons..	191,381	346,661	85,910	\$155,521
Crushed stone.....do....	5,624,517	10,472,323	5,589,373	11,422,660
Fluxing.....do.....	6,450	14,620	(1)	(1)
Agricultural.....do....	119,908	403,542	(1)	(1)
Miscellaneous.....do....	159,373	1,061,994	245,844	1,339,217
Undistributed.....do....	-----	-----	115,132	383,458
Total crushed and broken stone.....do....	6,101,629	12,299,140	6,036,259	13,307,856
Grand total (quantities approximate in short tons).....	6,102,324	12,307,480	6,036,259	13,307,856

¹ Included with "Undistributed" to avoid disclosing individual company operations.

MINERAL FUELS

Peat.—Reed or sedge peat for soil improvement purposes, mixed fertilizers, and highway use in curing concrete was recovered at two bogs near Newton and Stanhope, Sussex County.

TABLE 7.—Production of peat, 1948-53, in short tons

Year	Short tons	Value	Year	Short tons	Value
1948.....	23, 102	\$163, 056	1951.....	27, 678	\$213, 500
1949.....	25, 500	180, 750	1952.....	21, 800	191, 664
1950.....	26, 466	186, 338	1953.....	21, 706	(¹)

¹ Concealed to avoid disclosure of individual company operations.

REVIEW BY COUNTIES

ATLANTIC

Sand and gravel for structural purposes were produced by Dominic Macrie from a pit near Folsom.

BERGEN

Miscellaneous clays for use in manufacturing heavy clay products, such as building brick and drain tile, were produced by Tri-County Brick Corp., Woodbridge; Hackensack Brick Co., Little Ferry; and Kingsland Clay Products Co., Lyndhurst. Samuel Braen's Sons and McKee Bros., Inc., produced a substantial quantity of structural sand and gravel from pits near Mahwah and Ramsey, respectively.

BURLINGTON

Greensand marl, clays, and sand and gravel were produced in Burlington County in 1953. Greensand marl was mined by Permutit Co. and Zeolite Chemical Co. near Birmingham and Reeve's Station, respectively. Clays for water softening and agricultural purposes, building brick, drain tile, and foundry and steel refractories were obtained from the pits of Graham Brick Manufacturing Co., Maple Shade; Church Brick Co., Fieldsboro; and Burlington Clay & Engineering Co., Burlington. Sand for molding and structural purposes was produced by George F. Pettinos, Inc., Mount Holly; Lockhart, Inc., Riverton; H. R. Sherman, Burlington; and Whitehead Bros. Co., Mount Holly.

CAMDEN

Sand and gravel for structural and paving purposes, as well as glass and molding sand, were produced by Russell W. Ward, Inc., Palmyra; George F. Pettinos, Inc., Grenloch and Bridgeton; Reading Sand Co., Penbryn; and Albion Sand & Gravel Co., Berlin. Clays for brick manufacture was mined by The Alliance Clay Product Co., Winslow Junction.

CAPE MAY

Refractory magnesia from sea water and dolomite was the major mineral commodity produced in the county in point of value. This commodity was obtained from the plant of the Northwest Magnesite Co., Cape May. Cape May Sand & Gravel Co. produced blast and filter sands from a pit near Cape May Point.

TABLE 8.—Value of mineral production in New Jersey 1952-53, by counties and principal minerals produced in 1953

County	1952	1953			Principal minerals, in order of value
		Value	Per- cent of total	Rank	
Bergen.....	\$874, 238	\$959, 050	2	10	Sand and gravel, clays.
Burlington.....	478, 020	337, 166	1	16	Greensand, clays, sand and gravel.
Camden.....	880, 226	890, 799	2	11	Sand and gravel, clays.
Cape May.....	1, 621, 699	1, 956, 136	4	6	Magnesium compounds, sand and gravel.
Cumberland.....	4, 596, 222	6, 159, 372	12	3	Sand and gravel, ground sand, clays.
Essex.....	465, 740	529, 913	1	15	Stone.
Mercer.....	530, 035	531, 742	1	14	Stone, sand and gravel.
Middlesex.....	2, 626, 762	1, 728, 831	3	8	Clays, sand and gravel, ground sand.
Monmouth.....	524, 359	619, 955	1	13	Sand and gravel.
Morris.....	6, 871, 026	9, 895, 465	19	2	Iron ore, sand and gravel, "stone" clays.
Ocean.....	640, 476	661, 637	1	12	Sand and gravel, ground sand.
Passaic.....	4, 768, 934	4, 893, 717	9	4	Stone, iron ore, sand and gravel, "clays."
Somerset.....	4, 361, 294	4, 108, 468	8	5	Stone, magnesium compounds, lime.
Sussex.....	25, 539, 493	14, 762, 544	29	1	Zinc, manganiferous residuum, stone, lime, peat, sand and gravel.
Union.....	796, 000	1, 723, 164	3	9	Stone.
Warren.....	955, 002	1, 778, 494	3	7	Iron ore, sand and gravel, stone.
Undistributed.....	938, 235	408, 846	1	-----	-----
Total.....	57, 468, 000	51, 945, 000	100	-----	Stone, sand and gravel, iron ore.

¹ To prevent disclosure of individual company data, Atlantic, Gloucester, Hudson, Hunterdon, and Salem Counties are combined with "Undistributed."

CUMBERLAND

Cumberland County ranked third in value of mineral commodities produced in 1953 and first in the production of sand and gravel. Sand and gravel output was utilized for molding, glass, blast, engine and filter sands, as well as for structural material. Major producers were New Jersey Silica Sand Co., Millville; South Jersey Sand Co., Dividing Creek; and National Pulverizing Co., Millville. Other large producers were Whitehead Bros. Co., Dividing Creek and Dorchester; Jesse S. Morie & Son, Inc., Mauricetown; George F. Pettinos, Inc., Manumuskin; Armstrong Cork Co., South Vineland; Brunetti Bros., Vineland; and Daniel Goff Co., Inc., Millville. A plastic fire clay was mined by Daniel Goff Co., Inc., for use in manufacturing cupola and ladle linings.

ESSEX

The only mineral commodity produced in Essex County in 1953 was crushed and broken traprock from the quarries of Orange Quarry Co., West Orange, and M. L. Kernan, South Orange. Output was used for riprap, concrete aggregate, and road base.

GLOUCESTER

Greensand marl and sand and gravel were produced in Gloucester County in 1953. The one source of greensand was the open pit of Inversand Co. at Sewell. Structural sand and gravel and furnace sand were produced by Wenonah Sand & Gravel Co., Mount Royal, and Downer Silica Co. The Penn Jersey Sand & Gravel Co. pit near Bridgeport was sold to F. R. Warner, Inc., Pitman.

HUNTERDON

A granitic gneiss was quarried by Trimmer Stone Co. near Pattenburg for concrete aggregate and road base. Preen Crushed Stone Co. produced basalt for the same purpose from its Oldwick quarry. The Stockton dimension-sandstone quarry of Vernon Kerlin was sold in April 1953 to Albert Coppe, Lambertville.

MERCER

Sand and gravel were produced during part of 1953 by Crosswicks Sand & Gravel Co., Yardville; its plant was closed during the winter. Crushed basalt was quarried by Pennington Quarry Co.

MIDDLESEX

Middlesex County continued in 1953 to be the leading clay-producing area in New Jersey. The bulk of output was plastic fire clay for use in manufacturing refractories. Of the 12 producers active during the year the largest were Sayre & Fisher Brick Co., Sayreville; Natco Corp., Keasbey and New Brunswick; and Valentine Fire Brick Co., division of A. P. Green Fire Brick Co., Woodbridge. The largest of the county sand and gravel producers were Dallenbach Sand Co., Inc., South Brunswick; Crossman Co., Sayreville; and Raritan River Sand Co., Nixon. Dallenbach Sand Co. and Raritan River Sand Co. operated dredges during the year. Sand and gravel output was sold primarily for structural uses, although there was a substantial production of paving material. Coralux Perlite Corp. of New Jersey produced expanded perlite at its plant near Metuchen from material imported from the southwestern United States.

MONMOUTH

Sand and gravel were the only mineral commodities produced in Monmouth County in 1953. The largest producers were Bennett Sand & Gravel Co., Inc., Manasquan; Hause Gravel Co., Allenwood; and New Jersey Gravel & Sand Co., Inc., Farmingdale. Other active producers were Benjamin Fary and Scarano Gravel Co., both near Wayside. Output was sold for structural, paving, filter, and mason sand and gravel.

MORRIS

Morris County ranked second in New Jersey in value of mineral products, which included iron ore, sand and gravel, stone, and clays. Magnetic iron ore was obtained from the underground operations of Warren Foundry & Pipe Corp. Mount Hope mine, Dover; The Colorado Fuel & Iron Corp. Richard mine near Wharton; and the Alan Wood Steel Co. Scrub Oak mine near Wharton. Sand and gravel, principally for structural and paving, were produced by North Jersey Quarry Co., Netcong; Consolidated Sand & Stone Co., Riverdale; Seguire-Bogert Co., Inc., Kenvil; and Alan Wood Steel Co., Wharton. Three quarries active during the year yielded stone for use in concrete aggregate, road material, riprap, and railroad ballast. Basalt was quarried by North Jersey Quarry Co., Millington, and granite was

produced as a byproduct of iron mining at Alan Wood Steel Co. Mine Hill property, as well as from the surface mines of Pompton Crushed Stone Division, Union Building & Investment Co., Riverdale. Logansville Pottery Co., Bernardsville, produced a small quantity of miscellaneous clays for use in manufacturing flowerpots.

OCEAN

Sand and gravel were produced from the Pinewald plant of New Jersey Pulverizing Co. near Bayville and by Brown & Burdge, Point Pleasant. The output was used predominantly for molding and glass sand, although a substantial tonnage was also employed for such varied purposes as bird gravel and play sand.

PASSAIC

Passaic County ranked fourth in value of mineral output in New Jersey in 1953. Major commodities were stone, iron ore, sand and gravel, and clays. Crushed basalt for concrete aggregate, road material, and roofing granules was produced by Samuel Braen's Sons, Haledon and Hawthorne; Consolidated Stone & Sand Co., Montclair Heights; Union Building & Construction Corp., Clifton; Sowerbutt Quarries, Inc., Prospect Park; and Great Notch Corp., Great Notch. The Peters mine of Ringwood Iron Mines, Inc., near Pompton Lakes continued to yield magnetic iron ore. Sand and gravel were produced by Van Orden Sand & Gravel Co. and H. J. Hinchman & Sons, both of Paterson. Output of clays was reported by Paterson Brick Co., Inc., Little Falls, from a pit in Wayne Township. Expanded perlite from material imported from the Southwestern States was produced by PerAleX of New Jersey, Inc., Paterson.

SALEM

The only mineral commodity produced in Salem County in 1953 was structural sand from a dredge operated by A. W. Davis Lumber Co. in Clinton Township.

SOMERSET

Somerset County was the fifth largest mineral-producing area in New Jersey. Major commodities were stone, magnesium compounds, and lime. Peapack Lime & Stone Quarry, Inc., Peapack, was the sole producer of burnt lime. Johns-Manville Corp., Manville, manufactured a substantial quantity of precipitated magnesium carbonate from dolomite rock for use as insulation. Crushed basalt, principally for use as concrete aggregate, road metal, and riprap was obtained from the quarries of North Jersey Quarry Co., Bound Brook; Somerset Crushed Stone, Inc., Bernardsville; and Kingston Trap Rock Co., Kingston.

SUSSEX

The mines and quarries of Sussex County, with their production of zinc, manganese residuum, stone, lime, peat, and sand and gravel, ranked first in total value of mineral output in New Jersey in 1953.

County producers were responsible for more than one-fourth of the State total.

Ores containing zinc and byproduct manganiferous residuum continued to be recovered at the Franklin and Sterling Hill mines of the New Jersey Zinc Co.

Ore production at the Franklin mine fell during the year as a result of virtual exhaustion of reserves. The last of the ore deposit is expected to be mined during 1954, after which the mine will be abandoned. The company reports that loss of ore production at this mine will be offset by output from new mines being developed, such as at Friedensville, Pa., and by increased production from mines already in operation. Sinking of the new mine shaft at the Sterling mine, Ogdensburg, continued during the year. Construction of various surface buildings to house repair shops and equipment and to provide ore-crushing facilities also was in progress.

Concrete aggregate, road material, and agricultural stone, as well as stone for miscellaneous purposes, were produced by Limestone Products Corp. of America, Newton, and Farber White Limestone Co., Ogdensburg. Limestone Products Corp. also produced burnt lime for building, agricultural, and chemical uses. The company Lime Crest pit yielded structural and paving sand and gravel. Peat was produced in Sussex County by Hyper Humus Co. and Netcong Natural Products Co. from bogs near Newton and Stanhope, respectively. Output was reed or sedge peat for soil improvement and fertilizer use.

UNION

North Jersey Quarry Co., Summit, and Fanwood Stone Crushing and Quarry Co., Westfield, produced crushed basalt for use as concrete aggregate and road material. These producers reported that the demand for their product remained good.

WARREN

Iron ore, sand and gravel, stone, magnesium compounds, and clays were produced in Warren County in 1953. A magnetic iron ore was obtained from the Washington underground mine of the Alan Wood Steel Co. near Oxford. This ore was treated by a wet magnetic and gravity-concentration process. Output was consumed at the company blast furnace and open-hearth plant, Conshohocken, Pa. Structural and paving sand and gravel were products of the fixed plants of the Portland Sand & Gravel Co., Carpentersville, and Steckel Concrete Co., Phillipsburg. Steckel Concrete Co. pit was closed part of the year. Magnesium compounds were produced by the J. T. Baker Chemical Co., Phillipsburg, for rubber catalyst fillers, medicinal purposes, and special steel treatments. Shale from the Port Murray surface mine of Natco Corp. was utilized in manufacturing brick. Terrazzo was prepared from a serpentine quarried by the Royal Green Marble Co., Inc., 2 miles north of Phillipsburg.

The Mineral Industry of New Mexico

By A. J. Martin¹ and F. J. Kelly²



ALTHOUGH lead and zinc production dropped to the lowest level in 27 years and there were sharp declines in coal and fluorspar, the total value of the New Mexico mineral production in 1953, excluding uranium and the manganese ore shipped to the National Strategic Stockpile, rose to a new record high of \$330,797,000 compared with the previous record of \$288,500,000 in 1952. The gain in value resulted largely from increased production of petroleum, potash, natural gas, perlite, and sand and gravel and a sharp rise in the price of copper; however, the quantity of copper produced declined 5 percent from 1952.

The output of crude petroleum increased 20, natural gas 11, and natural gasoline 5 percent over 1952, and all three established new records for both quantity and value. New Mexico ranked seventh among the States in petroleum production. There were eight refineries in the State, but a large part of the crude oil produced was refined in other States. Important byproducts derived from petroleum and natural gas included carbon black, produced in New Mexico for many years, and elemental sulfur, first produced commercially in the State in 1952; two new plants for sulfur recovery had been completed and placed in operation by the end of 1953, and a third plant was under construction. Helium was extracted from natural gas in San Juan County.

Both production and shipments of potash reached new record highs in 1953. The value of the potash sold was \$52,293,000—the highest of any mineral produced in the State except petroleum. The increase over 1952 in production (K_2O equivalent) was 17 percent and in sales 10 percent. New Mexico produced 90 percent of the United States total output of potash in 1953.

The value of the copper produced in 1953 was higher than in any previous year, as the annual average price advanced nearly 19 percent over 1952 and was the highest since 1872. The copper mines operated steadily in 1953, except for a 2-week shutdown at the large Chino open-pit mine in Grant County caused by a strike; this mine continued to produce the bulk of the State copper.

The decrease in zinc production from 1952 was 74 percent and in lead 58 percent. The further drop in the price of zinc in 1953, following the previous sharp decline that caused some zinc and zinc-lead mines to shut down in 1952, led to closing of the remainder by October 1, 1953. The weakness of the zinc market was attributed to an oversupply of zinc caused by the unusually large quantity imported.

¹ Assistant chief for mineral statistics, Region IV, Bureau of Mines, Denver, Colo.
² Commodity-industry analyst, Region IV, Bureau of Mines, Denver, Colo.

Most of the output of gold and silver was recovered as a byproduct from copper, lead, and zinc ores. The quantity of gold recovered was the lowest in the 87 years for which figures are available; that of silver decreased 57 percent from 1952 and was the lowest since 1903.

Coal production decreased from 759,000 tons in 1952 to 514,000 tons in 1953, the lowest in the 49-year period from 1905 through 1953. The peak production was 4,023,000 tons in 1918. In recent years natural gas and petroleum products have supplanted coal in many uses. At least 10 coal mines in Colfax, McKinley, San Juan, and Santa Fe Counties closed during 1952 and 1953.

Fluorspar marketed in 1953 decreased from 1952, as a number of the mines shut down. The most common reason given for the decline in demand for New Mexico fluorspar was the increased imports.

Other minerals produced in important quantities in New Mexico included perlite, pumice, salt, barite, sand and gravel, and stone, for which increased production was reported, and molybdenum, clays, carbon dioxide, and beryl, which showed decreases.

The mining of manganese was stimulated by the Government purchase program, and shipments to the Government Ore-Purchasing Depot at Deming for stockpiling increased. Ore shipped for stockpiling and future treatment was not credited to production in 1953 but will be credited to the year in which the beneficiated product is shipped. Shipments of ferruginous manganese ore decreased. Some iron ore was shipped from Grant and Lincoln Counties.

Uranium mining and exploration continued to center in McKinley, Valencia, and San Juan Counties, but prospecting extended to many other counties. The Anaconda Copper Mining Co. completed a new ore-processing plant for limestone-type ores in September 1953 at Bluewater, near Grants. Under existing regulations of the Atomic Energy Commission, figures on the production of uranium are not available; therefore the value of the uranium output is not included in the total value of the State mineral production shown in table 1. Also, because of the close connection between uranium and vanadium production, for security reasons figures for vanadium are not published separately.

In addition to the mineral values credited to New Mexico in table 1, some are omitted owing to lack of information.

Many ores contain valuable minor constituents, such as arsenic, bismuth, cadmium, cobalt, nickel, platinum-group metals, selenium, tellurium, and some minor metals, such as gallium and germanium. These quantities sometimes are not known and sometimes, though known by analyses, are not accounted for metallurgically in early processing stages or credited to the mine of origin. These minor constituents are recovered at plants, frequently treating mixtures of materials from many sources, including residues from the refining of such metals as copper, lead, and others, and in other ways. In many such instances it is impossible to distribute the mineral products by States of origin, and sometimes it is even difficult to obtain an accurate separation as to domestic and foreign sources. Another mineral product of value—the production of which usually cannot be separated as to source—is byproduct sulfuric acid.

TABLE 1.—Mineral production in New Mexico, 1952-53¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Beryllium concentrate..... gross weight.....	101	\$29, 185	89	\$52, 014
Clays.....	57, 668	107, 633	49, 089	103, 931
Coal.....	759, 437	4, 382, 286	513, 781	3, 081, 366
Copper (recoverable content of ores, etc.).....	76, 112	36, 838, 208	72, 477	41, 601, 798
Fluorspar.....	16, 443	823, 320	(2)	(2)
Gold (recoverable content of ores, etc.)..... troy ounces.....	2, 949	103, 215	2, 614	91, 490
Helium (shipments)..... cubic feet.....	-----	-----	11, 158, 000	150, 127
Iron ore (usable)..... long tons, gross weight.....	7, 793	(2)	7, 525	(2)
Lead (recoverable content of ores, etc.).....	7, 021	2, 260, 762	2, 943	771, 066
Manganese ore (35 percent or more Mn)..... gross weight.....	2, 360	156, 745	-----	-----
Manganiferous ore (5 to 35 percent Mn)..... do.....	52, 934	(2)	(2)	(2)
Natural gas..... million cubic feet.....	359, 377	16, 414, 000	399, 086	24, 344, 000
Natural-gas liquids:				
Natural gasoline and cycle products				
thousand gallons.....	163, 926	11, 660, 000	171, 654	10, 094, 000
do.....	114, 408	3, 600, 000	121, 212	4, 618, 000
do.....	(2)	(2)	84, 891	661, 698
Perlite.....	58, 681	144, 940, 000	3, 70, 441	3 185, 260, 000
Petroleum (crude)..... thousand 42-gallon barrels.....	1, 411, 125	46, 385, 452	1, 552, 831	52, 293, 316
Potassium salts..... K ₂ O equivalent.....	217, 482	755, 139	528, 649	759, 840
Pumice and pumicite.....	(2)	(2)	62, 087	216, 364
Salt.....	496, 921	499, 589	1, 416, 380	1, 238, 979
Sand and gravel.....	479, 318	433, 807	205, 309	185, 815
Silver (recoverable content of ores, etc.)..... troy ounces.....	4 317, 894	4 191, 642	624, 528	510, 713
Stone.....	50, 975	16, 923, 700	13, 373	3, 075, 790
Zinc (recoverable content of ores, etc.).....	-----	-----	-----	-----
Undistributed: Barite, carbon dioxide, columbium-tantalum concentrate (1953), diatomite (1953), gem stones (1953), molybdenum, stone (crushed miscellaneous, 1952), recovered elemental sulfur (1953), vanadium and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2).....	-----	1, 995, 004	-----	1, 686, 990
Total New Mexico.....	-----	288, 500, 000	-----	330, 797, 000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

² Value included in "Undistributed."

³ Final figure. Supersedes preliminary figure given in the commodity chapter.

⁴ Excludes certain stone, value for which is included with "Undistributed."

TABLE 2.—Average prices of certain mineral commodities in New Mexico, 1952-53¹

Commodity	1952	1953
Beryl..... short ton.....	\$288. 960	\$584. 427
Clays..... do.....	1. 866	2. 117
Coal..... do.....	5. 770	6. 00
Copper ² recoverable content of ores, pound.....	. 242	. 287
Fluorspar..... short ton.....	50. 071	48. 859
Gold ³ recoverable content of ores, troy ounce.....	35. 000	35. 000
Iron ore..... long ton.....	(4)	3. 850
Lead ² recoverable content of ores, pound.....	. 161	. 131
Perlite..... short ton (crude, unexpanded).....	(4)	7. 795
Petroleum ⁴ 42-gallon barrel.....	2. 470	2. 630
Potassium salts..... short ton, K ₂ O equivalent.....	32. 871	33. 676
Pumice..... short ton.....	3. 472	1. 437
Sand and gravel..... do.....	1. 005	. 875
Silver ⁵ recoverable content of ores, troy ounce.....	. 905+	. 905+
Zinc ⁶ recoverable content of ores, pound.....	. 166	. 115

¹ Prices are based on average value f. o. b. mines or mills reported by the producers, except as otherwise noted.

² Yearly average weighted price of all grades of primary metal sold by producers.

³ Price under authority of Gold Reserve Act of Jan. 31, 1934.

⁴ Bureau of Mines not at liberty to publish.

⁵ Value at wells.

⁶ Treasury buying price for newly mined silver.

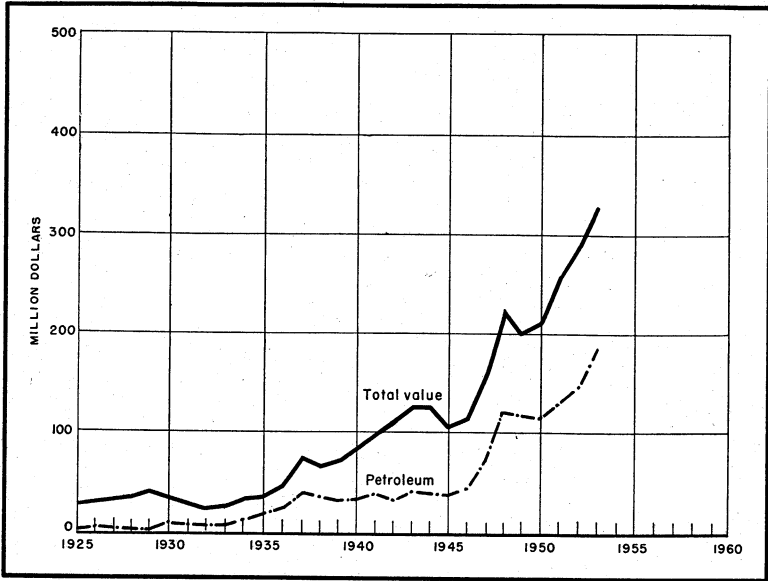


FIGURE 1.—Value of petroleum production and total value of all minerals in New Mexico, 1925-53.

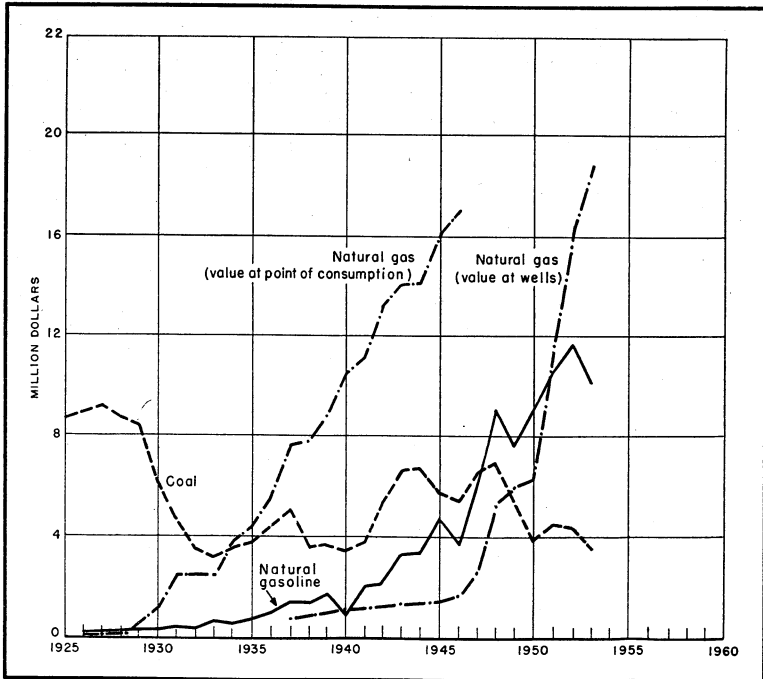


FIGURE 2.—Value of natural gas, natural gasoline, and coal in New Mexico, 1926-53.

The Government, through the Defense Minerals Exploration Administration (DMEA), continued to aid in financing exploration in search of strategic and critical minerals. The list of minerals eligible for aid and the percentage of Government participation for some of the minerals were revised in 1953 under Amendment 2 to DMEA Order 1, effective May 15, and Amendment 3, effective November 3. The projects undertaken in New Mexico from the beginning in 1951 through 1952 covered zinc, copper, lead, cobalt-uranium, and tungsten and involved \$1,012,156 in combined Government and private capital. The individual projects are listed in the 1952 chapter of this series (Minerals Yearbook, 1952, volume III, New Mexico chapter, table 3). In 1953 an additional project for copper, involving \$5,000, was undertaken at the Atwood mine in Hidalgo County.

REVIEW BY MINERAL COMMODITIES

METALS

Beryl.—Nearly all of the beryl produced in New Mexico in 1953 came from the Harding mine near Dixon, Taos County. This mine also has produced lepidolite, tantalum, and other minerals in the past. The Old Priest mine near Ribera, San Miguel County, produced some beryl in 1953. Most of the State output was marketed under the Government purchase program.

Columbite-Tantalite.—The Petaca and La Madera mines in Rio Arriba County produced columbite-tantalite in 1953.

Copper.—New Mexico ranked fourth among the States in copper production in 1953. Although the State output of 72,500 tons was 5 percent less in quantity than in 1952, the value increased to a new record high of \$41,602,000 owing to a rise in the price of copper. After the price of domestic copper was decontrolled by the Government on February 25, 1953, the quoted price per pound rose from \$0.245 to around \$0.30 and remained at about that point the rest of the year. The average yearly weighted price in 1953 (\$0.287 a pound) was the highest since 1872.

The bulk of the New Mexico output of copper in 1953, as in previous years, came from the Chino open-pit mine of the Kennecott Copper Corp. at Santa Rita, Grant County. The mine operated continuously 7 days a week in 1953, except for a 13-day shutdown (September 26 through October 8) caused by a strike, and on certain holidays. The Chino concentrator at Hurley, 10 miles from the mine, has a daily capacity of 22,500 tons. The concentrate was smelted in the company smelter adjacent to the mill. Molybdenum concentrate was recovered as a mill byproduct and selenium-bearing slag as a smelter byproduct.

Nearly all of the copper ore produced from underground mines came from the Banner Mining Co. Miser's Chest group, equipped with a 400-ton mill (concentrates shipped to the El Paso smelter), and the Atwood mine, the ore from which was shipped crude to the El Paso smelter, both in the Lordsburg district, Hidalgo County. The Stauber open-pit mine in Guadalupe County shipped low-grade, siliceous, copper fluxing ore to the El Paso smelter. At Tyrone the Phelps Dodge Corp. did prospect drilling and sampling at its Burro

Mountain property, an important producer of copper in the past. Statistical details of the copper ore mined, the metal produced, and the method of recovery are given in the following section under Gold.

Gold (and Ores of Gold, Silver, Copper, Lead, and Zinc).—Gold production in New Mexico, which in 1952 had fallen to the lowest level in 84 years, decreased further in 1953 to a new low (2,614 fine ounces) for the long period. Most of the gold was recovered as a byproduct from base-metal ores. Small tonnages of gold or gold-silver ore were shipped from mines and prospects in the Cooney district near Mogollon, Catron County, and the Hillsboro and Tierra Blanca districts in Sierra County. Some gold was recovered in the Hillsboro district from gold ore mined in previous years and treated in 1953 and in the Nogal district (Lincoln County) from gold ore treated for testing.

TABLE 3.—Mine production of gold, silver, copper, lead, and zinc, 1944-48 (average), 1949-53, and total, 1848-1953, in terms of recoverable metals¹

Year	Mines producing		Material sold or treated ² (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1944-48 (average).....	65	3	7,293,634	4,618	\$161,637	478,382	\$337,590
1949.....	77	3	6,539,602	3,249	113,715	380,855	344,693
1950.....	78	2	7,899,054	3,414	119,490	338,581	306,433
1951.....	83	3	8,670,489	3,959	138,565	443,267	401,179
1952.....	66	1	9,120,841	2,949	103,215	479,318	433,807
1953.....	55	2	8,070,056	2,614	91,490	205,309	185,815
1848-1953.....			(*)	2,205,580	50,529,493	70,655,568	55,870,576

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1944-48 (average).....	62,277	\$21,612,683	6,772	\$1,625,265	42,546	\$10,271,039	\$34,058,214
1949.....	55,388	21,822,872	4,652	1,470,032	29,346	7,277,808	31,029,120
1950.....	66,300	27,580,800	4,150	1,120,500	29,263	8,310,692	37,437,915
1951.....	73,558	35,602,072	5,846	2,022,716	45,419	16,532,516	54,697,048
1952.....	76,112	36,838,208	7,021	2,260,762	50,975	16,923,700	56,559,692
1953.....	72,477	41,601,798	2,943	771,066	13,373	3,075,790	45,725,959
1848-1953.....	1,828,926	619,574,725	313,489	40,779,053	1,098,921	199,861,156	966,315,003

¹ Includes recoverable metal content of gravel washed (placer operations), ore milled, old tailings or slimes re-treated, and ore, old tailings, or copper precipitates shipped to smelters during the calendar year indicated.

² Does not include gravel washed or tonnage of precipitates shipped.

³ Figure not available.

TABLE 4—Gold and silver produced at placer mines, 1944-48 (average) and 1949-53, in terms of recoverable metals.

Year	Gold		Silver		Total value	Year	Gold		Silver		Total value
	Fine ounces	Value	Fine ounces	Value			Fine ounces	Value	Fine ounces	Value	
1944-48 (average).....	13	\$455	4	\$4	\$459	1951.....	4	\$140			\$140
1949.....	31	1,085	9	8	1,093	1952.....	2	70			70
1950.....	6	210			210	1953.....	5	175	2	\$2	177

The State output of metals from ores of gold, silver, copper, lead, and zinc, 1949-53, and production in 1953, by counties, classes of ore, and methods of recovery are shown in tables 3-9.

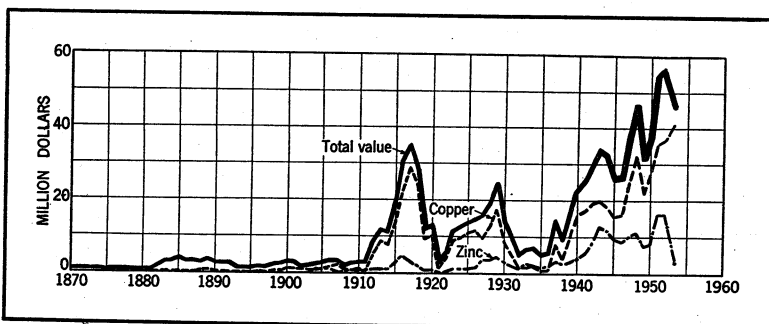


FIGURE 3.—Value of mine production of copper and zinc and total value of gold, silver, copper, lead, and zinc in New Mexico, 1870-1953. The value of gold, silver, and lead produced annually has been relatively small.

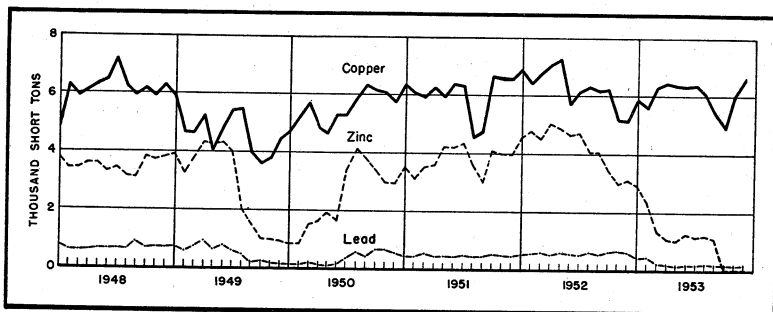


FIGURE 4.—Mine production of copper, lead, and zinc in New Mexico, by months, 1948-53, in terms of recoverable metals.

TABLE 5.—Mine production of gold, silver, copper, lead, and zinc in 1953, by months, in terms of recoverable metals ¹

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January.....	245	34,325	5,915	456	2,943
February.....	236	30,093	5,619	472	2,360
March.....	189	19,398	6,318	240	1,330
April.....	350	16,064	6,463	223	1,076
May.....	407	18,664	6,395	167	1,030
June.....	238	18,808	6,330	207	1,272
July.....	195	16,149	6,391	201	1,123
August.....	191	16,721	6,086	206	1,175
September.....	257	10,514	5,436	220	1,061
October.....	137	9,864	4,967	188	1
November.....	87	7,359	6,021	185	1
December.....	82	7,350	6,536	178	1
Total.....	2,614	205,309	72,477	2,943	13,373

¹ Mine production comprises ore, gravel, or other mineral material sold or treated and metal recovered as natural gold or as bullion from cyanidation or amalgamation and the estimated recoverable metal (or gross metal as indicated) contained in concentrates, ores, tailings and other mineral materials shipped directly to smelters or sold to ore buyers within the year.

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc in 1953, by counties, in terms of recoverable metals

County	Mines producing		Material ¹ sold or treated (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
Catron.....	2		48	37	\$1,295	2,433	\$2,202
Grant.....	11		7,888,727	988	34,580	81,444	73,711
Guadalupe.....	1		28,985				
Hidalgo.....	7		84,570	1,212	42,420	101,222	91,611
Lincoln.....	3		242	5	175	189	171
Luna.....	2		12			63	57
Otero.....	1		1,136				
Rio Arriba.....	1		12			9	8
Santa Fe.....	4	1	119	3	105	685	620
Sierra.....	8	1	1,301	271	9,485	907	821
Socorro.....	15		64,904	98	3,430	18,357	16,614
Total: 1953.....	55	2	8,070,056	2,614	91,490	205,309	185,815
1952.....	66	1	9,120,841	2,949	103,215	479,318	433,807

County	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
Catron.....							\$3,497
Grant.....	69,871	\$40,105,954	1,524	\$399,288	12,837	\$2,952,510	43,566,043
Guadalupe.....	537	308,238					308,238
Hidalgo.....	1,994	1,144,556	66	17,292	2	460	1,296,339
Lincoln.....	2	1,148	7	1,834			3,328
Luna.....			2	524			581
Otero.....	16	9,184					9,184
Rio Arriba.....							8
Santa Fe.....	2	1,148	13	3,406	10	2,300	7,579
Sierra.....			4	1,048	5	1,150	12,504
Socorro.....	55	31,570	1,327	347,674	519	119,370	518,658
Total: 1953.....	72,477	41,601,798	2,943	771,066	13,373	3,075,790	45,725,959
1952.....	76,112	36,838,208	7,021	2,260,762	50,975	16,923,700	56,559,692

¹ Does not include gravel washed or tonnage of precipitates shipped.

Iron Ore.—Shipments of iron ore from New Mexico in 1953 totaled 8,000 tons, the same as in 1952. There were 2 producing mines in Grant County (Central district) and 2 in Lincoln County near Carriazo and Corona. The ore was shipped to steel and cement plants outside the State.

Lead.—The New Mexico output of lead in 1953 was 2,943 tons—58 percent less than in 1952 and the lowest since 1924. The price of lead declined from 14.75 cents a pound at the beginning of 1953 to a low of 12 cents on April 20 and stood at 13.5 cents from September 16 through December. Lead and lead-barite ores, nearly all from the Hansonberg district, Socorro County, yielded 37 percent of the total lead; zinc ore, nearly all from the Central district, Grant County, 49 percent; lead-zinc ore, mostly from Socorro and Grant Counties, 11 percent; and other ores and cleanup material 3 percent. The heavy decrease in lead production resulted from shutdowns in 1952 and 1953 of the zinc and zinc-lead mines, which in 1952 produced 84 percent of the total lead; none of them were in production the last 3 months of 1953. The larger producers of lead in 1953, in order of output, were the Bayard zinc-lead mine group of the United States Smelting, Refining & Mining Co. in the Central district and the Portales lead

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in 1953, by classes of ore and other source materials, with content in terms of recoverable metals

Source	Number of mines ¹	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode ore:							
Dry gold.....	4	1,445	273	52			
Dry gold-silver.....	2	124	45	2,835	2,200		
Dry silver.....	13	371	1	691	9,900	6,640	600
Total.....	19	1,940	319	3,578	12,100	6,640	600
Copper.....	14	7,866,633	1,593	107,668	116,589,538	124,100	2,290
Lead.....	14	54,824	14	3,095	6,550	2,174,570	15,300
Lead-zinc.....	8	10,338	77	16,870	46,540	669,090	1,233,370
Zinc.....	4	135,811	596	73,572	383,700	2,902,100	25,479,940
Total.....	36	8,067,606	2,280	201,205	117,026,328	5,869,860	26,730,900
Other "lode" material:							
Slag, etc. ²		510	10	524	287,621	9,500	14,500
Copper precipitates.....	1	16,994			³ 27,627,951		
Total.....	1	17,504	10	524	³ 27,915,572	9,500	14,500
Total "lode" material.....	57	8,087,050	2,609	205,307	³ 144,954,000	5,886,000	26,746,000
Gravel (placer operations).....	2		5	2			
Total, all sources.....	59	8,087,050	2,614	205,309	³ 144,954,000	5,886,000	26,746,000

¹ Detail will not necessarily add to totals because some mines produce more than 1 class of ore.

² Includes 31 tons of lead-zinc mill cleanings, 58 tons of zinc mill cleanings, and 421 tons of copper slag.

³ Includes 241,800 pounds of copper contained in copper precipitates recovered from surface ore piled up by bulldozer and treated by heap leaching.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1953, by methods of recovery and types of material processed, in terms of recoverable metals

Type of material processed and method of recovery	Material treated (short tons)	Recoverable metals				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode:						
Amalgamation ¹	1,435	266	107			
Concentration, and smelting of concentrates:						
Ore.....	7,959,808	1,424	159,651	114,577,496	5,634,890	26,728,310
Mill cleanings (zinc).....	58		105	750	1,400	10,200
Total.....	7,959,866	1,424	159,756	114,578,246	5,636,290	26,738,510
Direct smelting:						
Ore.....	108,303	909	45,025	2,460,932	241,610	3,190
Copper precipitates.....	16,994			27,627,951		
Slag, etc. ²	452	10	419	286,871	8,100	4,300
Total.....	125,749	919	45,444	30,375,754	249,710	7,490
Placer.....	(³)	5	2			
Grand total.....	⁴ 8,087,050	2,614	205,309	144,954,000	5,886,000	26,746,000

¹ Ore only; no old tailings, etc., processed by this method in New Mexico in 1953.

² Includes 421 tons of copper slag and 31 tons of lead-zinc mill cleanings.

³ Not available.

⁴ Excluding placer gravel.

mine and Mex-Tex lead-barite mine in the Hansonberg district (Socorro County).

Manganese and Ferruginous Manganese Ores.—The Government manganese-purchasing program, formulated in 1951 to promote the development of larger domestic sources of manganese ore, continued to stimulate activity in prospecting and mining which brought about a substantial increase in shipments to the Government depot at Deming in 1953. There were about 58 producing mines and prospects, most of which were in Grant, Hidalgo, Luna, Sierra, and Socorro Counties. The price paid for manganese ore ranged from \$8.54 a ton for ore containing 15 percent manganese (the minimum grade accepted) to \$88.00 for 40 percent ore where deliveries per mine aggregated less than 200 tons monthly; larger quantities were paid for on a similar basis, with provision for premiums and penalties where ore deviated from the specifications of the ore-purchase schedules. The minimum lot accepted at 1 time was 5 long tons.

Shipments of ferruginous manganese ore from the Luck property near Silver City in Grant County, a steady producer for many years, were considerably less than in 1952.

Molybdenum.—Molybdenum concentrate was recovered as a by-product from copper ore at the Chino mill at Hurley in Grant County and from molybdenum ore mined at the Molybdenum Corp. of America mine near Questa in Taos County.

Silver.—The decrease in the New Mexico silver production from 479,300 ounces in 1952 to 205,300 ounces in 1953 was due to the heavy decline in the tonnage of zinc and lead-zinc ores mined; these ores yielded 80 percent of the State total silver in 1952 and 44 percent in 1953. Copper ore yielded 52 percent of the silver in 1953 and only 16 percent in 1952. Except for 2 ounces recovered along with placer

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1953, by classes of concentrates and crude materials, in terms of recoverable metals

Class of material	Concentrate shipped to smelters and recoverable metals					
	Short tons	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Copper.....	220,346	763	70,357	114,242,346	9,950	6,260
Lead.....	3,931	392	43,326	72,500	5,044,750	290,980
Zinc.....	25,159	269	41,073	263,400	581,590	26,441,270
Total: 1953.....	249,436	1,424	159,756	114,578,246	5,636,290	26,738,510
1952.....	367,430	1,789	432,122	110,622,155	13,544,875	101,923,060
Class of material	Crude material shipped to smelters					
	Short tons	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Dry gold, dry gold-silver ore.....	134	52	2,839	2,200	-----	-----
Dry silver ore.....	371	1	632	9,900	6,640	600
Copper:						
Crude ore.....	107,270	844	39,861	2,442,882	124,100	2,290
Precipitates.....	16,994	-----	27,627,951	-----	-----	-----
Slag.....	421	10	165	285,421	-----	-----
Lead.....	528	12	1,693	5,950	110,870	300
Mill cleanings (lead-zinc).....	31	-----	254	1,450	8,100	4,300
Total: 1953.....	125,749	919	45,444	30,375,754	249,710	7,490
1952.....	166,184	1,042	47,176	41,601,845	497,125	26,940

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1953¹ by counties and districts, in terms of recoverable metals

County and district	Mines producing		Material sold or treated (short tons) ²	Gold (fine ounces)		
	Lode	Placer		Lode	Placer	Total
Catron County: Mogollon.....	2		48	37		37
Grant County:						
Burro Mountain.....	2		6			
Central.....	5		7,887,446	987		987
Eureka.....	1		450	1		1
Pinos Altos.....	2		4			
Swartz.....	1		821			
Guadalupe County: Pintado.....	1		28,985			
Hidalgo County:						
Eureka.....	2		146	6		6
Lordsburg.....	3		84,324	1,205		1,205
San Simon.....	2		100	1		1
Lincoln County: Nogal and Red Cloud ³	3		242	5		5
Luna County: Cooks Peak.....	2		12			
Otero County: Orogrande.....	1		1,136			
Rio Arriba County.....	1		12			
Santa Fe County:						
Cerrillos.....	2		81			
San Pedro (New Placers).....	2	1	38	1	2	3
Sierra County:						
Hermosa.....	1		2			
Kingston.....	3		48			
Las Animas.....	2	1	1,230	265	3	268
Pittsburg.....	1		6			
Tierra Blanca.....	1		15	3		3
Socorro County:						
Hansonberg.....	3		54,276	2		2
Magdalena.....	9		10,307	88		88
Scholle Area.....	1		192			
Silver Mountain (Water Canyon).....	2		129	8		8
Total New Mexico.....	55	2	8,070,056	2,609	5	2,614

County and district	Silver (fine ounces)			Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
	Lode	Placer	Total				
Catron County: Mogollon.....	2,433		2,433				\$3,497
Grant County:							
Burro Mountain.....	11		11	700			211
Central.....	78,842		78,842	139,738,400	2,920,100	25,486,400	43,524,291
Eureka.....	650		650	100	14,600	6,200	3,278
Pinos Altos.....	142		142	500			272
Swartz.....	1,799		1,799	2,300	113,300	181,400	37,991
Guadalupe County: Pintado.....				1,074,000			308,238
Hidalgo County:							
Eureka.....	118		118	10,600	100		3,372
Lordsburg.....	100,844		100,844	3,975,000	124,000		1,290,513
San Simon.....	260		260	2,400	7,900	4,000	2,454
Lincoln County: Nogal and Red Cloud ³	189		189	4,000	14,000		3,328
Luna County: Cooks Peak.....	63		63		4,000		581
Otero County: Orogrande.....				32,000			9,184
Rio Arriba County.....	9		9				8
Santa Fe County:							
Cerrillos.....	644		644		26,000	20,000	6,289
San Pedro (New Placers).....	40	1	41	4,000			1,290
Sierra County:							
Hermosa.....	441		441		1,300	300	604
Kingston.....	413		413		5,700	9,700	2,236
Las Animas.....	50	1	51				9,426
Pittsburg.....	1		1		1,000		132
Tierra Blanca.....	1		1				106
Socorro County:							
Hansonberg.....	1,358		1,358	600	2,061,600	15,000	273,266
Magdalena.....	16,525		16,525	100,600	588,000	1,023,000	241,581
Scholle Area.....	13		13	6,400	100		1,862
Silver Mountain (Water Canyon).....	461		461	2,400	4,300		1,949
Total New Mexico.....	205,307	2	205,309	144,954,000	5,886,000	26,746,000	45,725,959

¹ The report of this series for 1929 (chapter of Mineral Resources of the United States, 1929, pt. 1, pp. 729-759) gives the yearly production of each important metal-producing district in New Mexico from 1904 to 1929, inclusive. Subsequent records, year by year, may be found in annual issues of Mineral Resources and Minerals Yearbook.

² Does not include gravel washed or tonnage of precipitates shipped.

³ Bureau of Mines not at liberty to show production figures separately by districts.

gold, the silver was sold to smelters as an accessory metal in copper, lead, and zinc concentrates and crude ores. The leading New Mexico producers of silver in 1953 were the Banner Mining Co. Miser's Chest copper mine in the Lordsburg district, Hidalgo County; the Bayard (United States Smelting, Refining & Mining Co.) zinc-lead group in the Central district, Grant County; and the Atwood copper mine in the Lordsburg district.

Uranium.—New Mexico produced substantial amounts of uranium in 1953. Although mining and exploration continued to center largely in McKinley, Valencia, and San Juan Counties, prospecting extended to many others. An important action affecting uranium mining taken during the year by the Atomic Energy Commission (AEC) was the extension of the expiration date of its guaranteed minimum price schedule for uranium ores on the Colorado Plateau from March 31, 1958 to March 31, 1962. The Commission also extended the time during which initial production of uranium ore from new domestic mines will be eligible for bonus payments from February 28, 1954 to February 28, 1957. According to a report³ of the Commission, the new ore-processing plant for limestone-type ores at Bluewater, near Grants, was completed in September 1953 by the Anaconda Copper Mining Co.; and the company was contemplating construction of additional facilities to treat the sandstone-type ores being produced in this area and stockpiled at the Government Ore-Buying Depot at Grants. Construction of a plant at Shiprock, N. Mex., by Kerr-McGee Oil Industries, Inc., was scheduled to begin early in 1954. This plant will treat the ores being produced in the Lukachukai Mountain area of northeastern Arizona and other areas on the Navajo Indian Reservation, as well as those stockpiled at the Shiprock ore-buying station over a period of about 2 years.

Under regulations of the Commission, figures showing production of uranium cannot be published; therefore the value of the uranium output is not included in the total value of the New Mexico mineral production in table 1 of this chapter.

Volume I of Minerals Yearbook, 1953, chapter on Uranium, Radium, and Thorium, contains a general review of the uranium industry, with references to literature published. Data on results of exploration and geological studies by the Government are available in publications of the Atomic Energy Commission and the United States Geological Survey.

Vanadium.—Vanadium was recovered as a byproduct or coproduct of the mining and treatment of uranium ore.

Zinc.—Production of zinc in New Mexico in 1953, lowest since 1926, was 13,400 short tons compared with 51,000 tons in 1952. The sharp decline in the zinc price in 1952 caused some zinc and zinc-lead mines to shut down toward the end of that year, and a further price drop in 1953 resulted in closing of the remainder by October 1. The zinc price was 13 cents a pound on January 2 and 10 cents at the end of December.

The larger zinc producers that were still in operation at the beginning of 1953 (all in the Central district) were the Kearney mine of the New Mexico Consolidated Mining Co. (subsidiary of the Peru Mining

³ Atomic Energy Commission, Fifteenth Semiannual Report: January 1954, p. 4.

Co.), which shut down on January 28; the Ground Hog group of the American Smelting & Refining Co., closed on February 25; and the Bayard group of the United States Smelting, Refining & Mining Co. (the employees of which consented to a reduction in wages), operated until September 30. The Lynchburg mine in the Magdalena district, a substantial zinc producer, was in production most of the time until September and then shut down. The Bayard group was much the largest zinc producer in 1953, and the Ground Hog ranked second.

Mills treating zinc and lead-zinc ores in 1953 were the United States Smelting, Refining & Mining Co. 600-ton Bayard mill in the Central district, operated 9 months; the Peru Mining Co. 1,000-ton concentrator at Deming, active 1 month; the American Smelting & Refining Co. 650-ton Deming milling unit at Deming, operated 9 months; and the Mineral Operations 75-ton mill at the Hornet mine near Hachita, active about 2 months. The zinc concentrates produced at the mills were shipped to smelters in Illinois, Montana, Pennsylvania, and Texas, and the lead concentrates to the El Paso, Tex., and Leadville, Colo., smelters and the Coffeyville, Kans., and Hillsboro, Ill., oxide plants.

NONMETALS

Barite.—The Mex-Tex Mining Co., Inc., recovered barite from lead-barite ore mined from open pits in the Hansonberg district of Socorro County and concentrated in the company mill at San Antonio.

Clays.—Output of clays in New Mexico in 1953 totaled 49,100 tons compared with 57,700 tons in 1952. The bulk of the clay was used by the producer. In 1953 fire clay totaling 5,400 tons was produced in Dona Ana, Grant, Hidalgo, and McKinley Counties; the remainder of the State output was miscellaneous clays (mostly shale) from Bernalillo, Chaves, Dona Ana, McKinley, San Miguel, and Santa Fe Counties. The average value reported for fire clay as mined was \$3.28 a ton and for miscellaneous clays \$1.97 a ton.

Diatomite.—The output of diatomite came from the Rhodes property near Espanola in Rio Arriba County.

Fluorspar.—Fluorspar from New Mexico mines marketed in 1953 decreased from 1952. Most of the crude fluorspar produced in 1953 came from the Shrine (General Chemical) mine in Grant County and the Ozark-Mahoning Co., White Eagle and the White & Mathis Greenleaf mines in Luna County. There were six other small producers in Grant, Luna, Sierra, and Valencia Counties. The General Chemical Division, Allied Chemical & Dye Corp., continued to operate its custom mill at Deming on crude fluorspar received from the various mines.

TABLE 11.—Production of fluorspar, 1944–48 (average), 1949–53, and total 1909–53

Year	Short tons	Value	Year	Short tons	Value
1944–48 (average).....	25, 500	\$767, 709	1952.....	16, 443	\$823, 320
1949.....	12, 844	446, 086	1953.....	(¹)	(¹)
1950.....	20, 036	742, 408	1909–53.....	373, 808	² 11, 162, 606
1951.....	24, 402	1, 163, 098			

¹ Bureau of Mines not at liberty to publish.

² Value estimated for some years.

Perlite.—Production of crude perlite in New Mexico totaled 84,900 tons in 1953, a sharp increase over 1952. Part of the increase was contributed by a new operation at Grants, Valencia County, begun in February 1953 by the United States Gypsum Co., which purchased the mining property and mill of the Pumice Corp. of America. The pumice mine was abandoned, and a perlite deposit on the property was opened. The other large producers were the F. E. Schundler & Co., Inc., in Taos County and the Great Lakes Carbon Corp. in Socorro County, both of which operated mines and crushing, sizing, and drying plants. Kirk's Perlite Industries in Hidalgo County also produced perlite.

Potash.—Production and sales of potash in New Mexico reached new record highs of 1,721,000 tons and 1,552,800 tons (K_2O equivalent), respectively, in 1953. The value of the potash sold was \$52,293,000—the highest of any mineral produced in the State except petroleum. The increase over 1952 in production was 17 percent and in sales 10 percent. New Mexico produced 90 percent of the United States total output of potash in 1953. The five producing companies, all of which operated mines and refineries in the Carlsbad Region, Eddy County, were the Duval Sulphur & Potash Co., International Minerals & Chemical Corp., Potash Co. of America, Southwest Potash Corp., and United States Potash Co., Inc. The Freeport Sulphur Co. completed its drilling program for potash in the Carlsbad region, and the Farmers Union Service Corp. carried on a drilling program in the same region, east of the present producing area.

The average value per ton of the 2,662,000 tons of salts sold in 1953 was \$19.65 compared with \$19.02 in 1952. The grade (K_2O equivalent) of the salts averaged 58.34 percent compared with 57.86 percent in 1952. Stocks on hand increased to 407,700 tons at the end of 1953 from 131,300 at the end of 1952. Data on markets, the price per unit of the various grades, and other information are given in the chapter on potash in volume I of Minerals Yearbook, 1953.

TABLE 12.—Production and sales of potassium salts, 1944–48 (average) and 1949–53, in short tons

Year	Crude salts: 1 mine production		Marketable potash salts				
			Production		Sales		
	Gross weight	K_2O equivalent	Gross weight	K_2O equivalent	Gross weight	K_2O equivalent	Value
1944–48 (average).....	4,354,597	914,206	1,517,486	809,366	1,521,499	810,184	\$26,919,294
1949.....	4,852,903	1,015,886	1,733,739	927,621	1,744,427	932,497	27,950,111
1950.....	5,802,004	1,198,021	1,904,565	1,086,996	1,878,094	1,072,772	31,944,365
1951.....	6,615,891	1,349,572	2,138,439	1,223,139	2,126,391	1,217,617	37,209,740
1952.....	7,852,732	1,644,034	2,530,596	1,468,029	2,439,042	1,411,125	46,385,452
1953.....	9,100,671	1,908,280	2,937,960	1,721,435	2,661,587	1,552,831	52,293,316

¹ Sylvite and langbeinite.

Pumice and Pumicite.—The output of pumice used for concrete aggregate, cleansing and scouring compounds, acoustical plaster, and other commercial uses increased sharply over 1952, and in addition a large tonnage was shipped for railroad ballast. In 1953, for the first

time in Bureau of Mines reports, "pumice" is used as an all-inclusive term that includes low-price volcanic cinders and scoria; substantial tonnages of the latter materials are produced in New Mexico. Union County was the largest producer in 1953; the output came from the properties of the Colorado & Southern Railway Co. and the New Mexico Aggregate Corp. on the Twin Mountains a few miles north of Des Moines. Other producers included the Big Chief Mining Co. and Edgar D. Otto & Son in Bernalillo County; Volcanic Cinder Co. in Dona Ana County; Folsom Cinder Co. and General Pumice Corp. in Rio Arriba County; Dooley Bros. Pumice, Inc., Vocalite Materials Co., and Lana-Pumice, Inc., in Sandoval County; and Santa Fe Pumice Co., Inc., in Santa Fe County. Although most of the output was used in plants in New Mexico, a substantial quantity was shipped to consumers outside the State.

Salt.—Most of the State output of salt was recovered from the potash mill tailings in Eddy County; one plant at Quemado in Catron County produced solar evaporated salt.

Sand and Gravel.—The output of sand and gravel reported by commercial and noncommercial producers in New Mexico totaled 1,416,000 tons in 1953 compared with 497,000 tons in 1952. Broader coverage in the annual canvass in 1953 than in 1952 explained some of the increase, but the largest part was due to expanded output. Commercial sand and gravel reported for 1953 totaled 1,022,000 tons, of which Bernalillo County contributed 67 percent and 9 other counties together 33 percent. Of the total commercial sand and gravel produced, 88 percent was washed. The bulk of the noncommercial output was used by the State Highway Department.

Stone.—The reported production of stone in New Mexico in 1953 totaled 625,000 tons, of which over 99 percent was crushed miscellaneous stone and basalt used for railroad ballast, concrete and road metal, and riprap. The largest production of stone was reported in Valencia County.

Sulfur.—Commercial shipments of elemental sulfur recovered as a byproduct from natural gas were begun in New Mexico in 1953 from 2 plants, 1 in San Juan County and the other in Lea County. A third plant was under construction in the southeastern part of the State.

MINERAL FUELS

Carbon Dioxide.—Carbon dioxide was produced at 4 plants in the Bueyeros field about 20 miles northeast of Mosquero in Harding County. Another plant was under construction near Des Moines, Union County.

Coal.—Coal production decreased from 759,000 tons in 1952 to 514,000 tons in 1953, the lowest in the 49-year period from 1905 through 1953. The peak production was 4,023,000 tons in 1918. In recent years natural gas and petroleum products have supplanted coal in many uses. At least 10 coal mines in Colfax, McKinley, San Juan, and Santa Fe Counties closed during 1952 and 1953. Colfax County was by far the largest producer in 1953, and McKinley ranked second.

Table 13 shows the output of coal by counties, and table 14 gives the production of petroleum by fields, in 1952 and 1953. Volume II

of Minerals Yearbook, 1953, which is devoted entirely to mineral fuels, contains additional details on coal mining and the petroleum and natural-gas industries.

TABLE 13.—Production of coal, 1952–53, by counties ¹

	1952			1953		
	Production (net tons)	Average value per ton	Total value	Production (net tons)	Average value per ton	Total value
Bernalillo.....	1,513	\$4.58	\$6,930	1,030	\$4.74	\$4,882
Colfax.....	645,770	5.80	3,743,833	423,465	6.12	2,593,305
McKinley.....	60,900	6.02	366,618	40,650	5.55	225,608
Rio Arriba.....	17,162	4.43	76,028	15,614	5.07	79,163
Sandoval.....	2,634	4.76	12,538	2,415	4.13	9,974
San Juan.....	3,943	4.97	19,597	3,162	3.89	12,300
Santa Fe.....	24,345	5.75	139,984	16,688	6.09	101,630
Socorro.....	1,700	5.74	9,758	3,032	6.08	18,435
Valencia.....	1,470	4.50	6,615	7,725	4.84	37,389
Total.....	759,437	5.77	4,381,951	513,781	6.00	3,082,686

¹ Figures are based on final complete returns from all operators known to have produced 1,000 tons and over per year.

Helium.—The Government-leased Rattlesnake gas field, which supplies helium-bearing gas to the Navajo (Shiprock), N. Mex., helium plant, produced about 13 million cubic feet in 1953.

Petroleum.—The output of crude petroleum increased 20, natural gas 11, and natural gasoline 5 percent over 1952, and all 3 established new records for both quantity and value. The largest producing oil and gas fields were those in the southeastern part of the State, but the fields in the San Juan Basin in the northwestern part have become important producers in recent years. New Mexico ranked seventh among the States in petroleum production. There were eight refineries in the State, but a large part of the crude oil produced was refined in other States. Important byproducts derived from petroleum and natural gas included carbon black and elemental sulfur.

TABLE 14.—Production of crude petroleum, 1952–53, by districts and fields, in thousand barrels

[Oil and Gas Journal]

District and field	1952	1953	District and field	1952	1953
Southeast:			Southeast—Continued		
Arrowhead.....	809	953	Lovington and East.....	1,136	2,472
Bagley.....	2,447	2,033	Maljamar.....	1,813	1,792
Brunson.....	3,511	3,007	Monument.....	(¹)	(¹)
Denton.....	4,329	8,668	Paddock.....	887	770
Drinkard.....	4,007	3,454	Saunders and South.....	1,571	2,164
Eunice.....	9,588	9,321	Vacuum.....	4,496	4,281
Grayburg-Jackson.....	1,353	1,162	Other.....	14,648	22,183
Hare.....	2,027	2,047	Northwest ²	566	755
Hobbs.....	3,902	3,663	Total.....	58,725	70,394
Langlie-Mattix.....	1,635	1,669			

¹ Included in "Other" fields.

² Bureau of Mines data.

REVIEW BY COUNTIES⁴

BERNALILLO

Sand and gravel constituted the bulk of the mineral output of Bernalillo County, and pumice ranked second in importance. Clays and coal were also produced. The largest producer of sand and gravel was the Albuquerque Gravel Products Co. Producers of pumice included the Big Chief Mining Co. (Jemez Mountains quarry) and Edgar D. Otto & Son. The Kinney Brick Co. at Albuquerque operated a clay pit.

CATRON

The Bearup gold-silver mine in the Cooney district near Mogollon was worked by Harry M. McQuigg from January to May 1953; the ore produced was shipped to the El Paso smelter. Mitchell Bros. & Son shipped about 1 ton (2,172 pounds) of ore assaying 0.11 ounce of gold and 21.5 ounces of silver to the ton and 5.40 percent copper⁵

TABLE 15.—Value of mineral production in New Mexico in 1952-53 (excluding uranium, and manganese ore shipped to the National Stockpile), by counties, and principal minerals¹ produced in 1953

County	1952	1953	Principal minerals produced in 1953, in order of value ¹
Bernalillo.....	\$355,751	\$616,791	Sand and gravel, pumice, coal.
Catron.....	(²)	23,319	Sand and gravel, salt.
Chaves.....	13,400	47,973	Sand and gravel, clays.
Colfax.....	3,745,536	3,050,685	Coal, stone, sand and gravel.
Curry.....	20,289		
De Baca.....		8,375	Sand and gravel.
Dona Ana.....	195,312	213,401	Pumice, clays, sand and gravel.
Eddy.....	(²)	52,500,928	Potash, salt.
Grant.....	³ 55,171,015	44,421,242	Copper, zinc, molybdenum, lead, fluorspar.
Guadalupe.....	257,004	308,238	Copper.
Hidalgo.....	990,647	1,308,536	Copper, silver, gold, lead, perlite.
Lea.....		(²)	Sulfur.
Lincoln.....	³ 9,528	9,125	Iron ore, lead, copper.
Los Alamos.....	³ 65,010		
Luna.....	305,146	339,936	Fluorspar.
McKinley.....	401,648	297,254	Coal, clays.
Otero.....		110,988	Sand and gravel, copper.
Quay.....	29,464	43,042	Sand and gravel.
Río Arriba.....	76,028	371,332	Pumice, coal, diatomite, sand and gravel.
Sandoval.....	(²)	104,892	Pumice, coal, sand and gravel.
San Juan.....	19,597	150,586	Sand and gravel, sulfur, coal.
San Miguel.....	3,770	8,027	Stone, sand and gravel.
Santa Fe.....	597,941	210,001	Coal, pumice.
Sierra.....	162,784	12,504	Gold.
Socorro.....	³ 1,757,160	775,365	Lead, perlite, zinc, barite, copper.
Taos.....	(²)	(²)	Perlite, molybdenum, beryl.
Union.....		(²)	Pumice.
Valencia.....	581,199	392,512	Stone, perlite, fluorspar, coal.
Undistributed ⁴	47,127,458	1,156,245	
	111,885,687	106,481,297	
Petroleum, natural gas, and natural-gas liquids.....	176,614,000	224,316,000	
Total.....	288,500,000	330,797,000	

¹ Excluding petroleum, natural gas, natural-gas liquids, and carbon dioxide.

² Value included with "Undistributed;" Bureau of Mines not at liberty to publish.

³ Revised figure.

⁴ Includes value for counties indicated in appropriate column by reference footnote 2, and for some undistributed sand and gravel, for carbon dioxide, vanadium, gem stones, and some undistributed stone.

⁵ The review is confined generally to minerals other than fuels and the noncommercial sand and gravel and crushed stone used on Federal, State, county, and municipal projects.

⁶ No output of recoverable copper is shown for Catron County in 1953 because the quantity produced was too small to be tabulated in rounded figures.

from the Mitchell group of claims, also in the Cooney district. The Curtis Salt Co. continued to produce solar evaporated salt at its plant at Quemado.

CHAVES

The Native Blanco Clay Co. operated its clay pit near Roswell 120 days in 1953. A substantial tonnage of sand and gravel was produced in the county.

COLFAX

This county continued to be the largest producer of coal in New Mexico, but the output in 1953 decreased heavily. Basalt rock was quarried and shipped for riprap.

DONA ANA

The El Paso Brick & Tile Co. operated its clay pit at Brickland 273 days in 1953; the clay produced was shipped to the company plant at El Paso, Tex., for making brick and tile. The Bowen quarry (shalebank) of the International Brick Co. operated 172 days. The Volcanic Cinder Co. operated its Klinker pumice open-cut mine west of Las Cruces 260 working days in 1953. The nonferrous metal mines in the Organ district had no output. Small tonnages of manganese ore were shipped from the Blackee No. 1 and Rincon Lode properties to the Government Ore-Purchasing Depot at Deming.

EDDY

The five potash mines in the Carlsbad region together produced 90 percent of the United States total output of potash in 1953. Operations were generally continuous throughout the year, but one company reported that the decline in demand necessitated a cutback in operations and the laying off of a few employees. It was pointed out that 1953 was an "off year" for the fertilizer industry because of the nationwide drought and reduced farm income. Also, high freight rates and high labor costs were problems faced by Carlsbad producers in meeting competition from abroad. However, production and sales of potash (K_2O equivalent) in the Carlsbad region increased 17 and 10 percent, respectively, over 1952 and established new high records. Crude salts mined totaled 9,101,000 tons compared with 7,853,000 tons in 1952.

The producing companies, each of which operated a mine and refinery, were the Duval Sulphur & Potash Co., with 2 mine shafts each 1,500 feet deep; International Minerals & Chemical Corp., 2 shafts 850 feet deep and 2 shafts 900 feet deep; Potash Co. of America, 3 shafts 1,000 feet deep; Southwest Potash Corp., 2 shafts 1,085 feet deep; and United States Potash Co., Inc., 2 shafts 1,060 feet deep. The room-and-pillar method of mining was followed in all of the mines. The thickness of the ore beds reported for some of the mines ranged from 4 to 13 feet. All of the mines produced sylvite, and the International Minerals & Chemical Corp. mine yielded sylvite on the 900-foot level and langbeinite on the 850-foot level. Mining was done by drilling, undercutting, and blasting and in three of the mines with continuous mechanical miners. Load-

ing and haulage were mechanized. Electric trolley locomotives were used for most rail haulage underground, and diesel-powered bulldozers and trucks were used extensively for cleanup work and service haulage. An average of 2,600 men was employed at the mines and plants in 1953.

In ore beneficiation, the Potash Co. of America used flotation of the salt gangue, and some of the other companies employed flotation of the potassium chloride. The products of the mills and refineries handling sylvite include a 50-percent K_2O granular product and a 60-percent or higher grade muriate of potash. Langbeinite was treated in the mill and chemical plant of the International Minerals & Chemical Corp. to yield potassium sulfate and potassium-magnesium sulfate.

News of exploration published ⁶ in 1953 stated that the International Minerals & Chemical Corp. had found a new ore body in Lea County, and other new ore bodies had been reported by both the National Farmers Union and the Freeport Sulphur Co. near the Lea-Eddy county line. It was also stated that the American Potash & Chemical Corp. had done some core drilling in the region.

The quantity of salt recovered from potash-mill tailings and refinery waste increased sharply over 1952. Salt salvage operations were carried on at the International Minerals & Chemical Corp. and the United States Potash Co. waste dumps. The producing salvage companies were the Carlsbad Salt Co., the Salt Supply Co., and Southwest Salt Co.

GRANT

Grant County continued to be the State's dominant metal producer, and although the output of copper was 6 percent less than in 1952, the value increased 12 percent to a new record owing to the rise in the copper price. On the other hand, both the quantity and value of the lead and zinc produced decreased heavily in 1953, as the price of these metals continued to decline, and all the zinc and zinc-lead mines in the county (as well as in the State) shut down by October 1. The combined value of the lead and zinc was the lowest since 1939. The output of gold and silver, mostly recovered as byproducts from copper and zinc ores, also decreased heavily in 1953. Other metallic minerals mined in Grant County included iron ore, manganese, and molybdenum (recovered as a byproduct from copper ore). There are a number of metal-mining districts in the county.

Central (Bayard, Fierro, Georgetown, Hanover, Santa Rita) District.—The Central district was by far the largest metal producer in New Mexico. The large Chino open-pit mine of the Kennecott Copper Corp., Chino Mines Division, at Santa Rita produces the bulk of the State output of copper. The mine operated continuously 7 days a week in 1953, except for a 13-day shutdown (September 26 through October 8) caused by a strike, and on certain holidays. Work continued on moving the town of Santa Rita to a new location to permit mining the ore under the old townsite, which was near the center of the past and present pit operations. A standard-gage railroad with over 40 miles of track was used in the pit and on the dumps. Electric shovels handling 8 tons per dip were used on benches for load-

⁶ New Mexico Miner, November 1953, p. 11

ing broken ore and waste rock; about 50,000 tons of material (ore and waste) was mined daily. The ore was transported from the terminal of the pit railroad to treatment plants at Hurley over a branch line of the Atchison, Topeka & Santa Fe Railway. The concentrator at Hurley had a daily capacity of 22,500 tons of ore. The concentrate was smelted in the company smelter adjacent to the mill. The smelter also treated copper precipitates recovered by leaching of dumps and siliceous copper ore from the pit used as a flux. Molybdenum was recovered as a mill byproduct and selenium-bearing copper slag as a smelter byproduct. The copper bullion contained minor quantities of gold and silver, which were not recovered from the bullion that was fire-refined at Hurley; the blister copper made and shipped away for refining contained some recoverable gold and silver.

The Oswaldo zinc mine of the Kennecott Copper Corp. at Santa Rita, shut down October 4, 1952, because of the decline in the price of zinc, remained idle throughout 1953.

The Ground Hog mine group of the American Smelting & Refining Co., largest producer of zinc and lead in the State in 1952, suspended operation on February 25, 1953. Development during the nearly 2-month period included 1,683 feet of crosscuts and raises and 6,979 feet of diamond drilling. The ore produced was shipped over the Atchison, Topeka & Santa Fe Railway branch line to the company Deming milling unit.

The United States Smelting, Refining & Mining Co. operated its Bayard group of mines and 600-ton flotation mill in 1953 from January 1 through September 30 and then shut down because of the continued depressed prices of zinc and lead. The mining was done by the company and lessees and the milling by the company. Development during the year included 50 feet of shaft sinking, 4,161 feet of crosscuts and drifts, 694 feet of raises, a 71-foot winze, and 14,788 feet of diamond drilling. Surface operations on the company properties included heap leaching of copper ore on the Zuniga property, carried on under lease by Douglas B. White.

The Kearney mine of the New Mexico Consolidated Mining Co. (subsidiary of the Peru Mining Co.), one of the larger zinc producers in 1952, was closed January 28, 1953, because of the decline in the price of zinc. The Peru Mining Co. Pewabic mine, closed December 23, 1952, remained idle throughout 1953.

The Hanover mine and mill of the New Jersey Zinc Co., Empire Zinc Division, were not in production in 1953, but mine development was carried on until November 15, when the property was shut down indefinitely.

A few tons of copper precipitates recovered by R. R. Thomas, and several cars of clean-up material from the old Combination (Black Hawk) millsite containing lead, zinc, copper, and silver, were shipped during the year.

Several thousand tons of iron ore was shipped from the Hanover-Bessemer property (operated by Mathis & Mathis under a sublease from the United States Smelting, Refining & Mining Co.) and the Pearson pit to a cement plant outside the State. Some manganese ore was shipped to the National Stockpile at Deming from the Central district.

Other Metal-Mining Districts.—Small lots of silver and copper ore were shipped from the Copper Lode No. 7 and the Amazon Exploration Corp. claim in the Burro Mountain district, and the Phelps Dodge Corp. continued exploratory drilling on its property at Tyrone. In the Eureka district the Hornet lead-zinc-silver mine and mill, operated on a small scale by Mineral Operations, Inc., from 1948 through 1952, ceased production early in 1953. At Pinos Altos the Deero Copper Nos. 1 and 2 claims produced a few tons of copper-silver ore, and the Silver Cell Mining Co. shipped a small lot of silver ore. In the Swartz (Carpenter, Camp Monarch) district, Explorations, Inc., continued to ship lead-silver-zinc ore from the Royal John mine until operations were suspended in October.

Small tonnages of manganese ore were shipped to the Government Ore-Purchasing Depot at Deming from scattered mines and prospects in Grant County. The producing claims or properties included the Black Eagle, Blacktower, Consolation, Corliss and Joe No. 2, Hillside, Lone and Bear Mountain, Manhattan, Middle Ridge, Northside, Old Lode, Sweet Home, and Treasure and Burro Mountain. The Luck Mining & Construction Co. continued to ship iron-manganese ore from the Boston Hill open pit near Silver City to the Colorado Fuel & Iron Corp. at Pueblo, Colo.

Fluorspar was the principal nonmetallic mineral produced in Grant County. The crude fluorspar was shipped to the Deming mill of the General Chemical Division, Allied Chemical & Dye Corp. The leading producer was the Shrine (General Chemical) mine near Tyrone. Other shippers included the James L. Reed and Foster (M. J. Wallace) mines. Fire clay was produced by Yacomo, Inc.

GUADALUPE

Shipments of siliceous copper fluxing ore to the El Paso smelter by Drunzer & Casner from the Stauber mine 15 miles southwest of Santa Rosa in 1953 totaled 28,985 tons containing 1,107,241 pounds of copper. The ore came largely from open pits, but some was produced from underground through a 100-foot tunnel driven during the year.

HARDING

Carbon dioxide was produced from gas obtained from the Bueyeros field about 20 miles northeast of Mosquero. Companies owning plants for processing carbon dioxide gas in the county were the Carbonic Chemical Corp., Iceco, Inc., Timmons Carbonic Co., and Witt Ice & Gas Co.

HIDALGO

Copper production in Hidalgo County, nearly all from the Lordsburg district, increased 35 percent in 1953 over 1952. As in each year since 1936, the Banner Mining Co. Miser's Chest group 5 miles south of Lordsburg was the principal producer. The Miser's Chest vertical shaft was sunk an additional 72 feet in 1953, making its total depth 1,389 feet. Other development during the year included 1,563 linear feet of drifts, 260 feet of raises, 1,010 feet of diamond drilling, and 1,224 cubic feet of station and pocket excavation. The ore was treated in the company flotation mill at the mine and yielded copper concentrate containing silver and some gold. The Atwood copper mine

was operated throughout the year under lease by Ira L. Moseley (incorporated in June 1953 under name of Atwood Mine, Inc.). The ore, containing gold, silver, and some lead in addition to copper, was shipped crude to the El Paso smelter. A small lot of silver ore was shipped from the Susie claim 8 miles south of Lordsburg.

The metal output from other districts was small. J. G. Sweet shipped 1 car of copper-lead-zinc-silver ore from the Moon-Star-Comet group 1½ miles south of Steins Pass in the San Simon district. The Silver Hill mine in the same district, a small but persistent producer of lead-zinc-silver ore in 1951 and 1952, shipped 1 car of ore in January 1953 and then shut down because of the low prices of lead and zinc. Some copper ore was shipped from the Big Chance and Little Hatchet mines in the Eureka district (which extends from Grant County into Hidalgo County).

Perlite was produced by Kirk's Perlite Industries near Lordsburg, and fire clay was mined by the Phelps Dodge Corp. near Pratt.

Some manganese ore was shipped from the Lucky Three and Ridge No. 1 claims to the Government ore-purchasing depot at Deming.

LEA

Elemental sulfur was recovered as a byproduct of natural gas at the new extraction plant at Monument, placed in operation in 1953.

LINCOLN

The Little Wonder mine of W. A. Mays 10 miles west of Corona was worked part of 1953 on a small scale and produced 39 tons of ore containing 14,351 pounds of lead, 4,529 pounds of copper, 183 ounces of silver, and 1,344 pounds of zinc. Development work was done at the Custom group 25 miles southeast of Corona, and a little ore was shipped for testing. Some gold was recovered during tests run on gold ore from the Great Western mine in the Nogal district.

Iron ore was shipped to the Colorado Fuel & Iron Corp. at Pueblo, Colo., from the J. B. Close mine near Carrizozo and the W. H. Cochran property. Terra Minerals shipped crude fluorspar from Gallinas to the General Chemical custom mill at Deming.

LUNA

The output of ore yielding nonferrous metals in Luna County in 1953 comprised 4 tons of high-grade lead-silver ore shipped from the Rimrock group and 8 tons of silver-lead ore hauled from the dump of the Lindy Ann group, both in the Cooks Peak district.

At Deming the American Smelting & Refining Co. operated its 650-ton zinc-lead-copper selective flotation mill on company and custom ores until the company Ground Hog mine closed on February 25, 1953, and then ran the mill part time on custom ores until the complete shutdown on October 1. The custom ores came from 5 mines in Arizona and 9 in New Mexico.

The 1,250-ton Peru Mining Co. zinc-lead mill near Deming continued to treat ore from the Kearney mine in the Central district, Grant County, and also handled some custom ore from Hidalgo and Socorro Counties, until the Kearney shut down January 28, 1953; the mill was then closed and remained idle the rest of the year.

The General Chemical Division, Allied Chemical & Dye Corp., operated its custom fluorspar mill at Deming throughout 1953. Most of the domestic ore treated came from the company Shrine mine in Grant County and the White Eagle (Ozark-Mahoning Co.) and the Greenleaf (White & Mathis) mines in Luna County. The Sierra Mining Co. operated the Lucky and Greenspar mines 11 miles from Deming in Luna County.

The Government, through the General Services Administration, purchased manganese ore for stockpiling at the Deming Depot. This ore was stockpiled for future treatment; that purchased in 1953 was not credited to production in that year but will be credited to the year in which the beneficiated product is shipped. The largest shipper to the depot was the Southwest Manganese Co., working the Manganese Valley mine. Other shippers included the American No. 29, Birchfield, Doubtful No. 1, Esperanza, Iron Clad, Luna, Mexican Hill, and Southside properties.

McKINLEY

Uranium mining, development, and prospecting were continued in the Thoreau-Prewitt and other areas. The largest mining operation was the Poison Canyon open-pit mine of the Haystack Mountain Development Co., but there were a number of other producing mines. Marketing facilities were afforded by the ore-buying station at Grants in adjoining Valencia County.

McKinley continued to be the second-largest coal-producing county in the State, but output in 1953 decreased heavily. The Gallup Brick & Tile Co. continued to operate its clay pit near Gallup.

OTERO

Drunzer & Casner shipped 1,136 tons of copper ore from the Providence mine 4 miles northwest of Orogrande to the El Paso smelter to test the ore content and character of the rock.

RIO ARRIBA

Twelve tons of ore averaging 2.16 percent copper and 0.74 ounce of silver to the ton was shipped in 1953 from an opencut on the Paradise claim 2 miles from Gallina.

Some tantalum-columbium ore was shipped by M. R. Griego from his claims at La Madera and by the Rio Arriba Tungsten Consolidated Co. from its property at Petaca.

The General Pumice Corp. Cullum open-pit mine and the Folsom Cinder Co. quarry were large producers of pumice. James H. Rhodes Pumice, Inc., shipped diatomite from the Magnesium mine near Espanola to the company mill near Sante Fe.

SANDOVAL

Dooley Bros. Pumice, Inc., acquired the Cochiti Pumice Co. pumice quarry in the Cochiti mining area north of Domingo on April 30, 1953, and operated it the remainder of the year. The mine-run rock was crushed, screened, and graded in the Dooley plant at Domingo. The company reported that demand for pumice slackened, although the sale price was reduced. Other producers of pumice included the Volcalite Materials Co. and Lava-Pumice, Inc. Some coal was produced in the county.

SAN JUAN

The recovery of elemental sulfur as a byproduct from natural gas from the Barker Dome field was begun in April 1953 by the Imperial Sulphur & Acid Co. in its new extraction plant adjacent to the San Juan processing plant of the El Paso Natural Gas Co. near Farmington. Newspaper reports stated that in test runs the plant produced over 1 ton of pure sulfur per hour. Another product recovered from natural gas in San Juan County is helium, extracted by the Bureau of Mines plant at Shiprock.

There were several producing uranium mines in the county. The Atomic Energy Commission maintained a uranium ore-purchasing depot at Shiprock, and the Kerr-McGee Oil Industries, Inc., was preparing to build a uranium ore-treatment plant at Shiprock.

SAN MIGUEL

Some beryl and columbite-tantalite were produced at the Old Priest (Pablo Lopez) pegmatite quarry near Ribera in 1953. The Las Vegas Brick Co. mined clay (shale) near Las Vegas for use in the company plant.

SANTA FE

Production of metals from lode mines in Santa Fe County in 1953 comprised a small tonnage each of lead-zinc-silver ore from the Pennsylvania mine, of lead-silver ore from the Cash Entry group in the Cerrillos district, and of copper-silver ore from the Parachute-Bail-Fulton-Lucky Fraction and San Pedro Copper groups in the San Pedro or New Placers district. A little placer gold was recovered near Golden.

The Santa Fe Pumice Co. White Eagle mine near Totavi produced a large quantity of pumice. Before being shipped the pumice rock was run through a roll crusher and screened with vibrating screens. The entire production was used for concrete aggregate, including precast building blocks and tile. Shipments were made to buyers in New Mexico and other States. The J. H. Rhodes Co. erected a grinding and sizing plant near Santa Fe producing pumice abrasives and polishing powders. The output of coal, the principal mineral product of the county, decreased.

SIERRA

Eight scattered mines and prospects, all small producers, contributed to the output of gold, silver, lead, and zinc in Sierra County in 1953. The Snake group near Hillsboro produced most of the gold; the ore, removed from the mine in a salvage operation from 1947 to 1949, was concentrated in 1953 by sorting and screening several times, after which the residue was trucked to points where water was available, and the gold was removed by the use of a small gasoline-powered gold saver and amalgamator. S. A. Wood shipped some gold ore from a prospect, and a little placer gold was recovered on the Mocking Bird claim, both in the Hillsboro district. A small lot of gold was produced from the Lookout claim in the Tierra Blanca district. Shippers of ore yielding base metals and silver were the Haile group (including the Miner's Dream, Lady Franklin, and other claims), Stowe claim, and Calamity Jane (dump) in the Kingston district;

Pelican in the Hermosa (Lower Palomas Creek) district; and Blue Jay in the Pittsburg (Caballos Mountains) district.

Shippers of manganese ore to the Government Ore-Purchasing Depot at Deming included the Big Hat, Black Chief, Ellis (Tower), Good Luck and Metal Reserve, Iron King, Lake Valley, Lucky Strike, Morey, Mustain, Palma Nos. 1 & 2, Riverside and Terrill properties. The Tower Mining & Refining Co. mill at Truth or Consequences treated mine-run ore and old tailings.

Some fluorspar was shipped from the White Star claim by Blanchard Hanson.

SOCORRO

In the Hansonberg district (Bingham) the Portales Mining Co. operated continuously the Louise-Halstead-Hansonberg-Prairie Spring group of open-pit lead mines. The ore was trucked 33 miles to the company gravity-concentration mill at San Antonio for treatment. Although the output of lead concentrate increased 10 percent over 1952, the company reported that the lead price in 1953 was too low to show any profit. The Mex-Tex Mining Co. continued to operate its group of mines, comprising the Royal Flush and other claims 5 miles south of Bingham. The mine is developed by open pit and horizontal tunnels. The ore contained lead and barites as commercial minerals and was trucked 35 miles to the company jig mill near San Antonio for concentration. The Sorrels Mining Co. shipped a small tonnage of lead concentrate from the Major Jones mine, equipped with a gravity-concentration mill.

In the Magdalena district the Lynchburg zinc-lead-silver mine of the New Jersey Zinc Co., Empire Zinc Division, operated under lease by C. S. Elayer, continued to be the largest metal producer, but output in 1953 was less than in 1952 because of curtailment in operations during the summer and the shutdown in September necessitated by the declining prices of zinc and lead. The ore produced was shipped to the custom mill of the American Smelting & Refining Co. at Deming. MacDonald & Dobson, operating the Nitt group, shipped a car of zinc ore to the Peru mill at Deming in January 1953 and continued to ship copper-silver ore to the El Paso smelter throughout the year. Lessees operated the Waldo group of the American Smelting & Refining Co. part of the year. Other small producers of nonferrous metal ores included the Bluestone claim and the El Tigre, Juanita, Mistletoe, Queen, and "Sixty" Copper (Thurmond) groups. Other output from Socorro County included shipments of low-grade copper ore by C. J. Barnhisel from a claim in the Scholle area and by V. F. Foy from the Buckeye group in the Silver Mountain district, and a car of lead-silver ore from the Sunset claim in the Silver Mountain district.

The following claims or properties shipped manganese ore to the Government Ore-Purchasing Depot at Deming: Black Cat No. 2, Black Crow, Black Jack, Grand Canyon, Hall, Knox, Manganese Queen, Nameth & Harper, Romero, Santa Rita Nos. 1 & 2, Socorro Mining & Smelting Co., Socorro Manganese, Van Pelt, and Westhafer.

The Great Lakes Carbon Corp., Perlite Division, continued to be a large producer of perlite at its quarry and processing plant near Socorro.

TAOS

The F. E. Schundler & Co., Inc., operated its No Agua open-pit perlite mine and processing plant near Tres Piedras at a greatly increased production rate over 1952.⁷ Most of the perlite was shipped to expanding plants outside the State.

The Molybdenum Corp. of America operated its molybdenum mine near Questa 307 working days in 1953; the ore produced was treated in the company mill at the mine.

The Harding pegmatite mine of Arthur Montgomery near Dixon, opened by an open pit and an adit, produced 88 short tons of beryl averaging 11 percent BeO in 1953. Five men were employed 25 days a month throughout the year.

UNION

Union County was the largest quantity producer of pumice in New Mexico in 1953, but the value per ton was lower than in most other counties owing to the fact that a large part of the output was shipped for railroad ballast. The producing properties were the Colorado & Southern Railway Co. ballast pit and the New Mexico Aggregate Corp. quarries (operated by the Twin Mountain Rock Co.) on the Twin Mountains a few miles north of Des Moines.

VALENCIA

The new uranium ore-processing plant for limestone-type ores at Bluewater near Grants was completed in September 1953 by the Anaconda Copper Mining Co. Under contractual agreement between the company and the Atomic Energy Commission, the plant processed ores purchased from other producers, as well as company-owned ores. The company was contemplating construction of additional facilities to treat the sandstone-type ores being produced in the area and stock-piled at the Government Ore-Buying Depot at Grants. Activity in uranium mining and prospecting in the Grants area were sustained throughout the year. The producers in Valencia County included the Anaconda mine, with underground mining, and the Red Bluff Nos. 8 and 10 (E. & M. Mining Co.), Uranium (Uranium Development Corp.), and several other open-pit mines. In addition to the deposits near Grants, important deposits of sandstone-type ores (carnotite) were being developed on the Laguna Indian Reservation about 50 miles southeast of Grants.

In January 1953 the United States Gypsum Co. purchased the mining property of the Pumice Corp. of America 9 miles north of Grants and the mill at Grants. The pumice mine was abandoned, and a perlite deposit on the property was opened. Shipments of perlite were begun in February and continued through the year. The mill was remodeled for processing perlite by crushing, grinding, and drying (when wet).

Crude fluor spar cleaned up by Joe Griego at the Zuni property southwest of Grants was shipped to the Zuni Milling Co. mill at Los Lunas (closed in 1953). The mine was shut down to a watchman basis as of September 1.

A large tonnage of stone was quarried and crushed at the Sais quarry southeast of Belen and shipped for railroad ballast and concrete and road metal.

⁷ Pit and Quarry, Expansion and Improvement Mark Growth of Schundler Perlite Mining Operation: Vol. 45, No. 12, June 1953, pp. 99-100.

The Mineral Industry of New York

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the New York State Science Service, Office of Geology.

By Alvin Kaufman¹



NEW YORK mineral production in 1953 increased 3 percent in value compared with 1952 but was 1 percent less than the record established in 1951. The rise was due largely to increased output of cement, iron ore, zinc, and lead, accompanied by higher total values.

The mineral industries were principally concerned with producing industrial (nonmetallic) minerals, which contributed .63 percent of the total value. Metals and fuels were responsible for 28 and 9 percent, respectively. The principal producing counties, largely cement and iron-ore areas, were Columbia, Erie, Essex, Greene, and St. Lawrence. Cement manufacture remained the leading element in the mineral economy in 1953. Production of iron ore ranked second; stone and sand and gravel output were in third and fourth place.

In addition to the mineral values credited to New York in table 1, some are omitted, owing to lack of information.

Many lead and zinc ores contain valuable minor constituents, such as bismuth and cadmium. These quantities sometimes are not known; and sometimes, though known by analyses, are not accounted for metallurgically in early processing stages or credited to mine or origin. These minor constituents are recovered at smelting plants that frequently treat mixtures of materials from many sources, including residues from the refining of metals, such as copper, lead, and others, and in other ways. It is impossible in many such instances to distribute the mineral products by States of origin, and sometimes it is even difficult to obtain an accurate separation as to domestic and foreign sources. Another valuable mineral product, the output of which usually cannot be separated as to sources, is byproduct sulfuric acid.

REVIEW BY MINERAL COMMODITIES

METALS

Iron Ore.—Crude ore and usable iron-ore shipments increased 20 and 18 percent, respectively, compared with 1952. Usable ore included direct-shipping ore (mined product requiring no treatment), washed ore, concentrate, and sinter. New York remained the fourth largest crude-ore and the fifth largest usable-ore producing State in the Nation in 1953 and supplied 6 percent of the domestic crude and 3 percent of the usable iron-ore output.

¹ Commodity-industry analyst, Region VIII, Bureau of Mines, Pittsburgh, Pa.

TABLE 1.—Mineral production in New York, 1952-53¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement ² 376-pound barrels.....	14,624,274	\$36,679,379	14,965,164	\$39,388,183
Clays.....	1,218,850	1,291,736	960,791	1,303,281
Emery.....	10,352	141,911	10,562	143,974
Gypsum.....	1,143,930	3,816,148	987,156	3,507,207
Iron ore (usable)..... long tons, gross weight.....	2,896,531	34,514,879	3,414,839	36,346,279
Lead (recoverable content of ores, etc.).....	1,120	360,640	1,435	375,970
Natural gas..... million cubic feet.....	3,627	1,059,000	2,347	742,000
Peat.....	(³)	(³)	3,775	46,307
Petroleum (crude)..... thousand 42-gallon barrels.....	4,242	17,940,000	4,800	4 16,260,000
Salt (common).....	3,417,443	16,746,462	3,322,659	17,351,111
Sand and gravel.....	20,270,038	18,287,623	22,530,891	23,493,857
Silver (recoverable content of ores, etc.)..... troy ounces.....	38,895	35,202	35,398	32,037
Slate.....	125,930	1,810,865	113,575	1,735,332
Stone (except limestone for cement and lime).....	16,234,549	25,244,245	15,961,657	5 25,250,576
Talc.....	4 149,837	4 4,069,771	7 156,299	7 940,541
Zinc (recoverable content of ores, etc.).....	32,636	10,835,152	51,529	11,851,670
Undistributed: A brasive stone (1953), natural cement, abrasive garnet, lime, calcareous marl, pyrites (1952), stone (crushed unclassified, 1953), recovered elemental sulfur (1952), titanium concentrate, wollastonite, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 3). Excludes value of clays used for cement.....		\$ 7,917,911		8,102,030
Total New York.....		\$180,751,000		186,868,000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

² Excludes natural cement, value for which is included with "Undistributed."

³ Value included with "Undistributed."

⁴ Final figure. Supersedes preliminary figure given in commodity chapter.

⁵ Excludes certain stone value for which is included with "Undistributed."

⁶ Sold or used by producers. Quantity and value of ground material.

⁷ Mine production of crude material.

⁸ Revised figure.

Waste rock at several beneficiation plants yielded material of economic value. At the MacIntyre mine, Essex County, titanium concentrate (ilmenite) was recovered from nonmagnetic mill tailing. Martite, the nonmagnetic iron oxide, was recovered from tailing at the Benson mine in St. Lawrence County. At several mines, such as the Republic Steel Corp. Chateaugay mine in Clinton County, rejected waste rock was processed and sold for highway construction and maintenance and for use in preparing concrete.

During 1953 there were 6 active iron-ore mines in New York—1 in Clinton County, 3 in Essex County, 1 in Oneida County, and 1 in St. Lawrence County. The largest producing mine in the State, and fourth in the United States, was the Jones & Laughlin Ore Corp. Benson open-pit mine near Starlake, St. Lawrence County. The second largest property was Republic Steel Corp. New Bed-Harmony-Old Bed mine near Mineville, Essex County. Of the 8,691,000 long tons of crude ore produced in New York in 1953, 63 percent was mined by open-pit methods. Most of the iron ore from New York mines was consumed in furnaces in the Pittsburgh, Pa., area.

Silver, Lead, and Zinc.—St. Joseph Lead Co. operated its Balmat and Edwards mines continuously during 1953 for the production of silver, lead, and zinc. Mine output of the latter 2 metals increased 28 and 58 percent, respectively, compared with 1952. The production

TABLE 2.—Production and shipments of iron ore, 1944-48 (average) and 1949-53

Year	Number of mines	Crude ore mined (long tons)	Usable ore shipped (long tons)	Value
1944-48 (average).....	7	5,128,547	2,051,643	\$16,465,224
1949.....	7	6,051,162	2,344,518	22,184,757
1950.....	7	6,722,422	2,917,257	27,914,818
1951.....	7	7,741,434	3,649,531	39,819,368
1952.....	6	7,267,202	2,896,531	34,514,879
1953.....	6	8,691,395	3,414,859	36,346,279

of silver dropped 3,500 fine ounces from 38,900 ounces in 1952 to 35,400 in 1953.

TABLE 3.—Mine production of silver, lead, and zinc, 1944-48 (average) and 1949-53, in terms of recoverable metals

Year	Mines producing	Material sold or treated (short tons)	Silver		Lead		Zinc		Total value
			Fine ounces	Value	Short tons	Value	Short tons	Value	
1944-48 (average).....	3	408,573	19,298	\$15,627	1,261	\$303,353	32,343	\$7,846,515	\$8,165,495
1949.....	3	504,105	18,378	16,633	1,317	416,172	37,973	9,417,304	9,850,109
1950.....	3	494,871	32,628	29,530	1,484	400,680	38,321	10,883,164	11,313,374
1951.....	2	500,490	47,568	43,051	1,500	519,000	40,051	14,578,564	15,140,615
1952.....	2	437,099	38,895	35,202	1,120	360,640	32,636	10,835,152	11,230,994
1953.....	2	646,041	35,398	32,037	1,435	375,970	51,529	11,851,670	12,259,677

Titanium (Ilmenite).—Titanium concentrate was produced at the National Lead Co. MacIntyre mine at Tahawus, Essex County. This property continued to supply over half the total United States output of ilmenite.

NONMETALS

Cement.—New York ranked fifth in the United States in 1953 in output of portland and natural cements. In all 12 plants were active. In terms of value, cement ranked first among the mineral products of the State. Production and shipments of portland cement increased 3 and 2 percent, respectively, over 1952 and were the largest ever recorded. Producing counties in 1953, in order of decreasing output, were Columbia, Erie, Greene, Warren, Schoharie, and Onondaga.

Natural cement was produced in New York in 1953 at an advanced rate compared with the previous year. Output was centered in Erie and Ulster Counties.

TABLE 4.—Production and shipments of portland cement, 1944-48 (average) and 1949-53

Year	Production (barrels)	Shipments		Year	Production (barrels)	Shipments	
		Barrels	Value			Barrels	Value
1944-48 (average)	8,663,458	8,879,416	\$16,105,765	1951.....	14,065,862	13,862,522	\$34,687,090
1949.....	12,734,887	12,679,906	28,483,681	1952.....	14,515,086	14,624,274	36,679,379
1950.....	13,054,556	13,271,469	30,895,295	1953.....	15,018,470	14,965,164	39,388,183

Clays.—Although clay and shale deposits suitable for the manufacture of clay products occur in a number of localities in New York, exploitation was limited to areas in eight counties. In all, 17 pits were worked during the year—4 in Ulster County, 3 each in Albany and Erie Counties, 2 each in Rensselaer and Onondaga Counties, and 1 each in Orange, Nassau, and Broome.

Emery.—In 1953, as in recent years, the entire domestic supply of emery came from the Kingston and De Luca mines southeast of Peekskill, Westchester County. Output from these properties was used as a nonskid agent in concrete floors and steps and for abrasive purposes, such as the preparation of emery cloth, grinding wheels, and similar products.

TABLE 5.—Emery sold or used by producers, 1944-48 (average) and 1949-53

Year	Short tons	Value		Year	Short tons	Value	
		Total	Average per ton			Total	Average per ton
1944-48 (average).....	6,437	\$67,854	\$10.54	1951.....	11,634	\$160,212	\$13.77
1949.....	4,909	60,017	12.23	1952.....	10,352	141,911	13.71
1950.....	5,949	75,308	12.66	1953.....	10,582	143,974	13.63

Garnet.—New York continued to be the principal domestic source of garnet in 1953. There were 2 active producers, the larger being the Gore Mountain deposit of Barton Mines Corp., 5 miles west of North Creek, Warren County. Cabot Carbon Co., Cabot Minerals Division, continued to produce byproduct garnet from its Willsboro wollastonite deposit, Essex County.

Gypsum.—New York ranked fifth among gypsum-producing States in the Nation in 1953, dropping from third place the previous year. The State's gypsum deposits were worked by five companies in Erie, Genesee, and Monroe Counties.

The leading producer of crude gypsum was the United States Gypsum Co., with mines and plants in the vicinity of Oakfield, Genesee County. Other producers, in order of decreasing output, were National Gypsum Co., Clarence Center, and Certain-teed Products Corp., Akron, both in Erie County; Ebsary Gypsum Co., Inc., Wheatland Station, Monroe County; and Universal Atlas Cement Co., Clarence Center, Erie County. Calcined gypsum was produced at each of the above plants with the exception of the Universal Atlas Cement Co. operation.

Imported crude gypsum from New Brunswick and Nova Scotia was treated in the calcining plants of National Gypsum Co., Bronx, Bronx County, and United States Gypsum Co., New Brighton, Richmond County.

Lime.—Lime production in New York in 1953 increased 5 percent from 1952. Quicklime and hydrated lime for a variety of uses were produced by 3 operators—1 each in Clinton, Erie, and St. Lawrence Counties. The largest producer was the Kelley Island Lime & Transport Co. at Buffalo, Erie County.

Marl (Calcareous).—Calcareous marl for agricultural uses was produced in New York in 1953 by Louis J. Johnston from a deposit in Livingston County.

TABLE 6.—Production of crude gypsum, 1944-48 (average) and 1949-53

Year	Number of active mines	Short tons	Value	
			Total	Average per ton
1944-48 (average).....	7	828,940	\$2,052,207	\$2.48
1949.....	6	916,117	2,805,154	3.06
1950.....	6	1,280,100	3,876,176	3.03
1951.....	5	1,259,484	4,010,766	3.18
1952.....	5	1,143,920	3,816,148	3.34
1953.....	5	987,156	3,507,207	3.55

Pyrites.—Pyrite concentrate, recovered as a byproduct of lead and zinc mining and milling in St. Lawrence County, was sold to sulfuric acid manufacturers in 1953.

Salt.—New York continued in 1953 to rank second to Michigan in the production of salt in the United States. Output was recovered from deposits that were either mined as such by underground methods or used as sources of artificial brines. In the latter method the brine was either used directly in manufacturing other sodium salts or evaporated. Producing counties, in order of decreasing output, were Onondaga, Livingston, Tompkins, Schuyler, and Wyoming.

TABLE 7.—Salt sold or used by producers, 1944-48 (average) and 1949-53

Year	Evaporated salt		Rock salt and salt in brine		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1944-48 (average).....	459,783	\$5,296,765	2,458,324	\$5,765,614	2,918,107	\$11,062,379
1949.....	417,518	5,535,001	2,534,232	7,174,818	2,951,750	12,709,819
1950.....	487,245	6,375,966	2,319,682	8,029,396	2,806,927	14,405,362
1951.....	502,216	6,419,061	3,016,499	10,133,829	3,518,715	16,552,890
1952.....	508,317	6,674,698	2,909,126	10,071,764	3,417,443	16,746,462
1953.....	532,924	7,832,362	2,789,735	9,518,749	3,322,659	17,351,111

Sand and Gravel.—New York was one of the leading sand-and-gravel-producing States in the Nation. In 1953, 51 of New York's 62 counties reported production. The principal commercial producing counties in 1953, in order of decreasing output, were Nassau, Suffolk, and Erie. The total production of these 3 counties constituted 64 percent of the commercial State output during the year. Demand for sand and gravel in the New York City area was supplied largely by producers in Nassau and Suffolk Counties.

A substantial portion (43 percent) of the total output of sand and gravel sales in 1953 was for building aggregate. Paving sand and gravel ranked second in value, with specialized sands and gravels following.

Slate.—Slate quarrying in New York was centered in northeastern Washington County just west of the Vermont State line. The quantity of slate produced in 1953 declined 10 percent from 1952. Nearly 99 percent of the value of New York slate sales in 1953 was from granules, flour, and flagging.

TABLE 8.—Sand and gravel sold or used by producers, 1952–53, by classes of operations and uses

	1952		1953	
	Short tons	Value	Short tons	Value
COMMERCIAL OPERATIONS				
Sand:				
Molding	371,063	\$1,054,758	292,915	\$835,498
Building	5,599,746	5,165,548	6,050,568	6,535,419
Paving	4,912,807	4,212,718	5,120,423	5,193,269
Filter	44,190	37,522	62,789	61,118
Other	127,693	85,145	174,866	102,855
Gravel:				
Building	3,180,138	3,854,060	3,463,115	4,767,410
Paving	3,438,375	3,053,246	3,721,360	3,980,578
Other	361,647	211,363	501,196	283,853
Undistributed.....	102,180	49,615	78,362	44,551
Total commercial sand and gravel.....	18,137,789	17,723,975	19,465,594	21,804,551
GOVERNMENT-AND-CONTRACTOR OPERATIONS ¹				
Sand:				
Building	59,582	10,772	56,887	30,588
Paving	193,053	56,608	199,768	41,054
Gravel:				
Building	54,711	4,178	94,326	15,119
Paving	1,824,923	492,090	2,714,316	1,602,545
Total Government-and-contractor sand and gravel.....	2,132,269	563,648	3,065,297	1,689,306
Grand total.....	20,270,058	18,287,623	22,530,891	23,493,857

¹ Includes figures for State, counties, municipalities, and other Government agencies.

TABLE 9.—Slate sold by producers, 1944–48 (average) and 1949–53, by uses

Year	Oper-ators	Roofing		Flagging, granules, flour, and other uses		Total value
		Squares (100 square feet)	Value	Short tons	Value	
1944–48 (average).....	10	946	\$22,607	115,828	\$1,160,812	\$1,183,419
1949.....	16	280	12,616	122,075	1,604,481	1,617,097
1950.....	21	800	38,874	150,860	2,015,851	2,054,725
1951.....	19	450	19,580	125,880	1,980,526	2,000,106
1952.....	20	600	21,456	125,694	1,789,409	1,810,865
1953.....	20	566	20,037	113,345	1,713,295	1,733,332

Stone.—Stone ranked third in value of the total mineral output in New York in 1953. Production was virtually the same as in the previous year and consisted of limestone, basalt, sandstone, granite, and marble. These were mostly crushed or broken to varying dimensions for use in highway and railroad construction and maintenance, concrete aggregate, and riprap. The principal stone-producing counties, in order of decreasing value of output, were Rockland, Dutchess, and Onondaga.

TABLE 10.—Stone sold or used by producers, 1944–48 (average) and 1949–53

Year	Short tons	Value	Year	Short tons	Value
1944–48 (average).....	9,836,024	\$12,309,571	1951.....	15,559,372	\$24,326,118
1949.....	13,022,070	18,160,387	1952.....	16,234,549	25,244,245
1950.....	13,121,850	19,728,957	1953.....	15,961,657	25,250,576

¹ Excludes miscellaneous crushed stone.

Talc.—New York supplied 25 percent of the total domestic output of crude talc, pyrophyllite, and soapstone in 1953 from operations near Gouverneur, St. Lawrence County.

Wollastonite.—The Bristol Mountain deposit of Cabot Mineral Division, Cabot Carbon Co., Near Willsboro, Essex County, continued to be the only commercial source of wollastonite in the United States.

MINERAL FUELS

Natural Gas.—Natural-gas production in New York came principally from wells in Allegany and Steuben Counties. Marketed output in the State in 1953 declined 35 percent compared with the previous year.²

Producing gas wells, as of December 31, 1953, totaled 1,300, a drop of 60 from the 1952 year-end figure. Approximately one-third of the State's natural-gas output came from wells in the Oriskany sandstone; wells in the Medina sandstone yielded the remainder.

The American Gas Association Committee on Natural-Gas Reserves estimated proved recoverable reserves in New York to be 71,004 million cubic feet on December 31, 1953. At the end of 1952 reserves had been estimated at 68,640 million cubic feet.

Peat.—Output of peat in 1953 came from 2 bogs in Seneca County and, as in recent years, was sold for agricultural purposes.

Petroleum.—Virtually all crude-oil production in New York in 1953 resulted from secondary-recovery methods. Nearly 75 percent of the output came from the Allegany field in Allegany and Steuben Counties; wells in Cattaraugus County yielded the remainder.

The Committee on Petroleum Reserves of the American Petroleum Institute estimated proved reserves of crude oil in New York on December 31, 1953, to be 49 million barrels. The number of producing wells in the State decreased from 22,950 in 1952 to 22,730 in 1953. In both years the average production per well per day was 0.5 barrel.

TABLE 11.—Petroleum production, 1944–48 (average), 1949–53, and total, 1864–1953

Year	Thousand barrels (42 gallons)	Value (thousand dollars)	Year	Thousand barrels (42 gallons)	Value (thousand dollars)
1944–48 (average).....	4, 718	18, 924	1951.....	4, 254	17, 990
1949.....	4, 425	15, 750	1952.....	4, 242	17, 940
1950.....	4, 143	15, 660	1953.....	3, 800	16, 260
			1864–1953.....	189, 307	1 430, 646

¹ Value shown for 1900–53 only.

REVIEW BY COUNTIES

ALBANY

Mineral products of Albany County in 1953, in order of decreasing value of output, were sand and gravel, stone, and clays. The South Bethlehem quarry of Callanan Road Improvement Co. yielded crushed limestone, which was utilized for highway and railroad maintenance, blast-furnace flux, agricultural purposes, and asphalt filler.

² Comprises gas sold or consumed by producers, including losses in transmission, amounts added to storage, and increases in gas in pipelines.

Two commercial sand and gravel operations were active during the year. Molding sand was recovered from pits at Selkirk and Slingerlands by Selkirk Molding Sand Co., Inc., and Whitehead Bros. Co., respectively.

Clays produced in 1953 were limited to miscellaneous clays used for manufacturing brick and heavy clay products. Producers active during the year included Sutton & Suderlay Brick Co., Roah Hook Brick Co., and Powell & Minnock Brick Works, all at Coeymans.

ALLEGANY

Building and paving sand and gravel were produced during the year by The Buffalo Slag Co., Alfred-Atlas Gravel & Sand Corp. from pits at Alfred Station, and Thomas Moogan.

TABLE 12.—Value of mineral production in New York, 1952-53, by counties, and principal minerals produced in 1953

	1952	1953	Principal minerals produced in 1953
Albany.....	\$1, 588, 128	\$2, 471, 308	Sand and gravel, stone, clays.
Allegany.....	179, 724	304, 930	Sand and gravel.
Broome.....	583, 248	524, 855	Sand and gravel, clays, stone.
Cattaraugus.....	381, 697	410, 008	Sand and gravel.
Chautauqua.....	164, 609	180, 099	Do.
Columbia.....	11, 019, 820	11, 385, 987	Sand and gravel, cement.
Cortland.....	20, 000	110, 253	Sand and gravel.
Delaware.....	224, 770	354, 703	Sand and gravel, stone.
Erie.....	15, 542, 603	17, 280, 473	Clays, sand and gravel, stone, cement, gypsum, lime.
Fulton.....	34, 949	34, 117	Sand and gravel.
Genesee.....	2, 859, 916	3, 141, 287	Sand and gravel, stone, gypsum.
Greene.....	8, 581, 517	8, 428, 314	Sand and gravel, cement.
Herkimer.....	510, 709	359, 933	Sand and gravel, stone.
Lewis.....	620, 593	7, 069	Sand and gravel.
Livingston.....	6, 679, 231	6, 256, 373	Sand and gravel, marl, salt.
Monroe.....	2, 155, 927	1, 568, 119	Sand and gravel, stone, gypsum.
Nassau.....	5, 118, 400	7, 385, 983	Clays, sand and gravel.
Onondaga.....	5, 328, 444	6, 144, 281	Clays, sand and gravel, stone, cement, salt.
Orange.....	591, 280	470, 513	Clays, sand and gravel.
Otsego.....	67, 510	64, 300	Sand and gravel.
Rockland.....	5, 886, 868	5, 413, 291	Sand and gravel, stone.
Saratoga.....	694, 865	752, 992	Do.
Schenectady.....	382, 085	441, 031	Sand and gravel.
Schoharie.....	2, 105, 090	2, 275, 616	Stone, cement.
Schuyler.....	3, 374, 271	3, 952, 583	Salt, sand and gravel.
Steuben.....	127, 283	267, 277	Sand and gravel.
Suffolk.....	3, 925, 068	4, 550, 909	Do.
Tompkins.....	4, 114, 422	4, 007, 858	Stone, salt.
Ulster.....	729, 001	1, 115, 017	Clays, sand and gravel, stone.
Warren.....	4, 470, 225	4, 632, 896	Sand and gravel, stone, cement.
Wayne.....	76, 387	15, 878	Sand and gravel, stone.
Wyoming.....	1, 502, 686	1, 951, 648	Stone, salt.
Yates.....	7, 002	3, 934	Sand and gravel.
Undistributed ¹	91, 523, 696	90, 604, 165	
Total.....	180, 751, 000	186, 868, 000	

¹ Includes Cayuga, Chemung, Chenango, Clinton, Dutchess, Essex, Franklin, Hamilton, Jefferson, Kings, Madison, Montgomery, Niagara, Oneida, Ontario, Orleans, Oswego, Putnam, Rensselaer, St. Lawrence, Sullivan, Tioga, Washington, Westchester Counties.

Crude petroleum and natural gas continued to be recovered from wells in the southern part of the county. The total production of crude oil from Allegany County pools was by far the largest of any county in the State. All drilling of oil wells during the year was in conjunction with secondary-recovery operations by water flooding.

BROOME

Three commercial sand and gravel producers were active in Broome County in 1953. Barney & Dickenson, Inc., recovered building sand and building and paving gravel from its pit at Vestal on the Susquehanna River. Binghamton Crushed Stone & Gravel Co. worked its pit on Front Street in Binghamton throughout the year and produced material for use in building construction in the immediate area. Royal Winne operated a pit near Vestal. Miscellaneous clays for brick manufacture were produced at the Binghamton pit of Binghamton Brick Co., Inc. Miscellaneous dimension stone was a product of the Clarence Chamberlain and George Wilbur quarries in New York across the State line from Hickory Grove, Pa.

CATTARAUGUS

Crude petroleum, natural gas, and sand and gravel were produced in Cattaraugus County in 1953. Wells in the southern part of the county yielded oil and gas from the north end of the Bradford, Pa., field. All drilling of oil wells during the year was in conjunction with secondary-recovery operations by water flooding.

The Buffalo Slag Co., Inc., worked its pits at Allegany and Franklinville throughout the year and produced building and paving sand and gravel. Pits were mined near Allegany by E. F. Lippert & Co. and William Lippert. Other sand and gravel producers in 1953 included Ray Vogtli & Son, Gowanda.

CAYUGA

The Auburn quarry of General Crushed Stone Co. yielded crushed limestone for use in highway and railroad construction and maintenance and for riprap. Building sand and gravel was produced by J. J. Harrington at his pit and fixed plant at Sennett.

CHAUTAUQUA

Mineral production in Chautauqua County in 1953 was limited to sand and gravel and natural gas. The largest commercial sand and gravel operator was W. Lee Bull, Inc., with a pit and fixed plant near Jamestown. Sack Bros. worked its pit and plant at Bemus Point and produced building sand and gravel for use in the immediate area. Sand and gravel for local building purposes was produced at a pit near Fredonia by Seybold Bros., Inc. Natural gas continued to be recovered from wells drilled in the Medina sandstone.

CHEMUNG

Two commercial sand and gravel producers were active in Chemung County in 1953. Dalrymple Gravel & Construction Co., Inc., worked its pit and fixed plant near Elmira during part of the year. Building and paving sand and gravel were produced at the pit and fixed plant of Elmira Transit-Mix, Inc., Horseheads. Natural gas was recovered from one field during the year.

CHENANGO

Sand and gravel, the only mineral product of Chenango County in 1953, was recovered from pits worked by Bundy Concrete Co., Sherburne, and Henry M. Champion, Greene.

CLINTON

Clinton County ranked sixth among New York counties in value of mineral output in 1953; iron ore represented nearly 95 percent of the total value. Other mineral commodities produced in the county during the year included stone, lime, and sand and gravel. Republic Steel Corp. continued to produce magnetite iron ore at its Chateaugay underground and open-pit mines at Lyon Mountain.

Stone production in the county in 1953 was limited to limestone and miscellaneous stone. Crushed limestone was quarried by Chazy Lime & Stone Co., Inc., and Plattsburg Stone Products Corp. for use in highway maintenance and agricultural purposes. Republic Steel Corp. produced miscellaneous crushed stone for highway construction and railroad ballast at its Chateaugay mine near Lyon Mountain. This material was a byproduct of operations for recovering iron ore. International Lime & Stone Co. continued to produce quicklime and hydrated lime for chemical uses at its plant near Chazy.

Sand and gravel for highway maintenance was produced at several pits in the county by the Clinton County Highway Department, Plattsburg.

COLUMBIA

Columbia County exceeded all other New York counties in the production of cement and again ranked fourth among counties of the State in aggregate value of mineral output in 1953. Universal Atlas Cement Co. operated its mill and quarry on Becraft Mountain south of Hudson throughout the year. Near-capacity production was reported at the Greenport plant of Lone Star Cement Co. south of Hudson.

Building and paving sand and gravel were produced by Columbia Sand & Gravel Co. and from a pit at Livingston by F. H. Stickles & Son. Whitehead Bros. Co. recovered molding sand from pits at Stuyvesant. A quantity of bank-run gravel was produced by Gardner Bros., Stuyvesant.

CORTLAND

F. H. Eldridge produced a small quantity of sand and gravel in Cortland County in 1953.

DELAWARE

The North River quarry of American Bluestone Co. near Unadilla yielded rough and dressed sandstone for building construction. Other producers of dimension sandstone in Delaware County in 1953 included Johnston & Rhodes Bluestone Co., East Branch, and Earl Tompkins, Fishs Eddy. A small tonnage of sand and gravel for highway maintenance was produced by the Delaware County Highway Department at Delhi.

DUTCHESS

In terms of value, limestone was the most significant mineral product of Dutchess County in 1953. Two quarries were active during the year; the largest was the New York Trap Rock Corp. quarry at Clinton Point near New Hamburg. Output from this operation was used for riprap, highway and railroad maintenance, and stone sand. Dutchess Quarry & Supply Co. worked its quarry at Clinton Corners and produced crushed limestone for highway maintenance, asphalt filler, and a variety of other uses. This company also produced paving sand and gravel from a pit at Clinton Corners.

ERIE

Erie County ranked first in gypsum and lime production, second in cement output, and third in total value of mineral production among New York counties in 1953. Less important mineral products included natural gas, sand and gravel, stone, and clays.

Three gypsum producers were active during the year; the largest was National Gypsum Co., which worked its mine and plant at Clarence Center throughout the year. Other active producers were Certain-teed Products Corp. mine and plant at Akron and Universal Atlas Cement Co. mine near Clarence Center. The United States Gypsum Co. processed crude gypsum from its mines in Genesee County in its gypsum products plant at Buffalo.

Capacity production was reported from the Federal Portland Cement Co., Inc., Buffalo plant in 1953. During the year the company increased its cement-storage capacity 96,000 barrels. Lehigh Portland Cement Co. operated its plant at Buffalo at near capacity throughout the year. Limestone used was received in crushed form by boat from quarries in Michigan; the shale was mined by the company at Shaleton, 12 miles south of the plant. Natural cement continued to be produced by the Louisville Cement Co. of New York at its plant near Akron. Production was marketed for use in mortar in brick and stone work.

Stone production in the county in 1953 was limited to crushed limestone from three active quarries. Buffalo Crushed Stone Corp. worked its quarry at Bowmansville throughout the year and produced rock for use in highway and railroad maintenance. The Cheektowaga quarry of Federal Crushed Stone Corp. was operated during the summer months; production was utilized for riprap, concrete, road material, railroad ballast, agricultural purposes, and asphalt filler. The Kelley Island Lime & Transport Co., the largest lime producer in New York in 1953, produced quicklime and hydrated lime for chemical, building, and agricultural purposes at its plant at Buffalo.

Expanded perlite was produced at the Cheektowaga plant of Buffalo Perlite Corp.

Five commercial sand and gravel pits were in operation during 1953. Buffalo Sand Co., Inc., worked its fixed plant and pit near Lancaster throughout most of the year and produced building and paving sand and gravel. Gravel Products Corp. continued to work its dredge on Lake Erie near Buffalo and produced a substantial tonnage of paving sand and gravel. Other sand and gravel producers included Clarence Sand & Gravel Corp., Clarence; Meyer & Meyer, who produced bank-

run gravel at pits in Lancaster and Alden; and Pfohl Bros., Inc., Cheektowaga.

Acme Shale Brick Co., Inc., the largest clay producer in the county in 1953, manufactured brick and heavy clay products from miscellaneous clays recovered at its pit near Lake View. Other producers of clays, in order of decreasing output, included John H. Black Co., East Aurora, and Buffalo Brick Corp., West Falls.

ESSEX

In addition to ranking first in usable iron-ore output and third in total value of mineral production among counties in New York in 1953, Essex County mines continued to be the sole domestic commercial source of wollastonite and the principal domestic supplier of titanium (ilmenite) concentrate.

National Lead Co. continued during the year to recover iron and titanium concentrates from titaniferous magnetite ores at its MacIntyre mine and mill at Tahawus. This property was the fourth largest producer of iron ore in New York State in 1953. Tailing from the magnetite separation was treated for recovery of titanium (ilmenite) concentrate and an iron product, which was sintered and sold to blast-furnace operators. Titanium (ilmenite) concentrate produced during 1953 was shipped to the National Lead Co. plant at Sayreville, N. J., and E. I. du Pont de Nemours & Co., Inc., plants at Edge Moor, Del., and Baltimore, Md., for manufacture of titanium pigments. Republic Steel Corp. worked its New Bed-Harmony-Old Bed and Fisher Hill underground mines near Mineville throughout the year. Ore from the New Bed-Harmony-Old Bed property was crushed at the mine and shipped by rail for concentration and sintering at the company Bartlett Pond Brook mill 3 miles northwest of Port Henry. Although the bulk of the material shipped from this property was in the form of concentrate and sinter, some direct-shipping ore was produced from the Old Bed vein. All ore from the Fisher Hill mine, 2 miles north of Mineville, was concentrated in the Bartlett Pond Brook mill and sintering plant.

In 1953 Cabot Mineral Division, Cabot Carbon Co., continued development work on its wollastonite deposit in Essex County. Sand and gravel was produced during the year by Saranac Lake Sand & Gravel Co., Inc., from its pit and fixed plant at Saranac Lake.

FRANKLIN

Sand and gravel was the only mineral product of Franklin County in 1953. Louis Para produced building sand and gravel from his pit and fixed plant near Malone.

FULTON

Seven commercial sand and gravel plants were in operation in Fulton County in 1953. Art Stone Co. worked its pit and fixed plant at Gloversville during the first 3 months of the year and produced building sand and gravel. Bank-run gravel for maintaining county roads was produced at pits operated by Edward Bradt, Gloversville; John Edwards, north of St. Johnsville; and Norman Smith, Lassellsville. Other producers during the year included A. Frederick, Gloversville, and Fred Machold Estate, Broadalbin.

GENESEE

Gypsum continued in 1953 to be the leading mineral product in Genesee County, in terms of value. The only producer of crude material during the year was the United States Gypsum Co. mine and plant near Oakfield. National Gypsum Co. operated its mill in the western part of the county and produced calcined crude gypsum but did not produce crude material from its mine.

Stone produced during the year was limited to crushed limestone. General Crushed Stone Co. North Leroy No. 1 quarry was the principal source of this material in 1953 in Genesee County. Production was utilized for highway and railroad maintenance. Other producers during the year included Leroy Lime & Crushed Stone Corp., with a quarry at Le Roy, and Genesee Stone Products Corp., with a quarry at Stafford. Production from these quarries was used for highway and railroad construction. Some limestone for agricultural purposes was also produced at the Stafford quarry.

Two commercial sand and gravel pits, both in Batavia, were active in 1953. Operators included Batavia Washed Sand & Gravel Co., Inc., and Philip A. Penepent.

GREENE

Greene County ranked fifth among mineral-producing counties in New York in value of mineral output in 1953, largely as a result of the concentration of portland-cement-manufacturing plants in the county. These plants, all near the Hudson River, had the advantage of easy access to tidewater and to important markets on the Atlantic seaboard. Abundant reserves of limestone in the ledges of the Helderberg formation were available a short distance from the river. The Catskill plant of North American Cement Corp. at Alsen was operated at near capacity throughout 1953. Except for fuel and a few minor items, the raw materials consumed in manufacturing cement were quarried locally. Alpha Portland Cement Co. worked its plant at Cementon throughout the year and produced general-use, high-early-strength, and air-entrained portland cement. Lehigh Portland Cement Co. operated four cement kilns at Alsen, virtually at capacity throughout the year.

Sand and gravel for use in winter maintenance of highways was recovered from a pit at Windham by Lawrence Bros. Whitehead Bros. produced molding sand from pits at Catskill and Coxsackie.

HERKIMER

General Crushed Stone Co. worked its Jordanville quarry and crusher throughout the year and produced crushed limestone for riprap, road material, and agricultural purposes. A quarry at Newport was worked by Newport Quarries, Inc., and yielded crushed limestone for highway construction and maintenance.

Building sand for use in the immediate area was produced by F. J. Steber from a pit at Poland.

JEFFERSON

Mineral products of Jefferson County in 1953 were limited to sand and gravel and limestone. The Watertown pit of Colwell Bros. was worked several months during the year and yielded building sand and gravel. Angelo Vespa was also active. Building sand and gravel was produced by Tomlinson Bros. at its pit on Route 11 near Antwerp.

The Watertown quarry of General Crushed Stone Co. yielded crushed limestone, which was utilized for highway and railroad maintenance and for agricultural purposes.

KINGS

F. E. Grauwiller Transportation Co., Inc., worked its dredge near Barren Island in Rockaway Inlet an average of 20 days per month during the year and recovered sand, which was used for building, engine, filter, and railroad purposes.

LEWIS

Sand and gravel was recovered from pits worked by the Lewis County Highway Department, Lowville.

LIVINGSTON

Salt continued in 1953 to be the most important mineral product of Livingston County. As in previous years, the underground mine of International Salt Co., Inc., at Retsof yielded rock salt, which was milled, screened, and packaged for shipment at the company plant at the mine. The only commercial producer of sand and gravel during the year was Valley Sand & Gravel Corp., which operated a pit and fixed plant at Avon. Calcareous marl for agricultural uses was produced by Louis J. Johnston.

MADISON

Crushed limestone for road material, agricultural purposes, and riprap was the principal mineral product of Madison County in 1953. Output came from quarries at Munnsville and Perryville worked by Munnsville Limestone Corp. and Worlock Stone Co., Inc., respectively. A small tonnage of miscellaneous stone for use in rock gardens was produced by John Filose at a quarry near Chittenango.

MONROE

Mineral products of Monroe County in 1953, in order of decreasing value of output, were limestone, sand and gravel, and gypsum. Dolomite Products Co., only producer of limestone, worked its plants at Gates and Penfield throughout most of the year, producing crushed limestone for riprap, highway and railroad construction and maintenance, and agricultural purposes.

Sand and gravel for building and road construction in the Rochester area was produced by Elam Bros. Corp., John E. Redman Sand & Gravel Corp., and Rappl & Hoenig Co. Active producers at Spencerport included Ingersoll Supply & Equipment Corp. and a

lessee who worked a pit owned by Paul Harter. The largest producer in the county in 1953 was Valley Sand & Gravel Corp., which worked its pit and fixed plant south of Scottsville most of the year.

The one producer of gypsum in Monroe County in 1953 was Ebsary Gypsum Co., Inc., mine and mill near Wheatland Station. Both crude gypsum and manufactured products were produced.

MONTGOMERY

St. Johnsville Supply Co., Inc., operated the only sand and gravel pit and washer plant active in Montgomery County in 1953. The output was sold to the New York State Highway Department.

Crushed limestone for highway construction and maintenance was produced at a quarry west of Pattersonville by Crushed Rock Products, Inc. Cushing Stone Co., Inc., worked its quarry at South Amsterdam during the summer months and produced crushed limestone for riprap, highway construction, and railroad ballast.

NASSAU

Nassau County ranked first in the State in the production of sand and gravel in 1953. Of the 10 commercial operations, the largest was the Colonial Sand & Stone Co. plant and pit at North Hempstead. This company also worked its pit and plant at Port Washington. U. S. Dredging Corp. continued to produce paving sand and gravel at its dredge offshore at Huntington. Other large producers in 1953 included Metropolitan Sand & Gravel Corp., Port Washington; J. W. Robinson & Sons, Farmingdale; Flatland Sand Excavating Corp., Syosset; and Searington Sand & Gravel Co., Inc., Hicksville.

Nassau Brick Co., Inc., sole producer of clays in the county in 1953, manufactured common brick from clay recovered at its pit at Farmingdale.

NIAGARA

Mineral products of Niagara County in 1953 included limestone and sand and gravel. Frontier Stone Products, Inc., produced crushed limestone for road material and agricultural uses at its quarry at Lockport. Crushed limestone produced at the Niagara Stone Corp. Niagara Falls quarry was used in airport construction in the area. This quarry also yielded limestone, which was crushed for use as an asphalt filler. The Gasport quarry of Colorado Fuel & Iron Corp. was worked most of the year and yielded crushed limestone for metallurgical purposes, highway maintenance and construction, and agricultural uses.

Building and paving sand and gravel were produced at the Lockport pit and fixed plant of Gasport Sand & Gravel Co., Inc.

ONEIDA

Eastern Rock Products, Inc., worked its Oriskany Falls and Prospect quarries throughout the year and recovered limestone, which was crushed for use in railroad and highway construction and maintenance and for agricultural purposes.

Six commercial producers of sand and gravel were active in Oneida County in 1953. Molding sand for cores was produced by George W.

Bryant Core Sands, Inc., from its pit near McConnellsville. Molding sand was also produced at Whitehead Bros. Co., which worked its pit at McConnellsville during most of the year. The pits and plants of Eastern Rock Products, Inc., at Barneveld and Boonville yielded building and paving sand. Keith Lee, lessee on a pit near Barneveld, recovered bank-run paving gravel. Clinton Metallic Paint Co. continued to produce red iron for use as a pigment in paint manufacture at its mine and mill at Clinton.

ONONDAGA

Mines, pits, quarries, and wells in Onondaga County yielded stone, salt, cement, sand and gravel, and clays in 1953. Allied Chemical & Dye Corp., Solvay Process Division, worked its Jamesville quarry throughout the year and produced crushed limestone for a number of uses, including highway and railroad construction, agricultural purposes, and preparation of chemicals.

Artificial brines from water circulated in wells at Tully, which had tapped rock-salt beds, continued to be the source of evaporated salt and sodium compounds produced at the Allied Chemical & Dye Corp., Solvay Process Division, Solvay plant. Limestone quarried at the company Jamesville quarry, a few miles from Solvay, yielded carbon dioxide essential in preparing sodium compounds. Evaporated salt was produced by the vacuum-pan process.

Alpha Portland Cement Co. operated its cement plant at Jamesville at near capacity in 1953. Limestone used at this plant was obtained at the Jamesville quarry of Allied Chemical & Dye Corp., Solvay Process Division.

Building and paving sand and gravel were produced at the General Crushed Stone Co. fixed plant and pit near Fayetteville. R. E. McCarthy & Sons worked a portable plant and pit at Solvay and produced building and paving gravel for the New York State Highway Department and the City of Syracuse. Bank-run gravel for road maintenance was produced at a pit in South Onondaga by Clarence Nichols. Syracuse Sand & Gravel Co., Inc., worked its pit at Nedrow throughout the year. During the year the company produced building sand, filter sand, building gravel, and unwashed bank-run gravel. Building sand and gravel were produced from a pit at Nedrow by William F. Saunders & Sons, Inc.

The Cicero pit of Syracuse Brick Co. yielded miscellaneous clays, which were used for manufacturing brick and heavy clay products.

Expanded perlite was produced at the Syracuse plant of Minerals Processing Corp.

ONTARIO

Building and paving sand and gravel were produced in 1953 by Ontario Sand & Gravel Co., Inc., at its pit and fixed plant near Phelps. A pit near Oaks Corner, worked by Nathan Oakes & Sons, yielded sand for building construction and winter maintenance of highways. Crushed limestone for riprap and highway and railroad construction and maintenance was quarried at Geneva by General Crushed Stone Co.

ORANGE

Middle Hope Sand & Gravel Co. produced building sand and building and paving gravel at its pit near Newburgh. Other producers were Windsor Building Supplies Co., Inc., Newburgh, and Dickinson Sand & Gravel Co., Middletown. Seasonal activity at the pit and fixed plant of E. C. Townsend Estate yielded a small tonnage of building sand and gravel. Miscellaneous clays were produced by Jova Brick Works at its pit at Newburgh.

ORLEANS

The sole mineral product of Orleans County in 1953 was bank-run gravel for road maintenance produced by Arnold H. Picketts Sand & Gravel Co. and the Orleans County Highway Dept.

OSWEGO

General Crushed Stone Co. continued to work its pit and fixed plant at Lacona in 1953 and produced building and paving sand and gravel. Sand and gravel for the preparation of ready-mixed concrete and cement blocks was produced at a pit near Volney by Massaro Co., Inc. Whitehead Bros. Co. pit near Pulaski yielded molding sand.

OTSEGO

Sand and gravel was the only mineral product reported from Otsego County in 1953. Commercial operators active during the year included Seward Gravel Co., with a pit at Colliersville; Unadilla Concrete Products Co., Unadilla; and Homer F. Baker, Richfield Springs.

PUTNAM

Crushed limestone produced by Eastern Mineral Co., Inc., at its quarry at Patterson was the only mineral product of Putnam County in 1953. Output during the year was used for agricultural purposes and as a filler in soap, fertilizer, and flooring compounds.

RENSSELAER

Bleau Brick Works, Inc., produced a small tonnage of clay for use in manufacturing heavy clay products from its pit at Troy. Champlain Brick Co. worked its pit across the Hudson River from Mechanicsville during the year and produced clay for use in the manufacture of high-grade tile and heavy clay products.

Sand and gravel was recovered from pits at Averill Park by Albert Flaxmyer and Everett Holser.

Fitzgerald Bros. Construction Co., Inc., quarried Rensselaer grit for highway construction at its quarry at Cropseyville.

ROCKLAND

Three quarries produced basalt in Rockland County in 1953; the largest was the Haverstraw quarry of New York Trap Rock Corp., Inc., where output was crushed for use in highway and railroad construction and maintenance. Other producers of crushed basalt in-

cluded Suffern Stone Co., Suffern, and West Nyack Trap Rock Co., West Nyack.

The Tomkins Cove quarry of New York Trap Rock Corp., Inc., was worked throughout the year and yielded crushed limestone, which was used for riprap, highway construction and maintenance, and stone sand.

Sand and gravel was produced in Rockland County in 1953 by Graney Building Materials Corp., Sparkill.

ST. LAWRENCE

St. Lawrence County ranked first among mineral-producing counties in the State in 1953. Mineral products, listed in order of decreasing value, included zinc, iron ore, talc, lead, stone, pyrite, sand and gravel, lime, and silver.

St. Joseph Lead Co. operated its Balmat and Edwards mines continuously throughout the year. Silver, lead, and zinc were produced from the Balmat mine and zinc from the Edwards property. The Balmat mine also yielded byproduct pyrite concentrates.

Jones & Laughlin Ore Corp. continued to work its Benson mine near Starlake throughout 1953. Crude ore from the open-pit workings was crushed, ground, and concentrated by magnetic and gravity methods. Concentrate produced was sintered before shipment to the company steel mills in the Pittsburgh, Pa., area.

The International Talc Co. mine near Gouverneur continued to be the largest producing talc property in New York State. Crude production was ground for use in the paint and ceramics industries and as an asphalt filler. Other talc mines active in the county in 1953 included the Gouverneur Talc Co. and W. H. Loomis Talc Corp. properties in Fowler Township.

Three limestone quarries were active in St. Lawrence County in 1953. The largest—the Norwood quarry of Barrett Division, Allied Chemical & Dye Corp.—yielded crushed limestone for use in highway maintenance and construction and for agricultural purposes. McConville, Inc., worked its Ogdensburg quarry and produced crushed limestone, which was used for highway construction. Balducci Crushed Stone Co. recovered crushed limestone for use in highway construction and agricultural purposes from its quarry at Gouverneur.

Vance Lucas produced unwashed bank-run sand for use in winter maintenance of highways at his pit near Massena. Molding and building sand and building and paving gravel were recovered from a pit near Massena by Kenneth J. Premo & Co. Other producers of sand and gravel in the county in 1953 included James Coffey, Pine Hill, and McConville, Inc., Ogdensburg.

Lime for agricultural uses was produced during the year by Balducci Crushed Stone Co. at its plant at Gouverneur.

SARATOGA

Eleven commercial sand and gravel producers were active in Saratoga County in 1953; most of the output was molding sand. Whitehead Bros. Co., the largest producer, washed material from a number of pits in the county. Other large producers of molding sand during the year included Hudson Valley Sand & Stone Co., Wilton;

W. J. Dyer, Gansevoort; John B. Belott & Son, Elnora; and Albany Sand & Supply Co., Ushers and Schuylerville.

Crushed limestone for use as riprap, highway construction, and agricultural purposes was quarried by the Sarotoga Springs quarry of Palette Stone Corp.

SCHENECTADY

Scotia Stone & Gravel Co. recovered road and building sand and gravel from its pit at Scotia during the year.

SCHOHARIE

North American Cement Corp. operated its Howes Cave plant at near capacity in 1953. Limestone and clay for use in the manufacture of portland cement were quarried at company operations nearby. Crushed limestone for use in highway construction was produced at the Schoharie quarry of Schoharie Stone Corp.

SCHUYLER

Evaporated salt was recovered from artificial brines at the Watkins Glen plant of International Salt Co., Inc., and The Watkins Salt Co. Although some salt produced was recovered by direct-heat evaporation in open pans, the bulk of the output in 1953 was obtained by the vacuum-pan process, using steam evaporation.

SENECA

The Montezuma marshes in northeastern Seneca County yielded a small tonnage of peat for local use as a soil conditioner.

STEBEN

Three commercial sand and gravel producers were active in the county in 1953. Rhinehart & Sons Sand & Gravel Co. worked its pit near Corning during part of the year and produced building and paving sand and gravel. The Cohocton pit of Buffalo Slag Co. yielded building and paving sand and gravel, as did the Bath plant of Bath Sand & Gravel Co.

Natural gas and crude petroleum continued to be recovered from wells in the Allegany field of Steuben County.

SUFFOLK

Sand and gravel was the only mineral product of Suffolk County in 1953. The principal producers during the year were Steers Sand & Gravel Corp., with a pit and fixed plant at Northport; East Coast Lumber Terminal, Inc., with a pit near Farmingdale; and the Metropolitan Sand & Gravel Co., Northport pit and plant. Other active sand and gravel operations in 1953 included the Port Jefferson Station pit and fixed plant of W. J. McLain; Huntington Sand & Gravel Co., Inc., Huntington; Riverhead Cement Block Co., Inc., Riverhead; Setauket Sand & Gravel Co., East Setauket; Irving Lathan, East Marion; and East End Gravel Co., East Hampton Township.

SULLIVAN

Three commercial sand and gravel producers were active in the county in 1953; the largest was Sullivan Highway Production Corp., which operated a pit and fixed plant at Summitville. Other producers included Louis Pshonick, who operated a pit on Loch Sheldrake road near Liberty, and the pit and plant of Roy Crandall, Inc., near Jeffersonville.

TIOGA

Herman E. Bunce, with a pit and fixed plant at Barton, and Central Materials Corp. were the only sand and gravel producers active in Tioga County in 1953. Material produced included building and paving sand and gravel.

TOMPKINS

Cayuga Rock Salt Co., Inc., continued in 1953 to work its rock-salt mine and mill near Myers. Evaporated salt was produced by the vacuum-pan process from artificial brines at the Myers plant of International Salt Co., Inc., near Ludlowville. West Shore Salt Co. recovered a small tonnage of evaporated salt by open-pan methods.

ULSTER

Mineral products of Ulster County in 1953 included clays, natural cement, stone, and sand and gravel. Miscellaneous clays for the manufacture of heavy clay products were produced by Star Brick Co. at its pit at Kingston. Heavy clay products were manufactured from clays recovered at the Kingston pit of the Hutton Co. Another producer of miscellaneous clays in the county in 1953 was Alva S. Staples, Malden-on-Hudson.

Century Cement Manufacturing Co., Inc., continued in 1953 to produce natural and special mortar cements at its plant at Rosendale.

The Callanan Road Improvement Co. quarry and plant No. 3 at Kingston yielded crushed limestone, which was used for road construction and riprap. A small tonnage of rough dimension stone was produced at a quarry near Accord by Vincent Lawrence.

Molding and building sands were produced by Robert Main & Co., Saugerties, and Anthony Costanzi, Kingston, respectively.

WARREN

The Glens Falls plant of Glens Falls Portland Cement Co. operated at capacity throughout 1953 and quarried limestone for preparation of the cement locally. Jointa Lime Co., Inc., worked its quarry at Glens Falls during part of the year and produced crushed limestone for highway construction and maintenance.

The open-pit mine of Barton Mines Corp. on Gore Mountain, 5 miles west of North Creek continued to yield rock containing 10 to 12 percent garnet in large crystals.

WASHINGTON

Washington County continued in 1953 to be the one source of slate in New York. Twenty operators were active during the year; the

largest was Staso Milling Co., Hampton. Other producers, in order of decreasing output, were Tatko Bros. Slate Co., Inc., and Hilltop Slate Co., both in Middle Granville; Joseph A. Ponda Slate Co., Granville; and Sheldon Slate Products Co., Inc., Middle Granville.

Sand and gravel for highway maintenance was produced in small quantities at a number of pits in the county in 1953. The largest producer was Mrs. Henry Holly, Hudson Falls. Other producers included Ernest Le Clair, Dresden; Raymond Sheehan, North Granville; George Keys, West Hebron; Hattie Dawson, Fort Ann; James Weaver, West Hebron; and Ray Stout, Argyle.

Hudson Valley Sand & Stone Co. worked its Bruno's quarry at Middle Falls throughout the year and produced crushed limestone, most of which was used for highway construction.

WAYNE

Commercial sand and gravel operators in Wayne County in 1953 included Genthner Bros., East Palmyra, and Llewellyn Welch, Savannah. Production was largely bank-run gravel.

WESTCHESTER

The only producers of emery in New York and in the United States in 1953 was Joe DeLuca, who operated the DeLuca mine and the Kingston property of DiRubbo & Ellis, both near Peekskill.

Five commercial sand and gravel plants were active in Westchester County in 1953. The Mount Kisco pit of Empire Sand & Stone Corp. yielded paving sand and gravel. The leased pit of Worden Sand & Gravel Co., Inc., on Harris Road near Bedford Hills was worked 9 months of the year and yielded building sand and paving gravel. During the summer months, Peekskill Masons Supply Co. worked its pit and fixed plant on Sprout Brook road near Peekskill. Building sand and a small tonnage of gravel were recovered at the Bedford Hills pit and fixed plant of Bedford Hills Concrete Products Corp. Camarco Materials & Supply Co., Carmel, also produced sand and gravel.

Quarries operated near Yonkers by Q. & D. Ciuffetelli and Joseph Saso yielded granite dimension stone for building purposes.

Ground limestone for agricultural purposes and asphalt filler were produced during the year at the New York Trap Rock Corp., Verplanck mill. Limestone for milling was produced at other quarries of the corporation in adjacent counties.

The Mineral Industry of North Carolina

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior and the Geological survey of North Carolina.

By J. R. Thoenen¹ and Jasper L. Stuckey²



THE REPORTED value of minerals produced in North Carolina in 1953 was \$38,451,000, an increase of \$3,725,000 or 11 percent above 1952; however, a study of the individual items contributing to this result reveals a rather complicated picture. First, several commodities—namely coal, and concentrates of columbium-tantalum, tin and titanium—produced in 1952 were not reported in 1953. Second, production of amphibole asbestos and beryllium concentrate, unreported in 1952, were recorded in 1953. Third, production of the big-tonnage materials, such as sand and gravel and stone, suffered losses in both tonnage and total value. The production of vermiculite, abrasive stones, and scrap mica also decreased in both categories, and olivine reported increased tonnage production but at a loss in overall value. On the other hand, the production of quartz dropped, but its total value increased.

The clays, feldspar, sheet mica, and tungsten concentrates were the only minerals for which increases in both tonnage and value were reported.

Talc production increased slightly in 1953, but the total value cannot be compared with that reported for 1952 because in 1953 a new basis was adopted for reporting. Both tonnage and value figures for 1953 are for crude ore at the mine, whereas in prior years the value of some ground material was included.

Activity under the Defense Minerals Exploration Administration (DMEA) program increased considerably over that of 1952. The year 1953 saw 66 projects in active operation compared with 45 in 1952. The total dollar value of expenditures was \$237,700, of which the Government share was \$214,000, compared with \$149,400 and \$134,400, respectively, in 1952, an increase of 59 percent in both total and Government expenditure.

As in 1952, the greatest activity under the DMEA program was in mica exploration. Other commodities included nickel and talc in 1952, while in 1953 one project covered columbium-tantalum, beryl, and tin.

Table 1 shows a general summary for the 2 years.

¹ Chief, Mineral Industry Division, Region VII, Bureau of Mines, Knoxville, Tenn.

² State geologist, North Carolina Geological Survey, Raleigh, N. C.

TABLE 1.—Mineral production of North Carolina, 1952-53¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Abrasive stones.....		\$28,992		\$16,150
Clays.....	1,357,700	2,080,172	1,466,232	2,534,908
Coal.....	1,600	12,684		
Feldspar (crude)..... long tons..	240,364	2,416,031	268,042	3,290,495
Mica: Scrap.....	58,576	1,551,071	56,884	1,428,793
Sheet..... pounds..	595,331	664,075	619,895	1,308,494
Sand and gravel.....	8,724,748	5,665,169	6,910,932	4,992,991
Stone.....	² 9,647,513	² 14,694,698	² 9,316,823	² 14,424,323
Talc and pyrophyllite.....	³ 115,481	³ 1,771,518	⁴ 119,341	⁴ 578,239
Tin, concentrate..... long tons..	(⁴)	11,601		
Titanium, concentrate.....	25,328	177,296		
Tungsten, concentrate, 60-percent WO ₃ basis.....	1,254	(⁵)	2,074	(⁵)
Undistributed: Asbestos (1953), beryllium concentrate (1953), columbium-tantalum concentrate, lithium minerals, manganiferous ores (1953), olivine, quartz, stone (crushed and dimension marble), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 5).....		⁶ 5,652,311		9,871,493
Total.....		34,726,000		38,446,000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

² Excludes marble, value for which is included with "Undistributed."

³ Sold or used by producers. Quantity and value of ground material included.

⁴ Mine production of crude material.

⁵ Value included with "Undistributed."

⁶ Revised figure.

TABLE 2.—Average unit values of mineral commodities in North Carolina, 1949-53¹

Commodity	1949	1950	1951	1952	1953
Asbestos..... short tons..	\$100.00	\$100.00	\$100.00		² \$21.08
Beryl..... do.....	250.00		300.00		400.00
Clays: Kaolin..... do.....	19.20	20.82	21.35	\$20.80	18.87
Miscellaneous..... do.....	.83	.90	1.18	1.16	1.16
Coal..... do.....	7.65			7.93	
Columbite-tantalite, 70% concentrate..... pound.....				3.20	
Feldspar..... long ton.....	6.05	6.05	7.40	10.05	12.28
Ilmenite, concentrate (51% TiO ₂)..... pound.....	(²)	(²)	(²)	(²)	
Manganiferous ore (10-35% Mn.)..... long ton.....					(²)
Mica: Scrap and flake..... short ton.....	25.82	26.59	27.44	26.48	25.14
Sheet..... pound.....	.26	.21	.27	1.12	2.11
Olivine, crude..... short ton.....	(²)	(²)	(²)	(²)	(²)
Quartz..... do.....	3.84	4.17	4.47	4.61	5.69
Gravel..... do.....	1.23	.99	.95	1.11	1.16
Grinding pebbles..... do.....	14.66	17.00	17.80	18.00	17.60
Sand..... do.....	.40	.41	.34	.38	.47
Spodumene..... do.....			55.00	55.00	
Stone:					
Granite: Crushed..... do.....	1.51	1.46	1.43	1.44	1.42
Dimension..... do.....	48.11	48.71	55.85	54.45	34.38
Limestone, crushed..... do.....	1.36	1.32	1.35	1.35	1.39
Marble: Crushed..... do.....			2.70	5.34	5.61
Dimension..... do.....	116.00	119.00	118.00	117.50	117.69
Miscellaneous, crushed..... do.....	1.07	1.17	1.02	1.08	1.21
Sandstone: Crushed..... do.....	2.16	.59			
Dimension..... do.....				2.40	
Traprock, crushed..... do.....	1.73	1.65	1.26	1.29	
Talc and pyrophyllite..... do.....	15.60	15.87	17.40	15.34	16.10
Tube-mill liners..... do.....	14.58	15.20	17.90	21.75	17.95
Tungsten ore..... do.....	(²)	(²)	(²)	(²)	(²)
Vermiculite..... do.....	9.49	18.20	12.68	8.93	8.93

¹ For greater detail on prices by grade and markets, see vol. I, Minerals Yearbook, 1953.

² Bureau of Mines not at liberty to publish.

³ Value reported for crude ore at mine.

The average expenditure per project in 1952 was \$3,320; in 1953 it was \$3,602, ranging from a minimum of \$61 to a maximum of \$12,606.

More details with respect to this program are discussed under the county section of this chapter.

Figure 1 shows the value of mineral production in North Carolina 1935-53.

TABLE 3.—Expenditures under the Defense Minerals Exploration Administration Program, 1952-53

Commodity	Number of projects		1952		1953	
	1952	1953	Government participation	Total contract	Government participation	Total contract
Mica.....	43	65	\$111,330	\$123,726	\$204,648	\$227,389
Nickel.....	1		9,306	10,340		
Talc.....	1		13,733	15,303		
Columbium.....		1			9,312	10,347
Tantalum.....						
Beryl.....						
Tin.....						
Total.....	45	66	134,369	149,369	213,960	237,736

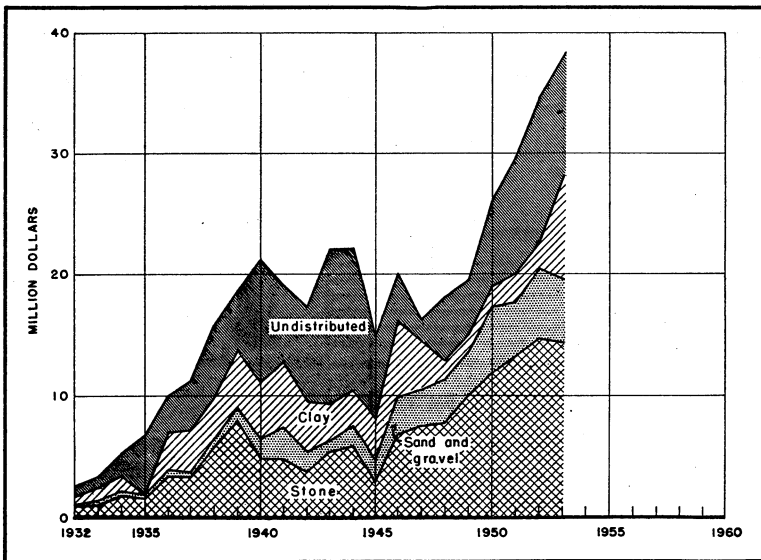


FIGURE 1.—Value of mineral production in North Carolina, 1932-53, in million dollars.

REVIEW BY MINERAL COMMODITIES

METALS

Beryllium Concentrate.—Beryllium-concentrate production was resumed on a small scale in 1953 after no production in 1952.

Columbium-Tantalum.—There was no reported production of columbium-tantalum concentrate in 1953.

Nickel.—Exploration for nickel by the Olivine Products Corp., under a DMEA cooperative project in 1952, did not result in a discovery of commercial interest. No activity was reported in 1953.

Titanium.—The Yadkin Mica & Ilmenite Co. mine at Finley, Caldwell County, remained closed during 1953.

This mine has been the only producer of ilmenite in the State, and with its closing in the fall of 1952 production of ilmenite ceased.

Tungsten.—The Tungsten Mining Corp. continued mining highly abrasive quartz veins carrying hübnerite as the principal tungsten mineral, with minor amounts of scheelite. Production was increased from 300 tons a day to 650. An innovation introduced during the year was the use of infrared driers for concentrates. It was reported³ their use requires little maintenance and creates practically no dust; further, there is no magnetization of the iron sulfides which could interfere with later magnetic separation processes.

Production in 1953 was 2,525 tons of concentrate containing 128,645 units of WO_3 , and sales were 2,285 tons containing 124,465 units, increases of 72 percent and 65 percent in units of WO_3 , respectively, over 1952. The value of shipments increased 82 percent over 1952.

TABLE 4.—Tungsten concentrate produced and shipped in 1944–48 (average) and 1949–53

Year	Produced		Shipped from mines	
	Short tons, 60 percent WO_3	Units	Short tons, 60 percent WO_3	Units
1944–48 (average).....	429	25,720	426	25,544
1949.....	942	56,484	770	46,216
1950.....	1,088	65,271	1,240	74,393
1951.....	1,035	62,078	1,041	62,463
1952.....	1,248	74,904	1,254	75,226
1953.....	2,525	128,645	2,074	124,465

NONMETALS

Abrasives.—Grinding pebbles, millstones, and tube-mill liners were produced in Rowan County. The value of total sales was \$16,150, or 44 percent below the 1952 report.

Asbestos.—Two operators, one in Transylvania County and the other in Yancey County, reported production of amphibole asbestos in 1953. Continuous production of asbestos ceased in 1948, but was revived in 1951 and again in 1953.

Clays.—Clays sold or used, including kaolin and clay for miscellaneous uses, reached a peak production in 1953 of 1,466,000 short tons valued at \$2,535,000, compared with 1,358,000 tons valued at

³ Mining Engineering, Tungsten Mining Corporation Expands Mill: Vol. 6, February 1954, p. 135.

\$2,080,000 in 1952—increases of 8 percent in tonnage and 22 percent in value. The production of kaolin increased 83 percent above 1952 and 66 percent in total value. Miscellaneous clays increased 7 percent in both tonnage and value.

Kaolin production came from five deposits operated by one company. Miscellaneous clays and shale were produced by 32 operators from 38 deposits.

Harris Clay Co. began production from the Bryson City mine in Swain County.

The Kendrick Brick & Tile Co. began to produce a dry-pressed hollow tile suitable for use as a load-bearing tile.⁴

TABLE 5.—Clays sold or used by producers, 1944-48 (average) and 1949-53

Year	Short tons	Value	Year	Short tons	Value
1944-48 (average).....	747,897	\$1,027,293	1951.....	1,462,030	\$2,177,515
1949.....	1,181,047	1,335,954	1952.....	1,357,700	2,080,172
1950.....	1,437,202	1,766,785	1953.....	1,466,232	2,534,908

Feldspar.—Crude-feldspar production sold or used by producers registered an alltime high for production and value at 268,000 long tons and \$3,290,000, exceeding the previous peak in 1952 by 12 percent in tonnage and 36 percent in value.

The International Minerals & Chemical Corp. moved the executive and sales offices of its feldspar department (formerly the Consolidated Feldspar Corp.) to Erwin, Tenn. The corporation announced⁵ plans for 3 new plants and increased the flotation capacity at Spruce Pine, N. C., by 50 percent. New fine-grind facilities were installed at Erwin, Tenn.

TABLE 6.—Crude feldspar sold or used by producers, 1944-48 (average) and 1949-53

Year	Long tons	Value	Year	Long tons	Value
1944-48 (average).....	184,898	\$1,008,145	1951.....	166,361	\$1,230,404
1949.....	160,916	973,431	1952.....	240,364	2,416,031
1950.....	183,027	1,107,061	1953.....	268,042	3,290,495

Mica.—Scrap- and flake-mica producers reported the sale or use of 56,800 short tons valued at \$1,429,000, compared with 58,600 short tons valued at \$1,551,000 in 1952.

On the other hand, sheet-mica production was the highest since 1944, with 620,000 pounds valued at \$1,308,000, an increase of 4 percent in quantity but 97 percent in value over the previous high in 1952. This was due to higher prices paid by the General Services Administration buying depot. The total value of mica sold or used was \$2,737,000, a 24-percent increase over 1952.

GSA continued purchases at its Spruce Pine Depot and accumulated 96,000 pounds of sheet mica valued at \$1,227,000. This represented 16 percent of the total sheet-mica production for the year and 94 percent of the sheet-mica value for the same period.

⁴ Brick and Clay Record, Makes Dry Pressed Hollow Tile on a George Press: September 1953, p. 56.

⁵ Rock Products, vol. 56, No. 12, December 1953, p. 120.

TABLE 7.—Mica sold or used by producers, 1949-53

Kind	1949		1950		1951		1952		1953	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
	Sheet mica:									
Uncut punch and circle.....pounds..	410,630	\$67,117	457,428	\$71,323	419,524	\$84,056	548,723	\$102,028	518,917	\$74,752
Larger uncut mica.....do.....	59,442	64,153	26,308	30,866	45,425	43,148	10,660	17,363	1,540	6,371
Half trim purchased by GSA.....do.....	-----	-----	-----	-----	-----	-----	677	2,032	1,409	3,345
Full trim purchased by GSA.....do.....	-----	-----	-----	-----	-----	-----	35,271	541,022	95,029	1,228,986
Total sheet mica.....do.....	470,072	121,270	483,736	102,179	464,949	127,204	695,231	684,075	619,895	1,308,494
Scrap and flake mica.....short tons..	24,801	640,374	48,193	1,231,584	52,550	1,441,886	58,576	1,551,071	56,834	1,428,793
Grand total (sheet and scrap).....short tons..	25,086	761,644	48,435	1,383,763	52,782	1,569,090	58,874	2,215,146	57,144	2,737,287

Olivine.—Harbison-Walker Refractories Co. continued production, and Carolina Pyrophyllite Co. also mined olivine. The total olivine as reported sold or used increased 20 percent above 1952, but the total value declined a like percentage.

Perlite.—Crude perlite is not known to occur in North Carolina; however, in 1953 a plant at Gold Mill, Rowan County, using crude rock from deposits in Western States, produced expanded perlite for use mainly as a lightweight aggregate.

Quartz.—Production of quartz was reported from Anson and Mitchell Counties by 3 operators, with production 7 percent below 1952 but reported value up 15 percent.

Sand and Gravel.—While still maintaining second place (stone retaining first place) in the commodities accounting for the value of the State mineral production, sand and gravel production (6,911,000 tons valued at \$4,993,000) dropped from 16 percent in 1952 to 13 percent of the State total in 1953. The total tonnage decreased 21 percent below 1952, and the total value decreased 12 percent. Commercial production represented 60 percent of the quantity and 76 percent of the value of the State total sand and gravel production. Compared with 1952, commercial production declined 9 percent in both tonnage and value, but noncommercial production declined 34 percent in tonnage and 19 percent in value in 1953.

TABLE 8.—Sand and gravel sold or used by producers, 1951-53, by uses

	1951		1952		1953	
	Short tons	Value	Short tons	Value	Short tons	Value
Sand (commercial):						
Building.....	534, 898	\$360, 241	580, 500	\$364, 253	1, 187, 343	\$776, 605
Paving.....	334, 393	173, 967	1, 134, 150	627, 269	618, 619	320, 865
Engine.....	22, 113	22, 113	22, 113	22, 113	59, 451	53, 760
All other.....	41, 554	62, 456	44, 494	48, 225	94, 443	68, 410
Total commercial.....	932, 958	618, 777	1, 781, 257	1, 061, 860	1, 959, 856	1, 219, 640
Total noncommercial.....	3, 695, 780	932, 137	3, 743, 907	1, 047, 727	2, 406, 774	835, 434
Total sand.....	4, 628, 738	1, 550, 914	5, 525, 164	2, 109, 587	4, 366, 630	2, 055, 074
Gravel (commercial):						
Building.....	346, 125	485, 262	(¹)	(¹)	687, 513	1, 014, 282
Paving.....	1, 948, 163	1, 678, 178	2, 621, 160	2, 970, 319	1, 212, 271	1, 311, 639
All other.....	151, 209	136, 789	122, 307	141, 579	279, 444	233, 569
Total commercial.....	2, 445, 497	2, 300, 229	2, 743, 467	3, 111, 898	2, 179, 228	2, 559, 490
Total noncommercial.....	582, 135	584, 559	456, 117	443, 684	365, 124	378, 427
Total gravel.....	3, 027, 632	2, 884, 788	3, 199, 584	3, 555, 582	2, 544, 352	2, 937, 917
Total commercial sand and gravel.....	3, 378, 455	2, 919, 006	4, 524, 724	4, 173, 758	4, 139, 084	3, 779, 130
Total noncommercial sand and gravel.....	4, 277, 915	1, 516, 696	4, 200, 024	1, 491, 411	2, 771, 898	1, 213, 861
Grand total sand and gravel.....	7, 656, 370	4, 435, 702	8, 724, 748	5, 665, 169	6, 910, 982	4, 992, 991

¹ Bureau of Mines not at liberty to publish; included in total.

The production of building sand was 1,187,000 short tons valued at \$777,000 and building gravel 688,000 short tons valued at \$1,014,000. Paving sand was reported at 619,000 short tons valued at \$321,000 and paving gravel 1,212,000 short tons valued at \$1,312,000. Engine

sand was reported at 59,000 short tons valued at \$54,000, and sands for other uses totaled 94,000 short tons valued at \$68,000. Gravel for other uses was reported at 279,000 short tons valued at \$234,000.

Of the total commercial sand and gravel produced, 90 percent was washed or otherwise beneficiated. The average value a ton for washed sand and gravel was 95 cents, whereas the unwashed material brought an average of 57 cents a ton.

Sand constituted 47 percent and gravel 53 percent of the State production of commercial sand and gravel; 42 percent of the commercial material was shipped by autotruck and 58 percent by rail.

The average production of commercial sand and gravel per man-hour was 5.3 tons, and the average days worked per year (22 plants) was 222.

Stone.—Stone represented the largest tonnage and value of all mineral commodities in the State in 1953, with 38 percent of the total value; this, however, was 4 percent lower than in 1952. The total stone sold or used (exclusive of marble) by producers was 9,317,000 short tons valued at \$14,424,000, a loss of 3 percent in quantity and 2 percent in value compared with 1952. Commercial stone production in 1953 was virtually the same in tonnage and value as in 1952 and represented 83 percent of the quantity and 86 percent of the value of total stone production. Noncommercial stone, however, showed a reduction of 22 percent in tonnage and 14 percent in value.

Dimension granite used included 19,000 short tons of rubble valued at \$55,000; 26,000 cubic feet of rough monumental stone valued at \$134,000; 27,000 cubic feet of dressed monumental stone valued at \$415,000; and the balance rough and dressed construction stone, rough and dressed architectural stone, paving blocks, curbing, and flagging. There was a small production of dimension marble.

Crushed stone was used as follows: Riprap, 12,800 short tons valued at \$22,600 or \$1.76 a ton; concrete and road metal, 8,256,600 short tons valued at \$11,955,600 or \$1.45 a ton; railroad ballast, 55,600 short tons valued at \$63,700 or \$1.15 a ton; stone sand, 448,800 short tons valued at 57 cents a ton; and unspecified uses, 502,200 short tons valued at \$721,500 or \$1.44 a ton.

Talc, Pyrophyllite, and Soapstone.—Production of talc, pyrophyllite, and soapstone came from the same sources as in 1952; total crude production increased a little more than 2 percent to establish an all-time high. Products sold or used by producers increased nearly 3 percent to an all-time high in tonnage and increased 8 percent in total value but still were below the peak of 1951. Pyrophyllite constituted 94 percent of the quantity and 74 percent of the value of material sold or used.

Vermiculite.—Vermiculite production in 1953 was virtually the same in tonnage and value as in 1952.

TABLE 9.—Stone sold or used by producers, 1949-53, by kinds

	1949		1950		1951		1952		1953	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Commercial:										
Basalt, crushed.....	3,330,650	\$5,070,529	3,908,760	\$5,967,268	4,669,493	\$6,730,408	40,000	\$50,000	5,430,467	\$7,833,869
Granite, crushed.....	20,790	1,000,184	23,880	1,163,098	23,458	1,309,981	24,190	1,317,249	40,825	1,403,666
Granite, dimension.....	1,478,690	2,026,802	1,976,340	2,629,911	2,080,886	2,829,244	2,534,446	3,446,841	2,252,409	3,150,588
Limestone, crushed.....	310	35,926	(¹)	(¹)	3,475	21,282	(¹)	(¹)	(¹)	(¹)
Marble.....										
Stone, miscellaneous.....							181,119	249,992		
Total *.....	4,830,440	8,133,441	5,908,980	9,760,277	6,774,012	10,920,915	7,614,887	12,337,001	7,723,701	12,388,123
Noncommercial:										
Basalt, crushed.....	(¹)	(¹)	97,560	160,802	75,164	94,648	72,697	95,684		
Granite, crushed.....	991,940	1,469,578	1,077,560	1,328,258	1,331,439	1,823,150	1,378,302	1,676,850	1,007,949	1,331,936
Limestone, crushed.....	68,230	76,253	(¹)	125,625	101,424	117,310	119,836	137,068	105,089	122,628
Sandstone.....	(¹)	(¹)	(¹)	(¹)	(¹)	(¹)	2,500	6,000		
Stone, miscellaneous.....	334,680	398,704	511,891	519,783	330,928	336,667	459,291	442,095	480,084	581,636
Total.....	1,394,850	1,944,535	1,802,601	2,134,468	1,838,955	2,371,775	2,032,626	2,357,697	1,593,122	2,036,200
Grand total *.....	6,225,290	10,077,976	7,711,581	11,894,745	8,612,967	13,292,690	9,647,513	14,694,698	9,316,823	14,424,323

¹ Bureau of Mines not at liberty to publish.

² Excludes dimension marble, 1951; and crushed and dimension marble, 1952.

³ Excludes dimension marble, 1950-53; and crushed marble, 1952-53.

TABLE 10.—Stone sold or used by producers, 1949-53, by kinds

Kind	1949		1950		1951		1952		1953	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Basalt, crushed.....	(1)	(1)	97,560	\$160,802	75,164	\$94,648	112,697	\$145,684	40,825	\$1,403,666
Granite, dimension.....	20,790	\$1,000,184	23,880	1,163,098	23,458	1,309,981	24,190	1,317,249	6,438,416	9,165,805
Granite, crushed.....	4,322,590	6,640,107	4,986,320	7,295,528	6,000,832	8,603,558	6,213,434	8,949,769	2,252,509	3,150,588
Limestone, crushed.....	1,546,920	2,103,055	2,091,930	2,755,536	2,182,010	2,946,554	2,654,282	3,583,909	(2)	(2)
Marble, dimension.....	310	35,926	(1)	(1)	(2)	(2)	(2)	(2)	(2)	(2)
Marble, crushed.....	287,250	308,166	343,160	401,873	475	1,282	640,410	692,087	480,084	581,636
Miscellaneous, crushed.....	(1)	(1)	(1)	(1)	330,928	336,667	2,500	6,000	(2)	(2)
Sandstone, crushed.....	47,430	90,538	168,730	117,910	(1)	(1)	(1)	(1)	104,989	122,628
Undistributed.....	6,225,290	10,077,976	7,711,580	11,894,745	8,612,967	13,292,690	9,647,513	14,694,098	9,316,823	14,424,323
Total.....										

¹ Included with "Undistributed" to avoid disclosing individual company operations.

² Bureau of Mines not at liberty to publish.

³ Total incomplete; excludes marble.

TABLE 11.—Talc, pyrophyllite, and soapstone production 1944-48 (average) and 1949-53

Year	Crude mined (short tons)	Sold or used by producers ¹		Year	Crude mined (short tons)	Sold or used by producers ¹	
		Short tons	Value ¹			Short tons	Value ¹
1944-48 (average)-----		87, 503	\$989, 269	1951-----	115, 480	113, 950	\$1, 982, 927
1949-----	88, 587	86, 208	1, 344, 767	1952-----	116, 722	115, 481	1, 771, 518
1950-----	115, 783	116, 895	1, 855, 163	1953-----	119, 341	118, 614	1, 909, 027

¹ Crude, crushed, ground, and sawed products.

REVIEW BY COUNTIES

ALAMANCE

North State Pyrophyllite Co., Inc., continued operation of its Snow Camp mine at about the same rate as in 1952. The Hanford Brick Co., operating its Burlington clay mine, mined 34,500 short tons of miscellaneous clays, an increase of 23 percent above 1952.

ALEXANDER

A. H. DeVier mined and prepared a small tonnage of beryl concentrate from the Luke Hofer mine.

Sheet-mica producers were Bowman Bros. (Bowlin Adams mine), A. H. DeVier (Luke Hofer mine), and D. B. Starrett (Dagonhart mine). Starrett also produced a small amount of scrap mica.

The North Carolina State Highway and Public Works Commission mined 35,000 tons of sand valued at \$11,000 and quarried 1,800 tons of crushed granite valued at \$1,600.

ANSON

The Charlotte Chemical Laboratories continued production of silica (quartz) but at a considerably curtailed rate compared with 1952.

W. R. Bonsal Co., B. V. Hedricks Sand & Gravel Co., and the North Carolina State Highway and Public Works Commission were active in mining sand and gravel. The total production was down slightly, but the total value was somewhat greater than in 1952.

ASHE

The Hog Rock Mining Co. (Hog Rock mine) and J. R. McKinney & Sons (Johnson mine) produced a considerable quantity of low-quality sheet mica, and McKinney mined a few tons of scrap mica.

AVERY

Harris Clay Co. mined kaolin from the Gusher Knob, Kalmia, and Sparks mines and increased production 24 percent, with a 22-percent increase in value compared with 1952.

The Feldspar Producing Co. and Waits Pitman production of feldspar were only a small percentage of that mined in 1952.

TABLE 12.—Value of mineral production in North Carolina in 1953, by counties and principal minerals

County	Value	Principal minerals in order of value
Alexander ¹	\$19,560	Sand, mica, granite.
Bertie.....	7,500	Sand.
Bladen.....	5,160	Do.
Brunswick.....	382	Do.
Burke.....	3,840	Do.
Cabarrus.....	1,250	Do.
Camden.....	7,500	Do.
Carteret.....	600	Do.
Chowan.....	36,000	Do.
Cleveland.....	2,077,594	Limestone, mica, sand, granite, clays.
Craven.....	8,000	Sand.
Currituck.....	600	Do.
Dare.....	25,800	Do.
Davidson.....	126,520	Gravel, clays, sand.
Durham.....	441,985	Granite, clays.
Edgecombe.....	7,250	Sand.
Franklin.....	3,900	Do.
Gates.....	3,000	Do.
Granville.....	1,080	Do.
Greene.....	25,000	Do.
Guilford ²	1,337,711	Granite, clays, sand.
Halifax.....	5,425	Sand.
Henderson.....	284,856	Limestone, clays, granite.
Hertford.....	15,000	Sand.
Hyde.....	3,000	Do.
Johnston.....	36,200	Do.
Jones.....	1,200	Do.
Lee.....	378,800	Clays.
Lenoir.....	110,536	Sand and gravel.
Lincoln.....	41,060	Mica, sand, granite.
Macon.....	349,208	Mica, sheet and scrap.
Madison.....	5,800	Feldspar.
Martin.....	9,000	Sand.
Mitchell.....	4,400,385	Feldspar, mica, kaolin, quartz, beryllium.
New Hanover.....	37,603	Sand.
Onslow.....	1,018,829	Limestone.
Orange.....	8,100	Granite.
Pamlico.....	15,000	Sand.
Pasquotank.....	5,100	Do.
Pender.....	222	Do.
Perquimans.....	10,500	Do.
Person.....	2,160	Do.
Pitt.....	20,000	Do.
Polk.....	7,938	Granite.
Randolph.....	288,161	Pyrophyllite, sand.
Richmond.....	41,200	Sand.
Robeson.....	35,742	Gravel and sand.
Rowan.....	1,339,375	Granite, clays, abrasive stones, sand.
Tyrrell.....	4,800	Sand.
Warren.....	1,800	Do.
Washington.....	5,400	Do.
Yancey.....	946,419	Mica, feldspar, asbestos, olivine, vermiculite.
Other counties in which values may not be shown without exposing individual operations. ³	22,432,886	
Undistributed by county.....	2,444,066	
Total.....	38,446,000	

¹ Excludes beryl and scrap mica included with "Other counties."

² Excludes mica, included in "Other counties."

³ Alamance, pyrophyllite and clays; Alexander, beryllium concentrate and scrap mica; Anson, sand and gravel, quartz; Ashe, mica; Avery, kaolin, mica, feldspar; Beaufort, sand and gravel, clays; Buncombe, sand and gravel, feldspar, mica; Caldwell, granite, clays; Caswell, granite; Catawba, sand, granite, mica; Chatham, clays; Cherokee, talc, granite, sand; Columbus, clays, sand; Cumberland, sand and gravel, clays; Davie, sand and gravel; Forsythe, granite, sand; Gaston, clays, mica, sand; Guilford, mica; Harnett, clays, gravel, sand; Haywood, sand and gravel, granite, mica; Iredell, clays, sand; Jackson, olivine, mica, feldspar; McDowell, sand and gravel, manganese ore, mica; Montgomery, clays, sand; Moore, pyrophyllite, sand and gravel; Nash, clays, sand; Northampton, sand and gravel, clays; Rockingham, miscellaneous stone, clays, sand, mica; Rutherford, clays, sand and gravel, granite, mica, beryls; Sampson, clays, sand; Stanly, clays; Stokes, clays, sand; Surry, granite; Swain, limestone, feldspar, kaolin, granite; Transylvania, granite, asbestos, mica; Union, clays; Vance, tungsten, granite, sand; Wake, granite, sand; Wayne, sand and gravel, clays; Wilson, granite, sand.

Sheet mica was mined and sold by more than 15 producers. The following each mined over 500 pounds: Elk Mica Miners (Elk mine), Robert Guy (Benfield mine), Dayton Ingram (Red mine), C. J. Keller (Hardin mine), Claude Stafford (Corn mine), Dewey Watson (Dewey mine) and R. L. Watson (Little Hawk mine). Total production from the county was 13,600 pounds valued at \$138,000. This represents an increase of 260 percent in quantity and 275 percent in value above 1952.

DMEA activities in the county for 1953 are shown as follows:

Company	Property	Government participation	Total contract
Elk Mica Miners.....	Elk mine.....	\$2,484	\$2,760
Fred Taylor, et al.....	Cow Camp mine.....	4,338	4,820

BEAUFORT

Eastern Brick & Tile Co. continued to produce clay for its own use in making brick and tile.

The North Carolina State Highway and Public Works Commission mined 60,000 short tons of paving sand valued at \$30,000.

BERTIE

The North Carolina State Highway and Public Works Commission mined 25,000 short tons of sand valued at \$7,500.

BLADEN

The North Carolina State Highway and Public Works Commission again was the only mineral producer, mining 52,000 tons of sand valued at \$5,200.

BRUNSWICK

The North Carolina State Highway and Public Works Commission was the only producer, accounting for 7,600 short tons of sand valued at \$380.

BUNCOMBE

The Blue Ridge Mining Co. operated the Goldsmith mine for feldspar.

DMEA continued the project begun in 1952 for mica at the Swannanoa mine for Robinson & West; the total expenditure in 1953 was \$4,000, of which the Government share was \$3,601. Production is anticipated from this mine in 1954.

D. M. Burgess (Burgess mine), George Burnett (Brush Mountain mine) and H. D. Trantham (Wadkins mine) mined a total of 230 pounds of full-trimmed sheet mica valued at \$3,000.

In the production of sand and gravel the Bell Sand Co., the Grove Stone & Sand Co., and Reed & Abee mined 456,000 short tons valued at \$494,000, 46 percent in tonnage and 40 percent in value below 1952.

TABLE 13.—Sand and gravel sold or used by producers in Buncombe County, 1949-53

Year	Short tons	Value	Year	Short tons	Value
1949.....	523, 260	\$527, 025	1952.....	852, 177	\$821, 931
1950.....	564, 860	536, 555	1953.....	456, 465	494, 172
1951.....	798, 454	631, 839			

BURKE

The North Carolina State Highway and Public Works Commission mined 12,800 short tons of sand valued at \$3,800.

CABARRUS

The North Carolina State Highway and Public Works Commission mined 5,000 short tons of sand valued at \$1,250.

CALDWELL

Moore Bros. Brick Co., continued to mine clay for their brick plant at Lenoir.

Clement Bros. reported production of 100,000 short tons of crushed granite valued at \$125,000.

Bowman Brothers conducted a DMEA project for mica, involving a total expenditure of \$3,100, of which the Government share was \$2,790.

CAMDEN

The North Carolina State Highway and Public Works Commission mined 25,000 short tons of sand valued at \$7,500.

CARTERET

The North Carolina State Highway and Public Works Commission produced 1,000 short tons of sand valued at \$600.

CASWELL

The only mineral production was crushed granite by Lambert Bros.

CATAWBA

The North Carolina State Highway and Public Works Commission quarried 3,000 short tons of crushed granite valued at \$2,700 for road construction and repair and mined 54,000 short tons of sand valued at \$16,000.

M. P. Lipe, Jr. (Lipe mine), and Grover Snyder (Jones mine) produced small quantities of sheet and scrap mica.

CHATHAM

The Boren Clay Products Co. (Boren mine), the Pomona Terra-Cotta Co. (Gulf mine), and the Chatham Brick & Tile Co. (Gulf mine) all mined clay for use in making brick and heavy clay products.

CHEROKEE

The Hitchcock Corp. reported the production of 34,000 short tons of crushed granite valued at \$52,000.

Talc was mined by the Hitchcock Corp. (Carolina and Nancy Jordan mines), the Minerals & Metals Corp. (Mulberry Gap mine), and the Mauney Mining Co. (Mauney mine). Total production was 7,000 short tons valued at \$501,000.

The Jobe Sand Co. produced building and engine sand.

CHOWAN

The North Carolina State Highway and Public Works Commission mined 120,000 short tons of paving sand valued at \$36,000.

CLEVELAND

The Bennett Brick & Tile Co. mined 6,000 short tons of heavy clay valued at \$4,500 for brick and tile manufacture.

The North Carolina State Highway and Public Works Commission quarried 10,000 short tons of crushed granite valued at \$9,000 and mined 49,000 tons of paving sand valued at \$15,000.

The Superior Stone Co. quarried 1,293,000 short tons of crushed limestone valued at \$1,806,000.

More than a dozen operators contributed to the production of sheet and scrap mica valued at \$243,700. Those producing over 500 pounds each of sheet mica were Oakley Buchanan (Metcalf mine), F. B. Hendricks (Beam mine), and W. O. Justice, Jr. (Doggett mine).

DMEA participated in the exploration of 9 mica properties for a total of \$21,502, of which the Government share was \$19,352. DMEA also assisted Foote Mineral Co. to explore for columbium-tantalum, beryl, and tin to the extent of \$9,312; the total expenditure was \$10,347.

TABLE 14.—DMEA mica-exploration projects, Cleveland County, in 1953

Company	Property	Expended in 1953	
		Government participation	Total contract
F. B. Hendricks.....	A. P. Mead.....	\$55	\$61
Do.....	Glen Mead.....	1,208	1,342
Forest City Mining Co.....	Old Mauney mine.....	2,150	2,389
Burns Spangler Construction Co.....	Lee Cornwell property.....	4,126	4,584
L. Rex Boone.....	Cliff Blanton mine.....	1,764	1,960
Joe A. Beasley.....	Lee Carpenter property.....	2,430	2,700
E. R. Wellman.....	Wellman mine.....	2,147	2,386
Blalock and Hamrick Mining Co.....	Hamrick prospect.....	72	80
Do.....	Blalock prospect.....	4,995	5,550
Joe A. Beasley.....	Hubert Cook No. 2.....	405	450
Total mica.....		19,352	21,502

COLUMBUS

Roger Moore Brick & Tile Co. operated its Acme mine to produce clay for brick and tile products.

The North Carolina State Highway and Public Works Commission mined 54,400 short tons of paving sand valued at \$5,440.

CRAVEN

The North Carolina State Highway and Public Works Commission mined 15,000 short tons of paving sand valued at \$8,000.

CUMBERLAND

The North Carolina State Highway and Public Works Commission mined 57,000 short tons of paving sand valued at \$5,700.

The Ideal Brick Co. operated its Linden mine to produce clay for brick manufacture.

The Bryan Rock & Sand Co. and the Becker County Sand & Gravel Co. were active in producing a considerable total tonnage of sand and gravel.

CURRITUCK

The North Carolina State Highway and Public Works Commission mined 2,000 short tons of paving sand valued at \$600.

DARE

The North Carolina State Highway and Public Works Commission mined 86,000 short tons of paving sand valued at \$25,800.

DAVIDSON

The North Carolina State Highway and Public Works Commission mined 30,000 short tons of paving sand valued at \$15,000 and 156,800 tons of paving gravel valued at \$78,400.

The Cunningham Brick Co. (Thomasville mine) mined 27,600 short tons of clay valued at \$33,120 for use in manufacturing heavy clay products.

DAVIE

Ira Pope & Sons mined sand and gravel and the North Carolina State Highway and Public Works Commission produced 65,000 short tons of paving sand valued at \$25,000.

DURHAM

The Borden Brick & Tile Co. mined clay from its Durham mine for use in manufacturing heavy clay products, and a single operator quarried and crushed granite for concrete aggregate. The total county mineral production was valued at \$442,000.

EDGECOMBE

The North Carolina State Highway and Public Works Commission produced and used 29,000 short tons of paving sand valued at \$7,250.

FORSYTH

Two operators crushed granite for concrete aggregate. The North Carolina State Highway and Public Works Commission mined 93,600 short tons of paving sand valued at \$36,000.

FRANKLIN

The North Carolina State Highway and Public Works Commission mined 6,500 short tons of paving sand valued at \$3,900.

GASTON

Kendrick Brick & Tile Co. mined clay for heavy clay products from its Mount Holly mine.

Sheet mica was mined and prepared by Bess Mica Miners (Bess mine), Gaston Strategic Minerals Co. (Huskins mine), and Piedmont Minerals Co. (Self mine).

The North Carolina State Highway and Public Works Commission mined 23,396 short tons of paving sand valued at \$7,019.

The DMEA participated with Fletcher C. Phillips et al. on an exploration project on the Bess property, totaling \$2,351, the Government share of which was \$2,116.

GATES

The North Carolina State Highway and Public Works Commission produced and used 10,000 short tons of paving sand valued at \$3,000.

GRANVILLE

The North Carolina State Highway and Public Works Commission produced and used 1,800 short tons of paving sand valued at \$1,080.

GREENE

The North Carolina State Highway and Public Works Commission mined for its own use 55,000 short tons of paving sand valued at \$25,000.

GUILFORD

Boren Clay Products Co. mined 60,000 short tons of clay valued at \$71,600 from its Pleasant Garden mine.

Whitlow Bros., Buchanan Stone Co., Superior Stone Co., and Pioneer Quarries Co. produced a total of 758,000 short tons of crushed granite valued at \$1,199,000, and the North Carolina State Highway and Public Works Commission quarried 41,000 short tons of crushed granite valued at \$62,000 and mined 10,600 short tons of paving sand valued at \$5,300.

The Glenda Mining Co. mined a small amount of sheet mica.

HALIFAX

The North Carolina State Highway and Public Works Commission contribution in this county was 14,900 short tons of paving sand valued at \$5,425.

HARNETT

In Harnett County the North Carolina State Highway and Public Works Commission produced 34,200 short tons of paving sand valued at \$9,800 and 12,576 short tons of paving gravel valued at \$31,440.

The Norwood Brick Co. mined clay for its own use.

HAYWOOD

Everett L. Poston and Putnam Bros. mined a small quantity of sheet mica.

The McCrory Construction Service and Sale & Alexander mined a substantial tonnage of gravel, and the North Carolina State Highway and Public Works Commission produced 16,600 short tons of crushed granite valued at \$24,900.

The DMEA was active in this county and participated in 7 projects, totaling \$18,457, the Government share of which was \$16,611.

TABLE 15.—DMEA exploration projects, Haywood County, in 1953

Company	Property	Expended in 1953	
		Government participation	Total contract
Fred Arrowood.....	Little East Fork mine.....	\$699	\$777
Conway Revis.....	Grassy Knob.....	2,168	2,409
Everett L. & R. W. Poston.....	Poston prospect.....	3,002	3,335
H. R. H., Inc.....	Bear Pen mine.....	3,078	3,420
Do.....	Holt No. 1.....	4,995	5,550
Everett L. Poston.....	Old Shining Rock.....	1,175	1,306
Everett L. Poston et al.....	Old Sharp mine.....	1,494	1,660
Total.....		16,611	18,457

HENDERSON

The Moland Drysdale Corp. mined clay from its Etowah mine for the manufacture of heavy clay products.

The Fletcher Limestone Co. operated its Fletcher quarry for concrete aggregate, and the Cogdill Limestone Co. operated its Cogdill quarry.

The North Carolina State Highway and Public Works Commission quarried 26,000 short tons of granite valued at \$38,750 for concrete aggregate and road stone.

Total value of county mineral production was \$284,856.

HERTFORD

Paving sand totaling 32,000 short tons and valued at \$15,000 was mined by the North Carolina State Highway and Public Works Commission.

HYDE

The North Carolina State Highway and Public Works Commission produced 10,000 short tons of paving sand valued at \$3,000 for its own use.

IREDELL

The Statesville Brick Co. operated its clay mine for its own use in the manufacture of heavy clay products.

The North Carolina State Highway and Public Works Commission mined and used 75,322 short tons of paving sand valued at \$22,596.

JACKSON

The Blue Ridge Mining Co. mined a small quantity of feldspar from its Mead mine.

Harbison Walker continued to produce olivine from its Addie mine for use in manufacturing refractory materials.

Seven operators mined sheet mica in Jackson County for a total of 20,120 pounds valued at \$51,645.

The following producers sold or used over 500 pounds each: Buchanan Mining Co. (Jasper mine), Goodmica Mining Co. (Engle Cope mine), J. B. Sutton (Culowhee mine), and J. E. Drennen (Frady mine).

A small tonnage of scrap mica was also produced.

J. L. Colville Construction Co. reported production of 125,000 short tons of gravel valued at \$62,500.

The DMEA participated in 5 projects in the exploration for mica for a total amount of \$18,840, of which the Government share was \$16,956.

TABLE 16.—DMEA exploration projects in Jackson County in 1953

Company	Property	Expended in 1953	
		Government participation	Total contract
Dixie Minerals, Inc.....	Stephens.....	\$3,087	\$3,430
Do.....	Shell Ridge mine.....	1,710	1,900
Goodmica Mining Co.....	Engle Cope mine.....	5,319	5,910
Hooper Bros.....	Old Sheep Mountain mine.....	4,626	5,140
Latt Young.....	Cox Mica mine.....	2,214	2,460
Total.....		16,956	18,840

JOHNSON

The North Carolina State Highway and Public Works Commission produced and used 75,700 short tons of paving sand valued at \$36,200.

JONES

The North Carolina State Highway and Public Works Commission mined, for its own use, 2,000 short tons of paving sand valued at \$1,200.

LEE

Clay was mined for the manufacture of heavy clay products by the Borden Brick & Tile Co., the Lee Brick & Tile Co., and the Sanford Brick & Tile Co. Production was 314,000 short tons valued at \$379,000, a loss of 10 percent in tonnage and 5 percent in value compared with 1952.

TABLE 17.—Miscellaneous clays sold or used by producers in Lee County, 1949-53

Year	Short tons	Value	Year	Short tons	Value
1949.....	236,860	\$194,360	1952.....	348,600	\$397,200
1950.....	280,250	280,250	1953.....	314,000	378,800
1951.....	310,000	355,000			

LENOIR

The Barrus Construction Co. reported the production of 105,000 short tons of sand valued at \$78,000 and 2,800 tons of gravel valued at \$5,500. The North Carolina State Highway and Public Works Commission reported the mining and use of 61,000 tons of paving sand valued at \$27,000.

LINCOLN

The North Carolina State Highway and Public Works Commission quarried 1,040 short tons of crushed granite valued at \$940 and mined 27,000 tons of paving sand valued at \$8,000.

Sheet and scrap mica, with a total value of \$32,130, were produced by a number of operators.

The Southeast Mica & Feldspar Co. and Wilson & Buchanan, operating the Foster and Houser mines, each sold or used over 500 pounds of sheet mica.

Earl Davis and T. J. Berkmyer, with the aid of DMEA, conducted a mica-exploration project in which the total amount expended was \$82 and the Government share was \$74.

MACON

Ten operators reported production of sheet and/or scrap mica; in addition, there was some production from unidentified sources for a county total value of \$349,208.

Those mining over 1,000 pounds each were: T. M. Barnard (Turkey Nest mine), J. R. Berry (Rock Cut mine), Macon Mica Co. (Shepherd Knob mine), Mica Development Corp. (Chalk Hill mine), Sam L. Phillips (Itola Bowers mine), Polly Miller Mining Corp. (Polly Miller mine), A. W. Reid (Mill Knob mine), and A. Ward (Emma Reid mine).

Exploration projects with the aid of DMEA were conducted at 16 deposits, totaling \$62,136, of which the Government share was \$55,921.

TABLE 18.—DMEA mica-exploration projects, Macon County, 1953

Operator	Property	Expended in 1953	
		Government participation	Total contract
Fred Wilson	A. mine	\$2,426	\$2,696
Burke John Mica Miners	Burke John mine	2,200	2,444
S. L. Phillips et al	Itola Bowers	3,240	3,600
A. Ward	Miller mine	126	140
Reid & Hooker	Reid mine	585	650
Bauer Mining Co.	Baird Cove mine	2,672	2,969
Zeb Angel	Kasson mine	6,729	7,477
Macon Mica Miners	Mashburn	3,254	3,616
Andrew W. Reid	May mine	1,628	1,809
Polly Miller Mining Corp.	Polly Miller	5,445	6,050
Ray E. Bennett	Bennett mine	2,862	3,180
Richard C. Angel	Quisenberry mine	4,633	5,148
B. T. R. Mining Co.	Terrell Bryson	1,935	2,150
Roy H. Fouts	Allman Cove mine	5,046	5,607
American Mica Corp.	Beasley No. 2 mine	10,125	11,250
Hardy C. Cable	Turkey Knob mine	3,015	3,350
Total		55,921	62,136

MADISON

Clinton Gardner reported production of 700 short tons of feldspar valued at \$5,800 from the Jarvies mine.

MARTIN

The North Carolina State Highway and Public Works Commission reported production and use of 30,000 short tons of paving sand valued at \$9,000.

McDOWELL

John R. Nichols (Burgin mine) and W. E. Silver (Little Ridge mine) produced a small quantity of sheet mica.

Frank B. Simpson reported shipment of a small tonnage of manganiferous ore (10-35 percent Mn).

The Becker Sand & Gravel Co. reported a substantial production of sand and gravel.

MITCHELL

L. B. Green and Lee McKinney both reported production of beryllium concentrates.

The Harris Clay Co. increased production of kaolin from its Minpro mine 300 percent in tonnage and 210 percent in value compared with 1952.

Fourteen operators contributed to an increase in the production of feldspar of 30 percent in quantity and 55 percent in value above 1952. This was the second year of major increase for Mitchell County's feldspar production—1953 totals were 103 percent in tonnage and 290 percent in value above 1951.

Sheet and scrap mica were produced from over 60 deposits. Sheet mica sold or used increased 172 percent in quantity and 67 percent in value above 1952. The average value received per pound of sheet mica in 1953 was \$8.70 compared with \$14.00 in 1952.

Producers of more than 500 pounds of sheet mica in Mitchell County in 1953 were: Lewis Aldridge (Branchville mine), J. L. Baker (Shepherd Knob mine), Burleson & Wilson (Abernathy mine), J. B. Carroll (Carroll mine), Sam Davis (Edwards mine), Duncan Mining Co. (Duncan mine), C. W. Greene (Greene mine), Hawkins Mining Co. (Long Cut mine), Henline & McKinney (Silvers mine), Julius Henline (Julius mine), Paul Henline (Paul mine), Paul Hoppe (Tater Chip mine), Herman Johnson (Morris Putnam mine), John Phillips (John's mine), S. L. Phillips (Clay Hole mine), George Reid (Hawk mine), Sinkhole Miners (Sink Hole mine), Thomas & Grindstaff (Geo. Howell mine), Thomas & Williams (Murphy Rock mine), Brown Whitson (Whitson mine), and Roe Woody (Woody mine).

Scrap-mica production increased 350 percent in volume and 620 percent in value over 1952.

DMEA projects involved in exploration for mica deposits were active at 6 deposits, with an equal number of participants, involving a total expenditure of \$36,134, of which the Government share was \$32,520.

TABLE 19.—DMEA mica-exploration projects, Mitchell County, in 1953

Company	Property	Expended in 1953	
		Government participation	Total contract
Byrd Mica Miners.....	Byrd mine.....	\$540	\$600
Sinkhole Miners.....	Sink Hole mine.....	11,345	12,606
Robert Baker.....	Zinniman mine.....	2,295	2,550
B. and R. Mica Co.....	Half Moon mine.....	8,188	9,098
Sam L. Phillips et al.....	White Oak Creek mine.....	6,570	7,300
Duncan Mining Co.....	Connolly mine.....	3,582	3,980
Total.....		32,520	36,134

The Harris Clay Co. recovered flake mica from the beneficiation of kaolin. The principal feldspar producers in 1953 were International Minerals & Chemical Co., Feldspar Flotation Corp., Blue Ridge Mining Co., Clifton Buchanan, and Steve Sparks Mining Co. International Minerals & Chemical Co. and Feldspar Flotation Corp. recovered quartz and flake mica from beneficiation of feldspar.

MONTGOMERY

The Mount Gilead Brick Co. continued mining clay for its own use in the manufacture of heavy clay products.

The North Carolina State Highway and Public Works Commission reported the production and use of 30,000 short tons of paving sand valued at \$15,000.

MOORE

The Standard Minerals Co. and the Glendon Pyrophyllite Co. continued production of pyrophyllite at virtually the same total rate as in 1952.

There were 3 producers of sand from 9 pits, namely, Bryan Rock & Sand Co. (Aberdeen and West End pits), Monroe Sand Co. and Harrison Sand Pit, but their combined production was less than in 1952.

The total value of mineral production for the county dropped 3 percent under that recorded for 1952.

NASH

The Nash Brick Co. increased production of clay for its own use in the manufacture of heavy clay products by roughly 10 percent in tonnage and 30 percent in value.

The North Carolina State Highway and Public Works Commission reported the production and use of 14,000 short tons of paving sand valued at \$4,650.

NEW HANOVER

The E. L. Robbins Co. and the North Carolina State Highway and Public Works Commission reported a combined total of 40,000 short tons of paving sand valued at \$38,000, a decrease of 24,000 tons from 1952.

NORTHAMPTON

Grant Brick Works mined 30,000 short tons of clay for its own use in manufacturing heavy clay products.

The Bryan Rock & Sand Co. continued production of sand and gravel and the North Carolina State Highway and Public Works Commission reported production of 35,000 short tons of paving sand valued at \$10,500.

The total value of mineral production for the county was somewhat less than in 1952.

ONSLow

The Superior Stone Co. quarried 724,000 short tons of crushed limestone valued at \$1,200,000 from its Belgrade quarry.

ORANGE

Duke University reported the production of 810 tons of dimension granite (volcanic slate) valued at \$8,100.

PAMLICO

The North Carolina State Highway and Public Works Commission reported the production and use of 25,000 short tons of paving sand valued at \$15,000. No production was reported in 1952.

PASQUOTANK

The North Carolina State Highway and Public Works Commission reported the production and use of 17,000 short tons of paving sand valued at \$5,100.

PENDER

The North Carolina State Highway and Public Works Commission reported the production and use of 4,440 short tons of paving sand valued at \$222. This compares with a production and use in 1952 of 110,000 short tons.

PERQUIMANS

The North Carolina State Highway and Public Works Commission reported the production and use of 35,000 short tons of paving sand valued at \$10,500. No production was reported in 1952.

PERSON

The North Carolina State Highway and Public Works Commission again reported a small tonnage of paving sand produced and used—3,600 short tons valued at \$2,160.

PITT

The North Carolina State Highway and Public Works Commission reported the production and use of 60,000 short tons of paving sand valued at \$26,000. No production was reported in 1952.

POLK

J. C. Williams reported quarrying 500 short tons of granite rubble valued at \$2,750.

The North Carolina State Highway and Public Works Commission reported crushing and using 5,325 short tons of granite valued at \$5,188 for concrete and road metal.

RANDOLPH

The Carolina Pyrophyllite Co. mined 18,000 short tons of pyrophyllite.

The North Carolina State Highway and Public Works Commission reported the production and use of 11,000 short tons of paving sand valued at \$5,500.

RICHMOND

The only mineral production was 82,400 short tons of paving sand valued at \$41,200 by the North Carolina State Highway and Public Works Commission.

ROBESON

The North Carolina State Highway and Public Works Commission was again the only mineral producer, with 61,000 short tons of paving sand valued at \$6,100 and 12,000 tons of gravel valued at \$30,000.

ROCKINGHAM

The Pine Hall Brick & Pipe Co. continued to produce shale for its own use in manufacturing heavy clay products.

The State of North Carolina quarried 125,000 short tons of crushed stone classed as miscellaneous stone and valued at \$187,000 for concrete and road metal.

C. P. Robertson operated the Ruby King mine for the production of a small amount of sheet and scrap mica.

The North Carolina State Highway and Public Works Commission reported production and use of 5,346 short tons of paving sand valued at \$2,673.

ROWAN

The Harris Granite Quarries operated its Balfour quarry and reported production of 150 short tons of grinding pebbles valued at \$2,600 and 400 tons of tube-mill liners valued at \$7,500.

The Gardner Granite Works reported production of millstones and chasers valued at \$6,000 from its Gardner quarry.

The Isenhour Brick & Tile Co. continued production and use of shale from its East Spencer mine for the manufacture of heavy clay products.

Roanoke-Webster Brick Co. mined material from its Draper mine for heavy clay products amounting to 21,000 short tons valued at \$25,000.

The Salisbury Granite Co. (Salisbury quarry), the Harris Granite Quarries (Carolina and Balfour quarries), Superior Stone Co. (Woodleaf quarry), and J. A. Logan quarried dimension and crushed granite totaling \$1,169,000 in value.

The Carolina Perlite Co. obtained raw perlite from deposits in Western States and expanded it for use in lightweight aggregate.

The North Carolina State Highway and Public Works Commission reported the production and use of 20,000 short tons of building sand valued at \$10,000.

The total value of mineral production was \$1,339,000, or roughly 1 percent below 1952.

TABLE 20.—Granite (crushed and dimension) sold or used by producers in Rowan County, 1949–53

Year	Short tons	Value	Year	Short tons	Value
1949.....	414, 271	\$715, 532	1952.....	548, 351	\$1, 216, 044
1950.....	530, 931	1, 030, 616	1953.....	482, 446	1, 167, 823
1951.....	410, 782	877, 460			

RUTHERFORD

Kenneth Haynes reported a small tonnage of beryl concentrates from his No. 1 mine.

The Bostic Brick Co. continued to operate its Bostic clay mine.

The State of North Carolina reported production and use of 28,600 short tons of crushed granite valued at \$25,000 for concrete and road metal.

The S. & S. Mica Co. (Lutz mine), John Tedder (Waters mine), Cherry Mountain Mining Co. (Cherry Mountain mine), and Grady Campbell (Price mine) reported production of sheet mica. In addition, there was a small production from unidentified properties.

The Jobe Sand Co. continued production of sand.

The North Carolina State Highway and Public Works Commission reported the production and use of 1,559 short tons of paving sand valued at \$468.

W. H. Covington operated a mica-exploration project in connection with DMEA on the Covington prospect. The total expenditure was \$96, of which the Government share was \$86.

SAMPSON

Crumpler Brick Co., Inc., and Sampson Brick Co. were both active in production of clay for heavy clay products manufacture.

The North Carolina State Highway and Public Works Commission reported the production and use of 3,335 short tons of paving sand valued at \$167.

STANLY

Stanly Shale Products Co. and Yadkin Brick Yards continued to produce shale for local use in the manufacture of heavy clay products.

STOKES

Pine Hall Brick & Pipe Co. continued to operate its No. 1 and No. 2 mines to obtain shale for heavy clay products.

The North Carolina State Highway and Public Works Commission reported production and use of 127,400 short tons of paving sand

valued at \$49,000, an increase of 31 percent in volume and 42 percent in value over 1952.

The Hawkins Mining Co. operated a DMEA project for exploration for mica at a total expenditure of \$2,746, of which the Government share was \$2,471.

SURRY

The Yadkin Granite Co. quarried 15,000 short tons of granite for rubble. One other producer operated in the county marketing dimension granite.

The same quarries also produced crushed granite for concrete and road metal.

SWAIN

Harris Clay Co. opened the Bryson City clay mine for production of kaolin.

Blue Ridge Mining Co. operated its Alexander mine for feldspar.

Needmore Quarries and Jim Taylor operated separate quarries for production of dimension granite.

Nantahala Talc & Limestone Co. operated its Hewitt quarry and crushed 91,000 short tons of limestone valued at \$133,000.

TRANSYLVANIA

The Powhatan Mining Co. mined a small tonnage of short-fiber amphibole asbestos.

The North Carolina State Highway and Public Works Commission reported production and use of 18,500 short tons of crushed granite valued at \$27,750 for concrete and road metal.

Eugene Buchanan reported production of 3 pounds of sheet mica valued at \$43.

TYRRELL

The North Carolina State Highway and Public Works Commission mined 16,000 short tons of paving sand valued at \$4,800.

UNION

Kendrick Brick & Tile Co. operated its Monroe mine for material in the manufacture of heavy clay products.

VANCE

The Tungsten Mining Corp., operating its Hamme mine, produced 2,144 short tons of tungsten concentrate (basis, 60 percent WO_3).

Greystone Granite Co. quarried 621,000 short tons of crushed granite valued at \$760,000.

The North Carolina State Highway and Public Works Commission reported production of 4,000 short tons of paving sand valued at \$2,400.

WAKE

The Bryan Rock & Sand Co. (Rolesville quarry) quarried crushed granite, but at a rate slightly lower than in 1952.

The North Carolina State Highway and Public Works Commission reported 9,000 short tons of paving sand valued at \$5,400.

WARREN

The North Carolina State Highway and Public Works Commission was the only mineral producer, reporting 3,000 short tons of paving sand valued at \$1,800.

WASHINGTON

The North Carolina State Highway and Public Works Commission was the sole mineral producer in this county; it accounted for 18,000 short tons of paving sand valued at \$5,400.

WAYNE

The Kendrick Brick & Tile Co. operated its Wayne County mine for material for manufacturing heavy clay products.

Bryan Rock & Sand Co. continued to produce sand for concrete and paving, and the North Carolina State Highway and Public Works Commission reported mining 50,500 short tons of paving sand valued at \$19,625—about 25 percent of the 1952 activity.

WILSON

Bryan Rock & Sand Co. operated its Neverson quarry for producing a considerable tonnage of crushed granite, but at a rate slightly below that of 1952.

The North Carolina State Highway and Public Works Commission mined 9,750 short tons of paving sand valued at \$4,875.

YANCEY

The Mining & Milling Corp. of America mined a substantial tonnage of short-fiber amphibole asbestos from its Blue Rock mine.

The Variegated Vermiculite Mines (Woody mine) sold or used 95 tons of vermiculite valued at \$848.

Feldspar production came from 9 mines operated by 6 companies, listed as Ray Cook (Bee Ridge mine), Feldspar Producing Co. (Smith, Bowditch A and B and Briggs mines), Dan Honeycutt (Smith mine), John C. Woody (Old Clay mine), Johnny Gouge (Old Red mine), and Finlay and Westall (Griffith mine). The total tonnage sold or used was 130 percent above 1952.

The Carolina Pyrophyllite Co. reported a small tonnage of olivine from the Wray mine.

Sheet-mica production came from 24 operators and some from various unidentified mines. The principal operators (over 500 pounds of sheet mica) are listed as Bourne Associates, M. E. Burleson, Virgil Chrisawn, Finlay & Westall, Gentesel Associates, Johnny Gouge, Hassett Mining Co., S. L. Phillips, J. Mack Thompson, Westall & Bennett, and Yancey Mica Miners. The total sheet mica sold or used by producers was 98,616 pounds valued at \$171,346, or \$1.74 a pound.

Scrap-mica production was reported from 15 deposits, of which 8 also produced sheet mica. The principal producers were: Consolidated Mica Co. (Celo mine), Deneen Mica Co. (Harris Clay and Peake mines), DeWeld Mica Co. (DeWeld mine), Eds Realty Co. (Carolina Mica mine), Hassett Mining Co. (Robinson mine), Southern Mica Co.

(Anglin mine), and Wilson Mica Co. (Wilson mine). Scrap mica sold or used by producers totaled 25,000 short tons valued at \$605,000, or \$24 a ton.

There were 13 DMEA projects operated in exploration for mica, in which the total expenditure was \$50,365 and the Government share was \$45,328.

TABLE 21.—DMEA mica-exploration projects, Yancey County, in 1953

Company	Property	Expended in 1953	
		Government participation	Total contract
Yancey Mica Mines, Inc.....	Jesse Autry mine.....	\$4,253	\$4,726
Chrisawn & Gibbs.....	Westall mine.....	720	800
Anglin & Elkins.....	Huskins mine.....	4,482	4,980
Grigg & West Co.....	Grassy Knob mine.....	4,407	4,897
Murphy Mining Co.....	Blevins mine.....	450	500
S. W. Presnell Mica Mines.....	Presnell mine.....	8,570	9,522
H. J. Twiggs et al.....	Sam Huskins mine.....	3,735	4,150
Bennett and Johnson Co.....	Hampton mine.....	3,555	3,950
Balsam Mica Miners.....	Balsam mine.....	1,830	2,033
Blue Ridge Mica Co.....	Grant Laws.....	4,698	5,220
Murphy Mining Co.....	Red mine.....	3,236	3,596
Carolina Clear Mica Co.....	Clear mine.....	4,244	4,716
Hyatt and Presnell.....	Banks mine.....	1,148	1,275
Total.....		45,328	50,365

The Mineral Industry of North Dakota

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of North Dakota.

By Samuel A. Gustavson¹ and D. H. Mullen²



THE VALUE of minerals produced in North Dakota in 1953 was 60 percent greater than in 1952. The continuing rapid development of the petroleum industry in the Williston Basin was responsible for most of the increase. Petroleum, first reported in 1951 with a production of only 25,000 barrels, had, by the end of 1953, supplied over half of the annual value of the minerals produced in the State. Lignite and sand and gravel, which for years had constituted the major portion of the mineral wealth of North Dakota, continued to be produced at about the same levels as in previous years.

Figure 1 shows the total value of North Dakota mineral production from 1920 through 1953. The rise in value since 1951 illustrates the effect of development of the petroleum industry upon the State's economy.

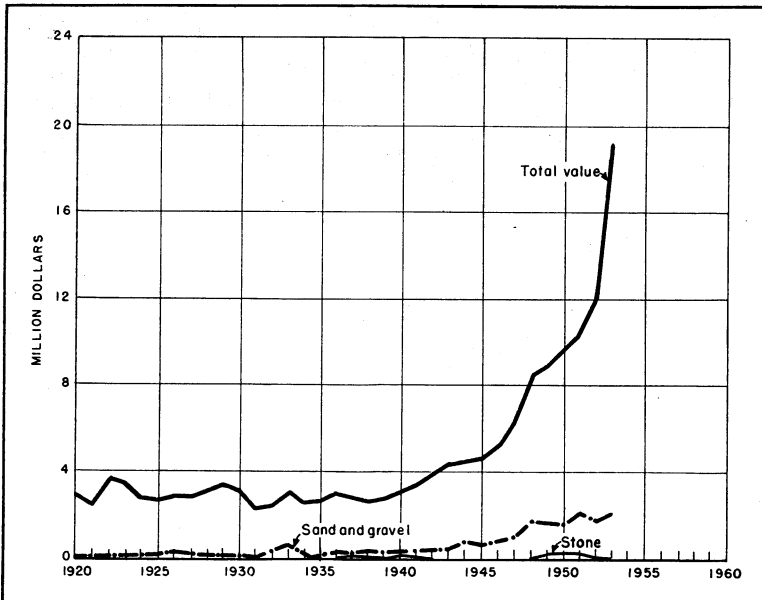


FIGURE 1.—Value of sand and gravel and stone and total value of all minerals in North Dakota, 1920–53.

¹ Chief, Mineral Industry Division, Region V, Bureau of Mines, Minneapolis, Minn.

² Commodity-industry analyst, Region V, Bureau of Mines, Minneapolis, Minn.

TABLE 1.—Mineral production in North Dakota, 1952-53¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays.....	(2)	(2)	23, 084	\$47, 862
Coal (lignite).....	2, 983, 752	\$7, 068, 259	2, 802, 558	6, 617, 980
Natural gas..... million cubic feet.....	369	23, 000	498	34, 000
Petroleum (crude)..... thousand 42-gallon barrels.....	1, 549	(2)	3 5, 183	3 10, 370, 000
Sand and gravel.....	6, 557, 069	1, 841, 216	6, 173, 737	2, 164, 685
Stone.....	67, 064	4, 968	35, 031	2, 595
Undistributed: Nonmetallic minerals and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2).....		3, 119, 000		
Total North Dakota.....		12, 057, 000		19, 237, 000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

² Value included with "Undistributed."

* Final figure. Supersedes preliminary figure given in commodity chapter.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Clays.—Clays for the manufacture of brick and heavy clay products were produced in Adams, Grand Forks, and Morton Counties by the Marion Clay Works at Hettinger, Red River Valley Brick Corp. at Grand Forks, and the Hebron Brick Co. at Hebron. Clay for lightweight aggregate was produced by Molite, Inc., at Mandan.

Mineral Pigments.—Mineral pigment has been produced from lignitic humus or leonardite, a weathered product of thin lignite beds found in Slope and Bowman Counties under shallow overburden. The pigment is water soluble and produces a vandyke brown. Production was from Bowman County in 1952 and 1953.

Sand and Gravel.—Sand and gravel production by commercial and Government-and-contractor operations was reported from 27 of the State's 53 counties in 1953. Volume declined 6 percent, while value increased 18 percent over 1952. Dollar gains for this commodity were the result of increased value for sand and gravel used for commercial building and paving operations.

Stone.—The North Dakota State Highway Commission produced crushed granite for use in road building. The quantity reported in 1953 was about half that for 1952.

MINERAL FUELS

Lignite.—Lignite production in North Dakota in 1953 was 2,803,000 tons, a decrease of 181,000 tons (6 percent) from 1952. These data represent the output and value of mines producing over 1,000 tons a year and were reported by 16 counties. In addition, 3 counties reported production of less than 1,000 tons during 1953.

Of 46 mines that produced over 1,000 tons, 6 were underground and 40 strip-mine operations. The days worked at these mines in 1953 averaged 188, and the average number of men working daily totaled 581. Output per man per day averaged 25.7 tons.

TABLE 2.—Sand and gravel sold or used by producers, 1952-53, by classes of operation and uses

Class of operation and use	1952			1953		
	Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per ton
COMMERCIAL OPERATIONS						
Sand:						
Building.....	145,048	\$146,971	\$1.01	208,898	\$214,710	\$1.03
Paving.....	44,675	41,419	.93	24,074	22,374	.93
Engine.....				240	41	.17
Other.....	1,678	452	.27	686	214	.31
Total commercial sand.....	191,401	188,842	.99	233,898	237,339	1.01
Gravel:						
Building.....	630,238	731,199	1.16	502,065	811,288	1.62
Paving.....	385,162	199,761	.52	1,060,855	634,367	.60
Railroad ballast.....	467,316	263,769	.56	208,076	124,682	.60
Other.....	192,407	81,296	.42	48,769	10,696	.22
Total commercial gravel.....	1,675,123	1,276,025	.76	1,819,765	1,581,033	.87
Total commercial sand and gravel.....	1,866,524	1,464,867	.78	2,053,663	1,818,372	.89
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand:						
Building.....	94	57	.61			
Paving.....	41,118	14,368	.35	29,160	2,160	.07
Total Government-and-contractor sand.....	41,212	14,425	.35	29,160	2,160	.07
Gravel:						
Building.....	187	112	.60	46,175	2,181	.05
Paving.....	4,649,146	361,812	.08	4,044,739	341,972	.08
Total Government-and-contractor gravel.....	4,649,333	361,924	.08	4,090,914	344,153	.08
Total Government-and-contractor sand and gravel.....	4,690,545	376,349	.08	4,120,074	346,313	.08
ALL OPERATIONS						
Sand.....	232,613	203,267	.87	263,058	239,499	.91
Gravel.....	6,324,456	1,637,949	.26	5,910,679	1,925,186	.33
Grand total.....	6,557,069	1,841,216	.28	6,173,737	2,164,685	.35

In 1952, 49 mines produced over 1,000 tons; of these, 10 were underground and 39 strip mines; the average number of days worked was 202, the average number of men employed 628, and the output per man per day averaged 23.6 tons.

Table 3 shows production for 1952-53, by counties.

Three studies on the gasification of lignite were released by the Bureau of Mines, during 1953.³

Natural Gas.—Natural gas, mostly from the Bowman County gas field, was marketed in 1952 and 1953. In 1953, over 5 billion cubic feet of gas from North Dakota oil fields was vented or flared.

³ Burr, A. C., Holtz, J. C., Koth, A. W., and Oppelt, W. H., Gasification of Lignite in a Commercial-Scale Pilot Plant; Progress report for 1947-48: Bureau of Mines Rept. of Investigations 4940, 1953, 28 pp.

Chetrick, M. H., Thermal Requirements for the Gasification of Lignite in an Externally Heated Retort: Bureau of Mines Rept. of Investigations 4957, 1953, 7 pp.

Burr, A. C., Ellman, R. C., Hoepfner, J. J., Holtz, J. C., Kamps, T. W., Kube, W. R., Ongstad, O. C., and Oppelt, W. H., Gasification of Lignite in a Commercial Scale-Pilot Plant; Progress report, Jan. 1, 1949, to June 30, 1950: Bureau of Mines Rept. of Investigations 4997, 1953, 48 pp.

TABLE 3.—Production of coal (lignite) by counties, 1952-53, in short tons (exclusive of mines producing less than 1,000 tons)

County	1952		1953	
	Short tons	Average value per ton ¹	Short tons	Average value per ton ¹
Adams.....	22, 114	\$3. 31	28, 349	\$3. 36
Bowman.....	148, 836	1. 64	163, 704	1. 73
Burke.....	440, 907	2. 33	426, 880	2. 29
Burleigh.....	20, 086	3. 35	16, 661	3. 32
Divide.....	292, 640	2. 37	242, 481	2. 59
Dunn.....	10, 012	2. 75	11, 505	2. 85
Golden Valley.....	1, 590	2. 73	.....	.....
Grant.....	26, 504	3. 13	28, 777	2. 82
Hettinger.....	15, 093	2. 87	12, 099	2. 97
McKenzie.....	1, 190	4. 00	1, 229	4. 00
McLean.....	289, 299	2. 49	293, 108	2. 37
Mercer.....	1, 054, 277	2. 33	976, 138	2. 31
Morton.....	37, 166	2. 55	29, 889	2. 43
Mountrail.....	1, 565	3. 65	.....	.....
Oliver.....	6, 280	2. 50	5, 081	2. 75
Stark.....	75, 789	2. 61	75, 043	2. 75
Ward.....	522, 618	2. 39	479, 909	2. 39
Williams.....	17, 786	3. 36	11, 705	3. 24
Total.....	2, 983, 752	2. 37	2, 802, 558	2. 36

¹ Value received or charged for coal f. o. b. mine, including selling cost. (Includes a value for coal not sold but used by producer, such as mine fuel and coal coked as estimated by producer at average prices that might have been received if such coal had been sold commercially.)

Petroleum.—In 1953, 5,183,000 barrels of petroleum was produced in North Dakota, an increase of 3,634,000 barrels over 1952. Production was reported from six counties.

Williams County continued to be the major producing area, supplying nearly seven-eighths of the total. Mountrail County wells produced over 900,000 barrels and McKenzie County wells about 100,000 barrels.

There was a total of 257 producing oil wells as of December 31, 1953, compared with 88 at the end of 1952, according to the North Dakota State Industrial Commission.

Crude-oil production was limited by facilities to transport and process petroleum, but work progressed on a large refinery at Mandan and smaller refineries at Williston and Dickinson and on a natural-gasoline plant at Tioga. These facilities were scheduled for completion in 1954.

The North Dakota Geological Survey⁴ reported cumulative production of petroleum, by counties, for the period April 1951 to January 1954, as follows:

County:	Barrels
Billings.....	24, 032
Bottineau.....	21, 940
Burke.....	14, 944
McKenzie.....	108, 116
Mountrail.....	996, 936
Williams.....	5, 750, 008
Total.....	6, 915, 976

⁴ North Dakota Geological Survey, Proration Schedule and Oil Production Report, Grand Forks, N. Dak., Mar. 1, 1954, p. 31.

REVIEW BY COUNTIES**ADAMS**

The Marion clay works at Hettinger produced building brick and heavy clay products. Lignite was produced by Dakota Collieries Co. at Haynes.

BENSON

Haggart Construction Co. of Fargo and the county highway department produced road gravel.

BILLINGS

Lignite was produced from the Little Missouri mine at Medora. Amerada Petroleum Corp. produced from wells in the Fryberg field.

BOTTINEAU

Petroleum production was reported from the Northeast Landa, Westhope, and North Westhope fields. Ward Williston Drilling Co. was the largest producer.

BOWMAN

Montana-Dakota Utilities Co. produced natural gas from the Cedar Creek field. Paint pigments were produced by the National Aluminate Corp. from lignitic humus. The Knife River Coal Mining Co. produced lignite at Gascoyne.

BURKE

Lignite was produced by the Truax Traer Coal Co. and at the Bonsness coal mine, Columbus. Warren Petroleum Corp. reported production from a well in the Madison formation of the Tioga field.

BURLEIGH

Dakota Sand & Gravel Co., Bismarck, and the North Dakota Highway Department produced sand and gravel for building and road use. Ecklund Taplin Coal Co., Wilton, produced lignite.

CASS

Lavoy & Scheffler, Fargo, produced road gravel.

DIVIDE

Baukol-Noonan Lignite Co., Inc., produced lignite at Noonan.

DUNN

The Pelton mine (Dunn Center), the Sampson mine (Fayette), and the Skalsky mine (Halliday), together produced over 90 percent of the county's lignite. Smaller producers at Dickinson, Dunn Center, and Halliday supplied the remainder.

FOSTER

Road gravel was produced by and for the county highway department.

TABLE 4.—Value of mineral production in North Dakota in 1952-53, by counties

County	1952	1953	Principal minerals produced in 1953, in order of value
Adams.....	\$74,600	\$95,466	Coal, clays.
Barnes.....	41,100	21,112	Sand and gravel.
Benson.....	56,727	72,770	Petroleum.
Billings.....		45,922	Do.
Bottineau.....		308,624	Coal, natural gas.
Bowman.....	267,100	1,013,214	Coal, petroleum, sand and gravel.
Burke.....	1,031,312	314,441	Sand and gravel, coal, stone.
Burleigh.....	434,934		
Dickey.....	111,716	628,026	Coal.
Divide.....	693,583	32,789	Do.
Dunn.....	27,534	1,041	Sand and gravel.
Foster.....	4,341		
Golden Valley.....	(¹)	87,245	Sand and gravel, clays.
Grand Forks.....		81,151	Coal.
Grant.....	83,635	2,885	Sand and gravel.
Griggs.....		36,713	Coal, sand and gravel.
Hettinger.....	43,319	14,544	Sand and gravel.
McHenry.....	(¹)	14,218	Do.
McIntosh.....	38,760	219,388	Petroleum, coal.
McKenzie.....	724,018	706,309	Coal, sand and gravel.
McLean.....		2,251,289	Coal.
Mercer.....	2,456,561	243,427	Sand and gravel, coal, clays.
Morton.....	113,277	1,808,086	Petroleum, natural gas.
Mountrail.....	462,953	56,128	Sand and gravel.
Nelson.....	22,088	13,973	Coal.
Oliver.....	13,701	58,087	Sand and gravel.
Ramsey.....		3,116	Do.
Ransom.....	22,114	753,050	Do.
Renville.....	383,041	4,675	Do.
Richland.....	11,600	44,955	Do.
Rolette.....	1,130	2,646	Do.
Sargent.....	2,715	7,198	Do.
Sheridan.....		206,368	Coal.
Stark.....	197,817	149,187	Sand and gravel.
Stutsman.....	(¹)		Do.
Trails.....	13,032	10,208	Do.
Walsh.....	14,840		
Ward.....	1,453,077	1,337,610	Coal, sand and gravel.
Wells.....	19,922	20,464	Sand and gravel.
Williams.....	2,954,007	8,311,895	Petroleum, sand and gravel, coal, natural gas.
Undistributed ²	280,289	258,902	
Total.....	12,057,000	19,237,000	

¹ Included with "Undistributed."

² Includes value of mineral production that Bureau of Mines is not at liberty to publish, as indicated by footnote 1 and for the following counties: In 1952—Eddy; in 1953—Cass, Pierce, and Traill.

GOLDEN VALLEY

Lignite was produced by the Bonnie View mine at Beach.

GRAND FORKS

Russell J. Bradshaw (Arvilla), Swingen Construction Co. (Grand Forks), and the Dakota Ready Mix Co. produced sand and gravel for building and road purposes.

Red River Valley Brick Corp. produced building brick and heavy clay products at Grand Forks.

GRANT

The Coffin Butte (Davenport) Ketterling and Stelter mines (all near New Leipzig), and the Comet Mining Co. (at Heil) produced lignite.

GRIGGS

Gravel for road purposes was produced by and for the county highway department.

HETTINGER

Sand for road use was produced by the county highway department. Lignite was produced by the New England Coal Co., New England; Regent mine, Regent; and the Watson mine, Mott.

McHENRY

Gravel for railroad ballast was produced by the Great Northern Railway Co.

McINTOSH

Otto F. Hinz and David A. Tschetter, both of Ashley, and the Minneapolis, St. Paul & Sault Ste. Marie Railroad Co. produced gravel for building and road use and railroad ballast.

McKENZIE

Lignite was produced from the Johnson Coal mine (underground) at Watford City. Other mines at Watford City, Banks, and Keene produced lignite from strip mines. Petroleum was produced from the Croff, Charlson, Keene, and Sanish fields. Amerada Petroleum Corp. was the largest producer. The Texas Co. and Stanolind Oil & Gas Co. also reported production.

McLEAN

Minneapolis, St. Paul & Sault Ste. Marie Railroad Co. produced gravel for railroad ballast. Truax Traer Coal Co. and Burns & Wretling Coal Co., both at Garrison, and the Underwood Coal Co. at Underwood produced lignite from strip mines.

MERCER

One-third of the lignite produced in North Dakota in 1953 was from mines in Mercer County. Principal producers were Truax Traer Coal Co., Hazen; and Knife River Coal Mining Co. and Dakota Collieries Co., both at Beulah. Smaller producers operated at Beulah, Hebron, Stanton, and Zap.

MORTON

Riverside Gravel Co., Bismarck, produced sand and gravel. Hebron Brick Co., Hebron, produced building brick and heavy clay products. Molite, Inc., produced clay for lightweight aggregate at Mandan. Lignite production was reported by Carbon Coal mine No. 2 and Flemmer Coal Co. Kaelberer coal mine at New Salem; Kohler coal mine and John Renner & Sons Richter coal mine at Glen Ullin; Thiel coal mine and Thor coal mine at Almont; the Harnish coal mine, Hebron; and the Regina Coal Mining Co., Mandan.

MOUNTRAIL

Petroleum production was reported from the Tioga field by Amerada Petroleum Corp., California Co., Concord Development, Inc., Hunt Oil Co., M. B. Rudman-Paul F. Rutledge, and the Skelly Oil Co. Amerada Petroleum Corp. also produced from the East Tioga field.

NELSON

Road gravel was produced by the Haggart Construction Co., Fargo, and by and for the county highway department.

OLIVER

The Hagel coal mine, Center, produced lignite.

PIERCE

Obert Blissum, Rugby, and Leslie M. Pieterich produced road gravel.

RAMSEY

Concrete Sectional Culvert Co., Fargo, produced building sand and gravel.

RANSOM

The Ransom County Highway Department produced road gravel.

RENVILLE

Haggart Construction Co., (Fargo) and J. L. Shiely Co., Inc., (St. Paul, Minn.) produced gravel for building and road purposes.

RICHLAND

Road gravel was produced by the county highway department.

ROLETTE

The county highway department produced road gravel.

SARGENT

Sand for road use was produced by the county highway department.

SHERIDAN

Road gravel was produced by the county highway department.

SLOPE

Lignite was produced at the Gress coal mine, Dickinson.

STARK

Dakota Briquets & Tar Products, Inc., Dickinson, produced lignite and manufactured briquets. Other producers of lignite were the Dickinson Coal Mining Co., Walter Coal mine, and Wock Bros. coal mine, all at Dickinson; Dietz coal mine, Belfield; and the Richter coal mine, Hebron.

STUTSMAN

Howard Struble (Jamestown) and the Northern Pacific Railway Co. produced gravel for road purposes and railroad ballast.

TRAILL

Carl Hovland and the county highway department produced gravel for building and road purposes.

WALSH

Engine sand and gravel for ballast were produced by the Minneapolis, St. Paul & Sault Ste. Marie Railroad Co., and road gravel was produced by and for the county highway department.

WARD

Sand and gravel for building and road use were produced by the Minot Sand & Gravel Co., Minot, and by and for the county highway department. Lignite was produced by Truax Traer Coal Co. and the Valley Coal Co., at Velva; the Miller coal mine and Vix Coal Co., at Sawyer; the Ankenbauer coal mine, Kenmare; and the Quality Lignite Coal Co., Minot.

WELLS

Bender Gravel Co., Harvey, and the county highway department produced sand and gravel.

WILLIAMS

Sand and gravel were produced by Pioneer Sand & Gravel Co. (Williston), by Scott & Zimmerman, and for the county highway department. Producers of lignite were the M & M Coal Co., Tioga; the Black Diamond Coal mine, the Ray Coal Co. and Star coal mine, all at Williston; Sorenson coal mine, Hanks; and the Cedar Coulee mine No. 2, Wheelock. Petroleum was produced from four fields, the Beaver Lodge and Tioga being the most important. Leading producers were Amerada Petroleum Corp., Hunt Oil Co., and Concord Development, Inc.

The Mineral Industry of Ohio

By Alvin Kaufman¹



OHIO ranked 12th in the Nation in the value of mineral production in 1953, with the value of State mineral output increasing 3 percent over that in the preceding year. Major products in 1953 were coal, stone, lime, and cement. Ohio ranked first in the United States in output of grindstones, clays, and lime; second in stone and peat; fourth in salt, calcium-magnesium chloride, and ground sandstone output. The principal mineral-producing counties were Belmont, Harrison, and Jefferson.

Fuels and nonmetals each represented half of the total value of Ohio mineral output in 1953. There was no mine production of metals.

TABLE 1.—Mineral production in Ohio, 1952–53¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement.....376-pound barrels.....	11,377,806	\$28,488,500	12,532,437	\$32,957,308
Clays.....	5,493,830	13,643,742	5,634,596	9,327,706
Coal.....	36,208,450	138,090,700	34,736,773	131,475,408
Lime (open-market).....	2,205,432	28,393,260	2,945,800	35,310,353
Natural gas.....million cubic feet.....	30,993	6,725,000	37,542	8,334,000
Natural-gas liquids: Natural gasoline thousand gallons.....	1,596	114,000	(2)	(2)
Peat.....	24,828	290,664	27,696	260,474
Petroleum (crude).....thousand 42-gallon barrels.....	3,350	10,020,000	³ 3,610	³ 9,710,000
Salt (common).....	2,827,455	5,991,626	3,040,237	7,484,795
Sand and gravel.....	20,751,493	23,069,458	24,032,388	27,076,276
Stone (except limestone for cement and lime).....	⁴ 24,693,189	⁴ 36,197,485	⁴ 25,784,561	⁴ 39,642,601
Undistributed: Abrasive stones, calcium-magnesium chloride, gypsum, ground sand and sandstone, stone (crushed unclassified, 1952; dimension unclassified), recovered elemental sulfur (1953), and minerals whose value must be concealed for particular years (Indicated in appropriate column by footnote reference 2). Excludes value of clays used in cement.....	-----	1,664,191	-----	1,264,540
Total Ohio.....	-----	292,689,000	-----	302,843,000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

² Value included with "Undistributed."

³ Final figure. Supersedes preliminary figure given in commodity chapter.

⁴ Excludes certain stone, value for which is included with "Undistributed."

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal.—Ohio in 1953 maintained its position as fifth largest producer of bituminous coal in the United States, despite a 4-percent decline from the 1952 output. The State ranked ninth in recoverable re-

¹ Commodity-industry analyst, Region VIII, Bureau of Mines, Pittsburgh, Pa.

serves, with approximately 41 billion tons estimated to be retrievable as of January 1, 1953, assuming 50-percent recovery.² The coal-bearing rocks underlie a 12,340-square-mile area in 30 eastern counties. Of these, 25 produced coal in 1953. The major producing counties, in order of decreasing tonnage, were Belmont, Harrison, and Jefferson.

Approximately 53 coal beds have been identified in the State; 17 were commercial under 1953 economic conditions. Nearness of the seams to the surface resulted in a high percentage (62 percent) of strip-mined coal. This applied particularly to coal output in Portage, Washington, and Wayne Counties, all of which reported 100 percent surface production. The State was also a leader in the production of bituminous coal by auger mining. In 1953 a total of 139,000 tons was mined by this method in Athens, Belmont, Carroll, Columbiana, Jefferson, and Tuscarawas Counties. Nine mines employed 10 augers, 1 power shovel, 3 power drills, and 10 bulldozers. The average auger miner produced 17.95 tons per day, which compares favorably with the average of 18.57 tons per man per day for strip mines in Ohio. Of the 37 percent of output produced underground, virtually 100 percent was cut and loaded by machines. The average Ohio miner, above and below the surface, produced 12.38 tons daily. This rate was a 9-percent increase over the average for the previous year. Coal was mined by 522 mines, of which 14 percent produced 100,000 tons or more annually and 47 percent were responsible for less than 10,000 tons. The largest producers in 1953 were Hanna Coal Co., Division of Pittsburgh Consolidation Coal Co., St. Clairsville; Powhatan Mining Co., Cleveland; Youghiogheny & Ohio Coal Co., Cleveland; and Sunnyhill Coal Co., New Lexington.

TABLE 2.—Bituminous-coal production in 1952-53, by counties

County	1952 production	1953				
		Production	Value per ton	Average tons per man per day	Strip production	Number of strip pits
Athens.....	811,672	585,629	\$4.38	7.26	54,903	4
Belmont.....	7,501,666	7,151,942	4.04	9.61	1,016,335	15
Carroll.....	468,772	505,362	3.59	9.51	397,448	8
Columbiana.....	1,243,024	1,241,049	3.39	11.61	1,171,471	36
Coshocton.....	1,018,126	1,035,519	3.63	12.02	851,314	11
Gallia.....	727,954	818,136	3.60	11.25	651,547	3
Guernsey.....	486,575	374,956	3.33	13.64	317,020	6
Harrison.....	7,035,932	6,987,389	3.84	18.71	5,869,616	18
Hocking.....	107,499	68,657	3.84	5.45	18,020	4
Holmes.....	3,305	1,619	3.26	8.80	1,619	1
Jackson.....	583,743	522,335	3.79	15.23	465,981	12
Jefferson.....	4,961,106	4,765,245	4.01	12.28	2,411,229	24
Lawrence.....	242,785	292,642	3.71	11.24	254,979	5
Mahoning.....	807,873	622,338	3.93	15.64	622,338	13
Meigs.....	526,244	677,807	3.28	11.77	537,185	5
Monroe.....	10,000					
Morgan.....	101,243	49,548	3.40	10.09	16,583	2
Muskingum.....	1,396,813	1,333,912	2.74	15.96	1,059,867	11
Noble.....	1,889,546	1,715,373	3.01	22.59	1,704,360	8
Noyes.....	2,433,716	2,143,316	4.25	11.99	1,363,504	3
Perry.....	191,410	142,855	4.12	11.76	142,855	3
Portage.....	901,942	863,347	3.00	13.18	802,239	14
Tuscarawas.....	2,260,736	2,284,506	3.82	9.78	1,360,515	26
Vinton.....	218,365	196,965	4.48	6.99	165,539	9
Washington.....	184,753	239,291	3.27	25.67	239,291	2
Wayne.....	93,650	117,035	4.00	11.13	117,035	1
Total.....	36,208,450	34,736,773	3.78	12.38	21,612,793	253

² Averitt, P., Berryhill, L. R., and Taylor, D. A., Coal Resources of the United States: Geol. Survey Circ. 293, 1954, p. 5.

Peat.—Ohio ranked second as a peat-producing State in 1953, replacing Michigan, which dropped to fourth place. The Federal Geological Survey issued a report in 1953 which indicated that Ohio had original known reserves of 50 million tons of peat on an air-dried basis.³ Major output was obtained in 1953 from Wyandot County, although peat was also obtained from Summit, Stark, and Mahoning Counties. Production was utilized for mulch and other soil-conditioning purposes. Output increased 12 percent in 1953 compared with the previous year.

Petroleum and Natural Gas.—Ohio petroleum output was derived from two major fields—the Lima field, in the northwest, covering Allen, Hancock, Wood, Mercer, Seneca, Van Wert, and Wyandot Counties, and the Pennsylvania Grade field, in the southeast. Total reserves were estimated by the American Petroleum Institute and the American Gas Association to be 32 million barrels of crude petroleum and 755,982 million cubic feet of natural gas. The latter figure includes 224,884 million cubic feet stored underground for future delivery.

The above figures represent a 5-million-barrel increase in petroleum reserves compared with 1952 and a 24,499-million-cubic-foot rise in natural-gas reserves. The improvement in the reserve picture was due primarily to the widespread acceptance of the hydraulic fracture method. This method had been introduced in the latter half of 1952, but it was not until early in 1953 that operators generally began to employ the new procedure. In 1953, 21,770 wells were producing in Ohio, including 15,670 oil wells and 6,100 natural-gas wells. The marketed production of petroleum and natural gas increased 8 and 21 percent, respectively, over 1952. The average value of petroleum declined from \$2.99 in 1952 to \$2.69 in 1953. Natural gas at the well-head increased in value from 21.7 cents per thousand cubic feet to 22.2 cents compared with the previous year.

The Ohio Geological Survey reported 471 oil, 187 gas, 64 combination, and 387 dry-well completions in 1953.⁴ Gas-well drilling had declined to the lowest number of successful completions since 1890. There were no major gas discoveries, but there were several promising wildcat completions that forecast possible new pool developments in 1954. Principal areas of successful gas development were in Athens, Lake, Lorain, Muskingum, Perry, Stark, Tuscarawas, and Washington Counties. The Geological Survey estimated that the total acreage developed for oil production in Ohio during 1953 was 5,100 and proved for future development 2,700. Two new oil pools were developed during the year. The first—known as the Shearer pool—was in the northwest corner of Bethlehem Township, Coshocton County; the limits of this pool had not been determined by the end of 1953. The second new producing area was the Fry pool in Pike Township, Stark County; 4 wells were completed here, the largest reporting an output of 40 barrels per day. In addition to petroleum and natural gas, a substantial quantity of natural gasoline was produced by two absorption plants.

³ Averitt, P., Berryhill, L. R., and Taylor, D. A., Coal Resources of the United States, Progress Report: Geol. Survey Circ. 293, Oct. 1, 1953, p. 38.

⁴ Alkire, Robert L., 1953 Oil- and Gas-Well Drilling Statistics: Ohio Div. of Geol. Survey, Dept. of Natural Resources, Rept. of Investigations 20, 1954, 53 pp.

NONMETALS

Cement.—Shipments of Ohio portland cement in 1953 increased 10 percent compared with 1952. In large measure the increased use of cement in Ohio resulted from construction of the Ohio Turnpike, which consumed substantial quantities of this material. Stocks of finished portland cement, as of December 31, 1953, showed approximately a 1-percent increase from those on hand at the end of the previous year. The average value increased from \$2.50 in 1952 to \$2.63 in 1953. The rated capacity of the Ohio cement industry increased approximately 2 percent to 13,510,125 barrels compared with the previous year. The industry operated at 93 percent of capacity. Of the nine plants active in Greene, Erie, Lake, Lucas, Muskingum, Lawrence, and Stark Counties, the largest quantities were produced by Southwestern Portland Cement Co., Fairborn, Greene County; Pittsburgh Plate Glass Co., East Fultonham, Muskingum County; and Universal Atlas Cement Co., Fairborn, Greene County.

TABLE 3.—Finished portland cement produced, shipped, and in stock, 1944-48 (average) and 1949-53

Year	Active plants	Production (barrels)	Shipments from mills			Stocks at mills on December 31 (barrels)
			Barrels	Value		
				Total	Average per barrel	
1944-48 (average).....	9	7,193,634	7,293,248	\$12,743,113	\$1.68	661,975
1949.....	9	10,313,496	10,157,001	22,388,726	2.20	758,327
1950.....	9	10,606,739	10,512,004	24,012,983	2.28	853,932
1951.....	9	11,873,852	11,872,278	29,498,956	2.48	855,543
1952.....	9	11,270,431	11,377,806	28,488,500	2.50	748,541
1953.....	9	12,539,132	12,532,437	32,957,308	2.63	755,236

Clays.—The Ohio clay industry originated in 1841, when A. Russell first produced firebrick near East Liverpool. This was followed by establishment of the G. & M. Meyers plant near Toronto in 1852. This company utilized the lower Kittanning clay beds for manufacturing various clay products. Flint clays were first used by Reese Thomas in Scioto County for manufacturing firebrick. From this small start the clay industry of Ohio increased, until in 1953 the State led the Nation as a producer. In 1953 output was reported from 116 clay pits, including 24 underground mines, operating in 40 counties. Fire clay comprised 50 percent of tonnage and 66 percent of value in 1953. The output of fire clay declined 2 percent compared with 1952. The production of miscellaneous clays increased 8 percent in tonnage and 16 percent in value. Approximately 65 percent of the clay output was utilized in manufacturing heavy-clay products. The major clay-producing counties were Columbiana, Stark, and Tuscarawas. The largest producers were Natco Corp., August Honeck & Sons, Belden Brick Co., and McLain Fire Brick Co.

Gypsum.—Ohio gypsum was first discovered in 1821 in rocks outcropping along the shore of Sandusky Bay, and in 1953 the State output of this commodity was still obtained from this area. The deposits were derived from sea water evaporated in restricted basins in

TABLE 4.—Clays sold or used by producers, 1952-53, by counties

County	1952		1953	
	Short tons	Value	Short tons	Value
Carroll.....	205, 423	\$368, 955	180, 128	\$397, 874
Columbiana.....	470, 436	2, 404, 065	493, 438	706, 821
Cuyahoga.....	609, 312	609, 312	409, 096	331, 090
Hocking.....	194, 530	1, 208, 136	189, 257	250, 614
Jackson.....	191, 393	660, 192	141, 918	334, 258
Jefferson.....	221, 587	901, 684	217, 567	345, 030
Lawrence.....	150, 471	424, 418	228, 043	1, 038, 566
Paulding.....	20, 960	20, 960	19, 933	55, 666
Perry.....	161, 338	210, 894	197, 231	308, 077
Putnam.....	16, 724	16, 724	26, 306	55, 162
Stark.....	513, 010	920, 415	579, 692	824, 967
Summit.....	145, 985	203, 210	59, 283	88, 025
Tuscarawas.....	1, 061, 094	2, 744, 741	1, 022, 976	1, 745, 355
Undistributed ¹	1, 531, 567	2, 950, 036	1, 869, 728	2, 846, 201
Total.....	5, 493, 830	13, 643, 742	5, 634, 596	9, 327, 706

¹ Includes data for the following counties: Darke, Delaware, Franklin, Hancock, Harrison, Henry, Highland, Holmes, Huron, Lake, Madison, Mahoning, Marion, Medina, Muskingum, Noble, Portage, Richland, Sciota, Seneca, Van Wert, Vinton, Washington, Wayne, Williams, Wood, Wyandot, and clay used in cement manufacture not apportioned by counties.

TABLE 5.—Clays sold or used by producers in 1953, by kinds and uses

Use	Fire clay		Miscellaneous clays		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
Pottery and stoneware: Stoneware including chemical stoneware.....	2, 800	\$14, 000			2, 800	\$14, 000
Tile, high-grade.....	19, 810	53, 370	25, 076	\$47, 652	44, 886	106, 022
Kiln furniture: saggars, pins, stilts.....	442	1, 326			442	1, 326
Portland and other hydraulic cements.....			581, 859	581, 859	581, 859	581, 859
Refractories:						
Firebrick and block ¹	640, 691	1, 531, 663			640, 691	1, 531, 663
Fire-clay mortar.....	19, 728	45, 097			19, 728	45, 097
Foundries and steelworks.....	336, 711	1, 160, 719			336, 711	1, 160, 719
Other ²	121, 636	583, 729	211, 012	105, 506	332, 648	689, 235
Total.....	1, 118, 766	3, 321, 208	211, 012	105, 506	1, 329, 778	3, 426, 714
Heavy clay products.....	1, 666, 225	2, 784, 731	2, 008, 606	2, 413, 054	3, 674, 831	5, 197, 785
Grand total.....	2, 808, 043	6, 179, 635	2, 826, 553	3, 148, 071	5, 634, 596	9, 327, 706

¹ Firebrick and block includes bauxite refractories.

² Other refractories includes zinc retorts and condensers.

ancient seas that once covered the northern part of the State. United States Gypsum Co. and Celotex Co., both in Ottawa County, were the producers.

Lime.—For over 30 years Ohio has been the leading producer of burnt lime in the United States. The output of this commodity ranked, in terms of value, as the third largest mineral industry in the State in 1953. The commodity had ranked fourth in 1952. Production of burnt lime increased 34 percent in 1953 compared with the previous year. The lime produced was utilized for refractory (48 percent), chemical and industrial (31 percent), building (19 percent), and agricultural purposes (2 percent). In 1952 chemical and industrial uses consumed only 18 percent of the total burnt lime produced in Ohio. The increased use of chemical and industrial lime in 1953 was part of the national trend toward more and more chemical products.

Of the 18 lime producers operating in 10 counties, the largest were Basic Refractories, Inc., Cleveland; Columbia Southern Chemical Corp., Barberton; and United States Gypsum Co., Genoa. Approximately 34 percent of the total lime output in the State was obtained from Sandusky County.

TABLE 6.—Lime (quick and hydrated) sold by producers, by types, 1944-48 (average) and 1949-53

Year	Agricultural (burnt)		Building		Chemical and other industrial		Refractory		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1944-48 (average).....	57,438	\$471,877	365,296	\$3,704,346	416,905	\$3,238,091	774,140	\$7,716,677	1,613,779	\$15,130,991
1949.....	51,724	603,555	525,357	6,713,569	327,425	3,268,128	807,742	9,736,135	1,712,248	20,321,387
1950.....	51,904	595,105	632,632	8,678,435	390,571	3,876,436	1,067,237	13,123,122	2,142,344	26,273,098
1951.....	47,092	519,367	623,236	8,290,569	437,891	4,491,313	1,181,254	15,744,947	2,289,473	29,046,196
1952.....	53,467	637,589	573,088	8,009,903	407,007	4,139,066	1,166,870	15,606,702	2,205,452	28,393,260
1953.....	52,376	618,108	556,537	8,328,900	922,655	7,350,473	1,414,232	19,012,872	2,945,800	35,310,353

Natural Salines.—Calcium chloride was produced from well brines by the ammonia-soda process in Meigs County in 1953. The sole producer was Pomeroy Salt Corp., Pomeroy.

Salt.—Ohio salt output increased 8 percent in 1953. Evaporated salt was produced in Summit, Wayne, and Meigs Counties. The output of brine was limited to Summit and Lake Counties. Brines are obtained by the underground solution of rock salt in hot water. The saline solution thus obtained was utilized directly by chemical plants as a raw material or evaporated for sale. Of the six producing companies in Ohio in 1953, the largest, in order of decreasing value, were Diamond Crystal Salt Co., Akron; Morton Salt Co., Rittman; and Diamond Alkali Co., Painesville.

TABLE 7.—Salt sold or used by producers, 1944-48 (average) and 1949-53, by kinds

Year	Evaporated		Brine		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1944-48 (average).....	455,150	\$3,847,311	2,350,988	\$1,139,536	2,806,138	\$4,986,847
1949.....	445,591	3,976,109	1,750,187	1,158,814	2,195,778	5,134,923
1950.....	472,966	4,274,738	2,042,239	1,216,815	2,515,205	5,491,553
1951.....	479,246	3,908,141	2,633,226	1,940,337	3,112,472	5,848,478
1952.....	461,289	4,189,883	2,366,166	1,801,743	2,827,455	5,991,626
1953.....	498,438	5,175,816	2,541,799	2,308,979	3,040,237	7,484,795

Sand and Gravel.—The western and northern portions of Ohio continued in 1953 to be major sand- and gravel-producing areas. These deposits result from prehistoric glacial action. Material was recovered from open pits by conventional earth-moving equipment and from bars in Lake Erie by dredges. Because of the commodity's low unit value and great bulk (which combine to limit shipping distance), output continued to be marketed locally. As a result, 63 of the State's 88 counties reported sand and gravel production in 1953. Compared with 1952, total State output advanced 16 percent.

Over 82 percent of Ohio's 1953 sand and gravel production was sold for building and paving aggregate. It was also utilized as a raw material for glass, as well as for polishing, grinding, filtering, railroad ballast, traction, and refractory purposes. Glass sand was obtained principally from Knox and Perry Counties. Major sand- and gravel-producing areas were Franklin, Hamilton, Montgomery, and Portage Counties. Of the 184 pits active in Ohio in 1953, the largest were operated by American Aggregates Corp., Greenville, and Ohio Gravel Co., Cincinnati.

TABLE 8.—Sand and gravel sold or used by producers, 1952-53, by uses

Use	1952		1953	
	Short tons	Value	Short tons	Value
Sand:				
Molding.....	744,356	\$2,094,427	578,740	\$1,721,459
Structural.....	4,383,974	4,368,680	5,444,457	5,445,785
Paving.....	3,065,943	2,757,387	3,363,564	3,153,538
Fire or furnace.....	66,702	187,979	69,139	164,594
Engine.....	63,900	110,593	81,856	133,450
Filter.....	17,382	33,089	37,321	39,590
Railroad ballast.....	(1)	(1)	23,677	19,927
Other ²	415,062	1,119,685	632,192	1,542,355
Total.....	8,757,319	10,671,840	10,230,946	12,220,698
Gravel:				
Structural.....	3,482,590	3,692,985	3,734,072	3,981,481
Paving.....	6,157,335	5,952,404	7,384,423	8,060,943
Railroad ballast.....	710,247	537,491	870,489	629,880
Other.....	1,644,002	2,214,738	1,812,458	2,183,274
Total.....	11,994,174	12,397,618	13,801,442	14,855,578
Total sand and gravel.....	20,751,493	23,069,458	24,032,388	27,076,276

¹ Combined with other sand to avoid disclosure of individual company operations.

² Includes glass, grinding, and polishing sands.

Sand and Sandstone (Ground).—Millwood Sands Co. and Central Silica Co., both of Zanesville, reported the production of ground sand and sandstone in Perry and Knox Counties, respectively. The output was utilized in pottery, porcelain, and tile manufacture.

Stone.—The output of stone in Ohio in 1953 increased 4 percent compared with 1952. The production in 1953 equaled that of 1951. Crushed and broken material comprised 99 percent of the total output and 86 percent of the value. Major uses of this commodity were concrete aggregate, road material, and railroad ballast. The most important types of stone were limestone and dolomite. These were utilized, aside from the three uses given above, for riprap, furnace flux, agricultural stone, and various miscellaneous purposes. Limestone and dolomite were produced in 46 counties by 93 producers. The largest of these were Kelley Island Lime & Transport Co., Cleveland; National Lime & Stone Co., Findlay; Marble Cliff Quarries Co., Columbus; and Carbon Limestone Co., Lowellville. Major producing counties were Ottawa, Franklin, Wyandot, and Sandusky.

Sandstone quarrying for building purposes was the oldest stone industry in the State. This industry, which has centered about Amherst, principally quarried the Berea formation of northeastern Ohio, although the Buena Vista, Blackhand, Massillon, Freeport, and

TABLE 9.—Commercial sand and gravel sold or used by producers in 1952-53, by counties

County	1952			1953		
	Number of pits	Short tons	Value	Number of pits	Short tons	Value
Ashtabula.....	4	80, 513	\$79, 901	4	123, 631	\$115, 834
Athens.....	3	58, 950	72, 827	3	69, 325	81, 727
Auglaize.....	3	251, 674	223, 346	3	297, 796	284, 864
Butler.....	9	884, 102	822, 406	10	940, 343	869, 254
Champaign.....	3	400, 765	330, 256	3	(1)	(1)
Clark.....	5	273, 450	273, 642	5	294, 176	309, 029
Coshocton.....	9	658, 239	414, 988	10	285, 609	287, 211
Cuyahoga.....	7	456, 530	495, 599	7	866, 046	872, 428
Darke.....	6	279, 658	277, 364	6	248, 834	249, 338
Fairfield.....	5	148, 174	153, 878	5	139, 069	157, 811
Franklin.....	4	2, 305, 756	2, 267, 668	4	2, 491, 234	2, 744, 006
Geauga.....	6	675, 737	921, 705	7	479, 202	648, 509
Greene.....	3	124, 003	111, 853	3	175, 863	164, 012
Hamilton.....	11	3, 295, 711	3, 645, 893	11	3, 295, 492	3, 880, 722
Henry.....	(1)	(1)	(1)	3	70, 226	88, 287
Holmes.....	(1)	(1)	(1)	3	71, 302	50, 553
Huron.....	3	123, 732	120, 153	3	130, 047	114, 613
Jefferson.....	(1)	(1)	(1)	3	345, 751	373, 003
Knox.....	5	378, 677	566, 505	5	332, 261	596, 616
Lake.....	(1)	(1)	(1)	3	166, 036	155, 516
Licking.....	5	271, 729	284, 695	6	409, 093	392, 966
Miami.....	(1)	(1)	(1)	4	271, 262	293, 647
Montgomery.....	9	1, 285, 299	1, 158, 129	9	1, 664, 222	1, 407, 782
Muskingum.....	4	383, 859	481, 213	3	(1)	(1)
Pike.....	(1)	(1)	(1)	4	413, 020	555, 592
Portage.....	7	823, 851	1, 547, 125	9	980, 301	1, 664, 013
Proble.....	3	111, 668	124, 263	3	105, 946	119, 803
Ross.....	5	561, 342	557, 695	6	858, 356	801, 687
Shelby.....	4	130, 946	140, 695	5	216, 724	251, 654
Stark.....	7	934, 826	863, 963	7	975, 594	923, 922
Summit.....	7	610, 623	635, 106	8	503, 791	516, 150
Tuscarawas.....	7	460, 072	608, 012	7	487, 598	609, 929
Warren.....	6	409, 464	365, 343	6	403, 563	380, 493
Washington.....	6	242, 293	234, 332	6	191, 706	215, 352
Wayne.....	3	49, 728	44, 004	5	499, 354	442, 136
Williams.....	5	55, 573	39, 514	4	94, 427	72, 606
Undistributed ²	38	3, 804, 988	4, 959, 766	27	4, 776, 152	6, 148, 443
Total.....	202	20, 351, 586	22, 821, 839	220	23, 673, 352	26, 839, 508

¹ Included with "Undistributed."² Includes the following counties: Adams (1952), Allen, Ashland, Belmont (1952), Carroll, Clermont, Clinton, Delaware, Erie, Gallia, Jackson (1952), Lawrence, Logan, Lorain, Lucas, Madison, Marion, Medina, Meigs, Morgan, Morrow, Perry, Pickaway, Richland, Sandusky, Scioto, Trumbull, Union, Wood (1952), Wyandot, and counties indicated by footnote 1.

TABLE 10.—Stone sold or used by producers, 1952-53, by kinds

Kind	1952		1953	
	Short tons	Value	Short tons	Value
Dimension stone:				
Limestone.....	16, 557	\$36, 376	17, 667	\$39, 852
Sandstone.....	150, 071	4, 853, 232	167, 589	5, 358, 310
Total dimension stone.....	¹ 166, 628	¹ 4, 889, 608	¹ 185, 256	¹ 5, 398, 162
Crushed and broken stone:				
Limestone.....	24, 388, 152	30, 234, 117	25, 456, 456	32, 999, 694
Sandstone.....	138, 409	1, 073, 760	142, 849	1, 244, 745
Total crushed and broken stone.....	¹ 24, 526, 561	¹ 31, 307, 877	25, 599, 305	34, 244, 439
Grand total.....	¹ 24, 693, 189	¹ \$36, 197, 485	¹ 25, 784, 561	¹ 39, 642, 601

¹ Excludes certain stone, Bureau of Mines not at liberty to publish.

Marietta sandstones were also utilized. Crushed sandstone was also produced, mainly for refractory use. Sandstone output was reported by Harbison-Walker Refractories, Portage County; Cleveland Quarries Co., Amherst; and Taylor Stone Co. and Waller Bros. Stone Co., both of McDermott, Scioto County. Grindstones were produced by Nicholl Stone Co., Lorain, Lorain County; Constitution Stone Co., Constitution, Washington County; and Hall Grindstone Co., Marietta, Washington County. Ohio was the major United States source of grindstones.

TABLE 11.—Limestone sold or used by producers, 1952–53, by counties

	1952		Number of pits	1953	
	Short tons	Value		Short tons	Value
Allen.....	687, 809	\$790, 867	4	715, 980	\$863, 631
Delaware.....	397, 543	454, 705	4	359, 082	419, 234
Payette.....	554, 644	798, 863	3	714, 903	937, 087
Hamilton.....	41, 505	48, 796	4	44, 567	51, 704
Hancock.....	446, 490	525, 054	3	420, 438	497, 865
Hardin.....	389, 515	465, 977	3	337, 794	500, 263
Highland.....	413, 798	573, 415	3	308, 062	414, 302
Logan.....	169, 175	183, 749	3	159, 490	184, 554
Lucas.....	1, 469, 386	1, 864, 225	4	1, 294, 284	1, 587, 647
Marion.....	789, 135	919, 536	3	772, 853	919, 375
Putnam.....	275, 685	344, 121	4	289, 800	368, 160
Sandusky.....	1, 604, 659	2, 104, 841	8	1, 604, 520	2, 223, 804
Seneca.....	959, 072	1, 076, 745	4	889, 857	995, 534
Van Wert.....	306, 289	280, 727	3	230, 089	287, 356
Wood.....	508, 629	567, 914	5	390, 394	490, 152
Undistributed.....	15, 391, 375	19, 270, 958	39	16, 892, 010	22, 298, 878
Total.....	24, 404, 709	30, 270, 493	97	25, 474, 123	33, 039, 546

REVIEW BY COUNTIES

ADAMS

Sand and gravel were produced in Adams County in 1953 by J. F. Hardyman Co., Manchester, for use as building and paving materials. Plum Run Division of New York Coal Sales Co. reported a substantial output of limestone for concrete aggregate, road material, and agricultural purposes.

ALLEN

National Lime & Stone Co. and Western Ohio Stone Co. (both at Lima), Bluffton Stone Co. (Bluffton), and A. J. Suever Stone Co. (Delphos) produced limestone and dolomite in 1953. The output from these quarries was utilized for concrete aggregate, road material, agricultural stone, railroad ballast, and riprap. C. E. Duff & Son, Lakeview, was the only commercial producer of building and paving sand and gravel in Allen County in 1953.

ASHLAND

Noncommercial washed sand and gravel were produced in Ashland County in 1953.

ASHTABULA

Fire and molding sand and building and paving sand and gravel were produced in Ashtabula County in 1953 by N. J. Pinney Co., Ashtabula; Peerless Mineral Products Co., Conneaut; Northeast Materials, Inc., Kingsville; and Carter Sand & Gravel Co., Ashtabula.

ATHENS

The mines of Athens County in 1953 were substantial producers of soft coal. Major producing companies were Gem Coal Co., Nelsonville; New York Coal Co., Columbus; and Sebring Coal Co., Alliance. Limestone was quarried by Dickson Bros. and Diamond Stone Quarries, Inc. These two companies produced crushed and broken material for use as concrete aggregate and road base. Building and paving sand and gravel were produced by Athens Building Material Co., Athens; Hocking Valley Sand & Gravel Co., Nelsonville; and John Slater, Plains.

AUGLAIZE

The only producer of limestone and dolomite in Auglaize County in 1953 was the National Lime & Stone Co. Rock yielded by this company's quarry near Buckland was crushed and sold for use as concrete aggregate, road material, and agricultural stone. Wapak Sand & Gravel Co., Western Ohio Stone Co., and Quality Sand & Gravel Co., all near Wapakoneta, reported an output of substantial quantities of building and paving sand and gravel.

BELMONT

In 1953 Belmont County was the largest coal-producing area in Ohio. Major producers were Hanna Coal Co., Division of Pittsburgh Consolidation Coal Co., St. Clairsville, operators of the Willow Grove No. 10 and Bradford No. 1 mines; Powhatan No. 1 and No. 3 mines of Powhatan Mining Co.; and Youghiogheny & Ohio Coal Co., Dorothy and Florence mines. Limestone and dolomite for agricultural purposes, concrete aggregate, and road material were quarried in Belmont County in 1953 by Somerton Crushing Co., Somerton, and George & C. H. McCort. Miscellaneous clays were produced by Standard Stone & Brick Co., Bellaire.

BROWN

Howard S. Watson, Georgetown, produced limestone in Brown County in 1953.

BUTLER

Ten sand and gravel pits were in operation in Butler County in 1953. The largest of these, in order of decreasing production, were American Materials Corp. and Hamilton Gravel Co., Hamilton; and Moorman Sand & Gravel Corp. and Middletown Sand & Gravel Co., both of Middletown. Output was utilized for building, paving, railroad ballast, and molding purposes. North Cincinnati Sand & Gravel Co. produced a small quantity of concrete aggregate and road material at its limestone quarry in Butler County.

CARROLL

Coal mines in Carroll County in 1953 yielded substantial tonnages of soft coal. Major producers were the Sterling mine of John M. Hirst & Co. and James Bros. Coal Co. James mine, Magnolia. Fire clay for use in manufacturing structural and drain tile was produced by Whiteacre-Greer Fireproofing Co., Magnolia; Metropolitan Brick Co., Inc., Canton; and Natco Corp. The latter organization operated a pit south of Magnolia on Route 542. Mineral City Sand Co. mined a substantial quantity of molding sand in Carroll County in 1953.

CHAMPAIGN

Sand and gravel were produced in Champaign County in 1953 by American Aggregates Corp., Urbana, and Cushman Bros., Mechanicsburg.

CLARK

Crushed limestone for blast-furnace flux, concrete aggregate, road material, fertilizer filler, and agricultural stone was produced by Moore Lime Co., Springfield. This organization also reported output of quick and hydrated lime for use as mason's lime, masonry mortar, agricultural purposes, dead-burned dolomite, and chemical and industrial uses. Eagle City Sand & Gravel Co. and George R. Malowney, Inc. (both near Springfield), Enon Sand & Gravel Co. (Enon), and Omer S. Porter and New Carlisle Sand & Gravel Co. (both in New Carlisle) produced building and paving sand and gravel.

CLERMONT

Ohio Gravel Co. operated a sand and gravel pit near Miamiville for production of building and paving sand and gravel, as well as railroad ballast.

CLINTON

Limestone and dolomite were produced in Clinton County in 1953 by Melvin Stone Co. This organization reported output of riprap, concrete aggregate, road material, agricultural stone, stone sand, and flux. This company was also the only producer of sand and gravel.

COLUMBIANA

Columbiana County in 1953 was one of the leading coal-producing areas in Ohio. Major producers were Industrial Mining & Engineering Co., Lisbon; A. B. C. Mining Co., operators of Crawford and A. B. C. mine No. 2 near Lisbon; and the Buckeye Coal Mining Co., operator of McCoombs mine. Virtually all output was strip-mined. Miscellaneous clays were produced by American Vitrified Products Co., Leslie, and Summitville Face Brick Co., Summitville. Fire-clay output was from the Wellsville and New Salisbury pits of McLain Fire Brick Co.; the Negley pit of West Darlington Clay Co.; National Fireproofing Corp.; and L. L. Adams, Lisbon.

COSHOCTON

Coshocton County in 1953 was a large producer of bituminous coal. Willow Brook Coal Co., operator of the Willow Brook mine, and

Freeport Gas Coal Co. Jenkins mine near Coshocton were major producers. Other mineral products included sand and gravel and sandstone. Nine sand and gravel pits were active in the county during the year. Molding sand was produced by Ayers Mineral Co., Blissfield, and E. F. & James A. Myer, Layland. Sawed sandstone was produced by Pearl Sandstone Co. from sandstone quarried near Fresno.

CRAWFORD

National Lime & Stone Co. continued to operate its limestone and dolomite quarry and crushing plant near Spore in 1953. The output was sold for use as concrete aggregate, road material, railroad ballast, and agricultural stone.

CUYAHOGA

Cuyahoga County in 1953 ranked first in the State in output of miscellaneous clays. Most of the production was utilized for brick and draintile manufacture. The major producer was Cleveland Builders Supply Co., Cleveland. Others were Berea Tile Co., Berea; Ohio Clay Co., operator of a pit 6 miles southeast of Cleveland; and Collinwood Shale Brick & Supply Co., Cleveland. Hydraulic Pressed Brick Co., South Park, manufactured lightweight aggregate from expanded shale. Seven sand and gravel pits yielded building and paving material. Of these, the largest were Kaiser Nelson Co., Canal Sand & Gravel Co., Lytle Bros., and Schmidt Bros. Sand & Supply Co., all near Cleveland. Expanded perlite was also produced in Cuyahoga County. Cleveland Gypsum Co., the only county producer, was the largest manufacturer in Ohio. Major use was for plaster and concrete aggregate.

DARKE

American Aggregates Corp., Fort Jefferson, was the largest sand and gravel operator in Darke County in 1953. Other important producers were Aubrey Shields and C. F. Poppelman, Versailles; Slagle Gravel Plant, Greenville; and Hollinger Gravel Co., New Madison. The output was utilized for building and paving material. The only producer of clays was Darke County Tile Co., which mined miscellaneous clays from its pit at Greenville for use in manufacturing draintile and brick.

DELAWARE

Galena Shale Tile & Brick Co., Galena, and Delaware Clay Co., Delaware, produced miscellaneous clays for use in manufacturing brick and tile in 1953. Scioto Lime & Stone Co., Delaware, produced a substantial quantity of chemical lime. This organization also reported an output of a small quantity of hydrated lime for building and agricultural purposes. Limestone for concrete aggregate, road material, and agricultural stone was quarried by the National Lime & Stone Co., Delaware; Shawnee Stone Co., Powell; Owens Stone Co., Ostrander; and Penry Stone Co., Radnor. A small tonnage of unwashed sand and gravel was produced by local governments.

ERIE

Wagner Quarries Co. produced a substantial quantity of riprap, concrete aggregate, road material, railroad ballast, and agricultural stone from a limestone quarry near Sandusky. Molding, building, and engine sands were produced by Keener Sand & Clay Co., Huron, and Kelly Island Lime & Transportation Co., Sandusky. Medusa Portland Cement Co. continued to operate its cement plant near Baybridge. Miscellaneous dimension stone for use as rough building material was quarried by Castalia Tuffa Rock Gardens, Castalia.

FAIRFIELD

Of the five sand and gravel pits in operation in Fairfield County in 1952, the largest were worked by F. H. Brewer Co. and Sargent Gravel Co., Lancaster; and Crystal Rock Products Co., Bremen. The output was utilized mainly for building and paving material. Molding sand was produced by H. N. Rose in Rush Creek Township.

FAYETTE

Riprap, concrete aggregate, road base, railroad ballast, and agricultural stone were produced from limestone quarries near Washington Court House by Blue Rock, Inc., Fayette Limestone, Inc., and Sugar Creek Stone Co.

FRANKLIN

Franklin County was one of the principal sources of sand and gravel in Ohio in 1953. Major producers were American Aggregates Corp., Jackson Pipe Sand-Gravel Co., and Arrow Sand & Gravel Co., all operating pits near Columbus. These companies produced building, paving, and railroad-ballast sand and gravel. Marble Cliff Quarries Co. worked its limestone quarry near Marble Cliff and produced blast-furance and open-hearth flux, concrete aggregate, road material, railroad ballast, agricultural stone, and asphalt filler. Limestone quarried was also used in the preparation of burnt lime for building, agricultural, and chemical purposes. Miscellaneous clays for use in manufacturing draintile and glazed brick were obtained from pits of Claycraft Co., Taylor, and Columbus Clay Manufacturing Co., Blacklick.

GALLIA

Bituminous coal was the principal mineral product of Gallia County in 1953. Building, paving, grinding, polishing, and molding sand and gravel were produced by Kenner Sand & Clay Co. and Epling Sand & Gravel Co., Gallipolis.

GEAUGA

Glass, building, paving, and molding sand and gravel were produced at 7 pits in Geauga County in 1953. Major producers were R. W. Sidley, Inc., Thompson; Jefferson Materials Corp., Burton; F. W. Dietz & Son and Walter C. Best, Inc., Chardon.

GREENE

Greene County was the leading cement-producing area in Ohio in 1953. Southwestern Portland Cement Co. and Universal Atlas

Cement Co. both operated plants near Fairborn. Building and paving sand and gravel were produced by Charles McNamee and Whitacre & Roberts, both of Xenia, and Greene Township Gravel Co., Cedarville.

GUERNSEY

Guernsey County mines in 1953 yielded a substantial tonnage of soft coal. The John Gress limestone quarry near Pleasant City produced limestone for concrete aggregate and road material.

HAMILTON

Hamilton County in 1953 was the largest sand- and gravel-producing area in Ohio. Production was utilized for molding, building, and paving purposes, as well as for railroad ballast. Of the 11 active pits, 5 were operated by Ohio Gravel Co.; these were near Cleves, Cincinnati, Camp Dennison, Miamitown, and Newtown. Ohio Gravel Co. also produced agricultural limestone from quarries near Camp Dennison, Miamitown, and Newtown. Indoken Perlite Co., St. Bernard, continued to produce expanded perlite under a franchised agreement with a large producer of crude perlite in the southwestern United States. Output was sold to building-supply houses.

HANCOCK

Limestone and dolomite were produced for use as concrete aggregate, road material, railroad ballast, agricultural stone, and asphalt filler in Hancock County in 1953. National Lime & Stone Co. and Tar-Box McCall Stone Co., both of Findlay, and Pifer Stone Co., Williamstown, were major producers. Hancock Brick & Tile Co. operated a pit $3\frac{1}{2}$ miles southeast of Findlay to produce miscellaneous clays for use in manufacturing draintile.

HARDIN

Riprap, concrete aggregate, road base, railroad ballast, and agricultural stone were produced from the limestone quarries of Hardin Quarry Co., Dunkirk, and The France Co. Limestone for blast-furnace and open-hearth flux, fertilizer filler, and dust for coal mines was produced by Herzog Lime & Stone Co., Forest.

HARRISON

Harrison County ranked second among coal-producing counties of Ohio in 1953. Major producers were Hanna Coal Co. Georgetown No. 12 mine and Youghiogheny & Ohio Coal Co. Nelms mine. Hanna Coal Co. also produced limestone and dolomite. Sole producer of clay in Harrison County in 1953 was Bowerston Shale Co.

HENRY

Sand and gravel for building and paving purposes were produced in Henry County in 1953 by F. H. Brewer, Harpers Supply Co., Inc., and Napoleon Sand & Gravel Co., all of Napoleon. Clays were produced by August Honeck & Sons, Malinta, and Napoleon Brick & Tile Works, Napoleon, for the manufacture of heavy-clay products.

HIGHLAND

Concrete aggregate, road material, railroad ballast, agricultural stone, fertilizer filler, and rock dust for coal mines were produced from limestone quarried in Highland County in 1953. Active operators were New York Coal Sales Co., Ohio Asphaltic Limestone Co., Inc., and Clay-Wilcox Quarry, Rainsboro. Ohio Asphaltic Limestone Co. was headquartered in New Vienna, Clinton County, but operated a quarry just across the Highland County line. Building brick and structural and drain tile were produced from local clays by the Mowrytown Brick & Tile Co.,

HOCKING

Hocking County in 1953 was one of the largest fire-clay-producing areas in Ohio. Major producers were Natco Corp., Haydenville; Logan Clay Products Co., Logan; and Hocking Valley Brick Co., Nelsonville. The Hocking County mines produced a relatively small output of bituminous coal.

HOLMES

Briarhill Stone Co., Glenmont, and Nicholl Stone Co. quarried dimension sandstone in Holmes County in 1953. This commodity was utilized as sawed architectural stone, dressed or cut material, and flagging. Bickel & Gloss Sand & Gravel Co. and Feikcof Sand & Gravel Co., F. E. Kaser, and Pioneer Sand & Gravel Co., all near Millersburg, mined building and paving sand and gravel. General Clay Products Co., Columbus, operated a pit near Baltic that yielded fire and miscellaneous clays. Output was utilized for manufacture of draitile and other types of tile. In 1953 Holmes County had a very minor production of bituminous coal.

HURON

E. Biglow Co. reported a substantial output of miscellaneous clays from its New London pit for use in manufacturing draitile. Huron Sand & Gravel Co. (Willard), Greenwich Sand Co. (Greenwich), and Tessmer Sand Co. (Norwalk) produced sand and gravel for building, paving, filter, and molding purposes.

JACKSON

Cedar Heights Clay & Coal Co., General Refractories Co., and Aetna Fire Brick Co. reported production of plastic and flint fire clay for use in manufacturing refractories in Jackson County in 1953. Other active clay producers were Pyro-Refractories Co., Oak Hill Fire Brick Co., and Ohio Fire Brick Co., all in the Oak Hill area. County mines yielded important tonnages of bituminous coal.

JEFFERSON

Jefferson County in 1953 ranked third in Ohio as a soft-coal producer. Twenty-six strip mines were in operation in that year. Hanna Coal Co., operator of Piney Fork No. 1 and No. 4 and Dun Glen No. 11 mines, was the major producer. McLain Fire Brick Co. and Frederick

J. Dando (Irontdale); Kaul Clay Manufacturing Co., Peerless Clay Corp., and Toronto Fire Brick Co. (Toronto); Larson Clay Products Co. (Stratton); and Union Clay Manufacturing Co. (Empire), produced plastic, fire, and miscellaneous clays. Kaul Clay Manufacturing Co. also reported an output of miscellaneous clays. Brilliant Sand Co. recovered building sand by slackline and cableway at its pit at Brilliant.

KNOX

Sand and gravel, chiefly for building and paving purposes, were produced in Knox County in 1953 by Millwood Sand Co., Millwood; Killbuck Sand & Gravel Co., Brinkhaven; Fredericktown Sand & Gravel Co., Fredericktown; and J. Harry Baughman, Mount Vernon. J. Harry Baughman also quarried stone for concrete aggregate and road material. Ground sand and sandstone for use in manufacturing pottery, porcelain, and tile were produced by Millwood Sand Co. from a quarry near Howard.

LAKE

Kelley Island Lime & Transport Co. and Minot H. Allen, Wiloughby, mined building and paving sand and gravel in Lake County in 1953. Kelley Island Co. operated a dredge near Grand River. Diamond Alkali Co. produced brine and magnesium compounds from a plant near Painesville. Standard Portland Cement Co. operated a portland-cement plant in Painesville Township in 1953. Miscellaneous clays for use in manufacturing paving brick were mined by Euclid Shale Brick Co. from its pit at Wickliffe.

LAWRENCE

The mines and quarries of Lawrence County yielded bituminous coal, limestone, and sand and gravel in 1953. Alpha Portland Cement Co. and New York Coal Sales Co., Superior Cement Division, operated portland-cement plants at Ironton and Superior, respectively. Limestone for use as concrete aggregate, road material, and agricultural stone was quarried by Southern Ohio Products Co., Ironton. George B. Wilson, Chesapeake, was the sole producer of building and paving sand and gravel. Fire clay for use in manufacturing brick and tile was produced at the Bear Run mine of Harbison-Walker Refractories Co. Other producers of fire clay included Eastern Clay Products Co., Pedro; Cambria Clay Products Co., Blackfork; Carlisle Tile Co., and Poetker & Smith Coal & Clay Co., South Webster, Southern Ohio Products Co., Ironton.

LICKING

Newark Sand & Gravel Co., Vanatta Gravel Co., and Dry Creek Crushed Gravel Co., all of Newark, were the largest of the five sand and gravel producers active in Licking County in 1953. Output was utilized for building and paving material.

LOGAN

Limestone and dolomite were quarried in Logan County in 1953 by Western Ohio Stone Co. and National Lime & Stone Co. The output

of these quarries was utilized for concrete aggregate, road material, and agricultural stone. Ezra J. Neer Engineering Laboratory, Bellefontaine, produced building and paving sand and gravel.

LORAIN

Lorain County was a major sandstone-producing area in Ohio in 1953. Production was predominantly for rough, sawed, dressed, and cut architectural stone, as well as for curbing and flagging. In addition, there was a substantial output for use as riprap. Sandstone producers were Cleveland Quarries Co., Amherst, and Nicholl Stone Co., Lorain. The latter also reported an output of grindstones. Kelley Island Lime & Transport Co. and Cleveland Quarries Co. dredged sand from Lake Erie for use as fire and furnace sand, and building and paving material.

LUCAS

Lucas County in 1953 ranked as fourth largest limestone-producing area in Ohio. France Stone Co. operated quarries near Holland and Waterville. Maumee Stone Co., Maumee, and Toledo Stone & Glass Sand Co., Toledo, also produced limestone for riprap, concrete aggregate, road base, railroad ballast, and agricultural purposes. Medusa Portland Cement Co. produced portland cement at its plant at Silica. Building sand was produced in Lucas County by Lake Sand & Gravel Co., Toledo, and Vermilion Sand & Gravel Co., Vermilion.

MADISON

Building and paving sand and gravel were mined in Madison County in 1953 by West Jefferson Sand & Gravel Co., West Jefferson. The only producer of clays was Madison Tile Co.

MAHONING

Carbon Limestone Co., Lowellville, one of the principal producers of limestone and dolomite in Ohio in 1953, was the only source of that commodity in Mahoning County. The output was for concrete aggregate, road material, agricultural stone, asphalt filler, coal mine rock dust, mineral food, and poultry grit and for various metallurgical uses, including blast-furnace flux. American Fire Clay & Products Co., Canfield, and Pen-Hio Clay Co., Youngstown, produced substantial quantities of fire clay for sale to other companies. Mahoning County mines yielded a large tonnage of soft coal in 1953. A small quantity of peat was also produced for use as a soil conditioner.

MARION

National Lime & Stone Co., Tri-County Limestone Co., and J. M. Hamilton & Sons Co., Marion, quarried limestone during the year for use as riprap, concrete aggregate, road material, and agricultural stone. Miscellaneous clays were mined by Marion Brick & Tile Corp., Marion, and La Rue Tile Co., La Rue. Building sand was produced by American Aggregates Corp. and Penry Sand & Gravel Co., Radnor.

MEDINA

Quillin Bros. Construction Co., Lodi, and Allied Supply Co., Medina, operated sand and gravel pits in Medina County in 1953. The output was used mainly as building and paving materials. Miscellaneous clays for use in manufacturing brick and draintile were produced by Wadsworth Brick & Tile Co.

MEIGS

Pomeroy Salt Corp. and Excelsior Salt Works, Inc., both of Pomeroy, produced evaporated salt in Meigs County in 1953, virtually all by the open-pan method. Pomeroy Salt Corp. reported output of a small quantity of calcium chloride and calcium-magnesium chloride by the ammonia-sodium treatment of well brines at a plant near Minersville. A small quantity of soft coal was also produced in Meigs County.

MERCER

Riprap, concrete aggregate, road material, and agricultural stone were produced in Mercer County in 1953 from the limestone quarries of John W. Karch Stone Co., Celina, and Rockford Stone Co., Rockford.

MIAMI

Piqua Stone Products Division, Armco Steel Corp., continued in 1953 to work its limestone quarry near Piqua for the production of riprap, metallurgical stone, concrete aggregate, road material, agricultural stone, putty whiting, rubber and asphalt fillers, coal-mine rock dust, and mineral food. Steiner Washed Sand & Gravel Co., Ludlow Falls, Fenton Construction Co., Troy, and Miller Bros. produced building and paving sand and gravel.

MONROE

Bituminous coal and limestone were produced at mines and quarries in Monroe County in 1953. Limestone was obtained from operations of Walter L. Christman and H. F. Zerger, near Woodsfield.

MONTGOMERY

Nine sand and gravel pits were in operation in Montgomery County in 1953. Of these, the pits of American Aggregates Co., Southern Hills Pit, Inc., and Keystone Gravel Co., all of Dayton, were the largest producers; the output was utilized mainly for building and paving. Limestone and dolomite were quarried by the Laura Gravel-Stone Co., Phillipsburg; rock produced was crushed and broken for riprap, blast-furnace flux, concrete aggregate, road material, and agricultural stone, as well as asphalt and fertilizer filler.

MORGAN

Stockport Sand & Gravel Co., Chesterhill, and Douglas Ervin, Stockport, produced building and paving sand and gravel. Chesterhill Stone Co., Chesterhill, was the only producer of limestone. Bitu-

minous coal was also produced and shipped from mines in Morgan County.

MORROW

Chesterville Sand & Gravel Co., formerly Carl Hunt & Co., mined building sand and paving gravel from a pit near Chesterville in 1953.

MUSKINGUM

Muskingum County produced bituminous coal in 1953. Approximately 14 strip pits were active, with production exceeding 1 million tons. Major coal producers were Central Ohio Coal Co., Zanesville, and George B. Herring & Son, Mansfield. Four sand and gravel pits were active during the year. The largest were worked by Muskingum River Gravel Co. and Zanesville Gravel Co., both of Zanesville. The output was building and paving material. Limestone for concrete aggregate, road base, agricultural purposes, and miscellaneous uses was quarried by Sidwell Bros. south of Zanesville. Columbia Cement Division, Pittsburgh Plate Glass Co., operated a cement plant at East Fultonham. Clyde Nelson, Roseville, was the only producer of fire clay.

NOBLE

Bituminous coal was produced in Noble County in 1953. Virtually all coal produced during the year came from six strip mines. Major producers were Commercial Fuel Co. Cumberland No. 3 strip mine and Electro-Metallurgical Co., Division of Union Carbide & Carbon Corp., Dexter City mine. James Merry, Caldwell, produced substantial quantities of limestone and dolomite. Miscellaneous clays for use in paving and building brick were produced by Ava Brick Co., Ava.

OTTAWA

Ottawa County again ranked first in 1953 among the limestone-producing counties in Ohio. The largest producer was Kelley Island Lime & Transportation Co., operator of 2 quarries, 1 near Marblehead and the other near Clay Center. United States Gypsum Co. operated a quarry near Gypsum. Its output was utilized for blast-furnace flux, concrete aggregate, road material, and agricultural stone and in glass manufacture, as well as a whiting agent for rubber, as an asphalt filler, and as rock dust for coal mines. The two stone producers also operated hydrated-lime and quicklime plants at Clay Center and Genoa, respectively. The output was utilized for building, agricultural, and chemical uses. In addition, there was a substantial production of dead-burned dolomite for refractory purposes. United States Gypsum and the Celotex Corp. continued gypsum operations at Gypsum and Port Clinton, respectively, in 1953.

PAULDING

Miscellaneous clays were produced in Paulding County in 1953 from the pits of the Haviland Clay Works Co., Haviland, and Baughman Tile Mill and Dangler Drain Tile Co., both of Paulding. Auglaize Stone Co. produced limestone and dolomite from its quarry at Oakwood.

PERRY

In 1953 Perry County ranked fourth as a bituminous-coal-producing area. Fifteen strip pits were producing, with a total output exceeding 1½ million tons. The major producing companies were Sunnyhill Coal Co. and Jones Motor Sales, Inc. Fire clay for use in manufacturing glazed brick and tile was produced by Claycraft Co. and Straitsville Brick Co., New Straitsville. Junction City Clay Co. and Rush Creek Clay Co. (both of Junction City), Belden Brick Co. (Somerset), and Ludowici Celadon Co. (New Lexington) mined miscellaneous clays for manufacturing roofing tile, chimney tops, building brick, acidproof brick, draitile, flue linings, and wall coping. Central Silica Co., Zanesville, operated a quarry near Glenford and produced ground sand and sandstone. The output was utilized in manufacturing pottery, porcelain, and tile. Glass and molding sands were produced by Central Silica Co.

PICKAWAY

Sturm & Dillard Co. continued to recover sand and gravel from its pit at Circleville.

PIKE

Standard Slag Co. and Sharon Silica Co. (Jackson) and Ohio Mineral Co. (Zanesville) operated sand and gravel pits in Pike County in 1953. The major product was gravel for miscellaneous purposes, although there was an important output of molding sand. Washed and unwashed noncommercial sand and gravel were also produced.

PORTAGE

The mines of Portage County yielded substantial tonnages of soft coal in 1953. Universal Sewer Pipe Corp. mined plastic fire clay from its pit near Palmyra. Harbison-Walker Refractories Co. produced sandstone for use as ganister in the manufacture of silica brick. Seven sand and gravel pits were active in 1953, the largest of which were Industrial Silica Corp., Garrettsville, and Geauga Lake plants and the Hugo Sand Co. Kent property.

PREBLE

The only producer of limestone and dolomite in Preble County in 1953 was the Marble Cliff Quarries Co., which worked its quarries near Lewisburg during most of the year. Rock produced was crushed for use as blast-furnace flux, concrete aggregate, and agricultural stone. Marble Cliff Quarries Co. also produced hydrated lime and quicklime for chemical purposes. Steiner Washed Sand & Gravel Co. and the Hawkey pit, West Alexander, and the White Gravel Co. Camden pit, produced building and paving sand and gravel.

PUTNAM

Four operators produced limestone and dolomite in Putnam County in 1953. National Lime & Stone Co. (Rimer), Putnam Stone Co. and Ottawa Stone Co., both of Ottawa, and Schumacher Stone Co.,

Pandora, operated quarries for the production of concrete aggregate, road material, railroad ballast, and agricultural stone. Miscellaneous clays were produced by Snyder Tile Co., Findlay; Etter Tile & Coal Co., Dupont; and Miller Bros. Clay Works, Ottoville.

RICHLAND

Building brick were produced by Richland Shale Brick Co. and Ohio Lumber & Face Brick Co., both of Mansfield, from miscellaneous clays mined in Richland County in 1953. Killbuck Sand & Gravel Co., Killbuck, and Paul Farst produced sand and gravel.

ROSS

Central States Construction Co., Miami Gravel Co., Ohio Mineral Co., Basic Construction Materials Division, New York Coal Sales Co., Brewer & Brewer Sons, Inc., and Paint Valley Sand-Gravel Co. operated pits in the Bainbridge-Chillicothe area in 1953. Virtually all sand and gravel production was utilized for building and paving material. Paint Valley Sand-Gravel Co. was the only producer of limestone.

SANDUSKY

In 1953 Sandusky County was the leading lime and third-ranking limestone-producing area in Ohio. Eight lime operations reported output in 1953—Standard Lime & Stone Co., Ohio Hydrate & Supply Co., and Woodville Lime Products Co., all of Woodville; the J. E. Baker Co., at Millersville; and the Dolite Co., National Gypsum Co., the Kelley Island Lime & Transport Co., and the Gibsonburg Lime Products Co., all of Gibsonburg. In addition to substantial tonnages of dead-burned dolomite, production consisted of building, agricultural, and chemical lime. The output of nine limestone quarries active in 1953 was utilized for riprap, blast-furnace flux, concrete aggregate, road material, railroad ballast, and agricultural stone, as well as for a variety of filler and whitening uses. Major producers were Woodville Lime Products Co., France Stone Co., Kelley Island Lime & Transportation Co., and Ohio Hydrate & Supply Co. Home Sand & Coal Co., Fremont, was the only producer of building sand in Sandusky County in 1953.

SCIOTO

A considerable tonnage of dimension sandstone was produced in Scioto County in 1953 from the quarries of Taylor Stone Co. and Waller Bros. Stone Co., both of McDermott. The output was utilized chiefly for rough, sawed, dressed, or cut architectural blocks, as well as for flagging. Some ganister was produced for use as furnace linings and riprap. Fire clay was mined by International Minerals & Chemical Corp., Eastern Clay Products Department, Lyra; Harbison-Walker Refractories Co., Scioto Furnace; and Pyro-Refractories Co., Wheelersburg. Portsmouth Sand & Gravel Co., Portsmouth, produced principally building and paving sand and gravel.

SENECA

Three quarries yielded limestone and dolomite in Seneca County in 1953. The production was utilized for various metallurgical purposes, including blast-furnace and open-hearth flux, as well as for riprap, concrete aggregate, railroad ballast, and agricultural limestone. The major producers operating in the county in 1953 were The France Co., Bloomville; Basic Refractories, Inc., Maple Grove and Bettsville; and Northern Ohio Stone Co., Flat Rock. Basic Refractories, Inc., the largest lime producer in Ohio, was the only one active in Seneca County in 1953. Production consisted entirely of dead-burned dolomite. Seneca County retained its position as the leading source of peat in Ohio. Arnold Gerhardstein mined some miscellaneous clays at a pit in St. Stephen.

SHELBY

Four sand and gravel operations were reported from Shelby County in 1953; the largest were worked by Sidney Washed Sand & Gravel Co., Ernst Gravel & Stone Co., and Carl Tunks, all of Sidney. Production was utilized for building and paving materials.

STARK

Clays, portland cement, coal, peat, and sand and gravel were produced in Stark County in 1953. The county ranked second and third, respectively, in output of miscellaneous clays, and six pits reported production of fire clay. The major fire-clay producers were Natco Corp., East Canton and Waynesburg; Belden Brick Co., Waco; and Stark Ceramics, Inc., East Canton. Alliance Clay Products Co., Alliance, and Metropolitan Brick Co., Inc., Canton, were major producers of miscellaneous clays. Diamond Portland Cement Co. continued to produce portland cement at its plant at Middlebranch. The coal mines of Stark County yielded a substantial tonnage of soft coal. Seven sand and gravel pits were active in 1953, the largest being operated by Canton Slag Co., Youngstown, and Massillon Washed Gravel Co., Navarre. The output was utilized for building and paving material.

SUMMIT

Summit County was the major source of salt in Ohio in 1953. Columbia Southern Chemical Corp., Barberton, and General Foods Corp., Diamond Crystal-Colonial Salt Division, Akron, produced brines, part of which were used for recovering evaporated salt by the vacuum and open-pan methods. Columbia Southern Chemical Corp. also operated a limestone quarry near Barberton. Its output was utilized predominantly for chemical raw material, but some rock was sold for use as concrete aggregate, road material, and agricultural stone. Summit County had seven sand and gravel producers active in 1953. The largest were Rubber City Sand & Gravel Co. and J. P. Loomis Coal Supply Co., both of Akron, and Botzum Bros., Doylestown. Output was utilized principally for building and paving material. There was also a small output of molding sand. Natco Corp., Aultman, mined a substantial tonnage of fire clay. Miscellaneous clays were obtained from the pits of Camp Bros. Co. and Robinson

Clay Products Co., both of Mogadore. Geotic Industries, Inc., and J. P. Loomis Coal & Supply Co. operated plants for the production of expanded perlite in Akron. This commodity was sold as an aggregate for plaster and concrete. Pure red oxides were produced by Minnesota Mining & Manufacturing Co.

TRUMBULL

Venetian reds and miscellaneous red oxides were produced from a plant near Warren by C. K. Williams & Co. Sand and gravel were recovered by Kinsman Sand & Gravel Co. from its pit at Kinsman.

TUSCARAWAS

Tuscarawas County ranked first in Ohio in 1953 in the output of fire clay, third in the production of miscellaneous clays, and fifth in coal output. Coal mines of the county, of which the largest was the Midvale operation of Columbia Southern Chemical Corp., yielded bituminous coal. Fire clay was produced by 20 clay pits, and 6 additional pits reported the production of miscellaneous clays. Belden Brick Co. Sugar Creek and Port Washington mines were by far the largest producers. Seven sand and gravel pits were active in Tuscarawas County during the year. These produced building, paving, fire, engine, and filter sand and gravel, as well as a substantial output of molding sand. Major producers were Industrial Silica Corp., Dundee; I. J. Lebold; and Superior Sand Corp.

UNION

Union Limestone Co. and H. E. Rockhold & Sons produced riprap, concrete aggregate, road material, and agricultural stone at limestone quarries near West Mansfield and Marysville, respectively. Building and paving sand and gravel were produced by Clymer Materials Co., Marysville.

VAN WERT

Limestone and dolomite were produced in Van Wert County in 1953 by Union Quarries Co., Van Wert; Delphos Quarries Co.; and The France Co., Middle Point. The rock quarried was crushed and sold for use as concrete aggregate, road material, and railroad ballast, as well as for agricultural purposes. Clays were produced by Fred Minsing & Son, Delphos, and Weck tile mill, Van Wert.

VINTON

The mines of Vinton County in 1953 yielded a substantial tonnage of bituminous coal. McArthur Stone & Coal Co. reported an output of limestone and dolomite for use as concrete aggregate, road material, and agricultural stone from its quarry near McArthur. Miscellaneous clays for structural-clay products manufacture were produced by McArthur Brick Co., McArthur.

WARREN

Of the six sand and gravel pits operating in Warren County in 1953, the largest were the Morrow operation of Van Camp Sand Gravel Co. and the Franklin plant of Franklin Sand & Gravel Co.

WASHINGTON

Sand and gravel were produced in Washington County by six producers; the largest of these were Marietta Concrete Corp., Ohio River Sand & Gravel Corp., and Briggs Gravel Co., all of Marietta. Marietta Concrete Corp. mined a substantial tonnage of miscellaneous clays for use in manufacturing lightweight aggregate. Other mineral products of the county during the year included grindstones produced by Constitution Stone Co., Constitution, and Hall Grindstone Co., Marietta. A small quantity of soft coal was also produced.

WAYNE

The mines of Wayne County in 1953 produced a small quantity of soft coal. American Aggregates Corp., W. A. Rupp Construction Co., and Laval Sand Co., Inc., mined building and paving sand and gravel. The only producer of salt in Wayne County was Morton Salt Co., operator of a plant near Rittman for producing open- and vacuum-pan evaporated salt, as well as pressed blocks. Miscellaneous clays for manufacturing building brick and tile were recovered from the pits of Medal Brick & Tile Co., Wooster, and Orrville Tile Co., Orrville.

WILLIAMS

Stryker Drain Tile Co. operated a pit for the production of miscellaneous clays near Stryker. Output was utilized in manufacturing draintile. Tri-State Gravel Co., Inc. (Pioneer), Easler Sand & Gravel Co., and Vincent Wortkoetter (Blakeslee) produced building and paving gravel. Sand was produced by Tri-State Gravel Co., Inc., and Easler Sand & Gravel Co.

WOOD

Limestone and dolomite for use as riprap, concrete aggregate, road material, and various miscellaneous purposes were quarried in Wood County in 1953 by Pugh Quarry Co., Custar; E. F. Brough, West Millgrove; Wood County Stone & Construction Co.; The France Stone Co., North Baltimore; and National Gypsum Co. National Gypsum Co. also operated a lime plant near Bowling Green, producing hydrated lime and quicklime for chemical, building, and agricultural purposes. Miscellaneous clays for use in manufacturing building brick and tile were produced by Perrysburg Tile & Brick Co., Perrysburg.

WYANDOT

National Lime & Stone Co. and J. L. Foucht were the only active producers of limestone and dolomite in Wyandot County in 1953. Their output was utilized for concrete aggregate, road material, blast-furnace and open-hearth flux, railroad ballast, agricultural stone, chemical uses, and coal-mine rock dust. National Lime & Stone Co. produced hydrated lime for use as building material and for agricultural and chemical purposes. The one producer of clay was Claycraft Co., which operated a pit near Upper Sandusky. Corfman Gravel Co. and Wilson Sand Co., both of Upper Sandusky, produced substantial quantities of building and paving sand and gravel. A small quantity of peat was also produced.

The Mineral Industry of Oklahoma

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of Oklahoma.

By F. F. Netzeband,¹ William E. Ham,² and John H. Warren²



A NEW RECORD of \$678 million for the value of mineral production in Oklahoma was established in 1953 (table 1). This was 9 percent greater than the previous high of \$621.4 million in 1952. Production of 15 minerals and 5 mineral fuels was reported in Oklahoma in 1953. Oklahoma was the second largest producer of LP-gases and the third largest producer of natural gas in the Nation in 1953 and the fourth largest producer of crude oil and natural gasoline. Important quantities of cement, coal, gypsum, sand and gravel, stone, and zinc were also produced. The mineral fuels—crude oil, natural gas, natural-gas liquids, and coal—were the State's most important minerals in value, accounting for 95 percent of total value of Oklahoma mineral production; metallic and nonmetallic minerals were responsible for the remaining 5 percent. Crude oil was produced in 57 of Oklahoma's 77 counties; natural gas in 55 counties, some of which also

TABLE 1.—Mineral production in Oklahoma, 1952-53¹

Minera	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays.....	520,050	\$577,420	577,557	\$637,082
Coal.....	2,193,409	12,687,855	2,167,594	13,226,881
Lead (recoverable content of ores, etc.).....	15,137	4,874,114	9,304	2,437,648
Natural gas.....million cubic feet.....	554,033	29,918,000	599,955	41,397,000
Natural-gas liquids:				
Natural gasoline and cycle products thousand gallons.....	405,720	29,459,000	433,650	28,066,000
LP-gases.....do.....	376,026	14,090,000	414,036	14,886,881
Petroleum (crude).....thousand 42-gallon barrels.....	190,435	487,510,000	220,570	2,546,940,000
Sand and gravel.....	3,769,663	2,911,845	4,701,366	3,969,585
Stone (except limestone for cement and lime).....	³ 9,636,475	³ 8,974,334	8,404,483	7,467,247
Zinc (recoverable content of ores, etc.).....	54,916	18,232,112	33,413	7,684,990
Undistributed: Native asphalt, cement, gypsum, lime, pumicite, salt, ground sand and sandstone, stone (dimension limestone, 1952), and recovered elemental sulfur (1953). Excludes value of clays used in cement.....		⁴ 12,116,791		11,447,919
Total Oklahoma.....		621,351,000		678,160,000

¹ Production as measured by mine shipments, sales or marketable production (including consumption by producers).

² Final figure. Supersedes figure given in commodity chapter.

³ Excludes certain stone, value for which is included with "Undistributed."

⁴ Revised figure.

¹ Commodity-industry analyst, Region VI, Bureau of Mines Amarillo, Tex.

² Geologist, Oklahoma Geological Survey.

produced oil; nonmetals in 49 counties; and metals—lead and zinc—in 1 county. Oil and natural gas were produced in a general belt extending from the northeastern part of the State to the southwestern part; nonmetallic mining was widely distributed over the northeast, north central, and central regions and in the Arbuckle and Wichita Mountain areas of the southern part, while metallic mining was limited to Ottawa County in the northeastern part.

CONSUMPTION AND MARKETS

Oklahoma mineral industries process a significant portion of their output into finished and semifinished products for local consumption within the State and for out-of-State shipments. These industries included oil refineries processing Oklahoma oil; natural-gasoline and cycle plants stripping natural gas; zinc smelters processing zinc concentrate mined in Oklahoma; brick, tile, pottery, and cement plants using clays and shales of Oklahoma; and producers of building materials made from Oklahoma gypsum. Out-of-State consumption of oil and natural gas was accelerated through expanded pipeline mileages to industrial sections in the Eastern States.

State regulatory bodies under the inter-state oil compact continued to control the output of crude oil and gasoline and well drilling in producing areas.

TRENDS AND NEW DEVELOPMENTS

New commodities, new methods of operation, and decentralized production of such materials as crushed stone and sand and gravel marked the trend for 1953. Reported for the first time were the production of elemental sulfur from natural gas, the production of lightweight aggregate from expanded clay, and the underground mining of chemical-grade limestone.

A sulfur plant erected by Joe L. Parker in 1952 was in its first full year of production during 1953. The plant, which is east of Madill in Marshall County, recovers elemental sulfur from waste sour gases furnished by the Warren Petroleum Co. gasoline plant by a modified Claus process. All sulfur produced in this plant was trucked in a liquid state to Tulsa, where it was used in manufacturing sulfuric acid.

Lightweight aggregate production was begun in December 1953 at the newly erected plant of the Oklahoma Lightweight Aggregate Co. about 1 mile east of Choctaw, Oklahoma County. This is the first plant in the State to utilize clay as a raw material for making lightweight aggregate. Clay was scraped from pits in the alluvium of a small stream adjacent to the plant. The clay is fired in a 6- by 75-foot rotary kiln at a temperature range from 800° to 2008° F. After firing the product is cooled, crushed, and sized.

The Oklahoma Glass Sand Co. at Hickory, Murray County, shipped sand for glassmaking after rebuilding a plant destroyed by fire in 1947.

Late in 1953 the St. Clair Lime Co. made new entries at its open-face quarries near Marble City, Sequoyah County, in preparation for underground mining of high-calcium limestone to be used as lime in manufacturing calcium carbide. A 27-foot face will be worked by the room-and-pillar method.

A new limestone quarry and crushing plant was opened in eastern Tulsa County about October 1953 by the Edgar Tinlin Equipment Co. The limestone was from the Oologah formation of Pennsylvanian age and was used chiefly for road-base material and concrete aggregate.

Four new quarries were opened during 1953 to obtain crushed stone near large building projects. The Gibson Construction Co. quarried limestone for highway construction near Drumright, Creek County. A granite quarry was opened in Kiowa County by the Metropolitan Paving Co. to supply crushed stone for construction of air fields. H. D. Youngman opened a limestone quarry in the southern part of the Arbuckle Mountains, Carter County, to supply 100,000 tons of crushed stone for air-base construction. Crushed stone (chert conglomerate) for highway construction was obtained at a new quarry in Seminole County by the Steelman Construction Co.

Custom Mills and Smelters.—Three custom mine mills in Oklahoma treated lead-zinc ores mined locally, as well as ores from Kansas, and three mine mills treated lead-zinc ores from company mines alone. One of the Nation's largest lead-zinc mills using the heavy-medium process was at Cardin, Ottawa County; it was the Central mill of the Eagle-Picher Co. and had a daily capacity of 15,000 tons. The other two customs mills were the Beck No. 1 of the Beck Mining Co. and the Lucky Jenny mill of the Harris Mining Co. The American Zinc, Lead & Smelting Co. operated three mine mills treating company ore only—the Rialto, Lawyers, and the Barbara J.

Three smelting companies operated horizontal zinc retort plants in Oklahoma in 1953, two at near capacity—the Blackwell smelter of the Blackwell Zinc Co. at Blackwell, Kay County, and the Bartlesville smelter of the National Zinc Co. at Bartlesville, Washington County. The Henryetta smelter of the Eagle-Picher Co. at Henryetta, Okmulgee County, was idle several months when the supply of concentrate was cut off by a strike of miners at company mines in the Tri-State district.

Mineral Brokers.—Several smelting companies maintained mineral brokers or ore buyers in the Tri-State district of Oklahoma, Kansas, and Southwest Missouri. All metal concentrates produced by district operators were sold, and none were stockpiled at the mines; the concentrates continued to be bought by the brokers f. o. b. the mill.

All Defense Minerals Exploration Administration (DMEA) and Defense Minerals Procurement Administration (DMPA) contracts in Oklahoma had been terminated before 1953. No new contracts were approved.

EMPLOYMENT IN THE MINERAL INDUSTRIES

Employment.—Total employment in the Oklahoma mineral-fuels industries except coal increased slightly in 1953 over 1952, with all departments of the oil and gas industries participating in this increase.³ Approximately 25,000 persons were employed in the oil and gas industries in 1953—5 percent in exploration, 12 percent in drilling, 33 percent in production, 22 percent in pipeline operation, 17 percent in refining, and 11 percent in miscellaneous. Employment in the

³ Jones, Nina L., and Bradley, Nell B., *Injury Experience in the Oil and Gas Industry of the United States in 1953*: Bureau of Mines H. S. S. 430, Aug. 31, 1954, 8 pp.

State coal industry declined 11 percent to approximately 1,550 persons in 1953 from 1952. More than 3,000 persons were employed in the metallic and nonmetallic industries in 1953—46 percent in the metals industry and 54 percent in nonmetallic industry. Zinc smelters afforded additional employment to nearly 2,050 workers. In general, employment in the oil and gas industry increased slightly in 1953, held steady in the nonmetallic industry, and declined in metal mining.

Accidents.—No major disaster was reported in any mineral or mineral-fuel industries of Oklahoma in 1953. There were 12 fatal accidents in the oil and gas industry, 3 in metal mining, 2 in coal mining, and 1 in nonmetallics in 1953. The frequency and severity rates of the mineral industries improved slightly over 1952.

Wages.—Wages of mineral fuels and nonmetallic workers increased in 1953 following a similar trend in industrial wages on a national basis. Wages of metal miners declined slightly during the year.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Oklahoma continued to be an important source of the Nation's crude oil and natural gas in 1953 and remained a major factor in the production of their refined products. Native asphalt and a substantial quantity of a low-ash bituminous coal were also produced.

Coal.—The 1953 output (2 million tons) and value (\$13 million) of coal in Oklahoma approximated that in 1952. This output came from 14 counties, with Haskell County the leading producer, followed by Okmulgee, Rogers, Le Flore, and Pittsburg. Open-pit methods accounted for over 60 percent of the tonnage, with underground mining about 40 percent. The industry worked an average of 134 days during the year, with an average daily output of 17,140 tons.

TABLE 2.—Coal production, 1944–48 (average) and 1949–53

Year	Short tons	Value	Year	Short tons	Value
1944-48 (average).....	3,129,527	\$12,653,960	1951.....	2,223,229	\$13,873,000
1949.....	3,021,859	15,242,000	1952.....	2,193,409	12,687,855
1950.....	2,678,581	14,567,000	1953.....	2,167,594	13,226,881

Natural Gas.—Marketed production of natural gas in 1953 increased 8 percent in quantity to 599,955 million cubic feet and 38 percent in value to \$41,397,000 over that of 1952. In addition to the gas marketed, 92,136 million cubic feet was used for repressuring, and 192,909 million cubic feet was vented. Loss due to venting and wasting was slightly greater in 1953 than in 1952. Natural-gas production was reported from 55 Oklahoma counties, the 5 leading producers being Texas, Garvin, Oklahoma, Beckham, and Stephen.

Of the 875 wildcats drilled in 1953, 166 were productive for an average of 19 percent, with 709 holes dry. Estimated proved reserves of natural gas increased 4 percent in 1953 to 12,228,373 million cubic feet from 1952 estimates.⁴ There were 8,250 miles of natural-gas pipelines in Oklahoma in 1953, 2,750 miles of field and gathering lines, and 5,500 miles of transmission lines.⁵

⁴ American Gas Association, Gas Facts, 1953.

⁵ American Petroleum Institute, Petroleum Facts and Figures: 11th ed., 1954.

TABLE 3.—Marketed production of natural gas 1944-48 (average) and 1949-53¹

Year	Quantity (million cubic feet)	Value	Value (mills per thousand cubic feet)	Year	Quantity (million cubic feet)	Value	Value (mills per thousand cubic feet)
1944-48 (average).....	389,788	\$15,264,000	39	1951.....	538,756	\$28,554,000	53
1949.....	435,262	20,327,000	47	1952.....	554,033	29,918,000	54
1950.....	482,360	23,636,000	49	1953.....	599,955	41,397,000	69

¹ Comprises gas either sold or consumed by producers, including losses in transmission, amounts added to storage, and increases in gas pipelines.

Natural-Gas Liquids.—Production of natural-gas liquids in Oklahoma increased 8 percent to 20,183,000 barrels in 1953; their value declined about 1 percent of \$42,952,000 from 1952. Production of natural gasoline and cycle products increased 7 percent in quantity but dropped 5 percent in value, while LP-gases increased 10 percent in quantity and 6 percent in value over 1952. Proved reserves of natural-gas liquids in Oklahoma in 1953 were estimated at 304,232,000 barrels, up about 7 percent over 1952 estimates.

TABLE 4.—Natural-gas liquids produced, 1944-48 (average) and 1949-53, in thousand 42-gallon barrels

Year	Natural gasoline and cycle products		LP-gases		Total	
	Barrels	Value	Barrels	Value	Barrels	Value
1944-48 (average).....	6,778	\$18,032,000	3,551	\$5,259,000	10,329	\$23,291,000
1949.....	6,855	20,360,000	5,630	8,404,000	12,485	28,764,000
1950.....	7,980	21,579,000	6,753	8,393,000	14,733	29,972,000
1951.....	9,458	27,498,000	8,084	12,436,000	17,542	39,934,000
1952.....	9,660	29,459,000	8,953	14,090,000	18,613	43,549,000
1953.....	10,325	28,066,000	9,838	14,886,000	20,183	42,952,000

TABLE 5.—Production of natural-gas liquids in 1953, by type of product

Product:	Thousand gallons	Value
Natural gasoline.....	417,606	\$26,448,000
LP-gases.....	414,036	14,886,000
Finished gasoline and naphtha.....	10,206	1,276,000
Other products ¹	5,838	342,000
Total	847,686	42,952,000
Natural gas processed (million cubic feet).....	476,094	-----

¹ Includes condensate, kerosine, distillate fuel, etc.

Petroleum.—Oklahoma remained the Nation's fourth largest producer of crude oil in 1953, with an output of 202,570,000 barrels valued at \$546,940,000 a 6-percent increase in quantity and 12-percent in value over 1952 (table 6). Crude oil was produced in 57 counties, the 5 leading producers being Stephens, Carter, Garvin, Oklahoma, and Osage.

There were 63,400 producing oil wells in Oklahoma in 1953, 3,080 more than in 1952. The average daily output per well was 8.8 barrels in both 1953 and 1952. The average price per barrel of crude at the well increased to \$2.70 in 1953 from the 1952 average of \$2.56.

Exploratory drilling increased in 1953 when 964 wells were completed, of which 177 were oil producers, 44 gas, 7 condensate producers, and 736 dry holes.⁴ Estimated proved reserves as of December 31, 1953, amounted to 1,752 million barrels, 12 percent over 1952 estimated reserves.⁵

The daily average demand for crude oil in 1953 was 560,000 barrels compared with 524,500 in 1952. Crude-oil stocks as of December 31 were 5,284,000 barrels at Oklahoma refineries and 20,906,000 barrels in pipelines and tank farms. Oklahoma refineries received 107,966,000 barrels in 1953, of which 81,126,000 barrels was Oklahoma production, while 9,664,000 barrels came from Kansas, 88,000 from New Mexico, and 17,088,000 from Texas producers. Pipelines carried most of the crude oil shipped to Oklahoma refineries in 1953; tank cars and trucks transported a small fraction of the remaining volume, as reported below:

Type of transportation:	Quantity shipped	
	Intrastate (barrels)	Interstate (barrels)
Pipelines-----	80,499,000	26,836,000
Tank cars and trucks-----	627,000	4,000

There were 22 refineries in Oklahoma in 1953; 20 of these, with a daily crude oil capacity of 339,950 barrels, were operating as of January 1, 1954 (table 12). Daily capacity of 5,000 barrels was under construction, with 32,300-barrel capacity shut down. There was also 117,244-barrel capacity in cracking plants, 106,874 barrels of which was operating. Additional construction would add 3,000 barrels to this daily capacity.

TABLE 6.—Production of petroleum (crude), 1944–48 (average) and 1949–53

Year	Thousand 42-gallon barrels	Value		Year	Thousand 42-gallon barrels	Value	
		At wells	Average per barrel			At wells	Average per barrel
1944–48 (average)-----	138,837	\$238,738,000	\$1.72	1951-----	186,869	\$480,250,000	\$2.57
1949-----	151,660	388,250,000	2.56	1952-----	190,435	487,510,000	2.56
1950-----	164,599	423,020,000	2.57	1953-----	202,570	546,940,000	2.70

⁴ American Petroleum Institute, Petroleum Facts and Figures: 11th ed., 1954, p. 88.
⁵ Work cited in footnote 4.

TABLE 7.—Production of petroleum (crude) in 1953, by months

Month	Thousand 42-gallon barrels	Month	Thousand 42-gallon barrels	Month	Thousand 42-gallon barrels
January.....	16,998	June.....	17,223	November.....	15,615
February.....	15,490	July.....	17,844	December.....	16,263
March.....	17,408	August.....	17,989	Total.....	202,570
April.....	16,703	September.....	17,270		
May.....	17,249	October.....	16,518		

TABLE 8.—Production of crude petroleum, 1949-53, by fields, in thousand barrels

(Oil and Gas Journal)

Field	1949	1950	1951	1952	1953
Allen.....	1,317	1,359	1,447	1,336	1,456
Apache.....	1,749	1,337	1,470	1,331	1,025
Beebe.....	740	1,272	1,073	1,244	1,067
Brock-west.....	858	1,114	982	679	640
Burbank.....	2,338	2,124	2,318	3,157	3,476
Cache Creek.....	1,780	1,511	1,289	1,042	956
Cement.....	4,207	4,091	4,127	3,964	4,070
Coon Creek.....	1,539	1,363	1,432	1,113	805
Cumberland.....	3,275	3,628	3,475	3,102	2,562
Cushing.....	2,726	2,759	2,816	2,889	3,385
Edmond.....	434	392	359	383	532
Elk City.....	788	5,066	7,426	7,248	6,380
Eola.....	370	595	891	1,178	1,651
Fitts.....	1,076	1,026	938	909	842
Fox-Graham.....	414	923	3,196	5,532	5,920
Glenn.....	2,587	2,551	2,502	2,252	2,145
Healdton.....	2,527	2,382	2,267	2,183	2,288
Hewitt.....	2,716	4,320	3,694	3,173	2,703
Hoover-northwest.....	766	1,034	887	693	601
Knox.....	2,250	1,886	1,725	1,627	1,595
Lone Grove.....	1,023	834	934	709	694
Lucien.....	589	670	978	1,222	965
Oklahoma City.....	7,703	6,785	6,303	5,513	5,187
Pauls Valley.....	1,488	1,091	957	817	590
Ramsey.....	712	767	728	615	448
Ringwood.....	260	1,927	2,288	1,338	855
Seminole districts:					
Bowlegs.....	1,176	1,201	1,178	1,003	1,121
Little River.....	1,194	1,016	945	852	826
St. Louis.....	1,283	1,405	1,560	1,440	1,507
Seminole City.....	1,441	1,164	1,207	1,077	1,211
Sholem Alechem.....	6,497	8,545	10,557	12,239	12,736
South Burbank.....	901	860	776	617	894
Tatums.....	3,795	3,456	3,378	3,466	3,892
Velma.....	10,134	10,227	16,089	18,634	15,533
West Edmond.....	5,478	3,914	3,482	4,471	1,887
Witcheer.....	2,094	1,942	1,655	1,120	660
Yale-Quay.....	796	825	1,352	1,891	2,171
Other fields.....	68,982	76,481	88,185	89,464	2 107,274
Total.....	160,003	163,843	186,866	191,523	2 202,570

¹ Includes Bayou.

² Bureau of Mines final figures.

TABLE 9.—Oil-pipeline runs in 1953 by counties, by months, in 42-gallon barrels 1

County	January	February	March	April	May	June	July	August	September	October	November	December	Total
Alfalfa	10,248	13,543	13,350	20,797	550	654	15,001	115	13,761	10,929	1,317	3,712	2,636
Beaver	4,785	1,043,258	508,620	523,942	2,465	1,096,016	1,098,153	1,048,037	471,923	3,468	16,784	1,771	164,165
Beckham	82,432	608,174	100,174	78,236	78,195	78,236	78,236	88,125	132,797	56,567	56,567	54,247	6,732,919
Big Horn	215,485	623,170	415,864	417,006	280,109	640,447	490,185	227,642	446,680	429,823	412,429	641,714	4,980,457
Cardwell	3,413	10,148	12,015	4,872	11,271	3,353	7,123	10,165	3,285	5,721	6,348	7,926	87,640
Canadian	1,793,549	1,248,496	2,711,812	1,974,309	1,932,328	1,774,594	2,196,018	1,845,886	2,228,982	2,060,424	1,733,278	2,070,136	23,875,762
Carrizo	117,082	190,357	254,506	181,969	130,176	249,662	2,708	2,708	1,793	54	2,058	898	11,442
Cherokee	52,822	68,551	64,414	60,850	60,850	45,070	190,208	104,147	61,623	209,608	197,963	228,274	2,363,262
Comanche	3,683	11,680	16,224	13,202	24,272	4,254	4,254	23,291	27,534	23,291	58,522	57,995	683,159
Concho	37,253	312,557	198,824	187,137	179,356	183,430	175,042	180,723	174,047	172,206	154,604	162,778	2,219,992
Craig	480	100	100	167	382	704	55	387	615	748	5,698	5,698	5,698
Greene	543,002	675,008	1,115,649	783,970	343,970	873,137	786,976	793,668	407,838	787,512	738,512	851,024	8,898,978
Garfield	74,539	74,594	85,940	83,961	145,045	52,036	102,276	174,174	25,617	120,186	118,666	100,880	1,157,614
Garvin	1,378,204	2,008,350	1,264,455	1,620,031	1,620,031	1,321,603	1,612,257	1,870,811	1,214,098	1,678,900	1,744,348	1,114,847	18,332,503
Grant	210,204	221,806	197,380	196,804	199,192	218,958	214,023	232,222	210,978	221,401	262,641	114,847	2,800,466
Grady	55,408	79,879	83,470	74,979	99,519	45,988	96,125	120,299	79,099	79,099	79,240	83,608	837,614
Greer	109	113	112	223	327	112	222	134	385,278	440,621	294,035	542,644	896
Harper	277,881	239,179	398,951	319,077	330,690	400,973	439,464	536,467	385,278	440,621	294,035	542,644	4,305,290
Hughes	17,588	42,596	42,596	42,596	19,176	34,656	21,011	25,850	85,945	35,945	70,711	41,719	609,552
Jefferson	81,189	305	172,287	88,241	90,190	86,836	85,065	91,258	84,227	80,212	337	150,196	1,020,353
Kay	102,847	199,552	186,886	185,000	205,980	191,436	204,426	133,266	103,913	215,589	230,078	427,257	2,479,360
Kingfisher	18,298	20,434	21,243	14,199	36,246	16,622	19,072	22,837	15,003	17,677	26,975	16,585	234,493
Kitowa	6,977	16,304	16,304	14,192	8,094	16,022	11,144	11,144	3,237	17,749	10,746	9,743	140,604
Lincoln	459,302	676,761	674,096	686,556	739,432	699,438	783,096	869,196	413,763	409,612	945,362	852,311	9,198,186
Logan	265,269	303,045	326,461	305,471	428,820	260,757	369,196	562,624	84,788	1,042,976	335,089	296,224	3,938,224
Love	14,374	12,282	13,452	12,339	14,768	14,291	14,845	14,818	13,230	13,230	482	31,978	165,250
Major	87,004	77,422	169,035	169,035	169,035	199,086	190,263	212,166	22,931	69,088	127,070	156,635	753,707
Marshall	217,543	24,854	390,626	204,306	195,207	199,086	190,263	212,166	22,931	69,088	127,070	156,635	2,306,146
Mayes	63	93	93	31	327	47	47	123	3,562	345,060	147,459	156,635	64
McKay	1,470	3,222	3,222	22,043	3,037	23,955	19,337	27,573	6,478	21,712	1,324	2,812	16,866
Muskogee	14,039	20,342	32,090	22,043	14,208	23,955	19,337	27,573	6,478	21,712	1,324	2,812	16,866
McClain	226,563	236,631	169,290	198,370	200,943	166,246	267,640	218,232	162,324	318,156	277,409	181,270	2,512,069
McCurtain	461	2,741	2,741	1,016	1,170	735	262,832	1,606	777	777	465	1,006	9,967
McGee	226,726	258,633	847,848	243,750	299,904	75,145	262,832	255,659	166,227	223,826	244,285	213,409	2,845,244
Noble	200,625	420,005	287,884	317,505	325,427	345,725	344,691	359,746	367,866	255,482	143,408	573,993	3,947,057
Ottawa	195,789	203,800	240,467	220,198	215,858	245,945	256,997	399,102	154,523	344,775	266,600	447,029	3,156,523
Oklahoma	1,045,431	996,934	960,869	914,531	1,297,837	616,535	715,732	1,120,052	536,788	1,166,144	682,263	1,028,565	11,541,772
Oklmulgee	65,135	99,534	100,105	103,216	169,856	110,904	110,904	172,162	21,968	300,999	154,926	135,195	1,361,890
Ossage	750,965	826,980	866,594	825,813	1,06,567	884,623	987,546	1,226,514	538,842	965,172	862,425	999,404	10,540,916
Pawnee	103,277	173,423	223,995	191,784	45,176	269,263	205,546	1,168,312	69,858	189,417	280,953	165,816	2,086,840

Payne.....	332,149	372,434	608,132	477,088	362,040	383,413	450,980	456,160	256,581	417,572	374,186	343,087	4,842,822
Pontotoc.....	48,393	644,955	366,364	350,429	394,527	370,075	376,303	386,262	348,681	350,103	364,305	344,969	4,363,330
Pottawatomie.....	201,105	507,120	548,408	401,205	251,450	468,265	376,809	391,131	274,832	300,608	386,092	422,592	4,732,777
Rogers.....	1,411	103,967	50,354	62,499	59,351	51,065	62,308	67,369	64,030	64,618	60,820	60,022	731,777
Seminole.....	556,984	989,731	1,001,143	826,794	617,168	989,341	864,428	994,101	517,832	928,624	923,630	906,011	10,107,169
Stephens.....	2,136,832	3,013,427	3,897,510	3,054,949	2,992,467	3,082,516	3,067,448	3,259,741	2,911,965	2,888,326	2,444,045	2,338,641	35,008,344
Texas.....	7,012	9,750	30,851	17,360	7,824	30,359	22,322	18,292	10,269	19,445	18,732	2,900	2,900
Tulman.....	76,793	129,410	173,468	130,762	60,110	151,549	155,967	109,382	72,971	117,183	117,607	110,955	918,633
Tulsa.....	14,636	8,909	20,737	16,989	15,281	14,803	8,944	32,981	1,238	16,291	11,871	16,575	1,412,177
Wagoner.....	332,141	332,423	304,628	337,935	319,639	327,762	320,274	329,846	330,497	323,601	237,070	430,741	3,016,566
Washington.....	46,877	9,917	68,331	34,151	25,603	13,499	54,183	6,828	41,098	29,449	14,468	49,546	3,393,950
Washita.....													
Woods.....													
Grand total.....													3201,414,544

¹ National Oil Scouts & Landmen's Association, Vol. 24, 1954, p. 559.
 :Detail does not add to total.

TABLE 10.—Indicated demand for petroleum in 1953, by months

Month	Thousand 42-gallon barrels	Month	Thousand 42-gallon barrels	Month	Thousand 42-gallon barrels
January.....	17,306	June.....	17,525	November.....	17,344
February.....	16,112	July.....	19,150	December.....	17,129
March.....	17,318	August.....	16,795	Total: 1953.....	204,389
April.....	15,064	September.....	16,848		
May.....	16,113	October.....	17,685	1952.....	191,983

TABLE 11.—Sales of petroleum products, 1949–53, in thousand 42-gallon barrels ¹

Product	1949	1950	1951	1952	1953
Gasoline.....	15,437	16,813	17,692	18,891	19,328
Kerosine.....	1,717	1,939	1,884	1,761	1,588
Range oil.....	814	923	1,012	942	852
Distillate fuel oil.....	1,929	1,928	2,223	2,192	2,436
Residual fuel oil.....	5,296	4,704	3,773	2,939	2,351

¹ American Petroleum Institute, Petroleum Facts and Figures: 11th ed., 1954.

TABLE 12.—Capacity of petroleum refineries and cracking plants in 1953

(Barrels per day)

Company	Location	Crude-oil capacity			Cracked-gasoline capacity		
		Operating	Shut-down	Building	Operating	Shut-down	Building
Allied Materials Corp.....	Stroud.....	2,000					
Anderson Prichard Oil Corp.....	Cyril.....	11,000			3,000		1,000
Bell Oil & Gas Co.....	Grandfield.....	8,000			3,600		
Ben Franklin Refining Co.....	Ardmore.....	12,000			7,100		
Champlin Refining Co.....	Enid.....	20,000			10,000		
Cities Service Oil Co.....	Ponca City.....	22,000			7,400		
Continental Oil Co.....	do.....	52,500			14,710	2,770	
Deep Rock Oil Corp.....	Cushing.....	19,000			3,800		
Harper & Turner Oil Co.....	Edmond.....		1,800				
Johnson Oil Refining Co.....	Cleveland.....	6,300			3,340		
Kerr-McGee Oil Industries, Inc.....	Wynnewood.....	10,000		5,000			
Mercury Oil Refining Co.....	Oklahoma City.....	5,000			700		
Mid Continent Petroleum Corp.....	West Tulsa.....	56,000	6,500		17,400		2,000
Midland Cooperatives, Inc.....	Cushing.....	10,500			2,554		
Monarch Refineries, Inc.....	Oklahoma City.....	1,000					
Peppers Refining Co.....	do.....	1,850			1,570		
Phillips Petroleum Co.....	Okmulgee.....	14,500			4,000		
Sunray Oil Corp.....	Allen.....		12,000			5,600	
Do.....	Duncan.....	33,000			6,500		
The Texas Co.....	West Tulsa.....	35,000			15,500		
Tide Water Associated Oil Co.....	Drumright.....	15,000	12,000		1,900	2,000	
Wilcox Oil Co.....	Bristow.....	5,300			3,800		
Total.....		339,950	32,300	5,000	106,874	10,370	3,000

TABLE 13.—Oil- and gas-well drilling in 1953, by counties¹

County	Proven field wells			Exploratory wells			Total		
	Oil	Gas	Dry	Oil	Gas	Dry	Oil	Gas	Dry
Alfalfa	2		1			2	2		3
Atoka	1		6	1		5	2		11
Beaver	4	6	5	2	2	5	6	8	10
Beckham	51		6	1		2	52		8
Bryan	3		3			3	3		6
Caddo	63	8	20	2		7	65	8	27
Canadian			1			1			1
Carte	491	10	80	5		13	496	10	93
Cimarron	1	16	5		6	1	1	22	6
Cleveland	15	2	9	6		5	21	2	14
Coal	7		5	3	1	7	10	1	12
Comanche	53		45			9	53		54
Cotton	13		30	1		12	14		42
Creek	370	5	177	11	1	16	381	6	193
Custer						1			1
Dewey			1			1			2
Ellis			1			2			3
Garfield	39	7	30	6	2	16	45	9	48
Garvin	265	6	67	18		26	283	6	93
Grady	29	8	13	3		3	32	8	16
Grant	11		14	2	1	10	13	1	24
Greer	4								4
Harmon			1			3			1
Harper			1			1			1
Haskell	3	1	1				3	1	1
Hughes	84	10	50	5	1	18	89	11	68
Jackson	13		9			11	13		20
Jeferson	27		17	1		18	28		35
Johnston		1				3		1	3
Kay	94	5	65	12	1	36	106	6	101
Kingfisher	6		5			3	6	1	8
Kiowa	3	1	2	1	1	6	4	2	8
Latimer			1			2			3
Le Flore						2			2
Lincoln	428	14	156	40	3	94	468	17	250
Logan	102	4	71	18	1	44	120	5	115
Love	1		4			7	1		11
Major	2	1	2			1	2	1	3
Marshall	6		9			4	6		13
McCain	23		10	5		3	28		13
McCurtain	2					2			16
McIntosh	2	7	1	2		2	4	7	3
Murray	2			1		8	3		8
Noble	57	9	63	10	1	22	67	10	85
Okfuskee	157	19	127	9	2	18	166	21	145
Oklahoma	61	9	38	5	1	9	66	10	47
Oklmulgee	157	13	128	5	1	6	162	14	134
Osage	382	6	182	25		35	407	6	217
Pawnee	153	4	68	7	1	35	160	5	103
Payne	124	1	85	10		30	134	1	115
Pittsburg		2	7		1	4		3	11
Pontotoc	353	35	187	3	1	30	356	36	217
Pottawatomie	84	3	66	11		28	95	3	94
Roger Mills						1			1
Seminole	229	17	137	11	2	14	240	19	151
Sequoyah						1			2
Stephens	512	15	139	6	2	26	518	17	165
Texas	2	101	12	1	1	6	3	102	18
Tillman	2		3	1		8	3		11
Washita	5			1	1	1	6	1	1
Woods						2			2
Woodward						4			4
Total	4,498	348	2,164	253	35	710	4,751	383	2,874

¹ National Oil Scouts & Landmen's Association, vol. 24, p. 538.

METALS

Production of metallic minerals declined in 1953 owing to lower metal prices and to an extended strike at one of the custom mills. Two of the State's zinc smelters operated at near capacity throughout the year, and one closed its operations the latter part of the year. Total slab-zinc stocks at smelters in the United States increased substantially during the year; beginning stocks were reported at 87,160 tons, with ending stocks at 180,620 tons, according to the American Zinc Institute.

Cadmium, Germanium, Indium, and Gallium.—These minor metals occur as trace elements in the lead-zinc ores of Oklahoma; the metals were recovered as byproducts from flue dusts of the zinc-smelting operations. It is impossible to determine the quantities of the metals derived from individual sources, since the accumulated flue dusts recovered at smelters are from domestic and imported concentrates, and no assay is made of the quantities contained therein.

The Eagle-Picher Co. completed a new germanium-processing plant at Miami, Okla., late in 1953. Production from this plant was to help meet the increased requirements of this new "wonder" metal, which, because of its peculiar electrical properties, has been finding unprecedented demand in the electronic field. The Eagle-Picher Co. has been the principal producer of this metal for many years as a by-product of zinc smelting.

Lead.—Mine production of recoverable lead in 1953 dropped 39 percent in quantity to 9,304 tons and 50 percent in value to \$2,437,648. The drop in value was greater than in quantity because the price of zinc metal dropped from 12.50 cents to 10.00 and lead from 14.75 cents to 13.50 during 1953. The mines are in Ottawa County and yield a predominantly zinc ore, with a ratio of 5 parts zinc to 1 part lead. The lead content of the ore increased slightly in 1953 to 0.45 percent compared with 0.41 percent in 1952.

Zinc.—Mine production of recoverable zinc in 1953 decreased 39 percent in quantity to 33,400 tons and 58 percent in value to \$7,685,000 coincident with a 23-percent drop in zinc-metal price. The major portion of this reduction occurred the last half of the year, as crude-ore production declined 68 percent, lead-concentrate production 78 percent, and zinc-concentrate production 71 percent. Operations at the Eagle-Picher mines and Central mill were closed by a strike beginning in June and terminating in late December 1953. About 40 shippers to the Central mill were obliged to shut down because of this strike. About 100 mines in Oklahoma were active in January; only 20 continued production in December. All tailing-re-treatment mills had shut down at the close of 1952 and remained idle throughout 1953.

Base-metal prices were generally sensitive to the changing metal-supply position in 1953. The domestic zinc price quickly reflected the unusual strength for the metal at the January 2, 1953, opening of free trading on the London Metal Exchange after 14 years of Government control. The zinc opened 1953 at 12.50 cents, advanced to 13 cents on January 2, then gradually declined to 10 cents by September, where it held for the remainder of the year. Lead opened at 14.75 cents, then fluctuated through a minor price range until September 24, when it steadied at 13.50 cents for the remainder of the year.

TABLE 14.—Mine production of lead and zinc, 1944-48 (average), 1949-53, and total 1891-1953, in terms of concentrates and recoverable metals ¹

Year	Lead concentrate (galena)		Zinc concentrate (sphalerite)		Recoverable metal content ²			
	Short tons	Value	Short tons	Value	Lead		Zinc	
					Short tons	Value	Short tons	Value
1944-48 (average).....	18,999	\$3,214,796	121,347	\$13,027,723	14,302	\$3,513,414	65,037	\$15,554,690
1949.....	26,910	5,020,076	82,522	6,407,589	19,858	6,275,128	44,033	10,920,184
1950.....	27,261	4,218,880	87,116	8,247,342	20,724	5,595,480	46,739	13,273,876
1951.....	22,613	4,714,358	99,612	12,297,096	16,575	5,734,950	53,450	19,455,800
1952.....	20,473	4,104,934	101,726	11,714,605	15,137	4,874,114	54,916	18,232,112
1953.....	12,213	1,915,195	61,896	4,541,616	9,304	2,437,648	33,413	7,684,990
1891-1953.....	1,600,865	150,187,472	9,477,904	463,300,356	1,231,596	179,150,103	4,998,668	740,112,050

¹ Based on Oklahoma ore ("dirt") and old tailings treated at mills during calendar year indicated.

² In calculating metal content of the ores from assays, allowance has been made for smelting losses of both lead and zinc. In comparing the values of concentrates ("ore") and metal it should be borne in mind that the value given for the concentrates is that actually received by the producer, whereas the value of the lead and zinc is calculated from the average price for all grades.

TABLE 15.—Tenor of lead and zinc ore, old tailings, and slimes milled (1952), and concentrates produced, 1952-53

	1952		1953 crude ore
	Crude ore	Old tailings and slimes	
Total material milled.....short tons..	3,715,329	502,350	2,090,760
Total concentrate produced:			
Galena.....do....	20,448	25	12,213
Sphalerite.....do....	98,856	2,870	61,896
Ratio of concentrate to material milled:			
Lead.....percent..	0.55	0.005	0.58
Zinc.....do....	2.66	0.57	2.96
Metal content of material milled: ¹			
Lead.....do....	0.41	0.003	0.45
Zinc.....do....	1.44	0.30	1.60
Average lead content of galena concentrate.....do....	75.43	56.00	77.74
Average zinc content of sphalerite concentrate.....do....	60.02	58.25	59.98
Average value per ton:			
Galena concentrate.....	\$200.57	\$148.08	\$156.82
Sphalerite concentrate.....	115.24	112.49	73.37

¹ Figures represent metal content of the crude ore ("dirt") only insofar as it is recovered in the concentrate; data on tailing losses not available.

TABLE 16.—Mine production of lead and zinc in 1953, by months in terms of recoverable metals

Month	Lead (short tons)	Zinc (short tons)	Month	Lead (short tons)	Zinc (short tons)
January.....	1,510	4,989	August.....	221	1,297
February.....	1,374	4,607	September.....	268	1,133
March.....	1,333	4,864	October.....	310	1,167
April.....	1,487	4,903	November.....	267	1,088
May.....	1,242	4,147	December.....	271	1,104
June.....	749	2,872			
July.....	272	1,242	Total.....	9,304	33,413

TABLE 17.—Quoted prices of 60-percent zinc concentrate and 80-percent lead concentrate at Joplin, Mo., in 1953¹

Zinc concentrate		Lead concentrate	
Week ended—	Price per short ton	Week ended—	Price per short ton
Jan. 1-Jan. 7.....	\$84	Jan. 1-Jan. 7.....	\$184.50
Jan. 8-Jan. 15.....	87	Jan. 8-Jan. 29.....	173.70
Jan. 16-Jan. 29.....	84	Jan. 30-Apr. 2.....	166.50
Jan. 30-Feb. 5.....	80	Apr. 3-Apr. 16.....	159.30
Feb. 6-Mar. 5.....	70	Apr. 17-Apr. 30.....	144.90
Mar. 6-Sept. 3.....	65	May 1-May 14.....	152.10
Sept. 4-Sept. 10.....	60	May 15-May 21.....	159.30
Sept. 11-Dec. 31.....	56	May 22-June 18.....	162.90
		June 19-July 16.....	166.50
		July 17-July 23.....	170.10
		July 24-Sept. 17.....	173.70
		Sept. 18-Dec. 31.....	166.50

¹ E&MJ Metal & Mineral Markets.

TRI-STATE DISTRICT

The Tri-State district of Oklahoma, Kansas, and Southwestern Missouri produced 3,455,000 tons of crude ore in 1953, down 44 percent from 1952. The ore produced in 1953 yielded 17,403 tons of lead concentrate valued at \$2,716,000 containing 13,273 tons of recoverable lead and 102,821 tons of zinc concentrate valued at \$7,456,000 containing 55,729 tons of recoverable zinc. Lead-concentrate recovery in 1953 was down 51 percent from 1952 and zinc-concentrate recovery down 38 percent. Oklahoma supplied 70 percent of the district's lead concentrate and 60 percent of the zinc concentrate in 1953, while Kansas produced 25 percent of the district's lead and 28 percent of the zinc concentrate; Southwestern Missouri is responsible for the remaining 5 percent of the lead and 12 percent of the zinc concentrate.

TABLE 18.—Mine production of lead and zinc concentrates in the Tri-State district (Kansas, Oklahoma, and Southwestern Missouri), 1944-48 (average) and 1949-53, in short tons

Year	Lead concentrate (galena)		Zinc concentrate (sphalerite)		Recoverable metal content			
					Lead		Zinc	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1944-48 (average).....	33,407	\$5,558,868	246,526	\$26,200,137	25,224	\$6,049,119	132,552	\$31,673,364
1949.....	41,471	7,824,788	147,178	11,445,018	30,883	9,759,028	78,628	19,499,744
1950.....	40,714	6,245,660	150,019	13,934,927	31,157	8,412,390	80,558	22,878,472
1951.....	36,300	7,720,530	170,263	21,023,818	26,906	9,309,476	91,553	33,325,292
1952.....	36,333	7,388,754	167,474	19,537,949	27,356	8,808,632	90,512	30,049,984
1953:								
Kansas.....	4,399	665,189	28,668	2,064,783	3,347	876,914	15,515	3,568,450
Southwestern Missouri.....	791	135,603	12,257	849,141	622	162,964	6,801	1,564,230
Oklahoma.....	12,213	1,915,195	61,896	4,541,616	9,304	2,437,643	33,413	7,684,990
Total 1953.....	17,403	2,715,987	102,821	7,455,540	13,273	3,477,526	55,729	12,817,670

TABLE 19.—Tenor of ore and concentrates in Tri-State district, 1949-53

	1949	1950	1951	1952	1953
Total material milled:					
Crude ore.....short tons..	4,470,778	4,700,698	5,990,100	6,140,155	3,454,980
Tailings and slimes.....do....	1,602,620	967,926	746,673	604,350	
Ratio of concentrate to material milled:					
Lead.....percent..	0.68	0.72	0.54	0.54	0.50
Zinc.....do.....	2.42	2.65	2.53	2.48	2.98
Metal content of material milled:					
Lead.....do.....	0.51	0.55	0.40	0.41	0.38
Zinc.....do.....	1.29	1.42	1.36	1.34	1.61
Average lead content of galena concentrate					
percent..	75.98	78.08	75.62	76.79	77.81
Average zinc content of sphalerite concentrate					
percent..	59.36	59.66	59.74	60.04	60.22
Average value per ton:					
Galena concentrate.....	\$188.68	\$153.40	\$212.69	\$203.36	\$156.06
Sphalerite concentrate.....	77.76	92.89	123.48	116.66	72.51

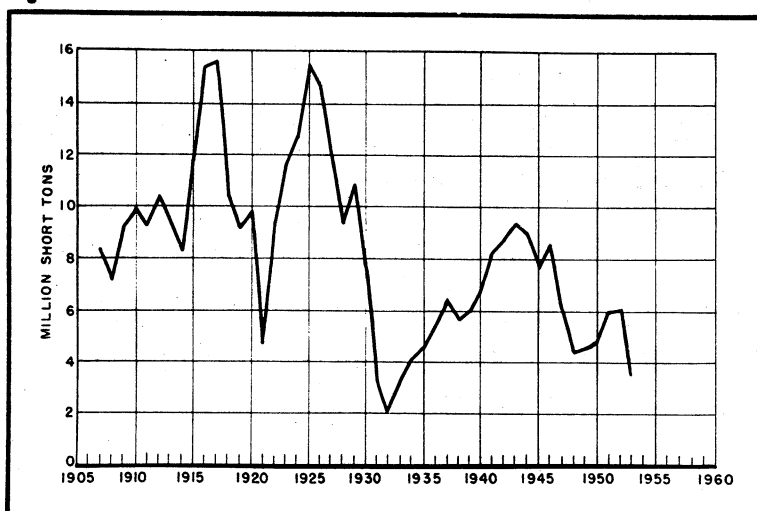


FIGURE 1.—Quantity of crude ore (rock) milled in the Tri-State district, 1907-53.

The Tri-State district's average lead recovery from zinc-lead ores was 0.50 percent in 1953, with a zinc recovery of 2.98 percent, compared with the 1952 recovery of 0.54 percent for lead and 2.48 percent for zinc (table 19).

There were 194 mines operating in the Tri-State district during 1953, of which 120 were in Oklahoma, 52 in Kansas, and 22 in Southwestern Missouri. This number had been reduced to about 40 mines at the close of the year as metal prices continued the decline begun in 1952, and the district's two big custom mills—the Eagle-Picher Co. Central mill and National Lead Co. Ballard mill—were idle. There were 18 mine mills operating at the beginning of 1953—9 in Oklahoma, 6 in Southwestern Missouri, and 3 in Kansas—while only 8 were active at the end of the year—5 in Oklahoma, 2 in Southwestern Missouri, and 1 in Kansas.

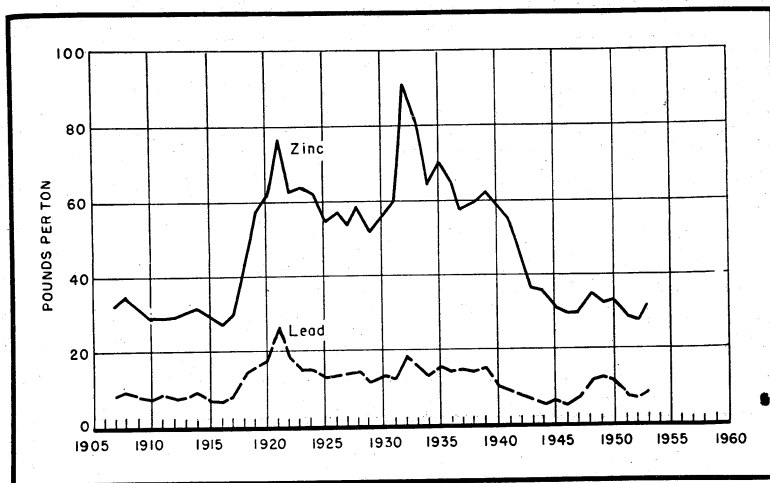


FIGURE 2.—Metal recovered per ton of crude ore (rock) milled in the Tri-State district, 1907-53.

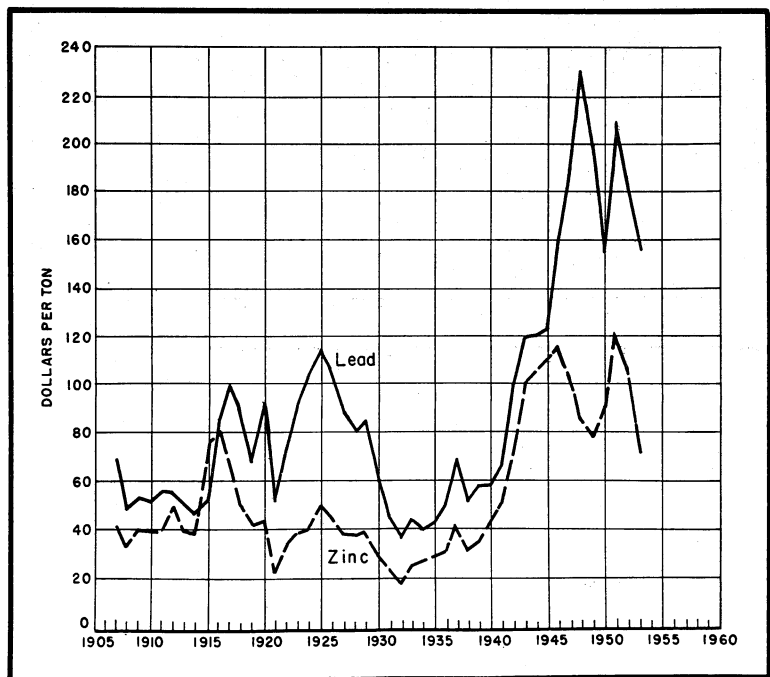


FIGURE 3.—Average prices received by sellers per ton of concentrate in the Tri-State district, 1907-53.

NONMETALS

Nonmetallic mineral commodities produced in Oklahoma in 1953 included clays, sand and gravel, stone, cement, gypsum, lime, pumicite, salt, ground sand (silica), recovered elemental sulfur, and tripoli. The value reported for these commodities in 1953 was \$23,247,000, approximately 4 percent below the record high previously established in 1952, when the value was reported at \$24,182,000.

Cement.—Cement was produced at Dewey, Washington County and Ada, Pontotoc County.

Clays.—Oklahoma has extensive and widely distributed clay resources. Nearly all the clay produced is used in manufacturing cement or brick and tile. In 1953 clay was produced by 12 brick and tile plants in Creek, Custer, Garfield, Greer, Oklahoma, Pittsburg, Pontotoc, Seminole, and Tulsa Counties. One plant in Lincoln County remained idle. Clay production in 1953 was 577,600 tons valued at \$637,100.

Clay used for the manufacture of lightweight aggregate was reported for the first time in 1953 when the Oklahoma Lightweight Aggregate Co. completed construction of its plant at Choctaw, Oklahoma County.

TABLE 20.—Clays sold or used by producers, 1944-48 (average) and 1949-53

Year	Clays sold or used		Year	Clays sold or used	
	Short tons	Value		Short tons	Value
1944-48 (average).....	387,915	\$275,098	1951.....	551,144	\$561,644
1949.....	480,199	374,179	1952.....	520,050	557,420
1950.....	555,910	493,659	1953.....	577,557	637,082

Gypsum.—In 1953, 3 operators in Blaine County continued to produce gypsum. Quarries formerly worked in other parts of western Oklahoma were inactive during the year.

The largest producer was the United States Gypsum Co., which operated quarries and a calcining plant at Southard, making wallboard and many kinds of plaster. Gypsum was quarried by the Universal Atlas Cement Co. near Watonga and by S. A. Walton near Southard, principally for use as a retarder in the manufacture of portland cement.

Lime.—High-purity limestone of the St. Clair formation at Marble City continued to be burned in shaft kilns at Sallisaw, Sequoyah County, by St. Clair Lime Co. The lime was sold chiefly for chemical use in manufacturing calcium carbide, in purifying water, and in steel metallurgy.

Perlite.—Perlite was expanded for use chiefly in concrete and plaster at Tulsa. All crude perlite was imported, as there are no deposits in Oklahoma.

Pumicite.—Pumicite or volcanic ash was produced by Dyer & Kite from deposits near Gate, eastern Beaver County, and by E. L. Henderson near Custer City, Custer County. It was used mostly for cleansing and scouring compounds and as a concrete admixture.

Salt.—Salt was produced in three counties in 1953. The major producer was the Oklahoma Salt Industries at Sayre, Beckham

County, where salt continued to be produced by injecting fresh water through wells into a salt bed and recovering the brine for surface evaporation. In Woods County salt was produced from surface encrustations on the Big Salt Plain of the Cimarron River, and in Harmon County salt was recovered by solar evaporation of brine from springs.

Sand (Ground).—Ground sand was produced by the Pennsylvania Glass Sand Corp. of Oklahoma at Mill Creek, Johnston County, by grinding high-purity glass sand. It was used mostly in cleansing and scouring compounds, as a filler, and for pottery, porcelain, and tile.

Sand and Gravel.—Sand and gravel deposits suitable for concrete aggregate and road surfacing occur along and adjacent to most of the larger streams in Oklahoma. Construction sand and gravel were produced in 30 counties in 1953. Nine plants were operated in Tulsa County, 4 in Oklahoma County, 2 in Kay County, and 3 in Pawnee County. Other plants were well distributed throughout the State.

High-purity silica sand was produced from sandstones of Middle Ordovician age in Johnston, Murray, and Pontotoc Counties in the Arbuckle Mountains region of south central Oklahoma. Most of this sand was used in manufacturing glass, but smaller quantities were used as foundry sand and for making sodium silicate.

Sand and gravel (including silica sand) produced in Oklahoma during 1953 were reported as 4,701,000 tons valued at \$3,970,000, an alltime high. This was a 25-percent increase in tonnage and a 36-percent increase in value compared with 1952, when the production was 3,770,000 tons valued at \$2,912,000.

Stone.—Limestone and dolomite, chat, granite, and sandstone were produced in Oklahoma in 1953. Limestone and dolomite, used principally as crushed stone, were the leading commodities. In 1953 the reported production of stone was 8,404,000 tons valued at \$7,467,000, a decrease of 13 percent in production and a 17-percent decrease in value compared with 1952, when the production was 9,636,000 tons valued at \$8,974,000.

Limestone and dolomite.—Oklahoma has abundant resources of limestone and dolomite. In 1953 limestone or dolomite was produced from 27 quarries in 17 counties, the greatest production being in the Arbuckle Mountains region of south central Oklahoma, the Tulsa area of northeastern Oklahoma, and the Wichita Mountains region of southwestern Oklahoma.

Chemical-grade limestone was quarried at Marble City in Sequoyah County for limemaking and as flux in glass manufacturing. Chemical-grade dolomite was produced at Troy, Johnston County, for glass manufacturing, fertilizers, and mineral feeds.

In 1953 Oklahoma produced 5,571,000 tons of limestone and dolomite valued at \$5,946,000 compared with 6,356,000 tons valued at \$6,940,000 in 1952. Limestone was quarried for building stone in the Arbuckle Mountains and near Eldorado in Jackson County, and limestone used in portland-cement manufacture was quarried in Washington and Pontotoc Counties.

TABLE 21.—Sand and gravel sold or used by producers, 1944-48 (average) and 1949-53

Year	Commercial			Noncommercial		Total	
	Short tons	Value		Short tons	Value	Short tons	Value
		Total	Average per ton				
1944-48 (average).....	1,119,624	\$861,166	\$0.77	458,505	\$72,487	1,578,129	\$933,653
1949.....	1,775,623	1,259,770	.71	1,145,534	265,645	2,921,157	1,525,415
1950.....	1,730,067	1,500,667	.87	1,556,767	856,196	3,286,834	2,356,853
1951.....	2,184,382	2,103,710	.97	1,015,869	217,943	3,183,251	2,321,653
1952.....	2,353,559	2,209,098	.94	1,416,104	702,747	3,769,663	2,911,845
1953.....	2,687,504	2,638,681	.98	2,013,862	1,330,904	4,701,366	3,969,585

TABLE 22.—Stone sold or used by producers, 1949-53, by kinds

Year	Granite		Limestone		Sandstone	
	Short tons	Value	Short tons	Value	Short tons	Value
1949.....	4,720	\$569,170	2,183,990	\$2,490,627	20,360	\$20,370
1950.....	216,930	646,872	2,992,920	3,334,374	19,480	18,700
1951.....	4,267	527,500	4,765,419	5,279,311	146,317	213,625
1952.....	5,337	511,073	6,355,780	6,940,219	1,350	1,300
1953.....	4,402	321,809	5,570,973	5,946,209	228,895	137,407

Year	Other stone		Total	
	Short tons	Value	Short tons	Value
1949.....	2,132,860	\$947,242	4,341,930	\$4,027,409
1950.....	1,792,330	848,277	5,021,660	4,848,223
1951.....	2,050,673	897,112	6,966,676	6,917,548
1952.....	3,274,008	1,511,742	9,636,475	8,974,334
1953.....	2,600,213	1,061,822	8,404,483	7,467,247

¹ Excludes dimension limestone.

Chat.—Chat is the term used in the West Central States to denote the coarse tailings obtained in milling zinc and lead ores. This material is composed mostly of chert or microcrystalline silica, with small quantities of limestone, sphalerite, galena, marcasite, and pyrite.

Most of the chat sold was used for railroad ballast, concrete aggregate, and road surfacing. In 1953 operators reported sales of 2,600,000 tons valued at \$1,062,000 compared with 3,274,000 tons valued at \$1,512,000 in 1952. All the chat sold was produced in Ottawa County.

Granite.—The granite industry of Oklahoma was centered in the Wichita Mountain district in the southwestern part of the State, where six producers operated quarries in Comanche, Greer, and Kiowa Counties in 1953. Granite was also produced by one operator near Mill Creek in Johnston County.

Production was from pre-Cambrian granites that are predominantly pink and red. The granite was used mostly for monumental stones and partly for exterior trim. Much of the stone was finished in plants

of the Wichita Mountains district, but some was exported as rough stock to other states. In 1953 granite production was reported to be 4,400 tons with a value of \$322,000.

Sandstone.—Sandstone produced in Oklahoma was used chiefly for building and veneer stone in construction of residence and business buildings. The stone was worked as slabs 1½ to 6 inches thick from shallow, open-face quarries in Choctaw and Pushmataha Counties. Two mechanized trimming plants—one in Okmulgee County and the other in Mayes County—were operated during the year.

Crushed stone (noncommercial).—Stone crushed by municipal, county, and State agencies included limestone and sandstone obtained from local quarries throughout the State. Oklahoma production in 1953 was 686,000 tons valued at \$593,000.

Sulfur.—Sulfur was produced east of Madill, Marshall County, by Joe L. Parker. The plant utilizes waste sour gases from a nearby gasoline plant. All sulfur produced was transported to Tulsa, where it was used to manufacture sulfuric acid.

Tripoli.—Tripoli continued to be mined in 1953 in eastern Ottawa County, which long has been the main source of the commodity. All tripoli mined in Oklahoma was transported to Seneca, Mo., where it was processed by the American Tripoli Corp. and sold chiefly for buffing compounds and foundry use.

REVIEW BY COUNTIES

Production of metals, nonmetals, and mineral fuels in 1953 was reported from 72 of the 77 counties in Oklahoma.

ALFALFA

A small quantity of petroleum was produced from the McWillie NW field in 1953.

ATOKA

Limestone was crushed by the Southwest Stone Co. at its quarry near Stringtown for use as railroad ballast, road base, and aggregate in concrete. Small quantities of noncommercial stone were produced by the Atoka County Highway Department for road maintenance. Two oil-discovery wells were completed in early 1953.

BEAVER

Construction sand was produced from a pit east of Beaver City by Everett Bush. Pumicite (volcanic ash) was produced north of Gate by Dyer & Kite for scouring compounds, paint, and filler mediums. Petroleum and natural gas were produced from the Glenwood and Greenough fields.

BECKHAM

Salt was produced from wells southwest of Sayre by the Oklahoma Salt Industries. Petroleum and natural gas were produced from four fields. Most of the petroleum produced in the county was from the Elk City field. Natural-gas liquids were produced by the Shell Oil Co.

TABLE 23.—Value of mineral production in Oklahoma, by counties, 1952-53

County	1952	1953	Principal minerals produced in 1953, in order of value
Beaver	\$888, 490	\$1, 367, 294	Natural gas, petroleum, sand and gravel.
Beckham	25, 347, 914	25, 635, 864	Petroleum, natural-gas liquids, natural gas.
Bryan	2, 887, 746	2, 513, 135	Petroleum, natural gas, sand and gravel.
Caddo	13, 731, 066	14, 531, 362	Petroleum, natural gas, natural gas liquids.
Canadian	462, 703	368, 335	Petroleum, natural gas.
Carter	49, 814, 632	64, 854, 229	Petroleum, natural-gas liquids, natural gas.
Cimarron	66, 741	317, 994	Natural gas, petroleum, sand and gravel.
Cleveland	5, 344, 566	6, 532, 446	Petroleum, natural gas, natural-gas liquids.
Coal	1, 078, 390	2, 541, 155	Petroleum, stone, natural gas.
Comanche	1, 598, 450	1, 816, 800	Stone, petroleum, natural gas.
Cotton	5, 799, 617	5, 419, 571	Petroleum, natural gas.
Craig	91, 449	75, 973	Coal, stone, petroleum.
Creek	23, 397, 614	26, 437, 014	Petroleum, natural-gas liquids, natural gas.
Garfield	3, 858, 561	5, 248, 820	Do.
Garvin	55, 617, 576	58, 929, 618	Do.
Grady	7, 503, 617	8, 802, 398	Petroleum, natural gas, natural-gas liquids.
Grant	3, 186, 616	2, 554, 722	Petroleum, natural gas.
Greer	102, 522	112, 376	Stone, clays, sand and gravel.
Haskell	1, 866, 587	3, 288, 924	Coal, stone, natural gas.
Hughes	9, 352, 665	13, 277, 561	Petroleum, natural gas, natural-gas liquids.
Jackson	362, 897	885, 833	Petroleum, sand and gravel, natural gas.
Jefferson	2, 829, 611	2, 735, 795	Petroleum, natural gas.
Johnston	846, 154	755, 100	Sand and gravel, stone, silica.
Kay	8, 364, 904	9, 802, 965	Petroleum, natural-gas liquids, stone.
Kingfisher	1, 098, 913	1, 061, 867	Petroleum, natural gas, sand and gravel.
Kiowa	540, 968	1, 021, 104	Petroleum, stone, sand and gravel.
Latimer	92, 409	255, 399	Coal, natural gas.
Le Flore	2, 630, 693	2, 449, 546	Coal, sand and gravel, natural gas.
Lincoln	18, 867, 270	26, 052, 475	Petroleum, natural-gas liquids, natural gas.
Logan	3, 705, 273	12, 425, 894	Petroleum, natural-gas liquids, natural gas.
Love	372, 873	465, 041	Petroleum, natural gas.
Major	4, 321, 165	3, 681, 553	Petroleum, natural-gas liquids, natural gas.
Marshall	7, 955, 009	6, 892, 370	Do.
McCain	6, 369, 418	7, 505, 241	Petroleum, natural gas.
McIntosh	730, 052	632, 622	Coal, natural gas, petroleum.
Murray	2, 071, 258	1, 711, 842	Stone, asphalt, sand and gravel.
Muskogee	905, 334	904, 244	Petroleum, sand and gravel, coal.
Noble	9, 078, 076	8, 525, 356	Petroleum, natural-gas liquids, natural gas.
Nowata	8, 952, 232	11, 063, 791	Petroleum, stone, natural gas.
Oklfuskee	5, 279, 071	8, 931, 807	Petroleum, natural gas, natural-gas liquids.
Oklahoma	47, 315, 772	43, 552, 945	Petroleum, natural-gas liquids, natural gas.
Okmulgee	5, 440, 318	6, 146, 255	Petroleum, coal, natural-gas liquids.
Osage	27, 306, 138	32, 977, 079	Petroleum, natural-gas liquids, natural gas.
Ottawa	24, 617, 968	11, 274, 775	Zinc, lead, stone.
Pawnee	5, 031, 931	5, 797, 439	Petroleum, stone, sand and gravel.
Payne	11, 887, 796	13, 754, 676	Petroleum, natural gas, natural-gas liquids.
Pittsburg	1, 628, 685	1, 709, 513	Coal, natural gas, stone.
Pontotoc	15, 770, 747	17, 624, 276	Petroleum, cement, natural-gas liquids.
Pottawatomie	14, 326, 195	13, 910, 446	Petroleum, natural-gas liquids, natural gas.
Rogers	3, 510, 612	3, 690, 317	Petroleum, coal, natural gas.
Seminole	29, 452, 929	32, 802, 074	Petroleum, natural-gas liquids, natural gas.
Sequoyah	2, 457, 342	1, 744, 799	Coal, lime, stone.
Stephens	92, 664, 527	95, 226, 639	Petroleum, natural gas, natural-gas liquids.
Texas	13, 339, 699	18, 406, 324	Natural gas, natural-gas liquids, petroleum.
Tillman	512, 769	583, 937	Petroleum, sand and gravel clays.
Tulsa	5, 542, 448	5, 792, 308	Petroleum, stone, sand and gravel.
Wagoner	412, 068	520, 264	Petroleum, natural gas, coal.
Washington	12, 805, 033	15, 477, 262	Petroleum, cement, stone.
Washita	1, 107, 348	1, 234, 123	Petroleum, natural gas.
Woods	22, 063	23, 769	Sand and gravel, salt, petroleum.
Undistributed ¹	2, 367, 460	3, 470, 344	
Total	621, 351, 000	678, 160, 000	

¹ Includes value of mineral production and principal minerals produced in 1953 in the following counties: Alfalfa (oil); Atoka (stone); Blaine (gypsum); Cherokee (sand and gravel); Choctaw (stone); Custer (clays); Dewey (clays); Ellis (1952 only); Harmon (natural-gas liquids); Harper (natural gas, petroleum); McCurtain (petroleum); Mayes (petroleum); Pushmataha (stone 1953 only); Woodward (sand and gravel).

BLAINE

Gypsum was produced by the U. S. Gypsum Co. from its quarries at Southard. The U. S. Gypsum Co. also operated a large calcining, sheet-rock, and plaster plant at Southard. The Universal Atlas

Cement Co. operated a gypsum quarry and crushing plant northeast of Watonga. S. A. Walton operated a gypsum quarry and crusher west of Okeene.

BRYAN

Construction sand and gravel was produced from pits of the M. & K. Sand & Gravel Co. near Colbert and by the H. C. Rustin Co. north of Durant. Noncommercial crushed stone and sand and gravel were produced for highway construction. Petroleum and natural gas were produced from the Aylesworth S. E. field.

CADDO

Petroleum and natural gas were produced from five fields, of which the Apache field produced more than 1 million barrels. Natural-gas liquids were produced by the Apache Gasoline Co. Construction sand and gravel were produced by James Avery near Fort Cobb.

CANADIAN

Petroleum and natural gas were produced from the Edmond, W., and El Reno fields.

CARTER

Petroleum and natural gas were produced from 20 fields, of which Fox-Graham, Healdton, Hewitt, Sholem-Alechem, and Tatum each produced more than 1 million barrels. Crushed limestone was produced by the H. D. Youngman Co. Natural-gas liquids were produced by the Magnolia Petroleum Co., Sokla Gasoline Co., Shell Oil Co., and Harry Ells, Inc.

CHEROKEE

Sand and gravel were produced by the Yahola Sand & Gravel Co. from Grand River, north of Fort Gibson.

CHOCTAW

Building sandstone was produced by the Hanselman Stone Co. in the northern part of the county.

CIMARRON

Construction sand and gravel were produced northwest of Boise City by Jack Parker. Petroleum and natural gas were produced from two fields.

CLEVELAND

Petroleum and natural gas were produced from the following fields; Moore; Moore, W.; Moore, E.; Moore, SE.; Clothier, SW.; Helsel, N.; Norman, NW.; Noble, E.; Noble, W.; Corbet, E.; Corbet, W.; Clear Brook, SW.; Short Junction, W.; Denver, SE.; Stella, E.; Oklahoma City; Roulette Creek; Roulette Creek, N.; and Roulette Creek, SE.

COAL

Petroleum and natural gas were produced from five fields. The Dolese Bros. Co. produced crushed limestone from its quarry near Bromide. Noncommercial crushed stone was produced for highway

construction. Coal was produced by the Dunn Fuel and Lumber Co., Peters Coal Co., Phillips Coal Co., S-H Coal Co., and 21 Coal Co.

COMANCHE

The Dolese Bros. Co. produced crushed limestone from its Richard Spur quarry north of Lawton. Ira Smith & Sons continued to produce unfinished granite dimension stone from its quarry in the western part of the county. Petroleum and natural gas were produced from five fields.

COTTON

Petroleum and natural gas were produced from 10 fields as follows: Cache Creek; Cache Creek, W.; Essaquanahdale, W.; Jensen; Rabbit Creek, W.; Randlett, S.; Randlett, SW.; Soldier Creek; Walters; and Warren.

CRAIG

Coal was produced by the Mayhew Coal Co. and the Patch Coal Co. Noncommerical crushed stone was produced by the Oklahoma State Highway Department. Petroleum and natural gas were produced in the northern part of the county.

CREEK

The Sapulpa Brick & Tile Co. produced clay for use in manufacturing brick and tile at its plant on the west edge of Sapulpa. Petroleum and natural gas were produced from 51 fields. The Cushing field and the Glenn field each had production that exceeded 1 million barrels. Natural-gas liquids were produced by the Sinclair Oil & Gas Co., Mid-Continent Petroleum Corp., Tidewater Associated Oil Co., Pure Oil Co., The Texas Co., and the Gulf Oil Corp.

CUSTER

Brick clay was produced west of Clinton by the Acme Brick Co. Volcanic ash was produced near Custer City by E. L. Henderson.

DEWEY

Bentonite deposits were worked north of Camargo by L. S. Fisher for the Filtrol Corp.

GARFIELD

Petroleum and natural gas were produced in 26 fields. Natural-gas liquids were produced by the Sterling Oil Co. of Oklahoma. The Davies Brick & Tile Co. continued to produce clay for making brick and tile from its quarry south of Enid.

GARVIN

Petroleum and natural gas were produced from 44 fields, of which southwest Antioch, northeast Elmore, Eola, Katie, Lindsay Townsite, southwest Maysville, New Hope, Panther Creek, and Tatum each had production that exceeded 1 million barrels. Natural-gas liquids were produced by the Sohio Petroleum Co., Lone Star Gas Co., Otha H. Grimes, and the Warren Petroleum Co. Construction sand and

gravel were produced from deposits east of Pauls Valley by Elmer Long. Noncommercial sand and gravel and noncommercial crushed sandstone were also produced.

GRADY

Petroleum and natural gas were produced from 11 fields. Natural-gas liquids were produced by the Magnolia Petroleum Co. Construction sand and gravel continued to be produced from pits near Tuttle by The Dolese Bros. Co.

GRANT

Petroleum and natural gas were produced from 10 fields, as follows: Deer Creek; Eureka, SE.; Jaruis, N.; Pond Creek, E.; Prairie Home, S.; Renfrow, E.; Rich Valley, Rich Valley, SE.; Webb; Ann Webb, N.

GREER

Granite was produced by the Granite Monument Works near the town of Granite. The Mangum Brick & Tile Co. produced clay from its quarry south of Mangum. Construction sand and gravel were produced from a pit east of Mangum by D. J. Cox. Petroleum and natural gas were produced from the Lake Creek field.

HARMON

Natural-gas liquids were produced by the Lone Star Gas Co. Salt was produced by W. W. Flowers & Sons by solar evaporation of brine from salt springs.

HARPER

Petroleum and natural gas were produced from the Howell and Laverne, S fields.

HASKELL

Coal was produced by Cedar Creek Coal Co., Fred Dock, Garland Coal Mining Co., Lone Star Steel Co., Reliance Coal & Coke Co., and Venable Coal Co. Noncommercial crushed limestone was produced for highway construction. Natural gas was produced during the year.

HUGHES

Petroleum and natural gas were produced from 39 fields. The Olympic field had production that exceeded 1 million barrels. Natural-gas liquids were produced by Charles W. and Otha H. Grimes and the Grimes Gasoline Co.

JACKSON

Petroleum and natural gas were produced from five fields. Construction sand and gravel were produced by Everett Gresham from pits east of Elmer.

JEFFERSON

Petroleum and natural gas were produced from eight fields: Asphaltum; Healdton; Oscars; Oscars, N.; Ringling, N.; Seay; Spring; and Woodrow.

JOHNSTON

The Pennsylvania Glass Sand Corp. of Oklahoma continued to produce glass sand and ground silica from pits north of Mill Creek. Claud Lamb produced construction sand from a pit east of Tishomingo. Unfinished granite was produced south of Mill Creek by the Granite Monument Works. The Rock Products Manufacturing Corp. produced crushed dolomite from its quarry near Troy.

KAY

The Cookson Stone Co. produced crushed limestone from its quarry northeast of Ponca City. Near Blackwell sand and gravel were produced by the Midwest Concrete Supply Co. Noncommercial sand was also produced. Petroleum and natural gas were produced from 29 fields. Natural-gas liquids were produced by the Cities Service Oil Co.

KINGFISHER

Construction sand and gravel were produced from pits near Dover by The Dolese Bros. Co. Petroleum and natural gas were produced from three fields: Cashion, NW.; Dover, SW.; and Edmond, W.

KIOWA

Dimension granite was quarried near Snyder by the Century Granite Co. and by the Roosevelt Granite Co. Near Mountain Park granite was quarried by the J. P. Gilman Granite Co. Construction sand and gravel were produced east of Hedrick by the Southwest Sand Co. The Lugert Sand & Gravel Co. produced sand south of Lugert. Petroleum and natural gas were produced from nine fields.

LATIMER

Coal was mined by Kavanaugh Coal Co., Kinta Stripping Co., Floyd Newman, Louis Rouviere, and Strickland Coal Co. Natural gas was produced from the Red Oak and Morris fields.

LE FLORE

Coal was produced by Bevel Coal Co., Beutelschies Coal Co., Black Diamond Coal Co., Cloud Coal Co., Dawes Coal Co., Evens Coal Co., Keithley Coal Co., Kleaner Coal Co., Myers Coal Co., Peerless Coal & Coke Co., Poteau Coal Co., Poteau Superior Coal Co., Pure Coal Co., Quality Coal Co., Reeves Excelsior Coal Co., and J. F. Turnipseed. Construction sand and gravel were produced by the Dixie Material Co., Inc. Natural gas was produced from three fields.

LINCOLN

Petroleum and natural gas were produced from 71 fields, of which the East Payson field had production that exceeded 1 million barrels. Natural-gas liquids were produced by the Highway Gasoline Co., The Texas Co., Magnolia Petroleum Co., and Moran Gasoline Corp.

LOGAN

Construction sand was produced by John McConnel and the Concho Sand & Gravel Co. Petroleum and natural gas were produced from 41 fields. Natural-gas liquids were produced by the Eason Oil Co.

LOVE

Petroleum and natural gas were produced from eight fields: Greenville; Leon, NE.; Marietta, N.; Marietta, NE.; Oswalt, NE.; Pike, N.; Sivells Bend; Stockton; and Thackerville, NE.

MAJOR

Construction sand and gravel were produced near Cleo Springs by Orin Law. Petroleum was produced from the Ringwood field. Natural-gas liquids were produced by the Warren Petroleum Co.

MARSHALL

Petroleum and natural gas were produced from six fields. Production from the Cumberland field exceeded 1 million barrels. Natural-gas liquids were produced by the Warren Petroleum Corp. and the Universal Gasoline Co. Joe L. Parker produced sulfur from waste sour gases east of Madill.

MAYES

Petroleum was produced from several small fields.

McCLAIN

Petroleum and natural gas were produced from 27 fields. Production from the East Lindsay field exceeded 1 million barrels.

McCURTAIN

Petroleum was produced from the Idabel, W., field. The quarry and crusher of the McCurtain Limestone Co. remained idle during the year.

McINTOSH

Coal was produced by Kerr Coal Co., Leavell Coal Co., and White Coal Co. Petroleum and natural gas were produced from two fields, the Coalton and Morris.

MURRAY

Asphaltic limestone and sandstone were produced near Dougherty by the Southern Rock Asphalt Co. Limestone was crushed near Davis and at Big Canyon at the quarries of The Dolese Bros. Co. Construction gravel was produced by Makins Sand & Gravel Co. near Dougherty. Glass sand was produced by the Oklahoma Glass Sand Corp. Petroleum and natural gas were produced from the Sulfur, NW., field.

MUSKOGEE

Petroleum and natural gas were produced from 12 fields. Sand and gravel were pumped from the Arkansas River north of Muskogee by the Muskogee Materials Co. Noncommercial sand and gravel were produced by the city of Muskogee. Coal was mined by the Hicks Coal Co.

NOBLE

Petroleum and natural gas were produced from 27 fields. Natural-gas liquids were produced by Shell Oil Co. Noncommercial sand and gravel were produced by the Noble County Highway Department.

NOWATA

Petroleum and natural gas were produced from six fields. Crushed limestone was produced by the Peerless Rock Co. Noncommercial crushed stone was produced by the State highway department.

OKFUSKEE

Petroleum and natural gas were produced in 72 fields, of which the Olympic field had production that exceeded a million barrels. Natural gas liquids were produced by The Carter Oil Co. and by C. W. and C. H. Grimes.

OKLAHOMA

Petroleum and natural gas were produced from 23 fields. Production in the West Edmond field and in the Oklahoma City field exceeded 1 million barrels. Natural-gas liquids were produced by Patton & Swab, Inc., Phillips Petroleum Co., Peppers Refining Co., and Cities Service Oil Co. Clay was quarried in the west part of Oklahoma City by the Acme Brick Co. and the United Brick & Tile Co. for use in making brick and tile. Construction sand was produced north of Oklahoma City by The Dolese Bros. Co. Paving sand was produced by the Vinsonite Sales Co. East of Oklahoma City construction sand and gravel were produced by the Murphy & Perkins Sand Co. and the Sizemore Sand & Gravel Co. Clay for lightweight aggregate was produced near Choctaw by the Oklahoma Lightweight Aggregate Co.

OKMULGEE

Coal was produced near Henryetta by the Atlas Coal Corp., Ben Hur Coal Co., Coal Creek Coal Co., McGinnis & Grafe, and Starr Coal Co. Petroleum and natural gas were produced in 27 fields. Natural-gas liquids were produced by Phillips Petroleum Co. A power trimming plant was operated near Henryetta by the Ada Stone Co.

OSAGE

Petroleum and natural gas were produced from 127 fields, of which Burbank field, with production of more than 1 million barrels, was the most important. Natural-gas liquids were produced by Phillips Petroleum Co., Skelly Oil Co., Neal Gasoline Co., and Sunray Oil Corp. Crushed limestone was produced by the Burbank Rock Co.

from their quarry east of Burbank. Noncommercial crushed stone was produced by the State highway department. Construction sand was produced by the Means Sand Co.

OTTAWA

Chat, a byproduct of zinc and lead milling, was produced by the Eagle-Picher Co. and by the American Zinc & Lead Smelting Co. Chat was produced by the U. S. Corps of Engineers. Tripoli was quarried in east central Ottawa County by the American Tripoli Corp. and processed in its plant at Seneca, Mo. Ottawa County supplied all of Oklahoma's lead and zinc output and the major portion of the Tri-State district's output.

PAWNEE

Petroleum and natural gas were produced from 28 fields. Sand and gravel were produced near Cleveland by the Osage Sand Co. Near Ralston sand was produced by the Ralston Sand Co. and the Tulsa Sand Co.

PAYNE

Petroleum and natural gas were produced from 71 fields, of which Cushing and Yale-Quay had production that exceeded 1 million barrels. Natural-gas liquids were produced by the Mid-Continent Petroleum Corp. Noncommercial limestone was produced by the State highway department. Noncommercial sand and gravel were produced by the county highway department.

PITTSBURG

Coal was produced by Bishop Coal Co., 42 Coal Co., Hodgens Coal Co., R. E. Lee, W. W. Lee, Lone Star Steel Co., McAlester-Alderson Coal Co., Passini Coal Co., Vinson & Vinson Coal Co., and Warren-Baldwin. Natural gas was produced from three fields. Noncommercial crushed sandstone was produced for highway construction. Clay for making brick and tile was produced by the Oklahoma State Penitentiary west of McAlester. The sand plant of Nix & Hill was idle during the year.

PONTOTOC

Petroleum and natural gas were produced from 23 fields. Natural-gas liquids were produced by The Carter Oil Co. and Kerr-McGee Oil Industries, Inc. Building limestone was quarried near Fittstown by the Ada Stone Co. Shale and limestone were quarried near Lawrence by the Ideal Cement Co. for use in its plant in Ada. Glass sand was produced by the Mid-Continent Glass Sand Co. near Roff. Light-burning clay was produced east of Ada by the Ada Brick Co. and the Frankhoma Pottery Co. Red-burning clay was produced at Ada by the Ada Brick Co.

POTTAWATOMIE

Petroleum and natural gas were produced from 68 fields. Production in the St. Louis field exceeded 1 million barrels. Natural-gas liquids were produced by the Warren Petroleum Co. and the Sinclair Oil & Gas Co. Gravel was produced by the Oklahoma Gravel Co.

PUSHMATAHA

Building sandstone was produced north of Antlers by Mike Emery.

ROGERS

Coal was produced by the McNabb Coal Co. and the Rogers County Coal Co. Petroleum and natural gas were produced from three fields.

SEMINOLE

Petroleum and natural gas were produced from 76 fields. Both the Seminole City and the Traugh fields produced more than 1 million barrels. Natural-gas liquids were produced by Carter Oil Co., Mid-Continent Petroleum Corp., Sinclair Oil & Gas Co., and Phillips Petroleum Co. Clay was quarried west of Wewoka for making brick and tile by the Wewoka Brick & Tile Co. Limestone was crushed southwest of Wewoka at the quarry of the Streeter Stone Co.

SEQUOYAH

Coal was produced by the Sallisaw Stripping Co. Limestone was crushed north of Marble City at the quarry of the Marble Stone Co. Part of the limestone crushed at Marble City was burned at Sallisaw in the kilns of the St. Clair Lime Co. Natural gas was produced from a small field.

STEPHENS

Petroleum and natural gas were produced from 38 fields of which North Alma, Camp, Doyle, Knox, Milroy, Sholem-Alechem, Velma, and Woolsey each produced more than 1 million barrels. Natural-gas liquids were produced by Magnolia Petroleum Co. and Skelly Oil Co.

TEXAS

Petroleum and natural gas were produced during the year. The Hugoton gas field was the largest. Natural-gas liquids were produced by Panoma Corp. and Cities Service Oil Co. Construction sand and gravel were produced north of Guymon and south of Guymon by the Stewart Bros.

TILLMAN

Clay was produced near Frederick by the Permian Pottery Co. Noncommercial sand and gravel were produced by the Tillman County Highway Department. Petroleum was produced from the Frederick, Frederick, S., Frederick, W., and Red River Bed fields.

TULSA

Petroleum and natural gas were produced from 23 fields. Natural-gas liquids were produced by the Pioneer Corp. and by Gulf Oil Corp. Coal was produced east of Tulsa by the Acme Coal Co. Brick clay was produced by the Acme Brick Co. and by the United Brick & Tile Co. in Tulsa and by the United Brick & Tile Co. in Collinsville. Limestone was produced at Gray Spur west of Tulsa by the Acme Materials Co. East of Tulsa, near Garnett, limestone was produced by the Acme Materials Co., the Anchor Stone Co., and the Chandler Materials Co. Construction sand was produced near Jenks by the Bagby-Harris Co. Near Sand Springs sand was produced by the Arkansas River Sand Co., the Mohawk Rock & Sand Co., and the Sand Springs Sand Co. Near Tulsa construction sand was produced by the Acme Materials Co., the Bagby-Harris Co., the Chandler Materials Co., the McMichael Concrete Co., the Smith Sand Co., and the Tulsa Sand Co. Noncommercial crushed stone was produced by the State highway department. Expanded perlite was produced at the Tulsa plant of Ozark-Mahoning Co.

WAGONER

Petroleum and natural gas were produced from 14 fields. Coal was produced by the Wagoner County Coal Co.

WASHINGTON

Petroleum and natural gas were produced from four fields. Cement was produced at Dewey by the Dewey Portland Cement Co. from shale and limestone quarried a short distance east of the plant. Crushed limestone was produced by the Dewey Portland Cement Co. east of Dewey.

WASHITA

Petroleum and natural gas were produced from three fields: Elk City, SE.; Rock, W.; and Sentinel, W.

WOODS

Sand and gravel were produced near Waynoka by the Waynoka Sand & Gravel Co. Salt was produced west of Freedom by Ezra Blackmon. Petroleum was produced from one field.

WOODWARD

Construction sand and gravel were produced by the Klines sand pit.

The Mineral Industry of Oregon

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior and the Oregon State Department of Geology and Mineral Industries.

By Kenneth D. Baber,¹ Frank B. Fulkerson,¹ Albert J. Kauffman, Jr.,² and Paul F. Yopes¹



CONSTRUCTION by Hanna Nickel Smelting Co. of a multi-million-dollar smelter to produce ferronickel from ore to be obtained from the Riddle nickel deposit in Douglas County highlighted mineral-industry activity in Oregon during 1953. Further development of the ore body and provision of mining and ore-handling facilities also were underway. The project was expected to reach the production stage in 1954, with all output scheduled for purchase by the General Services Administration (GSA).

Two other metallurgical developments were noteworthy. The National Metallurgical Corp. began constructing a pilot plant in Lane County to produce aluminum-silicon alloys from clays and similar aluminous materials. This plant was to employ a flash-roasting process utilizing hogged-wood waste. The Harvey Machine Co. acquired a site at The Dalles, Wasco County, and planned to construct an aluminum-reduction plant costing \$65 million.

Sand and gravel, stone, and cement continued to be the chief mineral commodities produced in Oregon. Nonmetallic minerals composed more than 95 percent of the State's total value of mineral production. A sharp decrease in the value of stone production, caused by decreases in the quantities used in road building and on hydroelectric projects, brought about an 8-percent decline in the value of mineral output.

Mining of chrome ore continued in Josephine, Curry, Jackson, Coos, Douglas, and Grant Counties. The entire output was purchased at the Grants Pass depot of the GSA. The Powder River Dredging Co., principal producer of gold in the State, increased output substantially in 1953.

Hearings were in progress before the Federal Power Commission regarding applications by several concerns to construct natural-gas pipelines into the region from fields in Canada and the Southwest. At the end of 1953 the Pacific Northwest was the only large area in the United States in which natural gas was not available.

The total individual income from mining represents a smaller percentage of income from all sources in Oregon than in the United States as a whole. In 1953 mining wages and salaries comprised only 0.2 percent of all income payments to Oregon residents compared to 1.4 percent for the entire Nation.³ Wages and salaries paid workers at Oregon's mines and quarries totaled \$5.5 million, a 6-percent increase over 1952. Income (\$104.2 million) from construction payrolls decreased 3 percent. The decline in total construction for the year resulted in the production of smaller quantities of nonmetallic raw materials for the building industry.

¹ Commodity-industry analyst, Mineral Industry Division, Region II, Bureau of Mines, Albany, Oreg.

² Chief, Mineral Industry Division, Region II, Bureau of Mines, Albany, Oreg.

³ Survey of Current Business, vol. 34, No. 8, August 1954, pp. 9-17.

Senate Bill 433, an oil- and gas-conservation measure, was passed by the Oregon Legislature and became law on April 16. The new law, which repealed chapter 365, Oregon Laws 1949, established several requirements designed to prevent waste in drilling of oil tests and in production of petroleum if discovered. The act will be administered by the Oregon State Department of Geology and Mineral Industries.⁴

TABLE 1.—Mineral production in Oregon, 1952-53¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Chromite.....gross weight..	6, 591	\$507, 981	6, 216	\$484, 453
Clays.....	277, 072	569, 968	292, 445	296, 050
Coal.....	1, 179	8, 630		
Copper (recoverable content of ores, etc.).....	1	484	9	5, 166
Gold (recoverable content of ores, etc.).....troy ounces..	5, 509	192, 815	8, 488	297, 080
Lead (recoverable content of ores, etc.).....	1	322		1, 310
Manganese ore (35 percent or more Mn).....gross weight..			46	(?)
Manganiferous ore (5 to 35 percent Mn).....do.....			271	(?)
Mercury.....76-pound flasks..	868	172, 819	648	125, 083
Pumice and pumicite.....	59, 678	201, 809	73, 080	173, 822
Sand and gravel.....	12, 219, 486	8, 556, 213	8, 763, 078	8, 629, 632
Silver (recoverable content of ores, etc.).....troy ounces..	4, 037	3, 654	12, 259	11, 095
Stone (except limestone for cement and lime).....	6, 250, 849	8, 893, 368	\$ 4, 939, 080	\$ 6, 301, 639
Tungsten concentrate.....60-percent WO ₃ basis..		15, 960	(1)	(2)
Zinc (recoverable content of ores, etc.).....	1	332		
Undistributed: Carbon dioxide, cement, diatomite, gem stones, lime (1952), perlite (crude), quartz, stone (crushed granite, 1953), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2). Ex- cludes value of clays used for cement.....		\$ 7, 549, 366		8, 123, 493
Total Oregon.....		26, 674, 000		24, 449, 000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

² Value included with "Undistributed."

³ Excludes certain stone, value for which is included with "Undistributed."

⁴ Less than 1 ton.

⁵ Revised figure.

During 1953 the program of the Defense Minerals Exploration Administration continued to encourage systematic investigation of strategic and critical mineral occurrences. Financial assistance extended under the Government contracts was repayable from royalties on ore discovered and subsequently mined. Table 2 shows projects active under the program during part or all of 1953.

TABLE 2.—Defense Minerals Exploration Administration contracts active during 1953

County	Name of operator	Name of property	Mineral	Total contract	Government participation (percent)	Contract No.
Crook....	Strickland Butte Mine.	Strickland Butte.....	Mercury..	\$5, 600	75	E537
Douglas..	Bonanza Oil & Mine Corp.	Bonanza.....	do.....	50, 056	75	E510
Grant....	Roba & Westfall.....	Purple Ridge, Beaver..	do.....	20, 140	75	E536

⁴ Oregon State Department of Geology and Mineral Industries, The Ore.-Bin, vol. 15, No. 5, May 1953, p. 3.

REVIEW BY MINERAL COMMODITIES

METALS

Aluminum.—Activity at three separate locations promised further growth of Oregon's aluminum-production industry. The largest project was that of the Harvey Machine Co. at The Dalles, Wasco County, where over 500 acres of land was purchased as a site for a reduction plant. Plans for the plant reportedly called for production of alumina from imported bauxite and conversion of the alumina to aluminum, using hydropower made available by the generating facilities of the new Dalles dam, under construction by the Army Corps of Engineers. Although early reports from various sources indicated that a plant having a capacity of 54,000 short tons of primary aluminum annually and costing approximately \$65 million would be completed by May 1955, there was only limited construction activity during the year.

The Harvey Co. also acquired ownership of the former Government alumina plant at Salem, built during World War II at a cost of \$5 million, with a bid of \$325,000. The plant reportedly was purchased by the firm for experimental use in producing alumina from local clays.

In Lane County, near Springfield, the newly formed National Metallurgical Corp., a subsidiary of Apex Smelting Co. and the American Smelting & Refining Co., proceeded with plans for constructing a pilot plant for producing aluminum-silicon alloys and silicon metal from quartz and clays. The plant was to employ a flash-roasting process utilizing hogged-wood waste available from lumber mills in that vicinity. At the year end the plant was nearing completion, and initial production was scheduled for early in 1954.

At Troutdale, Multnomah County, operations at the Reynolds Metals Co. aluminum-reduction plant continued throughout the year. A report⁵ issued in July presented historical and current information on the aluminum industry in the Pacific Northwest, including the Troutdale plant.

Chromium.—Shipments of chromite ores and concentrates decreased slightly from 1952, while the number of individuals and companies registering production remained nearly unchanged. Mines in Josephine County yielded over three times the quantity produced in Grant County, which ranked second. By far the largest single operation in the State was that of the Waldo Milling Co. in Josephine County. Two additional outstanding producers were the Ashland Mining Co. operation in the same county and the Zanetti Bros. operation at the Dry Camp mine in Grant County. Other operators contributing substantially to the State totals were F. I. Bristol and B. A. McCaleb in Curry County; John Day Mining Co. and Tri-County Mining & Concentrating Co. in Grant County; and D. W. Bowers, C. W. Dean & Fred Langley, J. N. Grissom & Helen Inman, E. K. McTimmonds, and Wm. S. Robertson in Josephine County.

Several new chromite deposits on Chrome Ridge and in the Illinois River area in Josephine County were discovered, and a number of

⁵ Bonneville Power Administration, Columbia River Power and the Aluminum Industry; A Research Report: July 1953, 22 pp.

TABLE 3.—Shipments of chromite ores and concentrates in 1953, by counties

County	Number of operations reported	Value	Gross weight, short tons		
			45 percent or more Cr ₂ O ₃	Less than 45 percent Cr ₂ O ₃	Total
Coos.....	1	\$1,528	7	11	18
Curry.....	8	64,947	678	49	727
Douglas.....	3	15,576	105	87	192
Grant.....	4	91,510	1,205	-----	1,205
Jackson.....	1	(¹)	(¹)	-----	(¹)
Josephine.....	21	292,007	3,013	820	3,833
Unassigned ²	16	18,885	161	80	241
Total.....	54	484,453	5,169	1,047	6,216

¹ Included with unassigned.

² In addition to data under footnote 1, includes value and production figures of operations for which county locations were not determined.

new mills were constructed during the year. Weather conditions and lack of adequate access roads in the mountainous southern Oregon area made satisfactory operation difficult in many instances. Important legislation affecting the chromite-mining industry was extension of the Government chrome-buying program through June 1957, an additional 2 years. The GSA announced that the restriction limiting a producer to delivery of 5,000 tons of ores or concentrates during any one year had been rescinded.

Copper.—Production of copper increased from 1 ton in 1952 to 9 tons in 1953 as a result of the first output in more than 25 years from the Standard mine near Prairie City, Grant County. The output resulted from surface trenching in a previously undeveloped area above the old workings. Gold ore from the Buffalo mine, Grant County, contained byproduct copper.

The Bureau of Mines in December began a diamond-drilling survey of the copper deposits of the Waldo-Takilma area of southern Josephine County.

Gold.—After dropping to its lowest peacetime level in 1952, production of gold advanced 54 percent in 1953 owing to a gain in output by the Powder River Dredging Co., which continued to operate a bucketline dredge near Sumpter, Baker County. An increase from 6 cents to 11 in the gold recovery per cubic yard of stream gravel and old tailings worked by the dredge accounted for the gain, which occurred despite a decline in the quantity of material processed. The Powder River Dredging Co. recovered 82 percent of the gold produced in Oregon in 1953. Production of gold from the Buffalo lode mine near Granite, Grant County, also increased. The Buffalo mine and 50-ton flotation mill were operated by James P. Jackson under lease from the Boaz Mining Co.

Of the 21 placer and 8 lode mines reported active, only the Powder River and Buffalo operations were substantial producers. The placers, including ground worked by prospectors but not classed as mines, supplied 86 percent of the production. By method of treatment of lode material, concentration and smelting of concentrates

supplied 87 percent of gold recovered; amalgamation, 12 percent; and direct smelting, 1 percent.

Baker County produced 84 percent of the State total; Grant County, 13 percent; and Curry, Jackson, Josephine, and Malheur Counties the remainder.

Lead.—Gold ore from the Buffalo mine, Grant County, contained a small tonnage of recoverable lead.

TABLE 4.—Mine production of gold and silver in Oregon in 1953, by months, in fine ounces of recoverable metals ¹

Month	Gold	Silver	Month	Gold	Silver
January	446	117	August	656	167
February	871	225	September	918	1,350
March	716	188	October	703	1,589
April	512	135	November	752	3,959
May	773	176	December	608	236
June	587	155			
July	946	3,962	Total	8,488	12,259

¹ Mine production comprises ore, gravel, or other mineral material sold or treated and metal recovered as natural gold or as bullion from cyanidation or amalgamation and the estimated recoverable metal contained in concentrates, ore, tailings, and other mineral materials shipped directly to smelters or sold to ore buyers within the year.

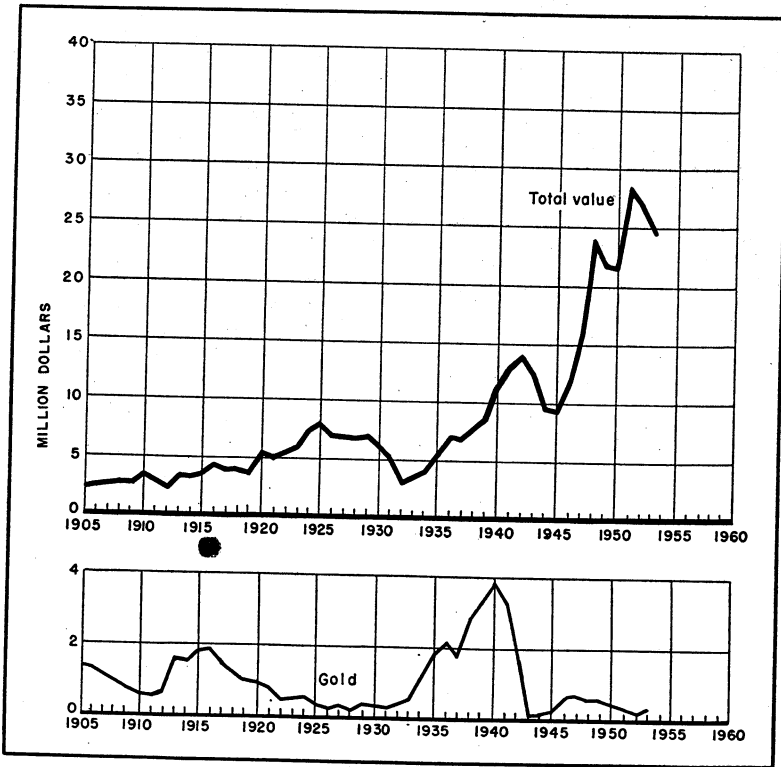


FIGURE 1.—Value of mine production of gold in Oregon, 1905-53, and total value of all minerals, 1905-53.

TABLE 5.—Mine production of gold, silver, copper, lead, and zinc, 1944-48 (average), 1949-53, and total, 1852-1953, in terms of recoverable metals ¹

Year	Mines producing ²		Material sold or treated ³ (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1944-48 (average).....	18	29	3,047	11,405	\$399,168	16,321	\$13,446
1949.....	28	29	6,215	16,226	567,910	12,195	11,037
1950.....	32	42	4,257	11,058	387,030	13,565	12,277
1951.....	14	31	1,495	7,927	277,445	6,218	5,628
1952.....	13	25	931	5,509	192,815	4,037	3,654
1953.....	8	21	1,215	8,488	297,080	12,259	11,095
1852-1953.....			(⁴)	5,774,350	130,065,293	5,317,561	4,877,924

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1944-48 (average).....	5	\$2,019	5	\$1,442		\$94	\$416,169
1949.....	20	7,880	12	3,792	6	1,488	592,107
1950.....	19	7,904	17	4,590	21	5,964	417,765
1951.....	11	5,324	2	692	3	1,092	290,181
1952.....	1	484	1	322	1	332	197,607
1953.....	9	5,166	5	1,310			314,651
1852-1953.....	12,419	4,674,069	804	93,449	173	23,194	139,733,929

¹ Includes recoverable metal content of gravel washed (placer operations), ore milled, and ore shipped to smelters during calendar year indicated.

² Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.

³ Does not include gravel washed.

⁴ Figure not available.

TABLE 6.—Gold produced at placer mines, 1944-48 (average) and 1949-53, by classes of mines and methods of recovery

Class and method	Mines producing ¹	Material treated (cubic yards)	Gold recovered		Average value per cubic yard
			Fine ounces	Value	
Surface placers:					
Gravel mechanically handled:					
Bucketline dredges:					
1944-48 (average).....	2	² 2,902,560	³ 7,912	² \$276,934	² \$0.095
1949.....	3	3,468,900	10,744	376,040	.108
1950.....	2	3,051,000	7,827	273,945	.090
1951.....	2	2,719,900	6,775	237,125	.087
1952.....	1	2,548,700	4,571	159,985	.063
1953.....	1	2,176,000	6,935	242,725	.112
Dragline dredges: ³					
1944-48 (average).....	5	347,780	1,788	62,594	.180
1949.....	3	594,750	3,224	112,840	.190
1950.....	3	101,000	446	15,610	.155
1951.....	1	6,500	47	1,645	.253
1952.....	1	5,000	27	945	.189
1953.....					
Suction dredges: 1944-48 (average).....		3,000	31	1,085	.362
Nonfloating washing plants: ⁴					
1944-48 (average).....	2	² 840	² 23	² 812	² 967
1949.....	4	12,700	54	1,890	.149
1950.....	5	8,300	40	1,400	.169
1951.....	1	(⁵)	5	175	
1952.....					
1953.....					
Gravel hydraulically handled:					
1944-48 (average).....	11	67,250	282	9,884	.147
1949.....	13	59,100	255	8,925	.151
1950.....	21	83,300	472	16,520	.198
1951.....	11	16,550	115	4,025	.243

See footnotes at end of table.

TABLE 6.—Gold produced at placer mines, 1944-48 (average) 1949-53, by classes of mines and methods of recovery—Continued

Class and method	Mines producing ¹	Material treated (cubic yards)	Gold recovered		Average value per cubic yard
			Fine ounces	Value	
Surface placers—Continued					
Gravel hydraulically handled—Continued					
1952.....	9	27,600	147	\$5,145	.186
1953.....	9	27,500	209	7,315	.266
Small-scale hand methods: ⁶					
1944-48 (average).....	9	8,900	147	5,145	.578
1949.....	5	21,600	181	6,335	.293
1950.....	10	3,200	229	8,015	2.505
1951.....	5	9,850	207	7,245	.736
1952.....	13	15,200	146	5,110	.336
1953.....	10	9,800	138	4,830	.493
Underground placers (drift):					
1944-48 (average).....		270	6	203	.752
1949.....	1	250	7	245	.980
1950.....	1	400	8	280	.700
1951.....	2	800	20	700	.875
1952.....					
1953.....	1	450	7	245	.544
Grand total placers:					
1944-48 (average).....	29	3,330,590	10,190	356,657	.107
1949.....	29	4,157,300	14,465	506,275	.122
1950.....	42	3,247,200	9,022	315,770	.097
1951.....	21	2,753,600	7,164	250,740	.091
1952.....	25	2,596,500	4,896	171,360	.066
1953.....	21	2,213,750	7,289	255,115	.115

¹ Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.

² Data for nonfloating washing plants included with bucketline dredges to avoid disclosure of individual output, 1947 and 1948.

³ Includes all placer operations using dragline excavator for delivering gravel to floating washing plant.

⁴ Includes all placer operations using power excavator and washing plant, both on dry land; when washing plant is movable, outfit is termed "dry-land dredge."

⁵ Data not available.

⁶ Includes all operations in which hand labor is principal factor in delivering gravel to sluices, long toms, dip boxes, pans, etc. "Wet" method used exclusively in Oregon.

⁷ Revised figure.

TABLE 7.—Mine production of gold, silver, copper, and lead in 1953, by counties, in terms of recoverable metals

County	Mines producing ¹		Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer	Fine ounces	Value	Fine ounces	Value
Baker.....	3	6	7,126	\$249,410	1,896	\$1,716
Curry.....	1		4	140	1	1
Grant.....	3	3	1,133	39,655	10,322	9,342
Jackson.....	1	6	148	5,180	32	29
Josephine and Malheur ²		6	77	2,695	8	7
Total.....	8	21	8,488	297,080	12,259	11,095

County	Copper		Lead		Total value
	Pounds	Value	Pounds	Value	
Baker.....					\$251,126
Curry.....					141
Grant.....	18,000	\$5,166	10,000	\$1,310	55,473
Jackson.....					5,209
Josephine and Malheur ²					2,702
Total.....	18,000	5,166	10,000	1,310	314,651

¹ Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.

² Combined to avoid disclosure of individual output.

TABLE 8.—Mine production of gold, silver, copper, and lead, in 1953, by classes of ore or other source materials, in terms of recoverable metals

Source	Number of mines	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)
Lode ore:						
Dry gold.....	7	1,156	1,180	10,261	2,000	10,000
Copper.....	1	59	19	72	16,000	-----
Total.....	8	1,215	1,199	10,333	18,000	10,000
Gravel (placer operations).....	21	-----	7,289	1,926	-----	-----
Total, all sources.....	29	1,215	8,488	12,259	18,000	10,000

TABLE 9.—Mine production of gold, silver, copper, and lead in 1953, by methods of recovery, and types of material processed, in terms of recoverable metals

Type of material processed and method of recovery	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)
Lode:¹				
Amalgamation.....	142	25	-----	-----
Concentration, and smelting of concentrates.....	1,038	10,236	2,000	10,000
Direct smelting.....	19	72	16,000	-----
Total lode mines.....	1,199	10,333	18,000	10,000
Placer.....	7,289	1,926	-----	-----
Grand total.....	8,488	12,259	18,000	10,000

¹ Comprises ore only; no old tailings, etc., processed in 1953.

TABLE 10.—Mine production of gold, silver, copper, and lead in Oregon in 1953, by counties and districts, in terms of recoverable metals¹

County and district	Mines producing ²		Ore (short tons)	Gold (fine ounces)			Silver (lode and placer) ³ (fine ounces)	Copper (pounds)	Lead (pounds)	Total value
	Lode	Placer		Lode	Placer	Total				
Baker County:										
Greenhorn ⁴	1	-----	20	11	11	2	-----	-----	\$387	
Sumpter.....	-----	4	-----	-----	7,026	1,883	-----	-----	247,614	
Wetherby.....	-----	1	-----	-----	7	-----	-----	-----	245	
Curry County:										
Chctco.....	1	-----	1	4	4	1	-----	-----	141	
Grant County:										
Canyon.....	1	-----	20	18	18	3	-----	-----	633	
Greenhorn ⁴	-----	3	-----	-----	64	12	-----	-----	2,251	
Quartzburg.....	1	-----	59	19	19	72	16,000	-----	5,322	
Jackson County:										
Beaver Creek.....	-----	1	-----	-----	3	1	-----	-----	106	
Gold Hill.....	-----	1	-----	-----	3	3	-----	-----	105	
Upper Applegate... ⁵	1	4	(⁶)	(⁶)	142	31	-----	-----	4,998	
Josephine County:										
Illinois River.....	-----	3	-----	-----	40	8	-----	-----	1,407	
Other districts ⁷	3	4	1,115	(⁶)	1,151	10,246	2,000	10,000	51,442	
Total Oregon.....	8	21	1,215	52	8,436	8,488	12,259	18,000	10,000	314,651

¹ Only those districts shown separately for which Bureau of Mines is at liberty to publish figures; other producing districts listed in footnote 7 and their output included with "Other districts."

² Excludes itinerant prospectors, "snipers," "high-graders," and others who gave no evidence of legal right to property.

³ Source of silver: 10,333 ounces from lode mines and 1,926 ounces from placers.

⁴ Greenhorn district is in Baker and Grant Counties.

⁵ Less than 1 ton.

⁶ Production included with placer to avoid disclosure of individual output.

⁷ Includes Auburn, Eagle Creek, and Whitney districts in Baker County; Granite district in Grant County; Grants Pass and Greenback districts in Josephine County; French Gulch district in Malheur County.

Manganese.—Manganese activity during the year was confined to the operations of Ketell Investment Corp. of Portland at the Jewell mine in Baker County near Pleasant Valley. A quantity of manganese ore (10–35 percent Mn) and a smaller tonnage of manganese ore (35 percent Mn and over) were shipped to the Geneva Steel Co. in Utah. Some exploration and test work, mainly in southern Oregon, was done by the Bureau of Mines as a part of a project to prepare an atlas of manganese occurrences in the Pacific Northwest.

Mercury.—As in 1952, the output of mercury during 1953 declined sharply, reflecting a continued decrease in prices throughout the year. The number of flasks produced in the State was 45 percent less than the output in 1951 and 25 percent less than in 1952. Production was reported by 5 operators in 4 counties, with the Bonanza Oil & Mine Corp. operation in Douglas County much the largest. An important contributor was the Maury Mountain mine in Crook County operated by Eickemeyer Bros. Other smaller producers were the Towner Motor Co. Lost Cinnabar No. 1 mine, also in Crook County; the Roba & Westfall Deer Creek mine in Grant County; and the War Eagle mine, operated by J. H. and J. A. Holtzclaw and S. A. Edwards, in Jackson County.

A report describing mercury occurrences in the Steens and Pueblo Mountains of southeastern Oregon was issued during the year.⁶

Nickel.—The Hanna Coal & Ore Corp. and the Hanna Nickel Smelting Co., subsidiaries of the M. A. Hanna Co. of Cleveland, Ohio, moved rapidly toward initial production of ferronickel from the Riddle Mountain nickel deposit in Douglas County. The contract between these companies and the Government, signed late in 1952, provided for production of 95 to 125 million pounds of nickel as ferronickel. The cost of developing the open-pit mine and constructing the smelter was to be covered by a Government loan of \$24.8 million (most of which was to be used for smelter construction) and the expenditure of an estimated \$4.3 million of company funds in developing the mine.

An interesting and informative article published during the year gave details on the geology of the deposit, the history of the area, and information on the project.⁷

Silver.—The small quantity of silver yielded annually by the State's metal mines more than tripled as a result of increased production from the Buffalo gold-lode mine, the principal producer. The Powder River Dredging Co. placer operation ranked second in silver output.

Tungsten.—The output of tungsten ore consisted of a small quantity produced in the course of development at the Hall property and by the Gold Hill Exploration Co. at the Sylvanite mine, both in Jackson County. Development also was carried on at the Bratcher and Mattern properties in Jackson County.

Zirconium.—The production of zirconium and hafnium sponge and ingots was continued throughout the year at the Bureau of Mines Northwest Electrodevelopment Laboratory in Albany, Linn County. The entire output of these metals was consigned to the Atomic Energy Commission.

⁶ Williams, Howel, and Compton, Robert R., Quicksilver Deposits of Steens Mountain and Pueblo Mountains, Southeast Oregon: Geol. Survey Bull. 995-B, 1953, 77 pp.

⁷ Oregon State Department of Geology and Mineral Industries, The Ore-Bin, vol. 15, No. 10, October 1953, pp. 59–65.

NONMETALS

Asbestos.—The search for commercial serpentine asbestos deposits in Oregon continued. No unusual discoveries were reported, however.

Cement.—The plant output and shipments of cement were at about the same level as in 1952; due to higher prices there was a small increase in the total value of shipments.

The Oregon Portland Cement Co. operated two cement-manufacturing plants, one at Oswego, Clackamas County, and the other in the northeastern part of the State at Lime, Baker County. Quarries in Polk and Baker Counties supplied cement rock, limestone, and shale for the plants. The company also sold limestone from the Baker County quarry. At the Lime operation a modernization and expansion program was undertaken, partly in anticipation of increasing demand for cement at new hydroelectric projects.⁸

The Ideal Cement Co. Pacific Division cement plant at Gold Hill, Jackson County, was active throughout the year. A plant-modernization program was underway. Limestone was obtained at the Marble Mountain quarry in adjoining Josephine County and shale was mined locally.

Clays.—The structural clay products and expanded-shale industries reported a slightly increased level of activity. The same 22 plants active in 1952 continued operating. Two plants, 1 in Portland and 1 at nearby Banks, produced lightweight expanded-shale aggregate from shale mined in Washington and Columbia Counties. Flowerpots and stoneware were manufactured at a plant in Portland, using clay mined in Yamhill County and Clark County, Wash. The other 19 plants produced heavy clay products. These plants were concentrated in the Willamette Valley, where the soil-drainage needs and large population provided the principal market in the State. About 85 percent of the clay for heavy clay products was mined in the following counties, listed in order of magnitude of output: Multnomah, Washington, Yamhill, Marion, Benton, Clackamas, Linn, and Polk. Other clay-producing counties, in order of output, were Klamath, Malheur, Union, Tillamook, and Josephine.

Shale for use in the manufacture of cement was mined in Baker, Clackamas, and Josephine Counties.

Diatomite.—The Great Lakes Carbon Corp. continued to operate at capacity the company diatomite quarry and preparation plant near Terrebonne, Deschutes County. Products, marketed under the trade name "Dicalite," were sold for use as filter aids, fillers, and thermal insulation.

Other diatomite occurrences in eastern Oregon were investigated during the year, and it was reported that a company was being formed to exploit deposits in northern Malheur County.⁹

Gem Stones.—No large companies were recovering gem-stone materials; however, Oregon was a source of agates, "thunder eggs," and other materials sold by mineral dealers and curio shops as polished stones and mineral specimens.

⁸ Mining Congress Journal, vol. 39, No. 11, November 1953, p. 120.

⁹ Oregon State Department of Geology and Mineral Industries, The Ore.-Bin, vol. 15, No. 6, June 1953, p. 37.

Perlite.—The Kaiser Gypsum Co., Inc., relinquished the lease it held on the perlite quarry and processing plant of Dant & Russell, Inc., near Freida, Wasco County, in May. The plant was operated by the owners for a short time thereafter. Two thousand tons of crude perlite was mined, and 4,100 tons of expanded perlite valued at \$81,000 was sold or used to manufacture acoustical tile. The plant closed late in the year, and plans were made to dismantle it.

Pumice.—The Oregon pumice industry continued to expand slowly following a sharp drop in production in 1951. Two companies in Deschutes County reported a large proportion of the total State output, and another operator in Deschutes and one in Harney County also recorded production. Most of the pumice was crushed and sized for use as lightweight-concrete aggregate. In Harney County crude pumice was sold at \$0.70 per ton for road and railroad ballast. Pumice was marketed throughout the Northwest, in northern California, and in British Columbia.

Contractors also prepared large quantities of pit-run and crushed and sized pumice or cinders for use as road ballast and asphaltic aggregate; this material is included under stone in the accompanying tables of mineral production.

Sand and Gravel.—The output of sand and gravel was valued slightly higher than in 1952, despite a sharp decrease in total volume. The apparent contradiction was due to consumption of high-unit-value building sand and gravel at the United States Army Corps of Engineers dam projects in Lane County in 1953, as compared with consumption of large quantities of low-unit-value random-fill gravel in 1952. On a value basis, 56 percent of the output was used for highway construction, 40 percent for other construction (including dams), and 4 percent for other purposes (mainly railroad ballast). Production was reported from 23 counties; however, 17 counties west of the summit of the Cascades supplied more than 93 percent of the gross output by value.

Silica.—For the second consecutive year, production of silica was increased greatly at the Bristol Silica Co. quarry near Rogue River, Jackson County, only producer in the State. Output was used in the production of ferrosilicon, silicon carbide, and refractories, and for other special purposes.

Stone.—The gross output of stone (excluding that used in manufacturing cement) declined for the second year from the all-time high of 8,722,000 tons valued at \$10,831,000 reached in 1951 to 4,939,000 tons having a value of \$6,302,000. The decrease was due to reduced use of stone at Federal dam projects and on highway construction. Production was reported from 25 counties. More than 85 percent by value of the output was used for concrete or road material. Trap-rock—largely basalt—was the principal stone quarried. Large quantities of volcanic cinders were prepared for use as a road material. Limestone was quarried in Baker and Polk Counties for use at paper mills, sugar refineries, and a calcium carbide plant and as agricultural stone. Granite crushed for poultry grit was quarried in Jackson County. Stone used in manufacturing cement is discussed in the cement section of this chapter.

MINERAL FUELS

Carbon Dioxide.—The Gas-Ice Corp., Seattle, Wash., converted natural carbon dioxide to "dry ice" at a plant near Ashland, Jackson County. The gas is obtained from mineral water tapped through drilled wells. The company also has a plant at a similar carbon dioxide occurrence near Klickitat, Wash.

Coal.—The Madrona mine in Clackamas County and South Slough mine in Coos County were active part of the year. Data on producers with less than 1,000 tons annual production are not included in the State and national totals. A publication on the geology and reserves of the Coos Bay coal field was issued.¹⁰

REVIEW BY COUNTIES AND DISTRICTS

BAKER

In Sumpter district the Powder River Dredging Co. operated its Yuba electric dredge throughout 1953 on the Sumpter Valley placers, washing 2,175,995 cubic yards of stream gravel and old tailings compared with 2,548,736 cubic yards in 1952. The quantity of gold recovered by the dredge, which has sixty-nine 10-cubic foot buckets, totaled 6,935 fine ounces, and silver production was 1,869 fine ounces as compared with 4,571 and 1,043 fine ounces, respectively, in the previous year. The China Bar drift mine, in Wetherby district, was operated during part of 1953, and numerous other small placer mines and prospects were active in the county. Lode mine production comprised gold ore from the Bayhorse (Auburn district), East Eagle (Eagle Creek district), and Jay Gould (Greenhorn district). A test mill was erected at the Sanger gold mine by the owner, William Wendt.

Over 300 short tons of manganese and manganiferous ores was shipped to the Geneva Steel Co. in Utah from the Jewell mine near Pleasant Valley by Ketell Investment Corp., Portland.

The Gales Creek quarry at Durkee and the Limerock quarry and portland-cement plant at Lime were operated by the Oregon Portland Cement Co., Portland. Crushed limestone was sold to sugar refineries and other consumers. An improvement and expansion program was planned during the year in anticipation of a growing demand for cement and limestone. The Morrison-Knudsen Co., Inc., Boise, continued diamond-drilling exploration of limestone deposits near Durkee and reported shipment of a small tonnage of chemical-grade limestone.

BENTON

Building brick and drain and building tile were produced at the Monroe Brick & Tile Co. plant, one of the largest clay-products plants in Oregon, and by the Corvallis Brick & Tile Co. Clays were mined locally. Sand, gravel, and crushed stone and gravel valued at \$110,000 were produced by Corvallis Sand & Gravel Co. for use principally as road-building materials.

¹⁰ Duncan, Donald C., Geology and Coal Deposits in Part of the Coos Bay Coal Field, Oregon: Geol. Survey Bull. 982-B, 1953, 72 pp.

TABLE 11.—Value of mineral production in Oregon, 1952-53, by counties

County	1952	1953	Minerals produced in 1953, in order of value
Benton.....	\$48,843	\$117,498	Stone, sand and gravel, clays.
Clackamas.....	4,196,972	4,705,021	Cement, sand and gravel, stone, clays, coal.
Clatsop.....	143,882	15,735	Stone, sand and gravel.
Columbia.....	327,792	244,900	Stone, clays, sand and gravel.
Coos.....	298,288	209,903	Stone, sand and gravel, coal, chromite.
Crook.....	3,783	(1)	Mercury.
Curry.....	32,779	65,088	Chromite, gold, silver.
Deschutes.....	1,115,142	1,047,494	Diatomite, pumice, sand and gravel, stone.
Douglas.....	1,054,247	1,219,732	Sand and gravel, stone, mercury, chromite.
Gilliam.....	115,500	120,000	Sand and gravel.
Grant.....	51,317	160,131	Chromite, gold, stone, silver, copper, lead, mercury.
Harney.....	6,718	9,822	Pumice.
Hood River.....	45,505	37,500	Stone.
Jackson.....	2,236,024	2,520,428	Cement, stone, sand and gravel, silica, carbon dioxide, gold, chromite, mercury, silver, tungsten.
Jefferson.....		26,555	Stone.
Josephine.....	445,095	324,579	Chromite, gold, clays, silver.
Klamath.....	212,308	49,770	Sand and gravel, clays.
Lake.....		152,180	Sand and gravel, stone.
Lane.....	1,433,279	2,957,613	Do.
Lincoln.....	(1)	155,930	Stone.
Linn.....	289,694	292,440	Sand and gravel, clays.
Malheur.....	3,750	2,605	Clays, gold.
Marion.....	143,685	169,140	Sand and gravel, clays.
Morrow.....	38,618	93,335	Stone.
Multnomah.....	2,355,229	2,181,067	Sand and gravel, stone, clays.
Polk.....	231,827	173,912	Do.
Sherman.....	2,500	18,000	Sand and gravel.
Tillamook.....	31,070	124,740	Sand and gravel, stone, clays.
Umatilla.....	385,246	282,250	Stone, sand and gravel.
Union.....	70,516	196,685	Stone, sand and gravel, clays.
Wallowa.....	76,249	195,945	Stone.
Wasco.....	108,429	219,825	Stone, sand and gravel, perlite.
Washington.....	593,257	335,262	Sand and gravel, clays, stone.
Yamhill.....	266,973	113,719	Do.
Undistributed ²	10,309,229	5,910,019	
Total.....	26,674,000	24,449,000	

¹ Included with "Undistributed" to avoid disclosure of individual output.

² Includes value of mineral production for the following counties: Baker (cement, stone, gold, manganiferous ore, silver, manganese ore), Wheeler (1952), and stone, sand and gravel, gem stones, and mercury production that cannot be assigned to specific counties.

CLACKAMAS

Largely as a result of the cement output at the Oswego plant of the Oregon Portland Cement Co., Clackamas was credited with being the leading mineral-producing county in Oregon, with output valued at nearly \$5 million. It should be noted, however, that most of the raw materials used at the cement plant were obtained from outside Clackamas County.

The principal materials mined in the county were sand and gravel and stone. Production was reported by several companies and by county road crews. Clay was mined and structural clay products were manufactured by the Needy Brick & Tile Co. and Molalla Brick & Tile Co. Coal was mined by Lowes-Madrones Coal Mining Co. at the Madrona mine, one-half mile east of Wilhoit.

CLATSOP

Sand and gravel were produced by the Brookfield Co., Astoria. Rock Creek Crushed Rock, Astoria, prepared crushed rock for road material and concrete aggregate.

COLUMBIA

Shale rock was mined near Vernonia and shipped to the Smithwick Concrete Products Co. plant in Portland, where it was expanded in rotary kilns for use as lightweight-concrete aggregate. Crushed rock, used principally on roads, was prepared by Goodat Crushed Rock Co., Portland, and Leslie Walters. The latter also reported an output of building sand and gravel, and Parker Schram Co., Portland, mined gravel near Scappoose.

COOS

Some development was reported at the Noonday-Thompson copper mine, on the west fork of Cow Creek in the eastern part of the county.

Chromite from the Independence and Last Chance mines was shipped to the Government Purchase Depot at Grants Pass by O. K. Coster.

Sand and gravel and crushed stone were produced by several companies and by county highway department crews. Bituminous coal was mined in the county.

CROOK

Mercury was produced and shipped from the Eickemeyer Bros. Maury Mountain mine. A DMEA mercury project was active at the Strickland Butte Mine claims, owned by C. J. and M. L. Page, near Prineville. A small quantity of mercury was produced from the Towner Motor Co. Lost Cinnabar No. 1 mine.

CURRY

Mines operated by Fayette I. Bristol, Fred Gardner & Sons, and B. A. McCaleb supplied the bulk of the chromite produced in the county during the year. Chromite ores were processed before shipment to the Government Purchase Depot at Grants Pass at the Bristol-Baker and Freeman-Twombly mills.

DESCHUTES

The diatomite quarrying and processing operation of Great Lakes Carbon Corp. near Terrebonne was the leading mineral industry activity in the county. Central Oregon Pumice Co., Lloyd A. Williamson, and Deschutes Concrete Products Co. together furnished the bulk of Oregon's pumice output in 1953. Large quantities of cinders were prepared for asphaltic aggregate, producing the fine dark-red-surfaced roads seen in central Oregon. The value of material used for this purpose is included with stone in mineral-production tabulations. Sand and gravel were produced by Bend Sand & Gravel Co.

DOUGLAS

J. E. Fitzpatrick, Dorothy Kartes and associates, and O. W. Stuempeges mined and shipped chromite ores and concentrates to the Government Purchase Depot at Grants Pass. The Bonanza Oil & Mine Corp. Bonanza mine near Sutherlin continued to be the largest mercury producer in the State and one of the major domestic pro-

ducers, although output from the mine was substantially less than in the preceding year. A DMEA mercury project was active at the property. Construction of smelter facilities near Riddle by the Hanna Nickel Smelting Co. and preparation of the site of the nickel silicate deposits on Nickel Mountain by Hanna Coal & Ore Corp. began early in the year.

The value of sand and gravel and stone output exceeded \$1 million. Seven companies reported production, a large share of which was used as road material.

GILLIAM

Road gravel was mined and prepared by county highway department crews.

GRANT

Chromite ores and concentrates were shipped to the Government Purchase Depot at Grants Pass by Burt Hayes, John Day Mining Co., Tri-County Mining & Concentrating Co., and Zanetti Bros. from properties near John Day. The Zanetti Bros. firm of Kellogg, Idaho, leased the Dry Camp mine and mill from Tri-County Mining & Concentrating Co. early in the summer for a 3-month period and produced a sizable quantity of concentrates. Output was trucked to the purchase depot at a reported cost of \$16 per ton. Ore produced by the John Day Mining Co. was from another section of the Dry Camp property, and Burt Hayes worked the Haggard and New Claims. A small quantity of mercury was produced by Roba & Westfall from its Deer Creek mine during the year, and a DMEA mercury project was active at the Roba & Westfall Purple Ridge and Beaver claims.

In Granite district the Buffalo mine, Oregon's principal producer of lode gold, was operated the entire year by James P. Jackson, lessee. Tonnage of ore milled in the 50-ton flotation plant at the property increased substantially. Development at the Standard mine, 7 miles north of Prairie City in the Quartzburg district, resulted in shipment of 59 tons of crude ore containing 19 ounces of gold, 72 ounces of silver, and 16,000 pounds of recoverable copper. Work was begun at the mine in October by Ray E. Summers after the property had been inactive for over 25 years. Henry M. Brown operated the Black Butte gold mine in Canyon district for about 4 months, milling 20 tons of ore. Three placer mines in the Greenhorn district were worked sporadically.

A small quantity of crushed stone was produced by the Newport Construction Co., Portland, for road material.

HARNEY

Pumice was mined by Harney Concrete Tile Co. near Burns. Pit-run material was sold for use as logging-railroad ballast, and about 800 tons of lightweight-concrete aggregate was prepared. The crushing plant was moved from the pit to a railroad-siding location in Burns. Aggregate was used at the company building-block plant and also shipped to other block manufacturers.

HOOD RIVER

The county highway department operated the Trout Creek quarry, producing crushed and broken basalt for road building.

JACKSON

Laughlin Engineering Co. shipped chromite concentrates to the Government Purchase Depot at Grants Pass early in the year. A small quantity of mercury was produced at the War Eagle mine by J. H. and J. A. Holtzclaw and S. A. Edwards. Some tungsten concentrates produced in the course of development at the Gold Hill Exploration Co. Sylvanite mine and at the Hall property near Ashland were shipped during the year.

Five small mines in Upper Applegate district produced all but 8 of the 148 ounces of gold recovered in the county. The Bullsnake and Sterling placers and the Pay Later prospect were the principal producers.

Jackson County was the third-ranking mineral producer in the State in value of output, due principally to the production of cement.

The Gold Hill cement mill of Ideal Cement Co., Denver, Colo., was active throughout the year. Shale was quarried near the plant, and limestone was quarried in adjoining Josephine County. Bristol Silica Co., one of the leading raw material producers in the county, reported a greatly increased output of silica and continued production of crushed granite for poultry grit at operations in the Rogue River area. The Dead Indian and Reese Creek quarries were operated by county road crews, and crushed rock was prepared for road material. County crews and Ashland city crews also mined road gravel. Sand and gravel plants were operated in Medford by M. C. Lininger & Sons and Medford Concrete Construction Co. Building materials and road gravel were produced. Near Ashland, the Gas-Ice Corp., Ashland, recovered carbon dioxide from mineral water wells and produced "dry ice."

JEFFERSON

A new mineral industry was established in the county by Pacific States Cut Stone Co. The company reported production of split-face ashlar stone valued at \$25,000 at a plant near Gateway. The stone is shaped by sawing and splitting with a hydraulic breaker. Small quantities of rough dimension stone and rubble also were sold.

JOSEPHINE

In December the Bureau of Mines began a diamond-drilling project in the old Waldo copper-mining district, in the southern part of the county. Based on results of a soil-sampling and soil-analysis program conducted by the Bureau in 1951 in cooperation with the California-Oregon Power Co., several holes were to be drilled in a belt 650 feet wide and 2 miles long to obtain data on the copper reserves in the area.

The copper mines in the Waldo district have not been worked to any great extent for 35 years. From 1904 to 1919 the district produced about 3,000 tons of copper, with most of the output coming from the Queen of Bronze mine. The Cowboy and Waldo mines also were early-day producers. In 1904 a small smelter was erected in the area by the Takilma Smelting Co., owner of the Queen of Bronze property. The smelter was closed in 1909, and the mines

were inactive until increased demand for copper in 1916 made their reopening possible. A labor force of 36 men was employed at the Queen of Bronze mine throughout 1917. When the price of copper dropped at the end of World War I, the mines in the area again were shut down. The Queen of Bronze was operated from 1928 to 1930 on a reduced scale.

A geologic map of the Galice quadrangle was published by the Geological Survey in cooperation with the Oregon State Department of Geology and Mineral Industries.¹¹ The map embraces a gold-producing area and shows the location of 95 gold lode and placer mines.

Chrome ores and concentrates produced from deposits in the county composed over half of the total quantity shipped to the Government Purchase Depot from mines in Oregon. The largest producer in the county, as well as in the State, was the Waldo Milling Co. Goncolda claims operation. Other producers contributing substantially to county and State totals were Ashland Mining Co., D. W. Bowers, C. W. Dean and Fred Langley, J. N. Grissom & Helen Inman, E. K. McTimmonds, Wm. S. Robertson, and Frank Tubandt. Mills were operated in the county during the year by D. W. Bowers, Waldo Milling Co., E. A. Foster, Frank Tubandt, Jean Pressler, and R. W. Radcliffe.

The Ideal Cement Co. quarried limestone at the Marble Mountain quarry for use in the manufacture of cement at its Gold Hill plant in adjoining Jackson County.

KLAMATH

The Klamath Falls Brick & Tile Co. manufactured brick and tile from local clay blended with clay shipped from Lincoln, Calif. Oil was burned as fuel. O. A. McCord, Klamath Falls, produced building and road sand and gravel. Large quantities of gravel, cinders, and basalt for State highway projects were quarried and crushed by Peter Kiewit Sons Co. The Great Northern Railway Co. also mined gravel for use as ballast.

LAKE

Large quantities of crushed gravel and stone for road material were produced by Peter Kiewit Sons Co. and other contractors and by county road department crews.

LANE

National Metallurgical Corp. began constructing a pilot plant near Springfield to produce aluminum-silicon alloys and silicon metal. The plant was to use raw materials available locally. By the end of the year construction was nearly complete, and operations were to begin early in 1954.

Sand and gravel and crushed stone valued at nearly \$3 million were produced in Lane County. A large proportion was used at the Lookout Point and Dexter dam building projects of the U. S. Army Corps of Engineers on the middle fork of the Willamette River south-

¹¹ Walls, F. G., and Walker, G. W., Galice Quadrangle, Oreg.: Geological Survey, 1953.

east of Eugene. County and State road construction programs also required large quantities. Nine local companies, county road department crews, and outside contractors contributed to the total production.

LINCOLN

Crushed and broken basalt was produced by Calkins Crushing Co., Ocean Lake; Yaquina Head Quarries, Newport; and contractors for the Bureau of Public Roads.

LINN

Zirconium and hafnium in sponge and ingot form were produced at the Bureau of Mines Northwest Electrodevelopment Laboratory at Albany and shipped to the Atomic Energy Commission.

Sand and gravel and stone valued at nearly \$300,000 were produced in Linn County for use as road material and in concrete aggregate. Nine companies were reported active, and county road crews also mined gravel. At Albany building brick and drain and building tile were manufactured by the Albany Brick & Tile Co. from locally mined clay.

A bulletin describing the geology of a portion of Linn and Benton Counties was published.¹²

MALHEUR

Oregon Clay Products Co., Inc., manufactured building brick at a plant in Vale.

MARION

There were two heavy clay products plants in Marion County; both used locally mined clay. The Donald Brick & Tile Co. was one of the leading drain-tile producers in the State and also manufactured other hollow ware and building brick. Drain tile was made at the Hubbard Clay Works. About 100,000 yards of sand and gravel was reported produced in the county; 9 companies or contractors were active.

MORROW

Stone was quarried and crushed by county road-department crews for road-building material.

MULTNOMAH

The principal raw mineral material mined in Multnomah County was sand and gravel. Gross output of washed, crushed, and pit-run material exceeded 2 million tons having an average value of \$1 per ton. Nine companies reported production. Although large quantities were used as road material, the bulk of the output was for general construction. County crews also produced crushed stone for road materials at the Hoyt quarry. Rough building stone was produced by Joe Marston at Rocky Butte quarry, Portland.

¹² Allison, Ira S., Geology of the Albany Quadrangle, Oregon: Oregon Dept. of Geol. and Min. Ind., Bull. 37, 1953, 18 pp.

Two of the largest heavy clay products plants in Oregon—the Sylvan Brick Co. plant at Sylvan and Columbia Brick Works, Gresham—were in the Portland area just east of the city. Both obtained raw clay locally. Face brick was manufactured at the Sylvan plant and common building brick and building tile at Gresham. Flower pots and stoneware were made by Pacific Stoneware Co. at its Portland plant from clay brought in from Yamhill County and Clark County, Wash. Lightweight expanded-shale aggregate was made by Smithwick Concrete Products Co. from shale mined in Columbia County.

A number of chemical and metallurgical plants operated in the county, using mineral commodities from Oregon and from outside the State. The Reynolds Metals Co. produced primary aluminum at its Troutdale plant from alumina shipped into the State. The only two calcium carbide plants on the Pacific coast are in Portland. Pacific Carbide & Alloys Corp. used limestone from Wallowa County and Union Carbide & Carbon Corp. lime shipped from Missouri. Ferrosilicon and silicon were produced by the Electro Metallurgical Co., using quartz mined in Oregon and Washington. Oregon steel mills operated electric furnaces and a rolling mill, using principally scrap for raw material. The Pennsylvania Salt Manufacturing Co. was a major caustic soda-chlorine producer. Stauffer Chemical Co. and Miller Products Co. used some of the Washington State output of soapstone in manufacturing insecticides.

POLK

The Oregon Portland Cement Co. quarried limestone near Dallas for use in manufacturing cement at the Oswego, Clackamas County, plant. Polk County Lime Co. also quarried limestone and crushed about 5,000 tons for agricultural use. The Monmouth Brick & Tile Co., Monmouth, made drain and building tile and building brick from locally mined clay. Broken and crushed stone and sand and gravel for construction work and road material were produced by several companies and by county road-department crews.

SHERMAN

Washed gravel for road material was produced by county road-department crews.

TILLAMOOK

The Tillamook Clay Works, 7 miles southeast of Tillamook, manufactured drain tile. County road-department crews quarried and crushed basalt and mined gravel.

UMATILLA

Sand and gravel and crushed stone were produced for road material and general construction, and the Union Pacific Railroad Co. produced bank gravel for use as railroad ballast.

UNION

The value of road and construction stone and sand and gravel produced in the county was nearly \$200,000. At La Grande the La Grande Brick Co. made building brick from locally mined clay.

WALLOWA

Limestone valued at \$50,000 was quarried by Greeley Lime Co., a subsidiary of Pacific Carbide & Alloys Co., and shipped by rail to Portland for use in manufacturing calcium carbide. Fines were sold for agricultural limestone. Crushed stone for road material was produced by Russell Olsen Construction Co. and by county road crews.

WASCO

The perlite quarry and preparation plant of Dant & Russell, Inc., near Frieda was active until late in the year, when operations were stopped and plans made to dismantle the plant. Earlier Kaiser Gypsum, Inc., relinquished the lease held on the operation. Sand and gravel and broken and crushed stone valued at \$183,000 were produced for road material, railroad riprap, and construction.

WASHINGTON

Expanded-shale lightweight-concrete aggregate was produced by Empire Building Materials Co., Portland, at a plant near Banks. Shale was mined in an open pit near the plant. The county operated the Durham and Jackson quarries and produced crushed-gravel and basalt road material. Sand and gravel were prepared by Vonaken Sand & Gravel Co. and Scoggins Valley Gravel Co., Gaston.

YAMHILL

The county was one of the leading producers of heavy clay products. Common brick and drain tile were manufactured by the McMinnville Brick & Tile Co. and face and common brick by Willamina Clay Products Co. Crushed stone and sand and gravel, used principally as road material, were produced.

The Mineral Industry of Pennsylvania

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Pennsylvania Topographic and Geologic Survey.

By Alvin Kaufman¹



THE MINES and quarries of Pennsylvania produced a wide variety of mineral commodities in 1953, ranging from fuels to nonmetals. Of these, the most important economically were coal, cement, stone, petroleum, and natural gas. The output of the last two was obtained mainly from the western and north central counties. Bituminous-coal production centered in the southwestern and central counties, with anthracite in the northeast. The cement and stone

TABLE 1.—Mineral production in Pennsylvania, 1952-53¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement.....376-pound barrels..	40, 037, 761	\$103, 388, 586	42, 093, 765	\$114, 002, 846
Clays.....	3, 731, 130	12, 639, 864	3, 575, 422	9, 983, 133
Coal:				
Anthracite.....	40, 582, 558	379, 714, 076	30, 949, 152	299, 139, 687
Bituminous.....	89, 181, 232	473, 475, 646	93, 330, 871	516, 490, 411
Cobalt (content of ore).....pounds..	639, 856	(²)	564, 450	(²)
Copper (recoverable content of ores, etc.).....	3, 485	1, 686, 740	3, 027	1, 737, 498
Gold (recoverable content of ores, etc.).....				
Iron ore (usable).....troy ounces..	1, 500	52, 500	1, 134	39, 690
Lime (open-market).....long tons, gross weight..	992, 110	(²)	1, 020, 826	(²)
Natural gas.....million cubic feet..	1, 202, 981	13, 842, 213	1, 335, 300	16, 010, 114
Natural-gas liquids:	108, 684	30, 758, 000	105, 558	30, 717, 000
Natural gasoline.....thousand gallons..	7, 182	548, 000	(²)	(²)
LP-gases.....do.....	798	75, 000	1, 008	90, 000
Peat.....	7, 898	43, 874	8, 232	47, 516
Petroleum (crude).....thousand 42-gallon barrels..	11, 233	47, 740, 000	³ 10, 649	³ 45, 680, 000
Sand and gravel.....	14, 696, 106	19, 920, 003	14, 715, 383	20, 692, 391
Sericite schist.....			2, 463	⁴ 4, 926
Silver (recoverable content of ores, etc.).....				
troy ounces..	9, 247	8, 369	6, 972	6, 310
Slate.....	214, 860	4, 487, 648	202, 386	4, 419, 612
Stone (except limestone for cement and lime).....	⁵ 25, 609, 812	⁵ 44, 676, 456	⁵ 26, 192, 607	⁵ 48, 094, 029
Undistributed: Graphite (crystalline, 1953), mica, pyrites, ground sand and sandstone, stonite (dimension basalt), recovered elemental sulfur, tripoli, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2). Excludes value of clays used for cement.....		⁶ 12, 575, 843		14, 461, 911
Total Pennsylvania.....		⁶ 1,145,633,000		1,121,622,000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

² Value included with "Undistributed."

³ Final figure. Supersedes preliminary figure given in commodity chapter.

⁴ Estimate.

⁵ Excludes certain stone, value for which is included with "Undistributed."

⁶ Revised figure.

¹ Commodity-industry analyst, Region VIII, Bureau of Mines, Pittsburgh, Pa.

industries had their largest production in the east and southwest, respectively.

The major producing counties—in order of decreasing value—were Luzerne, Washington, Schuylkill, Cambria, Greene, Allegheny, Northampton, and Fayette. All except Northampton owed their predominant position to output of coal.

In 1953 nearly 78 percent of the value of Pennsylvania's mineral output was attributable to fuels, 21 percent to non-metals, and 1 percent to metals, virtually all of the last was iron ore or byproducts of that commodity. The value of Pennsylvania mineral production declined 2 percent from 1952, principally because of a drop in anthracite output.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal.—Both anthracite and bituminous coal were mined in Pennsylvania. Bituminous or soft-coal beds underlie the western and central sections of the State. The anthracite or hard-coal deposits occur in the northeastern part of the Commonwealth. The production of anthracite in 1953 dropped 24 percent from that in 1952. In an attempt to combat the competition of petroleum and natural gas, in the spring of 1953, the industry organized the Anthracite Information Program and also began retrenching by closing inefficient mines and collieries. The year was characterized by bitter price wars in an attempt to capture what remained of the market. This was particularly underlined by the offering of freezers, trips to Bermuda, etc., as premiums for the purchase of carlots of anthracite by retail dealers.

Bituminous-coal production in 1953 was 5 percent above that in the previous year. The desire to achieve greater efficiency was characterized by modernization of facilities, including the opening of a new portall by Emerald Coal & Coke Co. in Morgan Township, Greene County.

TABLE 2.—Production of Pennsylvania anthracite, 1952–53, by counties, in short tons

County	1952	1953	County	1952	1953
Carbon.....	1,844,775	1,658,108	Northumberland.....	5,550,898	4,269,136
Columbia.....	647,514	637,989	Schuylkill.....	13,287,747	10,145,533
Dauphin, Susque- hanna and Wayne..	102,895	295,968	Sullivan.....	24,055	17,227
Lackawanna.....	5,323,145	3,799,331	Total.....	140,315,871	130,715,339
Luzerne.....	13,534,842	9,892,047			

¹ Excludes counties producing dredge coal only.

Petroleum and Natural Gas.—As a result of exploratory drilling early in 1953, the largest Oriskany-sand gas pool was discovered in southeastern Elk County. This was known as the Benezette pool and is an extension of the Benezette-Driftwood field. There were 2 other discoveries of minor significance in 1953, 1 at the Oriskany horizon in western Clearfield County and the other in the Albion (Median) sand in southeastern Erie County.²

² Fettke, Charles R., Oil and Gas Developments in Pennsylvania in 1953: Pennsylvania Topog. and Geol. Survey, Progress Rept. 144, 16 pp.

TABLE 3.—Production of bituminous coal, by counties, 1952-53

(Exclusive of mines producing less than 1,000 tons)

County	1952		1953	
	Short tons	Average value per ton	Short tons	Average value per ton
Allegheny.....	9,614,860	\$5.30	9,853,970	\$5.63
Armstrong.....	3,361,174	4.35	3,167,397	4.02
Beaver.....	455,384	4.29	461,142	3.87
Bedford.....	247,058	5.99	144,651	6.25
Blair.....	209,400	4.32	155,884	4.22
Bradford.....	9,739	5.12	10,353	4.90
Butler.....	1,897,263	4.02	2,043,625	3.93
Cambria.....	12,339,260	6.09	11,982,351	6.44
Cameron.....	66,206	3.87	51,536	3.93
Centre.....	1,096,230	3.95	1,022,257	3.55
Clarion.....	2,258,494	3.66	2,201,759	3.59
Clearfield.....	6,025,719	4.53	5,525,258	4.35
Clinton.....	630,972	3.26	590,967	3.07
Elk.....	617,535	4.26	544,960	3.95
Fayette.....	7,581,264	5.77	9,106,610	6.15
Greene.....	9,598,195	5.69	11,743,043	5.91
Indiana.....	6,288,635	5.24	5,848,703	5.22
Jefferson.....	1,726,513	4.20	1,687,222	4.02
Lawrence.....	287,702	3.61	677,344	3.90
Lycoming.....	31,961	4.47	(1)	(1)
McKean.....	43,847	3.39	79,001	3.26
Mercer.....	529,542	4.14	554,812	4.19
Somerset.....	5,301,972	5.22	4,036,308	5.19
Tioga.....	71,935	5.37	70,204	5.44
Venango.....	511,039	3.50	587,718	3.54
Washington.....	13,369,226	5.76	16,198,151	6.17
Westmoreland.....	4,588,705	5.33	4,585,003	5.79
Other counties: Fulton and Huntingdon (Lycoming, 1953)	421,402	6.21	400,642	5.89
Total.....	89,181,232	5.31	93,330,871	5.53

¹ To avoid disclosure of individual company data, production from Lycoming County is included with Fulton and Huntingdon.

In all, 204 deep wells (Middle Devonian or deeper) were completed in 1953 compared with 160 the previous year. Of these, 134 were gas wells. There were 1,770 shallow wells (Upper Devonian or higher) drilled during the year.

Crude-oil production in 1953 totaled 10,649,000 barrels compared with 11,233,000 barrels in 1952. Natural-gas output declined to 106 billion cubic feet in 1953 compared with 109 billion cubic feet the previous year. In addition to the production of natural gas, natural gasoline and LP-gases were produced as byproducts. Both compression and absorption methods were utilized.

METALS

Iron Ore.—The Bethlehem Steel Co. Cornwall mines in Lebanon County were Pennsylvania's only metallic ore producers in 1953. This property yielded a magnetic iron ore with byproduct recovery of pyrite and chalcopryite, containing sulfur, copper, gold, silver, and cobalt, all of which were recovered through iron-ore beneficiation. Bethlehem Steel Co. continued to develop the Grace iron mine, Morgantown, Berks County. Shaft A was sunk to a depth of nearly 1,300 feet, and Shaft B was below 700 feet at the end of the year. In addition, much of the surface construction, such as mine office, changehouse, main hoist, etc., was completed during 1953. The railroad spur and loading tracks were also finished.

Manganese.—Early in 1953 a syndicate of West Virginia businessmen, operating under the name of Manganese Development Co., began strip mining a 400-foot-wide manganese deposit in Sherman Valley near Cypher in eastern Bedford County. The company erected a crusher and log washer on Groundhop Hollow Road. The operation was economically unsuccessful, and activity ceased at the end of the year.

Zinc.—Although no mine production of zinc was recorded in the State in 1953, activity of the New Jersey Zinc Co. at Friedensville, Lehigh County, promises to make Pennsylvania again a producer of zinc ore. The New Jersey Zinc Co. reported that the shaft hoist and other facilities for the new mine were complete. Major efforts during 1953 had been directed, however, to dewatering the mine.

NONMETALS

Cement.—The production of cement from Pennsylvania plants increased 9 percent in 1953 compared with 1952. Shipments from these operations in 1953 were 705,600 barrels less than production. As a result, stocks increased 30 percent from those at the beginning of the year. Pennsylvania cement production is concentrated in two major areas. The larger consists of Lehigh and Northampton Counties in the northeastern part of the State; these 2 counties, with 16 mills, supplied 70 percent of the cement shipped in 1953. The second center of production is in the densely populated region of western Pennsylvania, comprising Allegheny, Butler, and Lawrence Counties. The five producing plants in this area utilize the Vanport limestone. Major cement producers in Pennsylvania in 1953, in order of decreasing output, were: Universal-Atlas Cement Co., Universal and Northampton; Penn-Dixie Cement Co., Bath, Nazareth, and West Winfield; and Lehigh Portland Cement Co. with operations at Sandt's Eddy, Fogelsville, and Ormrod.

TABLE 4.—Finished portland cement produced, shipped, and in stock, 1944-48 (average) and 1949-53

Year	Active plants	Production (barrels)	Shipped from mills			Stocks at mills on December 31 (barrels)
			Barrels	Value		
				Total	Average per barrel	
1944-48 (average).....	24	25,753,088	26,349,807	\$47,434,194	\$1.73	2,529,887
1949.....	24	38,122,065	36,905,254	84,839,175	2.30	3,275,594
1950.....	24	38,646,260	39,450,611	94,604,230	2.40	2,471,243
1951.....	24	41,981,431	41,560,431	107,035,506	2.58	2,892,243
1952.....	24	39,437,971	40,037,761	103,388,586	2.58	2,292,453
1953.....	24	42,799,409	42,093,765	114,002,846	2.71	3,096,232

Clays.—Pennsylvania clay production dropped 4 percent below 1952. The 102 clay pits active in Pennsylvania in 1953 produced kaolin, fire clay, and miscellaneous clays and shales. Of these, fire clay was the most important and represented 80 percent of the value of all clays. Fire clay was used principally for refractory and heavy clay products and was produced predominantly in Clearfield, Beaver, and

Jefferson Counties. The major producing companies continued to be Harbison-Walker Refractories Co., Hanley Co., and General Refractories Co.

Miscellaneous clays and shales were used largely for building brick and other structural clay products. The major producing counties were Allegheny, Berks, and Northumberland. The largest producer of this commodity by far was Glen Gery Shale Brick Co. It should be noted that the low value attributed to miscellaneous clays has little bearing on the price of the final product, because the labor and fuels involved in shaping, drying, and firing constitute such a large percentage of the manufacturing costs.

TABLE 5.—Clays sold or used by producers, 1944-48 (average) and 1949-53

Year	Kaolin		Fire clay		Miscellaneous clays		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1944-48 (average).....	31,033	\$114,549	1,577,338	\$5,488,058	1,289,132	\$1,068,012	2,897,553	\$6,671,519
1949.....	52,478	201,576	1,663,564	6,316,196	1,594,729	1,308,907	3,310,771	7,226,879
1950.....	62,626	250,383	1,731,855	7,149,589	1,687,713	1,415,346	3,482,194	8,315,318
1951.....	75,415	306,045	2,205,794	11,653,734	1,949,358	2,127,771	4,230,567	14,087,550
1952.....	(1)	(1)	1,992,099	10,726,085	1,739,031	1,913,779	3,731,130	12,639,864
1953.....	(1)	(1)	1,703,280	8,001,196	1,872,142	1,986,937	3,575,422	9,988,133

¹ To avoid disclosure of individual company figures, kaolin has been combined with fire clay.

TABLE 6.—Clays sold or used by producers in 1953, by kinds and uses

	Fire clay ¹		Miscellaneous clays	
	Short tons	Value	Short tons	Value
Refractories:				
Firebrick and block ²	835,642	\$5,154,320		
Foundries and steelwork.....	82,410	235,616	13,868	\$22,624
Miscellaneous refractories.....	94,334	540,013		
Heavy clay products.....	642,701	1,849,872	1,614,017	1,508,257
Fillers or extenders.....			6,640	28,522
Cement.....	(3)	(3)	216,923	364,101
Undistributed.....	48,193	221,375	20,694	63,433
Total.....	1,703,280	8,001,196	1,872,142	1,986,937

¹ Includes kaolin.

² Includes high-alumina brick.

³ Included with "Undistributed" to avoid disclosure of individual company operations.

Lime.—Pennsylvania lime production increased for the fourth consecutive year, registering a gain of 11 percent. There were 29 plants in operation during the year, of which the major producing units were owned by the Warner Co., National Gypsum Co., H. E. Millard Lime & Stone Co., and the J. E. Baker Co. The major lime-producing counties were Centre and York.

Pyrophyllite (Sericitic Schist).—Summit Mining Corp. opened a sericitic schist quarry near Bendersville 10 miles northwest of York Springs in June 1953. Quarry output is trucked 22 miles to the company mill at Dillsburg. Output was sold principally as an insecticide filler.

TABLE 7.—Lime sold by producers, 1944-48 (average) and 1949-53, by uses

Year	Agricultural		Building		Chemical and Industrial		Refractory		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1944-48 (average).....	155,706	\$1,412,822	61,879	\$738,853	¹ 789,193	¹ \$6,770,099	(¹)	(¹)	1,006,778	\$8,921,774
1949.....	136,199	1,512,069	111,278	1,566,371	¹ 663,588	¹ 7,112,239	(¹)	(¹)	911,065	10,190,679
1950.....	135,182	1,530,991	134,052	1,944,178	650,756	7,110,931	166,461	\$2,076,974	1,086,451	12,663,074
1951.....	134,559	1,532,813	126,048	1,740,850	741,673	8,551,011	178,820	2,435,330	1,181,100	14,260,054
1952.....	131,007	1,463,596	123,049	1,675,987	768,319	8,228,875	180,606	2,473,755	1,202,981	13,842,213
1953.....	116,863	1,367,594	114,839	1,575,387	865,747	9,766,852	237,851	3,300,281	1,335,300	16,010,114

¹ To avoid disclosure of individual company operations, refractory tonnage is included with chemical and industrial.

TABLE 8.—Lime sold or used by producers in 1952-53, by counties

County	1952		1953	
	Short tons	Value	Short tons	Value
Armstrong.....	608	\$7,406	955	\$11,364
Centre.....	481,572	4,816,476	580,050	6,561,742
York.....	¹ 88,397	¹ 1,084,908	144,187	1,932,181
Undistributed.....	¹ 632,404	¹ 7,933,423	610,108	7,504,827
Total.....	1,202,981	13,842,213	1,335,300	16,010,114

¹ Revised figure.

Sand and Gravel.—Sand and gravel output in Pennsylvania increased slightly in 1953 compared with that in the previous year. The major use of these commodities was as building and paving aggregate. Sand and gravel were also utilized for glass, polishing and grinding, filtering, railroad ballast, and molding and traction purposes, as well as various miscellaneous uses. Eighty-one commercial sand and gravel pits were active in 1953. Of these, the major producers were the Dravo Corp. and Iron City Sand & Gravel Corp., both of Pittsburgh; Pennsylvania Glass Sand Co., Lewistown; and the Warner Corp., Philadelphia.

TABLE 9.—Sand and gravel sold or used by producers, 1952-53, by uses

	1952		1953	
	Short tons	Value	Short tons	Value
Sand:				
Molding and fire or furnace.....	445,270	\$1,103,911	495,439	\$1,247,242
Building.....	4,270,064	5,021,197	4,086,393	4,888,762
Paving.....	2,038,867	2,741,982	2,111,500	2,895,286
Grinding, polishing, and blast.....	204,064	414,210	350,376	761,075
Engine.....	226,500	450,112	220,136	440,007
Glass and filter.....	547,969	1,592,924	611,168	1,906,436
Other.....	214,488	435,330	205,944	454,209
Total sand.....	7,047,222	11,759,666	8,080,956	12,593,017
Gravel:				
Building.....	3,907,124	4,862,059	3,917,298	4,835,198
Paving.....	2,709,622	3,145,421	2,578,982	3,096,656
Railroad ballast.....	67,627	45,245	57,956	31,850
Other.....	64,511	107,612	80,191	135,670
Total gravel.....	6,748,884	8,160,337	6,634,427	8,099,374
Grand total.....	14,696,106	19,920,003	14,715,383	20,692,391

Slate.—The value of Pennsylvania slate production declined 2 percent compared with 1952. The output of roofing slates in 1953 dropped 8 percent; production of millstock increased 14 percent. Major producers in 1953 were Funkhouser Co., York County; and North Bangor Slate Co., Anthony Dally & Sons, Capital Slate Co., and Albion Vein Slate Co., all in the Pen-Argyl-Bangor area.

Stone.—Stone production in Pennsylvania in 1953 increased 2 percent compared with 1952. The increase was principally the result of improved sale of limestone for furnace flux. Of the more than 26 million tons of rock mined or quarried in the State during the year,

TABLE 10.—Sand and gravel sold or used by producers in 1952-53, by counties

County	1952		1953	
	Short tons	Value	Short tons	Value
Allegheny.....	1,232,355	\$2,184,932	1,176,987	\$2,328,439
Beaver.....	1,060,869	1,395,564	1,399,061	1,778,693
Berks.....	23,666	38,270	(1)	(1)
Bucks.....	4,935,959	5,787,287	4,622,674	5,518,309
Carbon.....	351,697	440,256	330,246	439,022
Crawford.....	86,317	90,117	104,360	146,127
Dauphin.....	519,156	137,827	344,704	74,509
Dauphin.....	420,321	448,252	399,233	471,688
Erie.....	263,333	543,273	(1)	(1)
Lancaster.....	268,257	335,994	299,166	381,170
Luzerne.....	400,862	817,872	(1)	(1)
Mifflin.....	2,269	6,587	1,249	2,355
Somerset.....	5,131,045	7,693,772	6,037,703	9,552,079
Undistributed.....				
Total.....	14,696,106	19,920,003	14,715,383	20,692,391

1 Included with undistributed.

TABLE 11.—Slate sold by producers, 1944-48 (average) and 1949-53, by uses

Year	Number of operators	Roofing		Millstock		Other uses (value)	Total value
		Squares (100 square feet)	Value	Square feet	Value		
1944-48 (average).....	20	105,604	\$1,510,838	1,952,608	\$735,025	\$1,075,082	\$3,324,946
1949.....	26	112,870	2,124,573	2,339,830	1,243,798	1,210,273	4,578,644
1950.....	28	124,280	2,341,127	2,724,450	1,559,587	1,645,300	5,546,014
1951.....	25	134,180	2,681,072	2,589,090	1,416,657	1,591,141	5,688,870
1952.....	18	93,200	1,866,479	2,078,020	1,227,471	1,393,698	4,487,648
1953.....	18	86,116	1,688,167	2,363,266	1,452,320	1,279,125	4,419,612

82 percent was limestone. This commodity was used as a fluxing agent, in concrete production, as road material, as railroad ballast, and for agricultural purposes. A total of 12 quarries, all in the southeastern section of the State, produced basalt. This includes those quarries producing diabase and classified by the Bureau of Mines as basalt. The dark color of this traprock limited its use for dimension stone. However, it is an excellent concrete aggregate.

Sandstone for use as dimension stone and, when crushed, for road material and ganister, was produced at 35 quarries in 1953. Ganister was used by several refractory plants in the State in preparing silica brick. Small quantities of various miscellaneous rocks, such as serpentine, soapstone, gneiss, and mica schist, were quarried for local use during the year. An estimated seven miscellaneous stone quarries operated in the State in 1953.

Tripoli.—The material reported as tripoli produced in Pennsylvania was a rottenstone mined from open pits at Antes Fort and Muncy, Lycoming County. It was used predominantly as a filler in manufacturing phonograph records.

TABLE 12.—Stone sold or used in 1952-53, by counties

County	1952		1953	
	Short tons	Value	Short tons	Value
Adams.....	1, 537, 067	\$2, 533, 069	1, 709, 564	\$2, 840, 907
Berks.....	1, 504, 618	2, 215, 276	1, 285, 947	1, 921, 930
Blair.....	712, 010	1, 536, 159	719, 042	1, 553, 391
Bucks.....	443, 773	929, 456	545, 824	1, 077, 378
Butler.....	1, 424, 865	2, 446, 208	1, 637, 341	3, 047, 082
Carbon.....	23, 687	53, 545	.....	.....
Centre.....	987, 860	1, 879, 197	946, 361	1, 962, 012
Chester.....	864, 888	1, 492, 974	904, 541	1, 511, 107
Clinton.....	106, 769	164, 070	184, 312	273, 705
Cumberland.....	351, 743	539, 937	425, 797	620, 492
Dauphin.....	762, 144	1, 185, 904	1, 011, 884	1, 573, 146
Delaware.....	763, 072	1, 363, 716	867, 486	1, 489, 690
Fayette.....	59, 628	179, 225	26, 797	92, 020
Franklin.....	402, 151	638, 369	380, 469	558, 009
Greene.....	25, 000	50, 000	.....	.....
Huntingdon.....	600, 155	2, 325, 919	706, 762	2, 522, 074
Juniata.....	97, 995	180, 855	102, 109	187, 889
Lancaster.....	1, 325, 416	1, 944, 724	1, 402, 481	2, 306, 854
Lawrence.....	2, 632, 610	4, 377, 355	2, 109, 010	4, 999, 865
Lebanon.....	1, 280, 841	1, 893, 807	1, 176, 502	1, 956, 494
Lehigh.....	302, 385	388, 014	214, 221	324, 997
Lycoming.....	325, 651	528, 032	354, 559	620, 425
Mifflin.....	841, 479	1, 337, 498	992, 458	1, 132, 528
Monroe.....	39, 085	53, 546	77, 717	170, 336
Montgomery.....	2, 520, 564	4, 242, 792	2, 423, 403	4, 173, 198
Perry.....	77, 225	140, 000	.....	.....
Schuylkill.....	14, 281	20, 976	24, 362	82, 479
Susquehanna.....	4, 129	56, 480	2, 213	22, 789
Westmoreland.....	417, 805	851, 991	303, 846	778, 761
York.....	1, 288, 589	2, 747, 548	1, 112, 710	2, 526, 760
Undistributed.....	3, 872, 387	6, 379, 743	4, 533, 889	7, 767, 711
Total.....	125, 609, 812	144, 676, 456	126, 192, 607	148, 094, 029

¹ To avoid disclosing confidential information, total is incomplete.

TABLE 13.—Stone sold or used by producers, 1952-53, by uses

Use	1952		1953	
	Quantity	Value	Quantity	Value
Dimension stone:				
Building stone..... short tons	1 156, 413	1 \$769, 658	1 142, 795	1 \$749, 909
Monumental stone..... cubic feet	19, 449	243, 148	(²)	(²)
Curbing and flagging..... do	135, 218	186, 955	78, 205	131, 046
Total dimension stone (approximate equivalent in short tons)	1 169, 324	1 1, 199, 761	1 148, 947	1 880, 955
Crushed and broken stone:				
Riprap..... short tons	3 188, 549	3 322, 346	3 164, 096	3 253, 169
Crushed stone..... do	13, 254, 633	19, 160, 967	13, 594, 967	20, 093, 938
Furnace flux (limestone)..... do	8, 703, 922	14, 186, 713	9, 351, 478	16, 514, 344
Refractory..... do	676, 825	3, 195, 679	688, 583	3, 481, 474
Agricultural (limestone)..... do	1, 065, 358	2, 732, 395	895, 093	2, 712, 796
Other uses..... do	3 1, 485, 220	3 3, 327, 413	3 1, 426, 249	3 3, 849, 745
Undistributed..... do	65, 921	550, 282	23, 194	307, 608
Total crushed and broken stone..... do	25, 440, 488	43, 476, 695	26, 043, 660	47, 213, 074
Grand total.....	125, 609, 812	144, 676, 456	126, 192, 607	148, 094, 029

¹ To avoid disclosing confidential information, certain totals are incomplete.

² Included with "Undistributed."

³ Incomplete, the portion not included being combined as "Undistributed."

REVIEW BY COUNTIES

ADAMS

Mineral production in Adams County in 1953 was limited to stone, clays, and sericite schist. The county ranked fifth in the State in the value of stone output, most of which was crushed and broken limestone sold primarily for flux, road metal, and agricultural purposes. There was also a substantial output of basalt, which was crushed for use as roofing granules and stone flour. Major stone producers during the year included Bethlehem Quarry Co., Hanover, and the Gingell Quarries Co., Fairfield. Miscellaneous clays were produced by Alwine Brick Co., New Oxford, and Gettysburg Drain Tile Works, Gettysburg, for use in manufacturing brick and tile. Sericite schist, a material similar to pyrophyllite was produced in Adams County in 1953 by Summitt Mining Corp. from a quarry on the Heller farm near Bendersville. Output was used as an insecticide filler.

ALLEGHENY

The major mineral products of Allegheny County in 1953 were bituminous coal, cement, sand and gravel, clay, and stone. The county ranked third in the State during the year in sand and gravel and cement output, fourth in value of dimension-stone production, and sixth in the output of bituminous coal. The wells of the county also yielded petroleum and natural gas; a total of 159,622 barrels of petroleum was recovered, virtually all by secondary methods.

In terms of value, cement was, next to fuels, the most important mineral product of the county. Major producers in 1953 were Universal Atlas Cement Co., Universal, and Pittsburgh Coke & Chemical Co., Green Bag Cement Division, Neville Island.

All county sand and gravel production in 1953 was washed material obtained from river bottoms or old river terraces. Major producers were Dravo Corp. and Iron City Sand & Gravel Corp., both of Pittsburgh. Stone quarries in the county yielded substantial quantities of dimension sandstone for masonry walls and flagging. This material was produced by Elizabeth Stone Co., Elizabeth, and F. Matesia, Cuddy.

Allegheny County in 1953 was the largest source of miscellaneous clays and shale in Pennsylvania. Production was used in manufacturing building brick and tile. Major producers were Glassmere Brick & Tile Co., Glassmere; Milliken Brick Co., Inc., Wilkinsburg; Van Ormer Brick Co., Inc., Pitcairn; and McFetridge Bros. Brick Co., Creighton.

Perlite mined in the western United States was expanded at the Carnegie plant of Perlite Manufacturing Co. and at the Pittsburgh operation of Panacalite Perlite Co. Output was used as a lightweight aggregate.

ARMSTRONG

Mineral resources of Armstrong County consisted of bituminous coal, natural gas, oil, stone, sand and gravel, clays, and lime. Over 51 percent of the coal output was strip-mined. Oil wells yielded 15,138 barrels of crude oil in 1953.

All stone produced in the county was crushed or broken limestone or dolomite used for metallurgical fluxes, concrete aggregate, road material, and agricultural purposes, as well as in the production of lime. Producers of lime included C. D. McCanna lime plant, Walter Hershberger, and Craig Claypoll, all of Kittanning. The major producer of limestone was the Michigan Limestone Division, United States Steel Co., East Brady and Worthington.

Armstrong County was the fourth largest producer of sand and gravel in Pennsylvania in 1953. All output was washed material from J. K. Davison & Bros., Pittsburgh, the county's only producer.

The county ranked fifth among the clay-producing areas of the State in output of fire clay in 1953. Leading producers included Freeport Brick Co., Freeport; Kittanning Refractory Co., Inc., Kittanning; Graff-Kittanning Clay Products Co., Craigsville; Kittanning Brick Co., Adrian; Haws Refractories Co., Bridgeburg; Worthington Ceramics Co., Worthington; and Harbison-Walker Refractories Co., Templeton. The Graff-Kittanning Clay Products Co. and Continental Clay Products Co. also produced miscellaneous clays for use in manufacturing brick, tile, and pottery.

BEAVER

Beaver County mines produced a limited number of mineral commodities in 1953. This lack of diversification was more than compensated for, however, by the county's prominent position in the Pennsylvania clay and sand and gravel industries.

Beaver County ranked second in output of fire clay in Pennsylvania in 1953. Major producers were Negley Fire Clay Co., New Galilee; McLain Fire Brick Co., Vanport; Metropolitan Clay Products Co., Darlington; Standard Clay Mfg. Co., New Brighton; and Eastvale Clay Products Co., Eastvale. A small tonnage of miscellaneous clays was recovered from the pits of Brighton Clay Products Co. and Friedl-Elverson Pottery Co., Inc., both of New Brighton.

The county was the second largest sand-and-gravel-producing area in the Commonwealth. Production was derived from river gravel bottoms, river terraces, and glacial deposits. Five producers operated during the year; the largest were the Dravo Corp., Iron City Sand & Gravel Corp., and Shippingport Sand & Gravel Co. These 3 companies furnished 92 percent of the total county production of sand and gravel in 1953.

Mines in the county yielded a comparatively small tonnage of bituminous coal, with 85 percent of the output from strip pits. Oil wells in the county yielded 14,397 barrels of crude oil and a small quantity of natural gas during the year.

BEDFORD

The major mineral commodity produced in Bedford County in 1953 was limestone, used for concrete aggregate, road material, flux, lime, and agricultural stone. The only producer was New Enterprise Stone & Lime Co., New Enterprise. A considerable quantity of sandstone for refractory purposes was quarried by Leap Ganister Rock Co., Madley.

Mines in the northeast section of the county, which includes the major producing region of the Broad Top field, yielded low-volatile bituminous coal.

A small quantity of building sand was produced during the year by Feight Bros. Co., Everett.

Manganese Development Co. began strip-mining a manganese deposit in Sherman Valley near Cypher. Activity ceased at the end of the year.

BERKS

Cement, stone, clays, and sand and gravel were produced in Berks County in 1953. Cement continued to be the principal mineral commodity in this county. Production was from the Allentown Portland Cement Co. plant at Evansville.

Stone production in 1953 consisted of crushed diabase and limestone. The latter was produced by Berks Products' Corp., South Temple; E. J. Breneman, Inc., Pottstown; and Eastern Lime Corp., Kutztown. This limestone was used as a concrete aggregate and for agricultural purposes. Crushed diabase (produced mainly by J. T. Dyer Quarry Co., Monocacy Station) was sold for riprap, concrete aggregate, and railroad ballast.

Glen Gery Shale Brick Corp. produced miscellaneous clays for brick manufacture from its pits at Shoemakersville and Wyomissing.

Sand and gravel produced by J. H. Gring, Sinking Spring, and the Schildt Bros., Temple, was sold for building and paving purposes.

The Bethlehem Steel Co. continued development work on its iron-ore deposit near Morgantown in 1953.

BLAIR

Blair County quarries in 1953 produced limestone for concrete aggregate and agricultural purposes and sandstone for concrete aggregate, railroad ballast, and silica brick manufacture. The largest limestone producer was the New Enterprise Stone & Lime Co., Roaring Spring. Sandstone was quarried by Basalt Trap Rock Co., Woodbury Township; General Refractories Co., Claysburg; and J. L. Hartman Co., Sproul. A small tonnage of bituminous coal was mined in the county, mostly by stripping.

Clay production in Blair County in 1953 was small. The pits of United Clay Mines Corp. near Williamsburg, which had formerly yielded a small quantity of kaolin, were closed during the year. The operation was sold to Grannas Bros. Blair Clay Products Co., Altoona; and Woodbury Clay Co., Houston Township, mined fire clay. Pits of Franktown Sand Supply Co. and George H. Trude, both at Hollidaysburg, yielded a small tonnage of building sand.

BRADFORD

Eight men mined bituminous coal in Bradford County in 1953. Aside from this commodity, sand and gravel for building and paving purposes were produced by Karl D. Shiner, Towanda.

BUCKS

Bucks County ranked first among Pennsylvania counties in the production of sand and gravel in 1953. Most of this material was

dug by floating dredges from the Delaware River flood plain between Morristown and Tullytown. Production was sold for building, paving, and molding purposes. Major producers were Warner Co., Falls Township, A. L. Lewis, New Hope, and Durnan & Good Co., Upper Black Eddy. Stone production included a small quantity of diabase for monuments, architectural uses, concrete aggregate, and railroad ballast, and limestone for agricultural use and concrete aggregate. Major producers of stone were the General Crushed Stone Co., East Rockhill Township; Rushland Quarry Co., Rushland; and New Hope Crushed Stone & Lime Co., New Hope. The Quakertown Brick & Tile Co., Quakertown, produced a small quantity of clays for manufacturing bricks.

BUTLER

The major mineral commodity produced in Butler County in 1953 was bituminous coal. The county's oil wells yielded 215,572 barrels of crude petroleum and a small quantity of natural gas.

On the basis of value, cement output ranked second to fuels. Penn-Dixie Cement Co., Winfield Township, was the only producer. A substantial tonnage of limestone for concrete aggregate, road material, and railroad ballast was quarried during the year. The largest producers were Michigan Limestone Division of United States Steel Corp., Boyers; and Grove City Limestone Co., Osborne. The sole lime producer was Mercer Lime & Stone Co., Branchton.

Fire clay was produced by Pittsburgh & Erie Coal Co., Slippery Rock, and miscellaneous clays by Houston-Starr Co., Mars.

The only sand and gravel producer in the county in 1953 was H. W. Cooper Co., Slippery Rock.

CAMBRIA

Bituminous coal was the major mineral commodity produced in Cambria County in 1953; the county ranked second in Pennsylvania in the production of this material.

This county was also a producer of fire clay. Operators reporting in 1953 were Patton Clay Mfg. Co. and Hiram Swank's Sons, Inc. A small quantity of miscellaneous clays was produced by Triangle Clay Products Co.

CAMERON

Bituminous coal and natural gas were the only mineral commodities produced in Cameron County in 1953. All the bituminous coal was strip-mined; as a consequence, the county's coal industry had the highest production per man-day in the State.

CARBON

The major mineral product of Carbon County was anthracite. Production, approximately 50 percent of which was steam sizes, was valued at \$15,298,556. Carbon County was the second largest source of finished iron oxide pigments in the State in 1953. Products of Prince Mfg. Co., Bowmanstown, the sole producer, included mineral black, brown and red oxides, ocher, sienna, and umber. Sand and gravel was produced by Alliance Sand Co., Inc., Butz Lumber Co., and Wagner Sand Co., Inc.

CENTRE

Mineral products of Centre County in 1953, in order of decreasing value of output, included lime, bituminous coal, stone, and clays. Eighty-six percent of the coal produced was strip-mined. Most of the stone output was crushed limestone, which was used for flux, concrete aggregate, agricultural purposes, metallurgical purposes, and lime. Centre County led the State in lime production, primarily as a result of the widespread occurrence of the Bellefonte ledge in the Pleasant Gap-Bellefonte area. The 1953 output, used for building, agricultural, and chemical purposes, was produced by National Gypsum Co., Benner Township; Warner Co., Bellefonte; and Standard Lime & Stone Co. Limestone for uses other than in limekilns was produced by the above and by Neidigh Bros. Limestone Co., Oak Hall; Valley View Lime Co., Bellefonte; and Whiterock Quarries Co., Pleasant Gap. Crushed sandstone for silica brick was produced during the year by McFeely Brick Co.

General Refractories Co., Orviston, and J. H. France Refractories Co., Snow Shoe, produced a substantial tonnage of fire clay.

CHESTER

Lime, stone, and clays were produced in Chester County in 1953. Stone production included limestone, granite, sandstone, and miscellaneous stone. The principal producers of limestone were Warner Co., Cedar Hollow, and W. Ellis Johnson, Paoli. The output was used for flux, road material, and agricultural purposes, as well as an asphalt filler, and for the manufacture of lime. Lime from the kilns of Warner Co. was used for building, agricultural, and chemical purposes. A large production of diabase was reported by Keystone Trappe Rock Co., Glenmore, and French Creek Granite Co., St. Peters. Most of the output from these two operations was sold for concrete aggregate, although there was a small production of dimension stone for construction and architectural uses. A small quantity of dolomite was quarried for the production of magnesia during the year. Crushed and broken miscellaneous stone for use as concrete aggregate was produced by Bradford Hills Quarry, Inc., Downingtown.

Miscellaneous clays were produced by the McAvoy Vitrified Brick Co., Phoenixville, and a small quantity of fire clay was recovered by Phillip D. Cope, Lincoln University.

CLARION

Mineral commodities produced in Clarion County in 1953 were bituminous coal, natural gas, oil, and clays. As a result of the limited thickness of most of the coal beds, a very substantial portion was produced by stripping. Oil wells in the county reported production of 59,291 barrels of crude oil in 1953. Fire clay was obtained from the Lower Clarion formation and flint clay from the Mercer beds. Producers of these materials were McLain Fire Brick Co., St. Charles; Climax Fire Brick Co., Climax; and Frank B. Pope Co., Mayport, and New Bethlehem Tile Co., New Bethlehem. New Bethlehem Tile Co. was also the only producer of miscellaneous clays.

CLEARFIELD

Clearfield County ranked first among Pennsylvania counties in the production of clays in 1953. Virtually all the output was fire clay, although a small tonnage of common clay was produced by Robinson Clay Products Co., Clearfield. This company, as well as Harbison-Walker Refractories Co. (Mineral Springs and Wallaceton), Williams Grove Clay Products Co. (Bigler), Clearfield Clay Products Co. and Laclede-Christy Co. (Clearfield), and North American Refractories (Grampian and Lutherburg), mined high-grade flint clay for refractory use. Herman Kephart discontinued operations at Osceola Mills in 1953. A high-alumina clay for special high-temperature brick and cement was produced from the Mercer horizon at Curwensville and Morgan Run. Bells Landing Sand & Gravel Co., Bells Landing, produced building sand and gravel. Bituminous coal was mined from several beds, some of them less than 2 feet thick. The high quality of the coal and low cost of strip mining made possible economic recovery from the thin beds. A small quantity of natural gas was produced in the northwestern part of the county.

CLINTON

Mineral products of Clinton County in 1953 included soft coal, natural gas, clays, and crushed stone.

Fire clays were mined by North American Refractories Co., Lock Haven; General Refractories Co., Beech Creek; Harbison-Walker Refractories Co., Monument; and Kelsey Mining Co., Gallagher Township. In addition, the Mill Hall Clay Products Co., Mill Hall, reported a small quantity of common clay.

In the southern end of the county Lycoming Silica Sand Co. quarried limestone, which was crushed and broken for concrete aggregate, road material, and railroad ballast. Production of natural gas from the Leidy field continued in 1953.

COLUMBIA

Common clay was produced by Alliance Clay Products Co. from its pit at Mifflinville. Bloomsburg Sand & Gravel Co. operated a pit in Scott Township and recovered sand and gravel for local use. Anthracite was produced from several mines in Conyngham Township.

CRAWFORD

Crawford County's major natural resources are oil and gas. In 1953 crude oil and natural gas were produced almost entirely by repressurizing old oil-bearing sands. The production of crude oil in 1953 was 39,383 barrels.

Pits in the county yielded substantial tonnages of sand and gravel for building and paving purposes. Major producers were the W. L. Dunn Co., Cochranon; Moyer Bros. Sand & Gravel Supply Co., Conneaut Lake; and Meadville Supply Co., Meadville.

CUMBERLAND

Clay and stone were the only mineral products of Cumberland County in 1953. This county was the major source of kaolin in Pennsylvania. Output during the year was sold as a cement whitener

by the only producer, Philadelphia Clay Co., Mount Holly Springs. Stone production was limited to crushed limestone used for road material and construction purposes. Major producers were Hempt Bros., Eberlys Mill; J. F. Sours, Bonny Brook quarry, Carlisle; Valley Quarries, Inc., Chambersburg; and R. W. Smith, Dillsburg.

DAUPHIN

The principal mineral product of Dauphin County in 1953 was crushed limestone sold for flux and other metallurgical uses, concrete aggregate, railroad ballast, clay filler, and stone sand. Major producers were Bethlehem Quarry Co., Steelton; H. E. Millard Lime & Stone Co., Swatara Station; and Hoffman Bros. & Wilson, Inc., Swatara Township. H. E. Millard Lime & Stone Co. also produced lime, principally for agricultural use.

A substantial tonnage of sand and gravel for building and paving was recovered from pits on the Susquehanna River terrace by Highspire Sand & Gravel Co., Ltd., Highspire, and F. H. Downey, Inc., Harrisburg. Glen Gery Shale Brick Corp., Middletown, and Bethlehem Quarry Co., Steelton, reported production of miscellaneous clays.

Mines near Lykens, Wiconisco, and Williamstown yielded a small tonnage of anthracite during the year.

DELAWARE

Delaware County ranked second in the Commonwealth in production of granite dimension stone in 1953. Output was sold as irregular blocks for facing buildings and bridges, as well as for rubble. A small tonnage of the granite was crushed for stone sand. Major producers were Carl Galantino, East Lansdowne; Lima Building Stone Quarry, Inc., Lima; and Luglios Quarries and Media Quarry Co. (formerly John Randazzo), both at Media. There was also a substantial production of a crushed granite-gneiss for concrete aggregate.

The Philadelphia Brick Co. produced clays from its open pit in Darby Township. Output of expanded perlite was reported by Perlite Products, Inc., Primos.

ELK

Bituminous coal, crude oil, natural gas, and clay were produced in Elk County in 1953.

The major soft-coal-producing bed in the county is the Lower Kittanning, which was mined in Benezette, Jay, and Fox Townships. Over half of the 1953 coal output was from strip mines. Oil wells yielded 32,097 barrels of crude oil and some natural gas during the year.

Fire clay was produced at the Meyer clay mine and open pit of St. Marys Sewer Pipe Co., both in St. Marys. This material is used for manufacture of firebrick and heavy clay products.

ERIE

Erie County was a comparatively unimportant producer of mineral commodities. In 1953 the Kelly Island Lime & Transport Co. and the Nickel Plate Sand & Gravel Co., Erie, were the major pro-

ducers of sand and gravel. Output was predominantly from old lake terraces. There was also an output of natural gas from the Albion sand in the Corry field.

FAYETTE

Bituminous coal continued to be the major mineral commodity produced in Fayette County, and in 1953 the county ranked fifth in the State in coal production. A high percentage of the annual production was used in manufacturing the famous Connellsville coke. A comparatively small quantity of natural gas was recovered from wells in anticlines in the western section of the county and from the crest of Chestnut Hill. Crude-oil production totaled 735 barrels in 1953.

The mineral commodities ranking second in value in Fayette County were sand and gravel obtained from river beds and terraces. Principal producers were McClain Sand Co., Inc., Point Marion, and Dunbar Corp., Dunbar. The sand was sold for glass, molding, blast, fire, building, paving, and engine use. The gravel was used for building and paving purposes. Sandstone was quarried at several localities during the year. When crushed and broken, this material was used for silica brick, concrete aggregate, and road material. In dimension form it was used as irregular blocks for finishing buildings and bridges. The one producer of dimension sandstone was Lynn Quarry. The crushed and broken material was produced by General Refractories Co., Childs.

Flint and plastic clays for refractory use were recovered from pits worked by Big Savage Refractory Corp., Layton Fire Clay Co., Layton, and Eureka Fire Brick Works, Mount Braddock. Layton Fire Clay Co. also produced common clays.

FOREST

Forest County was in the center of the Commonwealth's oil and gas belt. Wells in the county in 1953 yielded 72,908 barrels of crude oil, mostly from the Venango, Warren, Bradford, and Elk sands. Virtually all output during the year was by secondary recovery.

FRANKLIN

The major mineral commodity produced in Franklin County in 1953 was crushed and broken limestone principally for concrete, road metal, and agricultural purposes. Producers active during the year included Fry Coal & Stone Co., Mercersburg; Valley Quarries, Inc., Chambersburg; Binkley Bros., Inc., Dry Run; and Stewart Gaston, Shippensburg. A small tonnage of agricultural lime was produced at the plant of Frank L. Heinbough, Mercersburg. Mount Cydonia Sand Co., Inc., recovered sand for building purposes from its open pit in Greene Township.

FULTON

A small tonnage of bituminous coal was produced from mines in the northwest corner of Fulton County, an extension of the Broad Top field of Bedford County. Limestone for concrete and road metal was quarried by H. B. Mellott Estate, Inc., McConnellsburg;

and Oscar Martz Co. produced agricultural lime at its plant in Knobsville.

GREENE

The principal mineral product of Greene County in 1953 was bituminous coal. Production exceeded 11 million tons, virtually all recovered by underground mining. Crude oil and natural gas were produced from the Upper Nineveh, Lower Nineveh, and Grodon Stray sands. The county yielded 62,893 barrels of petroleum in 1953.

Greene County Brick & Stone Co., Waynesburg, had a small production of miscellaneous clays.

HUNTINGDON

Huntingdon County ranked second among Pennsylvania counties in the production of sandstone and fourth in value of output of sand and gravel. Sandstone producers included Harbison-Walker Refractories Co., North American Refractories Co., and General Refractories Co., all at Mount Union. Their output was utilized in producing silica brick. White clay for refractory cement and furnace linings was recovered from pits of Harbison-Walker Refractories Co. The Alexandria Fire Clay Co., Alexandria, did not operate in 1953.

Sand produced by Pennsylvania Glass Sand Corp. and Alexandria Fire Clay Co. was sold for use as glass, molding, building, fire, and engine sand.

Crushed and broken limestone for concrete aggregate, railroad ballast, and agricultural stone was quarried in Spruce Creek Township by Warner Co. near McConnellstown by New Enterprise Stone & Lime Co. Tyrone Lime & Stone Co., Tyrone, also produced a substantial quantity of this commodity.

Mines in the extension of the Broad Top field in the southern part of the county yielded soft coal.

INDIANA

Coal, clays, and limestone were produced in Indiana County in 1953. The major mineral commodity was bituminous coal; of the more than 5 million tons produced, only 1,013,164 tons was strip mined.

Hiram Swank's Sons, Inc., Clymer, produced fire clay for refractory use. The Hillsdale agricultural lime plant of New Castle Lime & Stone Co., which had been destroyed by fire early in 1952, did not resume production in 1953.

JEFFERSON

Jefferson County ranked second in the State in the production of clays in 1953. Virtually all the output was fire clay produced by Haney Co., Summerville; and Brockway Clay Co., Brockway. The only producer of miscellaneous clays was Falls Creek Clay Products Co., Falls Creek.

Fuels produced in the county during the year included crude oil and natural gas from wells in the northwest part of the county and bituminous coal, most of which was strip-mined.

Iron oxide pigments were produced at the plant of Vitro Pigments, Inc. Agricultural limestone was produced by L. T. Van Norman.

JUNIATA

In terms of value, sandstone (quarried by National Refractories Co., Van Dyke, and used in silica brick) was the most important mineral product of Juniata County in 1953.

Crushed limestone for use as concrete aggregate was quarried by W. N. Quigley in Fermanagh Township.

The Jay A. Fulkroad & Son partnership near McAlisterville was dissolved in 1953; consequently there was no lime production in the county.

LACKAWANNA

Anthracite was the only mineral commodity produced in Lackawanna County in 1953. The county ranked fourth in the State in output of this material.

LANCASTER

Lancaster County was one of the principal sources of limestone in Pennsylvania in 1953. This stone was crushed and broken and sold for use as concrete aggregate and road material. A small quantity of dimension stone for irregular blocks was quarried by D. M. Stoltzfus & Son, Inc., Talmage, and J. C. Showalter Co., Blue Ball. The Stoltzfus Co., Brinkley & Ober, Inc., and A. G. Kurtz & Sons, Ephrata, were the major producers of limestone in 1953.

Lancaster County was also one of the few areas in the State in which lime was produced from dead-burned dolomite. J. E. Baker Co., Billmeyer, and Stoltzfus Co. were the only producers of this commodity.

Sand for building, paving, and fire purposes was recovered from pits operated by A. T. Harris Sand Co., Salisbury Township, and Milton Gravel Sand, Inc., East Petersburg. Clay for brick manufacture was produced in 1953 by Glen Gery Shale Brick Co., Ephrata, and Lancaster Brick Co., Manheim Township.

LAWRENCE

Lawrence County ranked first in limestone and total stone output in Pennsylvania in 1953. The limestone quarried in the county ranges from 81 to 97 percent pure calcium carbonate and was mined from large quarries, several of which had working faces nearly 1 mile long. Major producers were Michigan Limestone Division, United States Steel Corp., Hillsville, and New Castle Lime & Stone Co. Output during the year was sold for flux, miscellaneous metallurgical uses, concrete road metal, and agricultural purposes.

The cement industry of the county has been based upon the abundance of exceptionally pure limestone. Plants utilizing this rock for cement production in 1953 were Bessemer Limestone & Cement Co., Bessemer, and Medusa Portland Cement Co., Wampum.

The Mahoning Valley Sand Co., West Pittsburgh, and the Superior Sand-Supply Co., New Castle, produced a substantial tonnage of sand and gravel for building and paving use in 1953.

Fire clay was produced by the Metropolitan Brick Co., Inc., Bessemer, and common clays by the Fenati Brick Co., Inc., and Keystone Sand & Gravel Co., both of New Castle.

The county also produced a small tonnage of soft coal, all by strip mining.

LEBANON

Lebanon was the only county in Pennsylvania in which metallic ores were produced. All of this material was from the Bethlehem Steel Co. Cornwall mine, which operated continuously during the year. The magnetite iron ore of the Cornwall mine yielded iron, gold, silver, copper, cobalt, and pyrite in 1953.

Quarries yielded large quantities of stone, principally limestone, during the year. This output was used for flux, as a filler, and for agricultural purposes, as well as concrete aggregate. The largest producers are H. E. Millard Lime & Stone Co., Annville; Calcite Quarry Corp., Lebanon; and Pennsylvania Aggregates Co., Cornwall.

In addition, a small quantity of building sand was produced by Reber Sand & Coal Co., Lebanon.

LEHIGH

Lehigh County ranked second to Northampton in cement production in 1953. Producers were Lehigh Portland Cement Co., Fogelsville and Ormond; Whitehall Cement Manufacturing Co., Cementon; Giant Portland Cement Co., Egypt; and Coplay Cement Mfg. Co., Whitehall Township. The county continued to be one of the most productive slate areas in the United States. Slate quarried in 1953 was processed into a diversity of products, including roofing, flagging, and electrical slate; blackboards, bulletin boards; and structural and sanitary products. Producers during the year were Penn Big Bed Slate Co., Inc., and Francis Schleicher & Son.

Other mineral products of Lehigh County in 1953 included limestone and expanded perlite. Crushed limestone for concrete aggregate and road material was quarried by Lehigh Stone Co., Ormond. Perlite from mines in western United States was expanded at the Allentown plant of Pennsylvania Perlite Corp. for use as a lightweight aggregate.

LUZERNE

Luzerne County dropped to second place as a source of anthracite in the United States. Production followed the industry trend and decreased compared with the previous year. Other mineral products produced during the year included stone, sand and gravel, and clay. Sandstone from the quarries of General Crushed Stone Co., White Haven, and Coon Certified Concrete Co., Luzerne, was used for flagging and crushed for railroad ballast, concrete aggregate, and road material. Airport Sand & Gravel Co. (Wyoming), Honey Hole Sand & Stone Co. (Hazleton), Banks Stone & Sand Co. (Kingston), and Glendale Sand & Stone Co. (Avoca) were major producers of sand and gravel primarily for use in building and paving and as railroad ballast. Miscellaneous clays were mined by Hazleton Brick Co. from its open pit in Hazel Township.

LYCOMING

Lycoming County was one of the major sources of iron oxide pigments in Pennsylvania in 1953. Keystone Filler & Mfg. Co. and Pennsylvania Paint & Filler Co. produced mineral blacks and natural red oxides. These companies also mined colored shale and tripoli (rottenstone) for use as paint and phonograph-record filler, respectively.

Sand and gravel, mostly dredged from the Susquehanna River, were sold for molding, building, paving, and engine uses, as well as for railroad ballast. Lycoming Silica Sand Co., Fairfield Township, and J. A. Eck & Sons, Inc., were the principal producers of these mineral products.

Stone production in 1953 consisted mainly of crushed limestone for road material and agricultural and concrete uses. Major producers were Lycoming Silica Sand Co., Muncy Township; Pine Creek Lime & Stone Co., Porter Township; and K. Fromm.

McKEAN

McKean County continued in 1953 to rank first among Pennsylvania counties in the production of crude oil and natural gas. During the year 8,742,008 barrels of crude petroleum was obtained from 101,775 acres of oil-bearing land. Hanley Co., Lewis Run, produced miscellaneous clays. Mount Jewett Fire Clay Co., Mount Jewett, produced fire clay, and Kaul Clay Products Co., Clermont, reported an output of both types. Molding sand was recovered by C. L. McGavern, Jr.

MERCER

Structural sand and gravel were produced by the Liberty Stone Products Co., West Middlesex.

Mines and wells in the county also produced small quantities of bituminous coal, oil, and natural gas in 1953.

MIFFLIN

Mineral commodities produced in Mifflin County in 1953 included stone, lime, and sand. Virtually all the stone output was limestone from quarries of Bethlehem Quarry Co., Naginey. Production was used for flux, concrete aggregate, railroad ballast, stone sand, and agricultural purposes. The Haws Refractories Co., Hawstone, quarried sandstone for use in silica-brick manufacture.

The only producer of agricultural and chemical lime in 1953 was Lewistown Lime Co., Shrader.

Pits of Pennsylvania Glass Sand Corp., Wayne Township, and Miller Silica Sand Co., Burnham, yielded glass, molding, building, grinding, fire, and engine sand, as did those of James R. Kline's Sons.

MONROE

The only mineral production reported from Monroe County in 1953 was limestone from the Thomas P. Rogers Co. quarry near Stroudsburg and building sand and gravel from the Steward & Clyde

White pit near the same town. The limestone output was crushed and sold for use in concrete and as road material.

MONTGOMERY

In 1953 Montgomery County ranked second among Pennsylvania counties in the production of dimension stone and third in the output of all types of stone.

Most of the stone output was limestone and dolomite used for flux, concrete, refractories, agriculture, magnesia production, and a filler in asphalt. Major producers were Bethlehem Quarry Co., Bridgeport; G. & W. H. Corson, Inc., Plymouth Meeting; and Stowe Trap Rock Co., Oreland. Dimension stone quarried during the year and sold as irregular blocks consisted of sandstone, granite, and basalt. Sandstone was produced by William Bambi & Sons Co., Norristown, and M. & M. Stone Co., Harleysville; granite by Marcolina Bros., Inc., Chestnut Hill; and basalt by R. K. Kibblehouse, Perkiomenville, and Montgomery Stone Co., Montgomeryville. Firestone Products Co., Inc., Edge Hill, and M. & M. Stone Co. produced crushed and broken sandstone for silica brick, concrete aggregate, and road material. Firestone Products Co., Inc., and Anthony Manero & Sons Co., Edge Hill, produced miscellaneous types of rock, which were sold for rough and dressed building stone and for refractory purposes.

Montgomery was the only county in Pennsylvania in which magnesium compounds were produced. Keasby & Mattison Co., Ambler, and Phillip Carey Mfg. Co., Plymouth Meeting, used the Pattinson process to recover precipitated magnesium carbonate and extra light-light magnesias, from dolomite.

In 1953 Allentown Portland Cement Co., West Conshohocken, and Wm. Bambi & Sons, Inc., were the only producers of cement and sand and gravel, respectively.

The Norristown Brick Co. (Norristown), Keller-Whilldin Pottery Co. (North Wales), Robinson Clay Products Co. (Pottstown), and Lansdale Brick Products Co. (Lansdale), produced miscellaneous clays.

Montgomery County ranked sixth among Pennsylvania counties in output of lime in 1953. Lime suitable for use as building, agricultural, and chemical lime and dead-burned dolomite were produced by G. & W. H. Corson, Inc., Warner Co., and Cordol Corp., all of Plymouth Meeting.

MONTOUR

The major mineral commodity produced in Montour County in 1953 was limestone from Mausdale Quarry Co., Grovania, and Narehood Bros., Milton. Output was used as concrete aggregate and for road material. A small quantity of agricultural lime was produced at the plant of Harry Tittle Co.

NORTHAMPTON

Northampton County ranked first in the output of cement, slate (value), and iron oxide pigments in Pennsylvania in 1953. Major producers of the latter were C. K. William & Co., and Reichard-

Coulston Co. The State cement industry was concentrated to a large extent in this county. Of the 24 plants operating in Pennsylvania in 1953, 11 were in Northampton County. In addition, over half of the value of the State production came from this area. Major producers were Universal Atlas Cement Co., Northampton; Keystone Portland Cement Co., Bath; Hercules Cement Corp., Stockertown; Alpha Portland Cement Co., Martins Creek; and the Lone Star Cement Corp., Nazareth.

A substantial portion of the Nation's slate production was quarried in Northampton County. Output in 1953 was sold for roofing, structural, and sanitary uses, as well as for blackboards and flagging. Of the 15 plants reporting production in 1953, the largest were Albion Vein Slate Co., Plainfield Township; Capitol Slate Co., Inc., East Bangor; and North Bangor Slate Co., Bangor.

Mines, pits, and quarries in the county also yielded limestone for concrete aggregate, railroad ballast, and stone sand, as well as building and paving sand and gravel. Limestone was quarried by Bethlehem Quarry Co., Bethlehem; Binkley Bros., Inc., Newport; Eugene Meckley, Herndon, and Trumbower Co., Inc., Nazareth. Portland Sand & Gravel Co., Portland, and W. J. Lowe & Sons Co., Easton, produced sand and gravel.

NORTHUMBERLAND

The major mineral commodity produced in Northumberland County in 1953 was anthracite. A substantial output of crushed sandstone was also quarried by L. E. Kocher Co. The crushed material was used as concrete aggregate, road material, and railroad ballast. Miscellaneous clays were produced by Watsontown Brick Co., Glen Gery Shale Brick Corp., and Watsontown Mineral Products Co., all in Watsontown. M. E. Wallace Co. produced molding sand from pits near Danville.

A small quantity of agricultural lime was produced by Clyde Starook at his plant in Point Township.

PHILADELPHIA

United States Gypsum Co. continued to operate its gypsum-products plant in Philadelphia County in 1953. Crude gypsum for processing was imported from Nova Scotia. Building and engine sand and gravel were produced by Liberty Corp.

POTTER

Crude oil and natural gas were the only mineral products recovered in Potter County in 1953. Output was from the Oriskany and Bradford sands. The county ranked fourth among Pennsylvania oil-producing areas. Wells, principally in the northwestern part of the county, yielded 211,488 barrels of crude oil during the year.

SCHUYLKILL

The most important mineral commodity produced in Schuylkill County in 1953 was anthracite. The county was the largest producing

area in the United States. The Schuylkill region, of which the county is part, produced the highest percentage of steam sizes in the country. A small tonnage of common clay and crushed limestone was produced by Auburn Brick Co. and the Andreas Quarry Co., Andreas, respectively.

SNYDER

Mineral products of Snyder County in 1953 included crushed limestone for concrete and agricultural purposes and clays for brick and lime. Lime was produced by Carton Confort Co., Mount Pleasant Mills; the pits of Glen Gery Shale Brick Corp., Beavertown, and Paxton Brick Co., Paxtonville, yielded clays; and crushed limestone was quarried by J. C. Stahl in Franklin Township.

SOMERSET

Somerset County was an important source of soft coal in Pennsylvania in 1953. Fire clay was produced by Hiram Swank's Sons, Inc., Conemaugh Township; General Refractories Co., Fort Hill; and Otto Brick & Tile Works, Salisbury. There was also a minor production of agricultural lime, building sand and gravel, crushed limestone, sandstone, and natural gas. Lime was produced by Addison C. Lottig, Larimer Township, and sand and gravel by Boswell Sand Co. near Boswell. Crushed stone was recovered from the quarries of Somerset Limestone Co., Inc., Jefferson Township; Keystone Lime Co., Elk Lick Township; and the Friedens Block Co., Somerset.

SULLIVAN

The only mineral commodity produced in 1953 in Sullivan County was semianthracite mined from properties at Bernice and Lopez in the northeastern part of the county.

SUSQUEHANNA

Mineral products of Susquehanna County in 1953 were limited to dimension sandstone for building construction. This commodity was quarried by W. H. Swingle, Jr., Harford.

TIOGA

Wells and mines in Tioga County yielded oil, natural gas, soft coal, and sand in 1953. Twenty-five percent of the coal production was strip-mined. Continental Cement Products Co., Inc., produced paving sand. Crude-oil production during the year totaled 2,748 barrels.

UNION

The Faylor Lime & Stone Co., Winfield, and J. L. Iddings were the only mineral producers in Union County in 1953. Crushed and broken limestone produced by these companies was sold for concrete aggregate and agricultural stone.

VENANGO

Venango County ranked second as a producer of petroleum in Pennsylvania in 1953. Wells in the county produced 599,422 barrels of crude oil, virtually all through secondary recovery. Venango County also had a small output of soft coal, almost all of which was produced by strip mining. The Oil City Sand & Gravel Co., Oil City, and Industrial Silica Corp., Utica, reported a small production of molding, building, and paving sand and gravel.

WARREN

The major mineral commodity produced in Warren County in 1953 was petroleum. The 475,139 barrels of crude oil recovered in 1953 placed the county in third position among oil-producing areas in the State.

Building sand and gravel were produced by General Concrete Products Corp., Starbrick.

WASHINGTON

Washington County ranked first in the production of bituminous coal and sixth in the output of oil in Pennsylvania in 1953. Virtually all bituminous coal produced was recovered by underground mining. The 45,000 oil-productive acres in the county yielded 216,502 barrels of crude oil. Other mineral commodities produced in 1953 included natural gas, clay, and stone. Clays were produced by Westmoreland Clay Products Co., Vance Station; Monongahela Clay Products Co., Scott's Hollow; and Donley Brick Co., Washington.

WAYNE

In 1953 General Stone Co. quarried limestone for concrete and agricultural purposes. Wayne Concrete & Sand Works, Lake Ariel, and Chas. Caputo, Honesdale, produced building and paving sand and gravel.

WESTMORELAND

Westmoreland County was one of the larger sources of soft coal in the State.

Quarries in the county yielded a substantial tonnage of sandstone for irregular blocks and for concrete aggregate. Producers of dimension stone were J. C. Beumont Co., Brant Hoover Co., Andrew White Co., and J. S. Robinson Co., Inc. Crushed material was produced by Adam Eidemiller, Greensburg, and Latrobe Construction Co., Ligonier Township.

Fire clay was recovered by Garfield Refractory Co. from its pit at Boliver and from the pit of Kingston Brick Co., Latrobe. Westmoreland Clay Products Co., Greensburg, produced miscellaneous clays.

WYOMING

The Falls Sand & Gravel Co., Inc., and the Wyoming Sand & Stone Co., both in Falls Township, produced building and paving sand and gravel in 1953.

YORK

The mineral economy of York County was extensive and diversified in 1953. Mineral operations yielded large quantities of lime, cement, stone, and slate, as well as substantial tonnages of clays and sand and gravel. The county ranked second among Pennsylvania counties in production of lime, first in the output of slate, and eighth in the production of crushed and broken limestone.

Manufacture of lime was one of the principal mineral industries. Three plants were operating during the year; and one, J. E. Baker Co., York, produced dead-burned dolomite. Lime for building, agricultural and chemical purposes was produced by J. E. Baker Co. and National Gypsum Co.

Crushed and broken limestone was the only stone produced. Output was sold for concrete aggregate, railroad ballast, agricultural purposes, filler, flux, and whiting. Major producers during the year were Thomasville Stone & Lime Co., Thomasville; and York Stone & Supply Co., Eli Z. Zinn, Inc., Standard Concrete Products Co., Inc., and National Gypsum Co., all of York.

York County was also an outstanding source of cement in 1953. This material came from the Medusa Portland Cement Co. plant in York.

The Funkhouser Co., Delta, was the only producer of slate in the county in 1953. In terms of tonnage, the county ranked first in the State in quantity of slate produced; but the value of the product was low, since it was ground and sold as flour or granules.

Sand and gravel were produced by the Newman Sand-Supply Co., York, for building and paving purposes. Common clay, mainly for brick use, was mined by the Glen Gery Shale Brick Corp.

THE MINERAL INDUSTRY OF THE COMMONWEALTH OF PUERTO RICO, THE PANAMA CANAL ZONE, AND THE VIRGIN ISLANDS

The Puerto Rico portion of this chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Commonwealth of Puerto Rico.

By Avery H. Reed, Jr.¹



PUERTO RICO

THE MINERAL INDUSTRY of Puerto Rico includes the production of clays, salt, sand and gravel, stone, portland cement, and lime.

In 1953 the total value of mineral production declined, although sand and gravel output reached a new high, and salt production increased. The greatest decrease occurred in the cement industry, but lime and stone production also dropped. No iron ore was produced during the year.

The total value of mineral production was 18 percent below 1952 and 11 percent below 1951.

TABLE 1.—Mineral production in possessions of the United States, 1952–53, by individual minerals¹

Possession and mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Canal Zone:				
Sand and gravel ^{2,3}	56,600	\$53,000	85,914	\$95,500
Stone (crushed) ^{2,3}	86,000	152,000	171,908	231,752
Total Canal Zone.....		205,000		327,252
Puerto Rico:				
Cement.....376-pound barrels.....	3,994,483	10,517,894	3,641,135	9,335,421
Iron ore (usable).....long tons.....	138,613	797,025		157,467
Lime (open-market).....	8,575	195,000	7,338	131,490
Salt (common).....	12,676	122,158	13,692	250,202
Sand and gravel.....	122,730	164,166	228,386	41,237,236
Stone.....	4,689,320	4,807,388	4,648,400	44,466
Undistributed: Other nonmetallic minerals.....		6,328		
Total Puerto Rico.....		13,610,000		11,156,000
Virgin Islands: Stone (crushed) ^{2,3}	12,900	51,900	10,789	45,853
Grand total.....		13,867,000		11,529,000

¹ Production as measured by mine shipments or mine sales (including consumption by producers).

² Quantities are estimated equivalents of cubic yards reported.

³ Data for fiscal years ended June 30.

⁴ Excludes certain stone, value for which is included with "Undistributed."

¹ Assistant chief, Mineral Industry Division, Region VII, Bureau of Mines, Knoxville, Tenn.

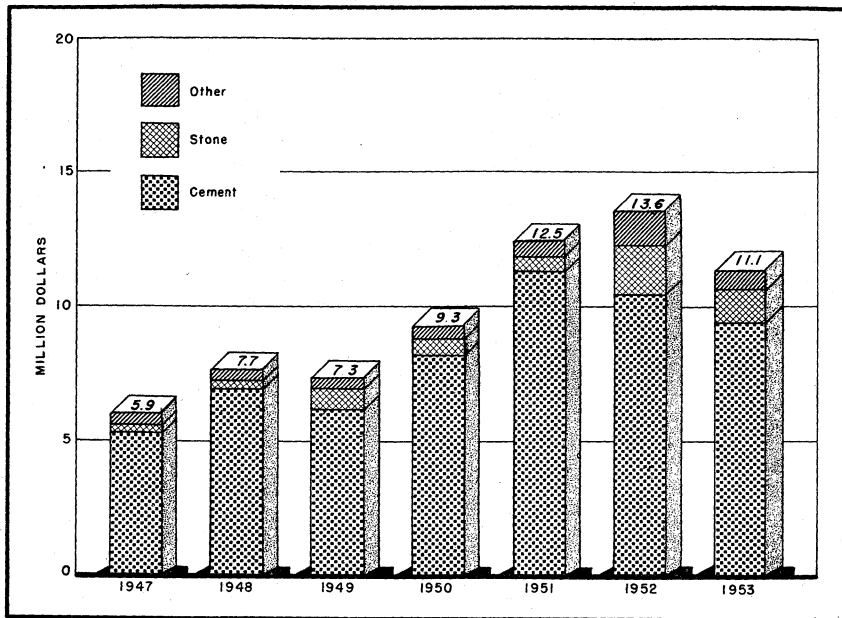


FIGURE 1.—Total value of the mineral production of Puerto Rico, 1947–53.

VALUES

The values of mineral production shown in the tables are those reported at the mine or plant. Table 2 shows the average unit values of all commodities produced in the Canal Zone, Puerto Rico, and the Virgin Islands, 1949–53:

TABLE 2.—Average unit values of mineral commodities produced in the Canal Zone, Puerto Rico, and the Virgin Islands¹

Area and commodity	1949	1950	1951	1952	1953
Canal Zone:					
Basalt, crushed.....short ton..	\$1.50	\$1.57	\$2.02	\$1.77	\$1.35
Sand and gravel.....do.....	1.50	.68	.81	.94	1.11
Puerto Rico:					
Basalt.....do.....	(²)	1.24	1.47	1.55	-----
Cement, portland.....376-pound barrel..	2.81	2.60	2.62	2.63	2.56
Granite, crushed.....short ton..	1.00	1.00	1.00	1.00	1.00
Iron ore.....long ton..	-----	-----	5.74	5.75	-----
Lime.....short ton..	25.13	22.14	18.49	22.74	21.46
Limestone:					
Crushed.....do.....	1.62	2.42	2.13	2.74	1.90
Dimension.....do.....	1.07	(²)	4.85	1.60	2.04
Salt.....do.....	6.11	10.13	11.29	9.64	9.60
Sand.....do.....	(²)	.97	.53	1.21	1.05
Gravel.....do.....	(²)	1.04	1.30	1.81	1.13
Stone, miscellaneous, crushed.....do.....	-----	-----	-----	2.33	1.70
Virgin Islands: Stone, miscellaneous, crushed.do....	1.65	1.57	4.08	4.02	4.25

¹ For greater detail on prices, by grades and markets, see vol. I, Minerals Yearbook, 1953.

² Data not available.

REVIEW BY MINERAL COMMODITIES

Cement (Portland).—The cement industry, which composed 84 percent of the total value of mineral production, operated at a reduced rate in 1953. Shipments declined 9 percent below 1952 and 15 per-

cent below 1951, the record year. The total value of shipments decreased 11 percent below 1952.

TABLE 3.—Portland-cement shipments from mills in Puerto Rico, 1939-53

Year	376-pound barrels	Value
1939-48.....	11,330,091	\$27,302,700
1949.....	2,171,486	6,109,041
1950.....	3,187,451	8,299,186
1951.....	4,297,583	11,252,350
1952.....	3,994,483	10,517,894
1953.....	3,641,135	9,335,421
Total.....	¹ 28,622,229	¹ 72,816,592

¹ Total cement shipments to date.

Clays (Miscellaneous).—The production of miscellaneous clays was reported for the first time, but clays have been produced for several years.

Granite (Crushed).—One operator reported the production of crushed granite.

Lime.—The total quantity sold or used by producers declined 14 percent below 1952, and the value dropped 19 percent.

Limestone (Crushed).—Crushed limestone was produced in each of the seven Provinces.

TABLE 4.—Crushed limestone sold or used by producers in Puerto Rico, 1952-53¹

Province	1952		1953	
	Short tons	Value	Short tons	Value
Aguadilla.....	² 100,509	² \$282,149	344,298	\$575,456
Arecibo.....	11,883	26,233	33,158	67,368
Guayama.....	² 32,474	² 80,606	38,224	73,342
Humacao.....	28,756	86,658	11,618	32,863
Mayaguez.....	47,091	86,922	38,047	59,737
Ponce.....	14,276	30,893	59,936	123,999
San Juan.....	370,841	1,072,449	106,567	265,738
Total.....	605,830	1,659,910	631,848	1,203,503

¹ Except for cement or lime.

² Revised figure.

Limestone (Dimension).—Dimension limestone was produced in San Juan, Mayaguez, and Ponce Provinces. The total quantity sold or used by producers was 21 percent more and the total value 54 percent more than in 1952.

Salt.—Salt was produced in Mayaguez Province by the evaporation of sea water. The total quantity sold or used by producers and the total value both increased 8 percent over 1952.

Sand and Gravel.—Sand and gravel were produced in each of the seven Provinces.

TABLE 5.—Sand and gravel sold or used by producers in Puerto Rico, 1950–53

Year	Sand		Gravel		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1950.....	19, 187	\$18, 594	81, 826	\$85, 212	101, 013	\$103, 806
1951.....	(¹)	(¹)	(¹)	(¹)	99, 628	99, 657
1952.....	86, 515	96, 143	36, 215	68, 023	122, 730	164, 166
1953.....	(¹)	(¹)	(¹)	(¹)	226, 586	250, 202

¹ Figure withheld to avoid disclosure of individual company operations.

Stone (Miscellaneous, Crushed).—Crushed miscellaneous stone was produced in San Juan and Humacao Provinces. The total quantity sold or used by producers was considerably less than in 1952.

REVIEW BY PROVINCES

AGUADILLA

Limestone (Crushed).—General Builders & Suppliers reopened the Pagan quarry and produced crushed limestone for concrete and road metal, and production was continued by the Antilles Area Office, the Department of Public Works, Antonio Santos, and Luis Viera.

Sand and Gravel.—Francisco Juame Rosello opened a new pit and produced structural and paving sand. General Builders & Suppliers reopened the Pagan mine, and production was continued by the Department of Public Works.

TABLE 6.—Sand and gravel sold or used by producers in Aguadilla Province, Puerto Rico, 1951–53

Year	Sand		Gravel		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1951.....	337	\$517	2, 341	\$4, 633	2, 678	\$5, 150
1952.....	162	198	7, 623	16, 167	7, 785	16, 365
1953.....	29, 364	29, 633	960	1, 992	30, 314	31, 625

ARECIBO

Limestone (Crushed).—Severo O'Neil opened a new quarry and produced crushed limestone for concrete and road metal, and the Department of Public Works continued to produce crushed limestone. The total quantity sold or used by producers was 33,158 short tons valued at \$67,368, compared with 11,883 short tons valued at \$26,233 in 1952.

Sand and Gravel.—The Department of Public Works continued to produce sand and gravel.

TABLE 7.—Sand and gravel sold or used by producers in Arecibo Province, Puerto Rico, 1951–53

Year	Sand		Gravel		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1951.....			3, 047	\$7, 146	3, 047	\$7, 146
1952.....	270	\$400	437	1, 157	707	1, 557
1953.....	250	328	3, 009	7, 064	3, 259	7, 392

GUAYAMA

Limestone (Crushed).—Compania de Ing. y Contratistas and Francisco Navarro opened new quarries and produced crushed limestone. The Department of Public Works continued to produce crushed limestone for concrete and road metal.

Sand and Gravel.—Planta del Turabo and Jose A. Lopez opened new pits, and the Department of Public Works continued production.

TABLE 8.—Sand and gravel sold or used by producers in Guayama Province, Puerto Rico, 1951-53

Year	Sand		Gravel		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1951.....	508	\$333	3,019	\$5,367	3,527	\$6,200
1952.....	4,624	5,633	3,782	6,764	8,406	12,397
1953.....	2,131	2,550	12,873	27,062	15,004	29,612

HUMACAO

Lime.—Planto de Col Hicaco, Inc., continued to produce lime; but the total quantity sold or used was 32 percent less than in 1952, and the total value decreased 37 percent.

Limestone (Crushed).—The Fajardo Sugar Co. continued to produce crushed limestone for concrete and road metal. Three new limestone quarries were opened—by Ramon Rivera Figueroa (for concrete and road metal), by Planto de Col Hicaco, Inc. (for agricultural stone and whiting), and by Mateo Peren Sanjurio (for riprap).

Sand and Gravel.—Marcial Sols opened a new pit and produced structural gravel.

TABLE 9.—Sand and gravel sold or used by producers in Humacao Province, Puerto Rico, 1951-53

Year	Sand		Gravel		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1951.....			455	\$870	455	\$870
1952.....	1,305	\$2,034	2,453	5,646	3,758	7,680
1953.....			352	900	352	900

Stone (Miscellaneous, Crushed).—The Fajardo Development Co. opened the Monserrate Quarry and produced crushed stone for concrete and road metal and for railroad ballast.

MAYAGUEZ

Granite (Crushed).—Conrado Forestier continued to produce crushed granite for concrete and road metal. The total quantity sold or used and the total value both decreased 9 percent from 1952.

Lime.—The South Puerto Rico Sugar Co. continued to operate the Ensenado limekiln.

Limestone (Crushed).—Cantera Bravo and Eugenio Natali opened new quarries and produced crushed limestone for concrete and road metal. The South Puerto Rico Sugar Co. continued to operate the Guanica Quarry.

Limestone (Dimension).—Liborio Lopez Sanchez opened a new quarry for rubble building stone. The South Puerto Rico Sugar Co. continued to operate the Guanica Quarry for rubble. The total quantity sold or used by producers was considerably more than in 1952.

Salt.—The production of salt from sea water was continued by Carlos M. Ramirez Acosta at Salina Fortuna; Puerto Rico Salt Works, Inc., at Boqueron, Cabo Rojo, and Providence; and Salinas del Papayo, Inc.

TABLE 10.—Salt sold or used by producers in Mayaguez Province, Puerto Rico, 1947-48 (average) and 1949-53

Year	Short tons	Value
1947-48 (average).....	14,245	\$106,680
1949.....	12,664	77,322
1950.....	13,545	137,225
1951.....	10,566	119,338
1952.....	12,676	122,158
1953.....	13,692	131,490

Sand and Gravel.—Cantera Bernat opened a new pit for structural gravel, and Liborio Lopez Sanchez opened a new pit for paving gravel.

PONCE

Cement (Portland).—The Ponce Cement Corp. operated the Ponce mill throughout the year. Total shipments were 12 percent less than in 1952, and the total value of shipments declined 18 percent.

Limestone (Crushed).—New quarries were opened by Francisco Semidey, the South Puerto Rico Concrete Works, and Jose A. Vallejo for crushed-limestone production. Ismael Torruellas opened a new quarry for railroad ballast in addition to concrete and road metal. The Department of Public Works continued to produce limestone for concrete and road metal.

Limestone (Dimension).—Ismael Torruellas opened a new quarry for rubble building stone.

Sand and Gravel.—Amparo Ortiz, Ponce Aggregates, and Ismael Torruellas opened new pits for the production of sand and gravel for structural paving purposes. The Department of Public Works continued to produce structural and paving sand.

TABLE 11.—Sand and gravel sold or used by producers in Ponce Province, Puerto Rico, 1951-53

Year	Sand		Gravel		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1951.....	525	\$666	783	\$1,025	525	\$666
1952.....	700	1,514	125,950	123,883	1,483	2,539
1953.....	21,721	21,332			147,671	145,215

SAN JUAN

Cement (Portland).—The Puerto Rico Cement Corp. operated the Guaynabo mill throughout the year. Shipments and their value were about 3 percent less than in 1952.

Clays (Miscellaneous).—Puerto Rico Clay Products, Inc., produced clays for heavy clay products.

Limestone (Crushed).—Severo O'Neil and Ramon Lopez Rodriguez opened new quarries for crushed limestone for concrete and road metal. Production was continued by the Department of Public Works, Ramos Hermanos, Inc., and J. Ortiz Toro.

Limestone (Dimension).—Ramon Lopez Rodriguez opened a new quarry and produced dimension limestone for rough construction and rubble building stone.

Sand and Gravel.—The Puerto Rico Glass Corp. continued to produce glass sand, and the Department of Public Works produced paving gravel.

Stone (Miscellaneous, Crushed).—Venancio Morales produced a small quantity of crushed miscellaneous stone for concrete and road metal.

PANAMA CANAL ZONE

The mineral industry of the Canal Zone is limited to the production of sand and gravel and stone.

The year 1953 was the best since 1948. The total value of mineral production increased 60 percent over 1952 and was only 6 percent below 1948, the record year.

TABLE 12.—Mineral production in the Panama Canal Zone, 1952-53¹

Mineral	1952		1953	
	Short tons	Value	Short tons	Value
Sand and gravel.....	56,600	\$53,000	85,914	\$95,500
Stone.....	86,000	152,000	171,908	231,752
Total.....		205,000		327,252

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

REVIEW BY MINERAL COMMODITIES

Basalt (Crushed).—Both the Panama Canal Co. and the U. S. Army-Caribbean produced basalt for concrete and road metal; the former company also produced some riprap.

TABLE 13.—Crushed basalt sold or used by producers in the Canal Zone, 1947-48 (average) and 1949-53

Year	Short tons	Value
1947-48 (average).....	140,000	\$210,000
1949.....	109,200	¹ 163,800
1950.....	53,000	83,000
1951.....	55,500	112,000
1952.....	86,000	152,000
1953.....	171,908	231,752

¹ Estimated.

Sand and Gravel.—Sand and gravel for structural and paving use were produced by the Panama Canal Co. Sand production was 29,820 tons valued at \$33,800, and gravel production was 56,094 tons valued at \$61,700.

TABLE 14.—Sand and gravel sold or used by producers in the Canal Zone, 1947-48 (average) and 1949-53

Year	Total	
	Short tons	Value
1947-48 (average)	49, 000	\$74, 850
1949	39, 000	¹ 58, 500
1950	22, 000	15, 000
1951	32, 000	26, 000
1952	56, 600	53, 000
1953	85, 914	95, 500

¹ Estimated.**VIRGIN ISLANDS**

The mineral industry of the Virgin Islands is limited to the production of stone. The total production in 1953 was 10,789 short tons, valued at \$45,853, compared with 12,900 short tons, valued at \$51,900, in 1952.

ST. CROIX ISLAND

Crushed miscellaneous stone was produced by the Virgin Islands Corp. Table 15 shows crushed miscellaneous stone sold or used by producers, 1947-53.

TABLE 15.—Crushed miscellaneous stone sold or used by producers in St. Croix Island, Virgin Islands, 1947-48 (average) and 1949-53

Year	Short tons	Value
1947-48 (average)	(¹)	\$13, 000
1949	9, 700	² 16, 000
1950	2, 540	4, 000
1951	5, 700	24, 200
1952	3, 800	16, 150
1953	10, 789	45, 853

¹ Data not available.² Estimate.

The Mineral Industry of Rhode Island

By Richard H. Mote¹ and Alvin Kaufman²



THE VALUE of mineral production in Rhode Island increased 17 percent in 1953 compared with 1952. This gain was principally the result of the 39-percent rise in the value of sand and gravel output. Sand and gravel became the State's major mineral products, replacing stone, which declined to second place; graphite remained third. Mineral output was reported from all counties except Bristol.

TABLE 1.—Value of mineral production 1952-53, by counties, and principal minerals produced in 1953

County	1952	1953			Principal minerals, in order of value
		Value	Rank	Percent	
Kent and Newport.....	\$228, 808	\$229, 308	3	15	Sand and gravel, stone.
Providence.....	753, 747	931, 945	1	64	Sand and gravel, stone, graphite.
Washington.....	267, 123	300, 543	2	21	Stone, sand and gravel.
Total.....	1, 250, 000	1, 462, 000	-----	100	Sand and gravel, stone, graphite.

REVIEW BY MINERAL COMMODITIES

METALS

Ores of iron, copper, manganese, and gold occur in Rhode Island and have been mined infrequently in the past. Iron for support of the Colonial and Revolutionary Armies was recovered during the 18th century from ore from Iron Mine Hill, Cumberland, and from bog deposits near Cranston.³ Because of the availability of larger or higher grade deposits elsewhere, Rhode Island's metal deposits are no longer considered economic. There was no mine output of metals in the State in 1953.

NONMETALS

Graphite.—Graphite Mines, Inc., was one of three producers of natural graphite active in the United States in 1953. This company mined amorphous graphite from a property once worked for coal in earlier years. Output during the year was utilized in preparing foundry facings and paint pigments.

Sand and Gravel.—Production of sand and gravel, mostly for building and paving uses, increased 52 percent over 1952. In terms of value, they displaced stone as the principal mineral products of the State. Output was from 10 pits active in Providence, Kent, and Washington Counties. Major producers were M. A. Gammino Con-

¹ Chief, Mineral Industry Division, Region VIII, Bureau of Mines, Pittsburgh, Pa.

² Commodity-industry analyst, Region VIII, Bureau of Mines, Pittsburgh, Pa.

³ Rhode Island Development Council, Research Division, Preliminary Report on Mineral Resources: June 1952, p. 3.

struction Co., Providence, Providence County; South County Sand & Gravel Co., Peace Dale, Washington County; and Rhode Island Sand & Gravel Co., Inc., Kent County.

Stone.—Stone output decreased 6 percent in value compared with 1952. Production, which consisted of granite, limestone, basalt, and miscellaneous stone, was quarried in Providence, Washington, and Newport Counties. The stone quarries of Providence County supplied 56 percent of the State total value of stone produced; Washington County producers were responsible for 38 percent.

REVIEW BY COUNTIES

KENT

Structural, paving, and molding sand and gravel were produced in Kent County by Rhode Island Sand & Gravel Co., Inc., and Whitehead Bros. The output of sand and gravel in the county declined in 1953 because the Joseph B. Barber plant closed.

NEWPORT

Miscellaneous stone was produced by Peckham Bros. Co. from a quarry near Newport and crushed for use as concrete aggregate and road material.

PROVIDENCE

The mines and quarries of Providence County yielded sand and gravel, stone, and graphite and furnished 64 percent of the value of the State mineral output in 1953. Sand and gravel, the most important mineral commodities were produced by M. A. Gammino Construction Co., Providence; Luigi Vallone, Inc., Warwick; Town Line Sand & Gravel Co., Slatersville; and Del Bonis Sand & Gravel Co., Cranston. This output was utilized for structural and paving purposes. M. A. Gammino Construction Co. also produced crushed basalt for concrete aggregate. Other stone producers active in 1953 were Fanning & Doorley Construction Co., Providence, and Conklin Limestone Co., Inc., Saylesville. Fanning & Doorley Co. operated a granite quarry to produce concrete aggregate and road material, and Conklin Limestone Co., Inc., produced crushed limestone, mainly for agricultural uses.

WASHINGTON

Washington County ranked second among the mineral-producing counties of Rhode Island in 1953. The major mineral industry was the quarrying of dimension granite near Westerly. Smith Granite Works and Sullivan Granite Co. produced a pink to red, medium-grain granite for use as rough construction stone, and a fine-grain blue-white granite for monumental purposes. Waste production from these quarries was used as rubble, riprap, and concrete aggregate. Four sand and gravel producers were active in Washington County in 1953; of these the largest were South County Sand & Gravel Co., Peace Dale, and Tascia Sand & Gravel Co.

The Mineral Industry of South Carolina

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of South Carolina.

By J. R. Thoenen,¹ Lawrence L. Smith,² and May G. Downey³



THE TOTAL VALUE of mineral production in South Carolina for 1953 increased slightly more than 3 million dollars, or 21 percent over 1952. Structural materials, including stone, cement, and sand and gravel, increased a little less than \$3 million in value, or 32 percent above 1952. The major portion of this increase in the value of structural materials was credited to sand and gravel and cement, which had a combined increase of 78 percent over 1952. In fact, all mineral commodities except barite and dimension stone reported increased values in 1953 over 1952.

TABLE 1.—Mineral production in South Carolina, 1952-53¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays.....	947,278	\$4,675,261	964,356	\$4,801,921
Sand and gravel.....	1,048,099	892,312	2,975,608	2,564,484
Stone, crushed.....	2,914,839	3,881,178	2,913,860	2,976,370
Undistributed: Barite, cement, kyanite, stone (dimension granite), and vermiculite (excludes value of clays used for cement).....		5,236,964		6,428,135
Total.....		14,686,000		17,771,000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

² Final figure. Supersedes preliminary figure given in commodity chapter.

TABLE 2.—Average unit value of mineral commodities produced in South Carolina, 1949-53¹

Commodity	1949	1950	1951	1952	1953
Crude barite.....short ton..	\$8.00	\$7.25	\$7.28	\$7.00	\$6.00
Cement.....376-pound barrel..	2.42	2.56	2.77	2.75	2.80
Clay:					
Fire clay.....short ton..	5.64	1.63	2.61	2.42	2.90
Kaolin.....do.....	12.71	12.91	12.71	12.64	12.87
Miscellaneous clays.....do.....	.77	.80	1.00	.93	.84
Cement manufacture (est.).....do.....	.50	.75	1.00	1.00	1.00
Kyanite.....do.....	29.76	32.76	37.00	40.00	40.00
Gravel.....do.....	1.33	.34	.45	.79	1.16
Sand.....do.....	.47	.51	.43	.86	.57
Vermiculite.....do.....	10.00	10.00	10.00	9.87	13.10
Stone:					
Granite (dimension).....cubic foot..	2.32	2.78	3.25	3.25	3.25
Granite (crushed).....short ton..	1.33	1.30	1.28	1.31	1.35
Limestone (crushed).....do.....	1.55	1.50	1.49	1.59	1.54
Miscellaneous stone (crushed).....do.....	.71	.60	.65	.65	-----

¹ For greater detail on prices by grades and markets, see vol. I, Minerals Yearbook, 1953.

¹ Chief, Mineral Industry Division, Region VII, Bureau of Mines, Knoxville, Tenn.

² State geologist, South Carolina Geological Survey, Columbia, S. C.

³ Statistical clerk, Region VII, Bureau of Mines, Knoxville, Tenn.

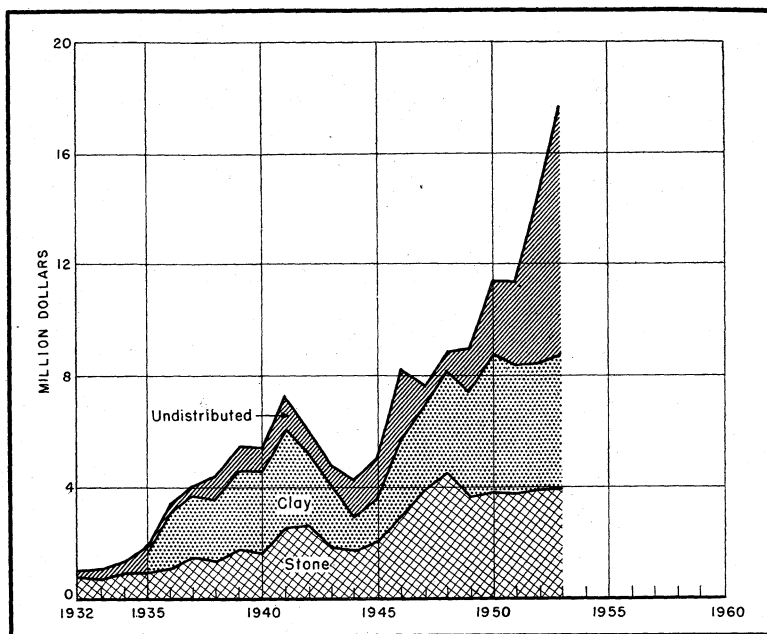


FIGURE 1.—Total value of mineral production of South Carolina, 1932-53.

REVIEW BY MINERAL COMMODITIES

METALS

No production of metals or metallic ores was reported from the State in 1953.

Monazite.—The Callahan Zinc-Lead Co. conducted exploration for monazite, columbium, and rutile under a Defense Minerals Exploration Administration project.

Tin.—The Banta Mining Co., Inc., of Detroit, Mich., conducted considerable exploration for tin at the site of the Old Ross mine near Gaffney by means of diamond drilling.

NONMETALS

Barite.—Barite production increased in tonnage but decreased in total value in 1953.

Clays.—Clay production, as represented by the total of kaolin, fire, and miscellaneous clays, increased 2 percent in quantity and 3 percent in value. Kaolin production increased 1 percent in tonnage and 3 percent in value, fire clay doubled in both tonnage and value, and miscellaneous clays increased slightly in tonnage but decreased 6 percent in value.

Kyanite.—Kyanite production from the Henry Knob mine of Commercialores Co. increased roughly 9 percent in tonnage and value over 1952.

TABLE 3.—Clays sold or used by producers, 1944-48 (average) and 1949-53, by kinds

	Fire clay		Kaolin		Miscellaneous clays		Total ¹	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1944-48 (average).....	(2)	(2)	220, 548	\$2, 230, 091	(2)	(2)	(2)	(2)
1949.....	(2)	(2)	274, 458	3, 488, 054	423, 902	\$318, 601	698, 360	\$3, 806, 655
1950.....	(2)	(2)	348, 948	4, 505, 022 ²	638, 852	508, 223	987, 800	5, 013, 245
1951.....	(2)	(2)	322, 208	4, 095, 912	619, 272	620, 022	941, 480	4, 715, 934
1952.....	7, 547	\$18, 250	322, 778	4, 079, 112	616, 953	577, 899	947, 278	4, 675, 261
1953.....	15, 208	44, 075	327, 594	4, 213, 431	621, 554	544, 415	964, 356	4, 801, 921

¹ Excludes fire clay, 1949-51.² Data not available.³ Figure withheld to avoid disclosure of individual company operations.

Sand and Gravel.—The production of sand and gravel for sale or use by producers in South Carolina in 1953 increased 184 percent in tonnage and 187 percent in total value. A number of producers reported for the first time, and production was reported from several counties not previously reporting. In all, 13 operators reported commercial production from 15 separate operations compared with 6 in 1952, and noncommercial production was reported by 5 operators from 15 counties; additional tonnage was reported without county credit.

The year was a record one for the State and surpassed the former record tonnage year 1941 by 164 percent and the previous record value year 1952 by 187 percent.

The 1953 production of sand and gravel was divided into roughly 1½ million short tons of commercial sand valued at \$880,000, 50,000 short tons of noncommercial sand valued at \$14,000, and 1½ million short tons of commercial gravel valued at \$1,680,000.

TABLE 4.—Sand and gravel sold or used by producers, 1944-48 (average) and 1949-53

Year	Short tons	Value	Year	Short tons	Value
1944-48 (average).....	423, 709	\$216, 775	1951.....	320, 195	\$139, 258
1949.....	¹ 287, 108	¹ 145, 142	1952.....	1, 048, 099	892, 312
1950.....	348, 060	166, 710	1953.....	2, 975, 608	2, 564, 484

¹ Incomplete total; excludes noncommercial production.

Stone.—*Granite.*—Crushed granite for road construction, railroad ballast, riprap, and stone sand again comprised over 90 percent of the State's crushed-stone production. Crushed granite sold or used by producers increased less than 1 percent in tonnage and 4 percent in value over 1952. The average value a ton increased 4 cents. Granite used for dimension stone decreased roughly 50 percent in quantity and value in 1953 below 1952.

Limestone.—All limestone quarried in the State in 1953, except that for cement manufacture, was crushed and used—36 percent for agricultural purposes and 64 percent for road construction. Both tonnage and value decreased slightly.

Vermiculite.—Three producers supplied vermiculite production in the State in 1953. The tonnage of screened and cleaned vermiculite increased 7 percent, and value increased 11 percent over 1952.

TABLE 5.—Stone sold or used by producers, 1944-48 (average) and 1949-53

Year	Dimension granite		Crushed granite		Crushed limestone		Miscellaneous stone		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1944-48 (average)	(1)	(1)	1,572,986	\$1,896,516	(1)	(1)	(1)	(1)	1,841,512	\$3,042,815
1949	11,740	\$330,388	2,095,279	2,776,904	335,520	\$521,304	(1)	(1)	2,440,539	\$3,628,596
1950	14,156	477,291	2,223,923	2,881,109	319,431	477,656	(1)	(1)	2,557,510	\$3,836,056
1951	(1)	(1)	2,528,473	3,242,140	300,150	447,815	245	\$159	2,828,868	\$3,690,114
1952	(1)	(1)	2,648,284	3,456,684	266,095	424,195	460	299	2,914,839	\$3,881,178
1953	(1)	(1)	2,660,989	3,587,827	252,871	388,543	-----	-----	2,913,860	\$3,976,370

¹ Figure withheld to avoid disclosure of individual company operations.

² Incomplete figure; excludes certain stone data indicated by footnote 1.

REVIEW BY COUNTIES

AIKEN

The Defense Minerals Exploration Administration (DMEA) furnished \$15,946 of a total of \$19,213 expended in an exploration project conducted by the Callahan Zinc-Lead Co. on Horse Creek in a search for monazite and other heavy minerals.

Production was reported by The Southeastern Clay Co. from its Flock, Johnson, Ramey, Rodgers, and Toole mines. This was the first reported production from the Toole mine. Other producers reporting were Dixie Clay Co., from its McNamee mine; National Kaolin Products Co., from its Aiken mine; and the J. H. Huber Corp., from operations of the South Carolina Clay Co. The tonnage and value reported as sold or used increased roughly 1 and 3 percent, respectively, over 1952.

Clays for brick and heavy clay products were mined by the Georgia-Carolina Brick Co., and both tonnage and value increased slightly over 1952.

TABLE 6.—Clays sold or used by producers in Aiken County, 1949-53

Year	Short tons	Value	Year	Short tons	Value
1949	295,906	\$3,487,813	1952	349,212	\$4,062,248
1950	373,794	4,491,157	1953	367,087	4,248,976
1951	349,708	4,100,912			

The Carolina Aggregate Co. and The Augusta Sand & Gravel Co. both reported production for the first time from Aiken County.

ANDERSON

The South Carolina State Highway Department reported the use of 5,520 short tons of paving sand valued at \$552.

CHEROKEE

Production of barite by Industrial Minerals, Inc., increased approximately 12 percent but total value declined 4 percent.

Production of clays by The Broad River Brick Co. continued at approximately the same rate as in 1952.

The Campbell Limestone Co. reported sale or use of 192,871 short tons of crushed limestone valued at \$268,543 from the Campbell quarry—a decrease of 6 percent in tonnage and 12 percent in value from 1952. The quarry was abandoned in September 1953, hence the production reported only covered a 9-month period.

The State highway department reported production of 3,500 short tons of sand, valued at \$2,625, for road pavement.

CHESTER

The State highway department reported the use of 8,410 short tons of paving sand valued at \$4,204.

CHESTERFIELD

Chesterfield County reported for the first time commercial production of sand and gravel by two producers, W. R. Bonsal Co. from the Cash mine and Becker County Sand & Gravel Co. from the Cherow mine. The State highway department also reported the use of 4,073 short tons of paving sand valued at \$733.

DARLINGTON

Production of clays by the Consumers Brick Yard from the Society Hill mine for brick and heavy clay products continued at roughly the same rate as in 1952.

DORCHESTER

Shipments of portland cement from the Carolina Giant Cement Co. plant at Harleyville increased 45 percent, and value increased 47 percent over 1952, setting a new record for the plant and State.

Production of clays by the Salisbury Brick Corp. for brick and heavy clay products declined approximately 10 percent in tonnage and value below 1952.

The Carolina Cement & Lime Co. operated at the same rate as in 1952 in producing agricultural limestone.

FAIRFIELD

Shale from the Richtex mine of the Richland Shale Products Co. was used in manufacturing heavy clay products at the same rate as 1952.

The Palmetto Quarries Co. took over operation of Blair Quarries in April of 1953.

Production of crushed granite by 2 operators was 32 percent less in tonnage and 27 percent less in value than in 1952.

The Rion Crush Stone Corp. was reported as constructing and operating a new plant to utilize Fairfield County granite to supply a growing market for poultry grit.

Production of monumental granite declined approximately 50 percent in tonnage and value below 1952.

FLORENCE

The Coastal Sand Co., operating the Jacksonville pit, reported initial production of sand and gravel.

GREENVILLE

The State highway department reported the use of 1,584 short tons of paving sand valued at \$1,109.

GREENWOOD

The Angus Brick & Tile Co. and the Southern Brick Co. reported a total production of 65,000 short tons of clay for brick and heavy clay products valued at \$49,662, a reduction of 6 percent in tonnage and value below 1952.

TABLE 7.—Miscellaneous clays sold or used by producers in Greenwood County, 1949-53

Year	Short tons	Value	Year	Short tons	Value
1949	60,000	\$45,000	1952	69,275	\$52,956
1950	81,500	61,125	1953	65,000	49,662
1951	81,500	181,500			

¹ Estimate.

JASPER

The Deerfield Sand Co. reported a small tonnage of sand from its Deerfield mine, Ridgeland.

KERSHAW

The State highway department reported using 500 short tons of paving sand valued at \$75.

LANCASTER

The Ashe Brick Co., Van Wyck, reported mining 45,000 short tons of miscellaneous clays valued at \$22,000.

LAURENS

A small tonnage of vermiculite was reported from Laurens County.

LEE

The State highway department reported the use of 850 short tons of paving sand valued at \$128.

LEXINGTON

The Weston & Brooker Co. reported the production of approximately 550,000 short tons of crushed granite valued at \$775,000.

Six operators reported commercial production of sand and gravel 163 percent greater in tonnage and 123 percent greater in value than 1952. Foster Bros. Dixiana Sand Co., Harrison Sand Corp., South-

eastern Sand Co., and Southern Silica Mining & Manufacturing Co. continued to produce, and the Columbia Silica & Sand Co., Columbia, reported initial production from its Columbia pit. The Capitol Sand Co., Columbia, also reported initial production from its Capitol pit.

The State highway department reported consumption of 900 short tons of paving sand valued at \$135.

TABLE 8.—Sand sold or used by producers in Lexington County, 1949-53

Year	Short tons	Value	Year	Short tons	Value
1949.....	254, 086	\$118, 934	1952.....	240, 322	\$132, 431
1950.....	229, 068	112, 747	1953.....	632, 497	295, 528
1951.....	265, 852	116, 039			

MARION

The Standard Brick Co. and J. D. Murchison mined clays for brick and heavy clay products at a rate somewhat reduced from 1952.

MARLBORO

The Palmetto Brick Co. and the Cherow Brick Works mined clays for brick and heavy clay products at the same rate and value as in 1952.

OCONEE

The State highway department reported consumption of 4,956 short tons of paving sand valued at \$743.

ORANGEBURG

The State highway department reported the use of 500 short tons of paving sand valued at \$500.

PICKENS

Crushed-granite production declined 18 percent in tonnage and 14 percent in value compared with 1952.

The State highway department reported consumption of 858 short tons of paving sand valued at \$129.

RICHLAND

Columbia Pipe Co., Carolina Ceramics Co., and Landrum Fire Brick Works reported a substantial increase in the production of fire clay.

Columbia Pipe Co., Carolina Ceramics Co., and Guignard Brick Co. reported a small increase in the production of clays for brick and heavy clay products.

Crushed granite for use in concrete and road metal, railroad ballast, riprap, and stone sand as used or sold by producers amounted to 659,000 short tons valued at \$905,000, an increase of 17 percent in tonnage and 25 percent in value.

A substantial production of commercial sand was reported by Mrs. J. A. Rendsland from the Columbia pit, but without designation as to use.

TABLE 9.—Mineral production in Richland County, 1949-53¹

Year	Clays		Granite		Sand and gravel		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1949.....	67,822	\$68,443	559,288	\$786,009	(²)	(²)	³ 627,110	³ \$854,452
1950.....	113,552	125,687	552,968	718,840	75,542	\$25,763	742,062	870,290
1951.....	109,188	144,990	554,000	⁴ 717,000	45,799	20,780	708,987	882,770
1952.....	106,255	151,576	562,000	723,500	61,623	23,631	729,878	898,707
1953.....	103,798	132,461	659,000	905,000	(²)	(²)	(²)	(²)

¹ Excludes a small quantity of miscellaneous stone (less than 1,000 tons) in 1949-53.

² Figure withheld to avoid disclosure of individual company operations.

³ Incomplete total excludes sand and gravel.

⁴ Estimate.

SPARTANBURG

A single producer sold or used roughly 300,000 short tons of crushed granite valued at \$400,000.

The State highway department reported consuming of 1,650 short tons of paving sand valued at \$825.

Production of vermiculite showed a moderate increase over 1952 in both tonnage and value.

SUMTER

The Becker County Sand & Gravel Co. opened the Camden pit and produced a substantial tonnage of sand and gravel for a variety of uses.

The State highway department reported the use of 1,400 short tons of paving sand valued at \$210.

YORK

Commercialores, Inc., Clover, reported an increase of roughly 9 percent in tonnage and value, making this the record year.

The State highway department reported the use of 1,118 short tons of paving sand valued at \$93.

The Mineral Industry of South Dakota

By D. H. Mullen ¹



MINERAL production in South Dakota in 1953, excluding uranium, was valued at \$33,901,000, a record high for the State and an 11-percent increase over 1952. Of the total value of all metal and mineral commodities produced in 1953, gold and silver represented about 56 percent, stone (except limestone for cement and lime) 15 percent, sand and gravel 8 percent, clays 8 percent, and all other metal or mineral commodities 13 percent.

TABLE 1.—Mineral production in South Dakota, 1952-53 ¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Beryllium concentrate..... gross weight..	334	\$166, 251	392	\$157, 656
Clays.....	292, 791	2, 640, 640	330, 983	2, 826, 074
Columbium-tantalum concentrate..... pounds..	(²)	(²)	23, 671	82, 117
Feldspar..... long tons..	(²)	(²)	4, 431	9, 022
Gold (recoverable content of ores, etc.)..... troy ounces..	40, 163	220, 954	50, 601	321, 026
Iron ore (usable)..... long tons, gross weight..	482, 534	16, 888, 690	534, 987	18, 724, 545
Lead (recoverable content of ores, etc.).....			1, 060	(²)
Mica:	2	644	10	2, 620
Scrap.....	915	24, 148	1, 687	27, 388
Sheet..... pounds..	4, 308	32, 034	11, 174	77, 352
Natural gas..... million cubic feet..	6	300	5	³ 250
Sand and gravel.....	5, 846, 140	2, 478, 314	5, 402, 378	2, 827, 726
Silver (recoverable content of ores, etc.)..... troy ounces..	132, 102	119, 559	138, 642	125, 478
Stone (except limestone for cement and lime).....	1, 671, 187	4, 806, 882	⁴ 1, 189, 418	⁴ 4, 996, 197
Tungsten concentrate..... 60-percent W ₂ O ₅ basis....	(²)	335	2	(²)
Undistributed: Cement, lime, lithium minerals, stone (dimension miscellaneous, 1953), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2). Excludes value of clays used for cement.....		⁵ 3, 076, 258		3, 723, 387
Total South Dakota.....		30, 455, 000		33, 901, 000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

² Value included with "Undistributed."

³ Estimate.

⁴ Excludes certain stone, value for which is included with "Undistributed."

⁵ Less than 1 ton.

⁶ Revised figure.

¹ Commodity-industry analyst, Region V, Bureau of Mines, Minneapolis, Minn.

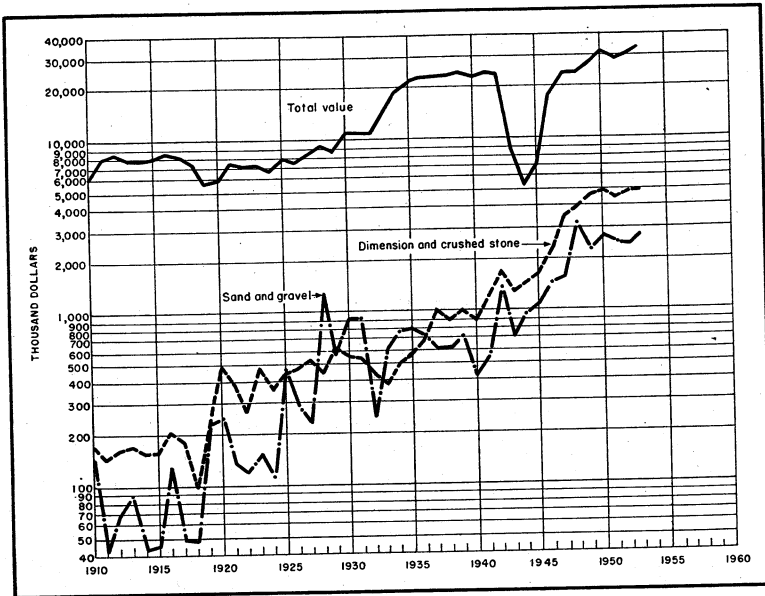


FIGURE 1.—Value of dimension and crushed stone, sand and gravel, and total value of mineral production in South Dakota, 1910-53.

DEFENSE MINERALS EXPLORATION ADMINISTRATION

Ten Defense Minerals Exploration Administration (DMEA) contracts, in which the Government and the mine operators jointly contribute to the cost of the work, were in effect in South Dakota in 1953. Six contracts were completed during the year; three resulting in DMEA certifications of discovery. Still in effect at the end of 1953 were four contracts, including a holdover from 1951 with the Keenan Properties, Spearfish, for tin, tungsten, and columbite-tantalite in Lawrence County with a proposed total cost of \$100,000. DMEA contracts in effect in the State during 1953 are summarized in table 2.

REVIEW BY MINERAL COMMODITIES

METALS

Ores of gold, silver, columbium-tantalum, beryllium, and lead were produced in South Dakota in 1953 from properties in Custer, Lawrence, and/or Pennington Counties. Iron ore for use in manufacturing cement also was produced in Pennington County.

Beryllium.—Production of beryllium concentrate recovered from pegmatite dikes by hand sorting increased 17 percent over 1952. The recorded value was 5 percent less than in 1952. Previously the value assigned to beryllium concentrate was the national average. In 1953 most of the production was sold to the General Services Administration (GSA) at Custer; and the actual value of the product, based on grade, could be determined. Several local buyers representing consumers also purchased beryl. Production was reported by 36 opera-

TABLE 2.—DMEA contracts in effect in South Dakota in 1953

Company or operator	County	Mine	Minerals	Contract date	Work begun	Work completed	Proposed total cost	Actual cost to Government	Government share, percent of total cost	DMEA certifications of discovery or development issued
Belle Eldridge Gold Mines, Inc. ¹ Keenan Properties.....	Lawrence... .....do.....	Belle Eldridge..... Placer claims on Bear and Potato Creeks.	Zinc, lead..... Tin, tungsten, columbite-tantalite.	Mar. 11, 1952 July 16, 1951	June 10, 1952 July 16, 1951	Dec. 4, 1952 (²)	\$11,600 100,000	\$2,772.00 16,756.24	50 90	Yes. (²)
Lewis W. Collingwood, Dean W. Collingwood, Dale M. McDermond.	Custer.....	Dyke No. 2.....	Beryl, mica, columbite-tantalite.	Nov. 6, 1952	Nov. 19, 1952	May 27, 1953	5,250	3,260.70	90	Yes.
Francis E. Duncan and E. Boyd Himebaugh. Mineral Mills, Inc.....	.....do..... .....do.....	Last Chance..... Great Northern Lode known as Old Mike also.	Beryl, mica..... .....do.....	Mar. 6, 1953 May 26, 1953	Apr. 20, 1953 June 16, 1953	Aug. 15, 1953 Aug. 4, 1953	3,000 2,100	2,462.40 1,485.00	90 90	Yes. No.
C. E. Weir, L. A. Henderson, and J. H. Schuh.	.....do.....	"Weir Property" various unpatented lode claims.	Uranium.....	June 23, 1953	July 8, 1953	Sept. 24, 1953	11,037	3,948.70	90	No.
Urova Co. C. G. Ortmyer, R. G. Sullivan, and C. R. Boyle.	.....do..... Fall River..	Lakota Lode..... Ripsnotter-Parker Groups.	.....do..... .....do.....	Sept. 21, 1953 May 7, 1953	Oct. 12, 1953 June 18, 1953	(²) (²)	9,780 38,945	(²) (²)	75 90	(²) (²)
Mining Research Corp.	.....do.....	Secs. 14, 15, 22, and 23, T. 8S, R. 3E.	.....do.....	May 14, 1953	May 27, 1953	(²)	52,873	(²)	90	(²)
Oxide Metals Corp.....	.....do.....	South View-Valley View Group.	.....do.....	Aug. 10, 1953	Oct. 1953	Oct. 29, 1953	8,080	2,996.28	90	(⁴)

¹ No work done under contract in 1953, which was terminated on November 25 of that year.

² Contract still in effect as of Dec. 31, 1953.

³ As of Dec. 31, 1953.

⁴ No discovery reported as of Dec. 31, 1953.

tors from 31 deposits. There also were a number of smaller producers recorded only through purchases. The Bureau of Mines continued to investigate the concentration of beryl from pegmatite rocks at its station in Rapid City. A progress report on pegmatite investigations from 1939 through June 1951 was published.²

Columbium-Tantalum.—Columbite-tantalite was recovered as a byproduct in mining other pegmatite minerals. Virtually all the production was sold to the GSA at Custer. Production in 1953 was reported from 14 deposits by 13 operators.

Gold, Silver, and Lead.—During the year 4 lode mines in Custer and Lawrence Counties produced 535,000 fine ounces of gold valued at \$18,725,000; 138,600 fine ounces of silver valued at \$125,500; and 10 short tons of lead valued at \$2,600. Values of recoverable gold and silver in 1953 increased 11 and 5 percent, respectively, over 1952. Values for gold and silver were calculated at \$35 and \$0.9050505 per ounce, respectively, for both 1952 and 1953. The average annual price of lead used was \$0.131 per pound in 1953 and \$0.161 in 1952.

Details of mining and milling in South Dakota are given in the section Review by Counties. Tables 5 and 6 show the quantity of material treated and the gold and silver recovered by amalgamation and cyanidation. The Homestake Mining Co. treats its ore by both amalgamation and cyanidation, which explains the duplication, in tables 5 and 6, of tonnage of material treated.

Iron.—Iron ore was mined in South Dakota in 1953 for use in the State cement plant at Rapid City. The Nemo Ore Co., owned and operated by Pete Lien & Sons of Rapid City, produced 1,100 long tons of hematitic iron ore from an open pit near Nemo in Lawrence County.

Tungsten.—Increased shipments of tungsten concentrate over 1952 was reported.

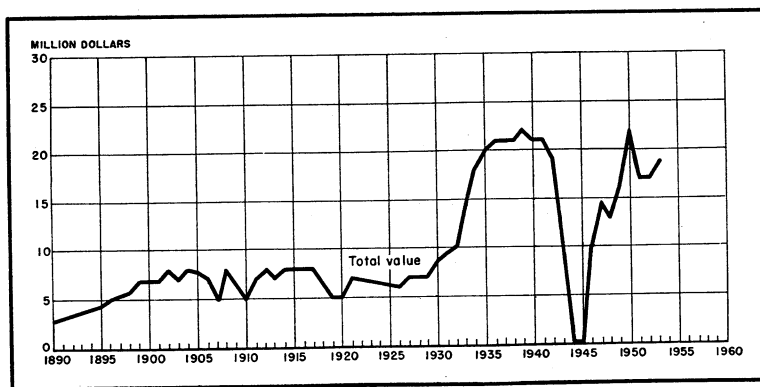


FIGURE 2.—Total value of mine production of gold and silver in South Dakota in 1890–1953

² Runke, S. M., Mullen, D. H., and Cunningham, J. B., Progress Report on Pegmatite Investigation in South Dakota for Fiscal Year Ended June 30, 1951: Bureau of Mines Rept. of Investigations 4928, 1952 46 pp.

TABLE 3.—Mine production of gold, silver, and lead in 1953, by months, in terms of recoverable metals ¹

Month	Gold (fine ounces)	Silver (fine ounces)	Lead (short tons)	Month	Gold (fine ounces)	Silver (fine ounces)	Lead (short tons)
January.....	40,263	10,450	1	August.....	41,349	11,661	-----
February.....	37,627	9,284	-----	September.....	47,858	11,997	-----
March.....	49,867	11,902	-----	October.....	43,671	11,424	-----
April.....	46,483	11,396	-----	November.....	46,103	11,891	-----
May.....	48,199	12,641	2	December.....	51,393	12,999	-----
June.....	37,475	10,724	6	Total.....	534,987	138,642	10
July.....	44,699	12,273	1				

¹ Mine production comprises ore, gravel, or other mineral material sold or treated and metal recovered as natural gold or as bullion from cyanidation or amalgamation and the estimated recoverable metal contained in concentrates, ores, tailings, and other mineral materials shipped directly to smelters or sold to ore buyers within the year.

TABLE 4.—Mine production of gold, silver, copper, lead, and zinc, 1944-48 (average), 1949-53, and total 1876-1953, in terms of recoverable metals ¹

Year	Number of mines		Material sold or treated (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1944-48 (average).....	-----	-----	626,483	252,972	\$8,154,020	65,057	\$55,951
1949.....	5	1	1,230,172	464,650	16,262,750	109,383	98,997
1950.....	2	-----	1,391,162	567,996	19,879,860	142,065	128,576
1951.....	5	3	1,166,380	458,101	16,033,535	139,590	126,336
1952.....	6	-----	1,324,817	482,534	16,888,690	132,102	119,559
1953.....	4	-----	1,479,802	534,987	18,724,545	138,642	125,478
1876-1953.....	-----	-----	(²)	24,339,613	633,483,664	10,556,168	7,685,780

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1944-48 (average).....	(³)	\$54	12	\$2,694	21	\$5,016	\$8,217,735
1949.....	-----	-----	4	1,264	-----	-----	16,363,011
1950.....	-----	-----	-----	-----	-----	-----	20,008,436
1951.....	-----	-----	2	692	-----	-----	16,160,563
1952.....	-----	-----	2	644	-----	-----	17,008,893
1953.....	-----	-----	10	2,620	-----	-----	18,852,643
1876-1953.....	106	36,466	497	71,752	265	56,406	641,334,068

¹ Includes recoverable metal content of gravel washed (placer operations), ore milled, old tailings or slimes re-treated, and ore or old tailings shipped directly to smelters during the calendar year indicated. For production of gold and silver in South Dakota in earlier years, see Mineral Resources, 1913, pt. 1, p. 42; Mineral Resources, 1922, pt. 1, p. 194; and subsequent volumes of Mineral Resources and Minerals Yearbook.

² Figure not available.

³ Less than 1 ton.

TABLE 5.—Gold and silver bullion produced at mills by amalgamation, 1944-48 (average) and 1949-53

Year	Material sold or treated (short tons)	Gold in bullion (fine ounces)	Silver in bullion (fine ounces)	Year	Material sold or treated (short tons)	Gold in bullion (fine ounces)	Silver in bullion (fine ounces)
1944-48 (average).....	567,584	149,172	33,382	1951.....	1,046,305	317,593	62,685
1949.....	1,112,193	312,676	83,538	1952.....	1,209,926	328,844	64,584
1950.....	1,265,118	389,473	111,080	1953.....	1,368,059	365,442	74,608

TABLE 6.—Gold and silver bullion produced at mills by cyanidation, 1944–48 (average) and 1949–53

Year	Material treated (short tons)			Gold in bullion (fine ounces)	Silver in bullion (fine ounces)
	Crude ore	Sands and slimes	Total		
1944–48 (average).....	57, 286	553, 210	610, 496	81, 452	30, 295
1949.....	117, 979	1, 112, 183	1, 230, 162	151, 950	25, 632
1950.....	126, 044	1, 265, 118	1, 391, 162	178, 523	30, 985
1951.....	120, 051	1, 045, 384	1, 165, 435	140, 493	76, 436
1952.....	114, 863	1, 209, 884	1, 324, 747	153, 690	67, 183
1953.....	111, 676	1, 368, 059	1, 479, 735	169, 542	63, 434

Uranium.—Development of uranium deposits in Fall River County progressed rapidly. The buying station at Edgemont operated by the American Smelting & Refining Co. as agent for the Atomic Energy Commission (AEC) operated the entire year. Some consideration was given to establishment of a mill to process the ore. The Hot Springs suboffice of the Raw Materials Division, AEC, was expanded, and investigations were extended into Wyoming, Montana, and North Dakota.

Aerial surveys during the year have shown radiometric anomalies on the northern end of the Black Hills, east of Sturgis in Meade County, and east of Rapid City in Pennington County. The Bureau of Mines completed a drilling project for the AEC on deposits of uraniumiferous lignite in the Slim Buttes area east of Buffalo in Harding County. The project, begun in October 1952, was completed in July 1953 and involved drilling 46 diamond-drill holes totaling 9,758 feet at a cost to the Government of \$97,283.

Exploration of uranium deposits with the assistance of the DMEA continued. Five DMEA contracts involving exploration for uranium were in effect in South Dakota in 1953.

NONMETALS

Cement.—The State-owned cement plant at Rapid City in Pennington County operated the entire year. A new finish grinding mill increased finish grind capacity by 80 percent. Bulk storage capacity was increased 120,000 barrels. Shipments in 1953 exceeded those in 1952 by 168,344 barrels. Limestone and shale used in manufacturing the cement were mined near the plant in Pennington County. Small quantities of gypsum, sand, and iron ore, produced locally were added to produce various types of cement. The plant also produced air-entrained cement and masonry cement. The average value per barrel in 1953 was \$2.67 and in 1952 was \$2.58. This was the only cement plant in South Dakota, and the distribution area extended into all adjoining States and Canada.

Clays.—Clays were produced in Pennington and Butte Counties for the manufacture of cement, lightweight aggregates, building brick, and drain tile. Shale from the Pierre formation near Rapid City was used in manufacturing cement, and lightweight aggregates and shale from the Fuson formation near Belle Fourche were used for building brick and drain tile. Bentonite, produced mainly from Wyoming deposits, was processed at two plants in Belle Fourche.

Feldspar.—Feldspar was produced in Custer and Pennington Counties. The quantity increased 26 percent and the value 45 percent over 1952. Production was by two major operators and numerous smaller operators. The bulk of the production was ground at plants in Custer and Keystone for use in the pottery, glass, and enamel industries.

Gem Stones.—Rose quartz, feldspar, and other pegmatite minerals were produced in Custer and Pennington Counties for sale to tourists as specimens. Agate and chalcedonic quartz are found in Meade and Pennington Counties. No sales were reported in 1953.

Gypsum.—Gypsum was mined from the Spearfish formation about 2 miles north of Rapid City for use by the State-owned cement plant. There has been no production of gypsum for calcining since 1948.

Lime.—Quicklime was produced at Pringle in Custer County. The entire production was used within the State for metallurgical purposes.

Lithium.—Lithium minerals were produced in Custer, Lawrence, and Pennington Counties. Mills at Hill City and Keystone in Pennington County and at Tinton in Lawrence County produced spodumene concentrates. Hand-sorted spodumene was produced in Custer and Pennington Counties, all of which was shipped to Minnesota and New Jersey for processing. Lepidolite and amblygonite were produced in Pennington County. The lepidolite was stockpiled and the amblygonite shipped to Germany.

Mica.—Mica was produced from numerous pegmatite deposits in Custer and Pennington Counties. Hand-cobbed mica was sold to GSA at Custer for processing and only the sheet mica recovered was tabulated in this report. Scrap mica, recovered with other minerals in pegmatite mining, was sold to local buyers and to grinders in consuming centers. Thirty-five producers reported production from 49 deposits. Mica sold or used from 1949–53 is shown in table 7.

TABLE 7.—Mica sold or used by producers, 1949–53

	1949	1950	1951	1952	1953
Sheet mica:					
Uncut punch and circle:					
Pounds.....	7,206	12,560			
Value.....	\$346	\$1,375			
Average per pound.....	\$0.12	\$0.11			
Uncut, larger than punch and circle:					
Pounds.....	1,161	458		1,490	2,921
Value.....	\$2,542	\$309		\$6,580	\$8,983
Average per pound.....	\$2.19	\$0.67		\$13.43	\$9.75
From hand-cobbed mica:					
Pounds.....				1,381	10,253
Value.....				\$25,454	\$68,369
Average per pound.....				\$6.67	\$6.67
Total:					
Pounds.....	8,367	13,018		4,308	11,174
Value.....	\$3,388	\$1,684		\$32,034	\$77,352
Average per pound.....	\$0.40	\$0.13		\$7.44	\$6.92
Scrap mica, Total:					
Short tons.....	1,125	1,902	2,292	915	1,687
Value.....	\$31,285	\$24,989	\$42,714	\$24,148	\$27,388
Average per ton.....	\$27.81	\$13.14	\$18.64	\$26.39	\$16.23
Total sheet and scrap mica:					
Short tons.....	1,129	1,909	2,292	917	1,693
Value.....	\$34,673	\$26,673	\$42,714	\$56,182	\$104,740

¹ Sold to GSA. Sheet mica from hand-cobbed mica was estimated to be 4½ percent of the total hand-cobbed mica purchased by GSA. This is the minimum GSA specification.

² Major part of this production sold to GSA as full trimmed sheet.

TABLE 8.—Sand and gravel sold or used by producers, 1952–53, by classes of operation and uses

	1952			1953		
	Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per ton
COMMERCIAL OPERATIONS						
Sand:						
Building.....	315,915	\$265,679	\$0.84	374,314	\$307,498	\$0.82
Paving.....	177,795	151,328	.85	97,304	73,261	.75
Railroad ballast.....	(1)	(1)	(1)	11,000	8,000	.73
Other.....				180	151	.84
Gravel:						
Building.....	(1)	(1)	(1)	61,373	80,175	1.31
Paving.....	1,678,657	928,403	.55	1,826,987	1,199,671	.66
Railroad ballast.....	76,995	39,099	.51	84,820	60,365	.71
Other.....	1,941	920	.47	5,000	5,000	1.00
Undistributed ¹	43,115	45,615	1.06			
Total commercial sand and gravel.....	2,294,418	1,431,044	.62	2,460,978	1,734,121	.70
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand:						
Building.....	140,150	50,147	.36			
Paving.....	182,747	128,258	.70	66,874	43,628	.65
Gravel:						
Building.....	78,265	4,801	.06	750	203	.27
Paving.....	3,150,560	864,064	.27	2,873,776	1,049,774	.37
Total Government-and-contractor sand and gravel.....	3,551,722	1,047,270	.29	2,941,400	1,093,605	.37
Grand total.....	5,846,140	2,478,314	.42	5,402,378	2,827,726	.52

¹ Figures that may not be shown separately are combined as "Undistributed."

Sand and Gravel.—Sand and gravel deposits are widespread throughout the State, and production was reported from 39 of the 68 counties. Production was from permanent plants on substantial deposits and from small fixed and mobile plants that produce from deposits near points of consumption.

Major uses were for building and road construction. Transportation was chiefly by truck (94 percent) and rail.

Table 8 shows the major categories of use of the sand and gravel produced in South Dakota in 1952–53.

The 10 leading commercial producers of sand and gravel in South Dakota in 1953 were: J. H. Beckman Construction Co., Sioux Falls; Ed Birdsall Sand Co., Rapid City; R. E. Casey Construction Co., Ellendale, N. Dak.; Myrl Clark, Tyndall; Concrete Materials Co., Sioux Falls; Eagle Sand & Gravel Co., Sioux Falls; G. H. Lindekugel & Sons, Mitchell; Northwestern Engineering Co., Rapid City; J. B. O'Connor, Belle Fourche; and Dean R. Rounds, Rapid City.

Stone.—Dimension granite was quarried extensively in Grant County. A portion of the rough stone was cut and polished in Minnesota. The remainder was finished in South Dakota or shipped to other processing centers. The granite was mahogany and red in color and was in demand for building and monumental purposes. A small quantity of miscellaneous stone was produced in Hughes County

for use in monuments. Crushed sandstone, for use as furnace lining, riprap, concrete aggregate, road construction, and railroad ballast, was produced in Hanson and Minnehaha Counties. Limestone was produced in Custer, Lawrence, and Pennington Counties. A small quantity was used as rough building stone; the remainder was crushed and used for cement manufacture, riprap, concrete aggregate, and road construction, railroad ballast and sugar processing. Stone of unspecified type was produced in Beadle and Custer Counties for road construction.

MINERAL FUELS

Lignite.—Lignite occurs extensively in the northwestern counties of South Dakota. Recoverable reserves in South Dakota, assuming 50-percent recovery, have been estimated by the Federal Geological Survey at one-half billion tons.³

Strip mines in Dewey County operated by the Dewey County Coal Co. and the Baker Coal Co. were the only commercial operations reported in 1953.

Coal data in this report cover only mines with an annual output of 1,000 tons or more.

Natural Gas.—Production of natural gas continued in Hughes County. About 5 million cubic feet was produced for local consumption in 1953 from shallow wells near Pierre. This gas is an accumulation of methane derived from organic material trapped in the glacial drift.

Petroleum.—Exploration for petroleum continued in 1953. Activity was concentrated in the northwestern counties on the edge of the Williston Basin, in the productive structure of North Dakota and eastern Montana, and in the southwestern part of the State near the productive area around Newcastle, Wyo.

Although numerous oil showings were discovered in the Ordovician Red River formation, no commercial production was reported in 1953.

REVIEW BY COUNTIES

BEADLE

The county highway department produced sand and gravel for its own use and also had miscellaneous stone and sand and gravel produced for it under contract.

BUTTE

Mineral output in Butte County in 1953 consisted of bentonite, miscellaneous clays, and gravel. The American Colloid Co. and Eastern Clay Products Department of International Minerals & Chemical Corp. operated bentonite-processing plants at Belle Fourche, with most of the material produced in Wyoming. Black Hills Clay Products Co. produced heavy clay products from locally mined shale.

J. B. O'Connor, Belle Fourche, and the county highway department, produced gravel for building and road use.

³ Averitt, Paul, and Berryhill, Louise R., Coal Resources of the United States, a Progress Report, November 1, 1950: Geol. Survey Circ. 94, 1950, 33 pp.

TABLE 9.—Value of mineral production in South Dakota, by counties, 1952-53

County	1952	1953	Minerals produced in 1953, in order of value
Bon Homme	\$212, 969	\$267, 622	Sand and gravel.
Brown	14, 255	78, 011	Do.
Buffalo		165	Do.
Butte	2, 599, 468	2, 820, 579	Clays, sand and gravel.
Charles Mix	5, 000		Sand and gravel.
Clark	54, 592	20, 527	Do.
Corson		268	Do.
Custer	1 261, 757	614, 607	Feldspar, lithium, beryl, mica, stone, columbite-tantalite, lime, lead, silver, gold.
Davison		34, 363	Sand and gravel.
Day	62, 152	75, 413	Do.
Douglas	9, 709	12, 492	Do.
Fall River	39, 604	130, 707	Do.
Grant	2, 470, 299	2, 930, 786	Stone.
Gregory	28, 069	5, 513	Sand and gravel.
Hand	2, 279	3, 093	Do.
Hanson	416, 768	235, 511	Stone.
Jerauld	14, 225	17, 878	Sand and gravel.
Lawrence	17, 112, 759	19, 057, 910	Gold, silver, stone, lithium, sand and gravel, tungsten lead, columbite-tantalite, iron.
Lincoln	40, 175	63, 296	Sand and gravel.
McPherson	2, 600	31, 771	Do.
Meade		2, 318	Sand and gravel, stone.
Minnehaha	1, 404, 857	1, 641, 653	Stone, sand and gravel.
Pennington	1 4, 098, 926	4, 737, 442	Cement, stone, lithium, sand and gravel, feldspar, beryl, mica, clays (lightweight aggregate), columbite-tantalite.
Union	31, 391	9, 683	Sand and gravel.
Undistributed ²	1 1, 573, 155	1, 109, 247	
Total	30, 455, 000	33, 901, 000	

¹ Revised figure.

² Includes value of sand and gravel production and additional minerals in parentheses for the following counties: Aurora (1952), Beadle (stone), Brookings, Brule (1952), Campbell (1953), Clay, Codington, Deuel, Dewey (coal only), Hamlin, Hughes (stone and natural gas both 1952 and 1953: sand and gravel 1952 only), Hutchinson, Hyde (1952), Jackson, Kingsbury, Lake, McCook (stone, 1952), Marshall, Miner (1952), Moody, Roberts (1952), Spink, Sully, Tripp (1953), Turner, and Walworth.

CUSTER

The principal activity in Custer County was production of the pegmatite minerals; feldspar, mica, beryl, columbite-tantalite, and lithium. Operations were widespread. Consolidated Feldspar Department of International Minerals & Chemical Corp. operated its feldspar grinding plant at Custer the entire year. Crude material was obtained from company operations, lessees and purchases from smaller operators. Abingdon Potteries operated their Abingdon mine. All production was shipped to its grinding plant at Abingdon, Ill. Lithium Corporation of America, Inc., operated the Beecher No. 2 mine, producing spodumene ore, which was processed at the Hill City mill; George Bland operated the Beecher, Beecher No. 3 and Black Diamond mines producing scrap mica, beryl, columbite-tantalite, feldspar and a small quantity of spodumene.

John Ross operated the Highland Lode near Custer and has successfully applied a crushing plant and sorting belt to the separation of pegmatite minerals. Minerals produced were scrap mica, beryl, columbite-tantalite, and feldspar. Numerous other operators reported production of pegmatite minerals.

Mica production, mostly hand-cobbed, was reported by 29 operators from 41 deposits. Beryl production was reported by 21 operators from 19 deposits. Columbite-tantalite was produced by 7 operators from 9 deposits. Feldspar was produced by 11 operators. Two operators reported production of lithium (spodumene).

Hand-cobbed mica, beryl and columbite-tantalite was purchased by GSA at Custer. Beryl was purchased by Beryl Ores Co. of Arvada, Colo. Gladys Wells of Custer purchased beryl and scrap mica.

The Black Hills Lime Co. at Pringle produced quicklime, all of which was used in the State for metallurgical purposes. Floyd Stapp Construction Co. produced limestone for building, concrete aggregates, and road construction. John Ross also produced some miscellaneous crushed stone which was sold locally for driveways.

DEWEY

Lignite was produced by the Dewey County Coal Co. at Firesteel and by the Baker Coal Co. at Isabel. Both mines were strip operations.

FALL RIVER

Development of carnotite deposits continued. Facilities of the AEC's suboffice in Hot Springs were expanded. Investigations from this office cover all of Wyoming and Montana. The ore-buying station at Edgemont, operated for the AEC by the American Smelting & Refining Co., purchased ore the entire year. The growing stockpile of material accelerated consideration of the construction of a processing plant at Edgemont.

Sand and gravel for building and road purposes were produced by the Fall River Sand & Gravel Co., Hot Springs; Reitz & Crites Sand Co., Oral; and Dean R. Rounds, Rapid City.

GRANT

Granite was produced for building and monumental purposes from quarries near Milbank and Big Stone City. All granite produced in the State for these purposes was quarried in this county, except for a small quantity in Hughes County. Distribution of both rough and finished stone was widespread. The following companies reported production of granite in 1953:

<i>Name of company and location</i>	<i>Type of granite and use</i>
Dakota Granite Co., Milbank.....	Rough and dressed, monumental.
Delano Granite Works, Inc., Delano, Minn.....	Rough and dressed, building and monumental.
Robert Hunter Granite Co., Milbank.....	Dressed, monumental.
Melrose Granite Co., St. Cloud, Minn.....	Do.
North Star Granite Corp., St. Cloud, Minn.....	Do.
Quarry Center Mfg. Co., St. Cloud, Minn.....	Do.
Steiner Rausch Granite Co., Inc., Ortonville, Minn.	Rough, monumental.

HANSON

Spencer Quarries of Spencer produced crushed sandstone for use in road construction and for refractories.

HARDING

The Federal Bureau of Mines completed a drilling project of uraniumiferous lignites in the Slim Buttes area east of Buffalo in July, 1953. Drill cores were sent to the Federal Geological Survey for examination and analysis.

HUGHES

S. T. Jacobs produced a small quantity of miscellaneous stone, chiefly for use as monuments.

Natural gas was produced in the county from shallow wells. The gas, mostly methane, was derived from organic material trapped in the glacial drift. The gas was used in Pierre for cooking and heating.

LAWRENCE

Gold and silver were the principal mineral products of Lawrence County. These minerals together furnished approximately 56 percent of the total value of all minerals produced in South Dakota in 1953 (excluding uranium).

The State's largest producer of gold and silver, the Homestake Mining Co., operated the Homestake mine at Lead throughout 1953. Production of gold was about 11 percent greater and silver about 15 percent greater than in 1952. The following data are extracted from the company annual report for the year ended December 31, 1953:

In spite of the persistence of conditions that were extremely bad for the gold mining industry, the Homestake Mining Company was able to increase its earnings in 1953 somewhat above those in the previous year. Under the circumstances, the record is particularly gratifying for it reflects the excellent technical work of the operating staff in overcoming the difficulties of the times. Unit costs rose only about 3% though wages and certain other expenses continued to advance with the further depreciation of the paper dollar. The effect of the changes, however, was more than offset by the added revenue from the larger output of bullion obtained from mining and milling around 158,000 tons of ore more than in 1952.

★ ★ ★

The improvement in tonnage is to be attributed both to the adequate number of skilled miners available in the latter part of the year and to more rapid extraction of ore in certain ground resulting from changes in stoping methods. Grade, as anticipated, declined slightly. The average for the year was still above that estimated for the reserves as a whole, and some further decrease in grade is to be expected.

★ ★ ★

The findings of fact by a Commissioner of the United States Court of Claims in the case to determine liability on the part of the Government for losses caused by War Production Board Order L-208 that closed most of the gold mining operations of the country from October 1942 to July 1945 are expected soon. The decision of the Court of Claims itself will undoubtedly be reached in the course of the year. If the question of liability of the Government be decided in favor of the Company, Homestake will then present proof of losses suffered as a result of the shutdown.

★ ★ ★

Guy N. Bjorge, who had served as General Manager in Lead since 1932, retired from this position in May and was succeeded by Abbott H. Shoemaker. Mr. Bjorge will remain with the Company in his capacity of Director and Vice President.

Tonnage milled in 1953 was 1,368,059—an increase of 158,175 tons over 1952. Bullion production was valued at \$18,251,984.24, an increase of \$1,871,998.22 over 1952. Recovered value per ton was \$13.34, giving an extraction of 96.66 per cent compared with \$13.54 and 96.80 per cent in 1952.

Total cost per ton of ore increased 25.6 cents over 1952. However, the development cost increased approximately fifty per cent over 1952, due to better availability of underground labor and the policy decision to reduce the backlog of development work created by the severe labor shortage of the postwar years. Had the same amount per ton for development been spent in 1953 as in 1952, unit costs would have dropped 7.7 cents per ton.

Broken ore in shrinkage stopes decreased from 635,000 to 540,000 tons, due to reduction in the number of shrinkage stopes and an increase in cut and fill. The reserve of developed ore (including broken ore) at January 1, 1954 was 18,437,000 tons compared with 19,256,000 January 1, 1953. The decrease is to be attributed almost entirely to the postponement of development in depth until full facilities have been provided for such work. The Yates and Ross Shafts are now being deepened and preparations are being made for sinking a new interior shaft below the 5,000 level, which at present is the deepest in the mine. An additional two years at least will be required on this major lower level project before significant additions to the reserves can be expected from the downward extension of the known ore bodies. Furthermore, as the mine is deepened, it will be inadvisable to open new levels far in advance of stoping on account of the increasing cost of maintenance of such workings. Therefore, formally blocked out reserves of additional ore reported in future years will in all probability be less than in the past decade, even though comparable quantities of ore may eventually be developed on each successive level.

Installation of the three new grinding units was completed in 1953. Their performance is better than estimated. This resulted in the final elimination of all stamps which had been an integral part of milling since the beginning of operations. In the mine, complete changeover to light drills was effected and replacement of high pressure air haulage by electricity was started.

TABLE 10.—Ore milled, receipts, and dividends, Homestake mine, 1949–53¹

Year	Ore milled (short tons)	Receipts for bullion product		Dividends
		Total	Per ton	
1949	1,112,183	\$15,683,159.05	\$14.1012	\$4,520,880
1950	1,265,118	19,264,048.20	15.2271	5,525,520
1951	1,046,203	15,486,682.10	14.8028	4,319,952
1952	1,209,884	16,379,986.02	13.5385	3,717,168
1953	1,368,059	18,251,984.24	13.3415	4,018,560

¹ From 1876 to 1953, inclusive, this mine yielded bullion and concentrates that brought a net return of \$563,495,851 and paid \$182,757,994 in dividends.

Table 10 presents salient operating data for the Homestake mine for 1949–53.

The Bald Mountain Mining Co. operated its Portland, Dakota, and Clinton group of mines (classed as 1 mine) and 370-ton all-sliming cyanide mill continuously during the year. Production of gold and silver decreased about 5 and 19 percent, respectively, from that in 1952.

The American Mining & Smelting Co. made several small shipments of gold-silver-lead ore from the Silver Queen mine in 1953.

Iron ore was produced from a mine near Nemo by the Nemo Ore Co., owned and operated by Pete Lien & Sons of Rapid City. The hematite ore was used at Rapid City in manufacturing cement.

A contract between Belle Eldridge Gold Mines, Inc., and the DMEA for lead-zinc exploration was terminated in November 1953 with a certification of discovery.

The Black Hills Tin Co. produced spodumene and columbite-tantalite from the Giant Volney dike, operating the mine until September, at which time it was leased to the Bald Mountain Mining Co.; however, operations ceased in November, when the mill was destroyed by fire.

Tungsten ore was produced by H. L. Colburn.

The Cole Construction Co. produced crushed limestone for riprap, road construction, and sugar processing. The Lawrence County Highway Department produced road gravel.

MEADE

The Meade County Highway Department produced road gravel and contracted for crushed limestone for road construction.

MINNEHAHA

Concrete Materials Co. and L. G. Everist, Inc., both of Sioux Falls, produced crushed sandstone for use in road construction, furnace lining, railroad ballast, and riprap. Concrete Materials Co. also produced sand and gravel. Other sand and gravel producers in 1953 included Eagle Sand & Gravel Co. and Frank E. Lacy, both of Sioux Falls; and J. H. Beckman Construction Co. Sand and gravel were produced chiefly for building and road construction.

PENNINGTON

Mineral production was principally cement, clays, limestone, and the pegmatite minerals (feldspar, mica, beryl, columbite-tantalite, and lithium).

The South Dakota State-owned cement plant at Rapid City operated the entire year, producing portland cements and masonry cement. A new finish grinding mill was installed, increasing grinding capacity about 80 percent. Storage silos, increasing capacity 120,000 barrels, were completed.

Lightweight Aggregates, Inc., Rapid City, produced shale for the production of a lightweight aggregate used principally in making concrete blocks.

Hills Materials Co. and Pete Lien & Sons, both of Rapid City, produced crushed limestone for riprap, railroad ballast, concrete aggregate, and road construction. Lithium Corporation of America, Inc., operated the Mateen mine and its flotation mill at Hill City. Maywood Chemical Works operated the Etta mine, shipping spodumene to New Jersey. Consolidated Feldspar Department, International Minerals & Chemical Corp., operated the Hugo mine and its feldspar-grinding plant at Keystone. Much of the crude material is obtained from lessees and small operators. The company also produced scrap mica and beryl.

The Black Hills Keystone Corp. operated the Bob Ingersoll mine, producing beryl, columbite-tantalite, and amblygonite, which was shipped to Germany, and lepidolite, which was stockpiled. The Keystone Feldspar & Chemical Co. operated the Peerless mine, producing beryl, scrap mica, and feldspar. George Flavin completed alterations of the Holy Terror cyanide mill at Keystone and produced spodumene concentrates from material from the Etta dump. A substantial quantity of beryl and columbite-tantalite also was recovered. Jack Pendelton operated the Cobb mine, producing hand-cobbed mica which was sold to GSA at Custer.

Other producers of beryl included Baldwin Sagdalene at the White Cap mine, who also produced feldspar; the B. & M. Corp. from the Sitting Bull mine; Harold Hall from the Hardesty and Big Chief mines; and Cecil Meyer from the Wood Tin mine. Production of columbite-tantalite was reported by Clark Butts at the White Cap mine and Walter Wolff at the Hardesty mine; all of it was sold to GSA at Custer.

The Bureau of Mines operated a pilot plant at its station in Rapid City, investigating methods of concentrating the numerous pegmatite minerals, especially beryl.

Sand and gravel for building and road construction were produced by Ed Birdsall Sand Co., Northwestern Engineering Co., and Dean R. Rounds, all of Rapid City; Richard H. Christie, Wasta; the county highway department; and the Bureau of Public Roads, United States Department of Commerce.

The Mineral Industry of Tennessee

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Geological Survey of Tennessee.

By Avery H. Reed, Jr.¹ and William D. Hardeman, Jr.²



TENNESSEE'S mineral output in 1953 continued at the high level established in 1951 and 1952, with moderate production increases in coal, copper, synthetic fluorspar, gold, lime, manganese ore, petroleum, phosphate rock, sand and gravel, silver, stone and zinc. The total output was valued at 98 million dollars, or about 3 percent less than in 1952, not because of smaller production but chiefly due to the decline in the unit value of zinc. New alltime highs were attained in the production of phosphate rock, sand and gravel, and stone.

TABLE 1.—Mineral production in Tennessee, 1952-53¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Cement.....376-pound barrels..	7,428,604	\$17,834,060	7,276,964	\$18,283,366
Clays.....	1,042,239	3,519,143	1,037,450	3,478,622
Coal.....	5,264,954	25,599,740	5,466,569	25,151,682
Copper (recoverable content of ores, etc.).....	7,620	3,688,080	7,829	4,493,846
Fluorspar (synthetic).....	348	(²)	426	(²)
Gold (recoverable content of ores, etc.).....troy ounces..	241	8,435	293	10,255
Iron ore (recoverable content of ores, etc.) long tons (usable)/gross weight..	(²)	(²)	12,751	82,499
Lead (recoverable content of ores, etc.).....	18	5,796	9	2,358
Lime (open-market).....	100,189	1,005,235	114,474	1,177,461
Manganese ore (metallurgical).....gross weight..	126	(²)	2,625	201,898
Natural gas.....million cubic feet..	107	11,000	89	11,000
Petroleum (crude).....thousand 42-gallon barrels..	15	(²)	³ 16	(²)
Phosphate rock.....long tons..	1,444,737	11,306,438	1,518,912	11,305,098
Sand and gravel.....	5,173,401	5,303,321	5,231,329	5,629,687
Silver (recoverable content of ores, etc.).....troy ounces..	57,569	52,103	68,935	62,390
Stone (except limestone for cement and lime).....	10,377,320	17,652,763	⁴ 10,485,351	⁴ 16,948,053
Zinc (recoverable content of ores, etc.).....	38,020	12,622,640	38,465	8,846,950
Undistributed: Barite, pyrites, stone (crushed granite 1953), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2). Excludes value of clays used for cement.....		2,363,399		2,364,412
Total Tennessee.....		100,932,000		98,050,000

¹ Production as measured by marketable production, mine shipments, or mine sales (including consumption by producers).

² Value included with "Undistributed."

³ Final figure; supersedes preliminary figure given in commodity chapter.

⁴ Excludes certain stone, value for which is included with "Undistributed."

¹ Assistant chief, Mineral Industry Division, Region VII, Bureau of Mines, Knoxville, Tenn.

² Director, Division of Geology, Department of Conservation, Nashville, Tenn.

TABLE 2.—Average unit values of mineral commodities in Tennessee, 1944-48 (average) and 1949-53¹

Commodity	1944-48 (average)	1949	1950	1951	1952	1953
Barite..... short ton.....	(²)	\$10.24	\$10.44	\$12.82	\$12.95	\$14.55
Cement, portland..... 376 pound barrel.....	\$1.80	2.15	2.20	2.40	2.40	2.51
Clays:						
Ball..... short ton.....	10.15	12.55	12.09	9.18	12.98	12.52
Fire..... do.....	5.14	4.93	8.88	9.51	9.57	11.36
Fuller's earth..... do.....	(³)	13.30	14.90	14.19	13.81	13.82
Miscellaneous..... do.....	.82	.71	.72	1.00	1.00	.96
Coal..... do.....	4.20	5.25	5.40	4.99	4.85	4.60
Copper..... pound.....	.22	.20	.21	.24	.24	.29
Granite, crushed..... short ton.....						1.20
Iron ore..... long ton.....				3.97	5.91	6.47
Lead..... pound.....	.22	.16	.14	.17	.16	.13
Lime..... short ton.....	7.54	9.47	9.75	10.08	10.03	10.29
Limestone:						
Crushed..... do.....	1.18	1.23	1.27	1.27	1.25	1.24
Dimension..... do.....	(³)	1.01	.97	.77	1.84	*.79
Manganese ore..... do.....	(⁴)	(⁴)	(⁴)	(⁴)	(⁴)	76.91
Marble:						
Crushed..... do.....	3.43	5.64	5.45	6.78	7.50	5.57
Dimension..... do.....	83.04	83.85	79.72	90.10	90.13	110.51
Natural gas..... thousand cubic feet.....	(⁵)	.10	.10	.09	.10	.12
Phosphate rock ⁶ long ton.....	5.23	6.74	7.24	7.47	7.49	7.55
Sand..... short ton.....	(⁴)	1.26	1.31	1.37	1.25	1.26
Gravel..... do.....	(⁴)	.84	.85	.89	.81	.89
Sandstone:						
Crushed..... do.....	(⁷)	1.67				*5.84
Dimension..... do.....	(⁷)	21.59	20.86	19.10	18.10	21.82
Stone (miscellaneous): Crushed..... short ton.....					1.50	
Zinc..... pound.....	.12	.12	.14	.18	.17	.11

¹ For greater detail on prices by grades and markets, see vol. I, Minerals Yearbook, 1953.

² Data not available.

³ Rubble.

⁴ Figure withheld to avoid disclosure of individual company data.

⁵ Average value of sold or used.

⁶ Refractory.

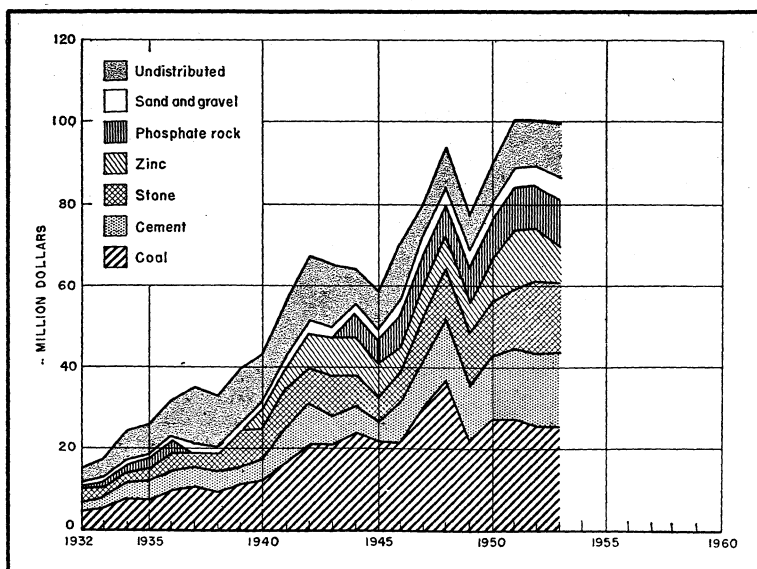


FIGURE 1.—Value of mineral production in Tennessee, 1932-53.

Three Defense Minerals Production Administration contracts were active—one with the Appalachian Mining & Smelting Co. for zinc; another with the Electro Manganese Corp. for electrolytic manganese; and a third with Cramet, Inc., for titanium. No Defense Minerals Exploration Administration projects were active during the year.

REVIEW BY MINERAL COMMODITIES

METALS

Copper.—Production of recoverable copper increased 3 percent over 1952 and value increased 22 percent. The only producer was the Tennessee Copper Co., which mines copper-zinc ores at Copperhill, Polk County.

Gold.—The Tennessee Copper Co. recovered gold as a byproduct from smelting copper-zinc ores; production increased 22 percent over 1952.

Iron Ore.—Monroe County was the source of Tennessee's brown iron ore (limonite). Shipments increased substantially over 1952. Sinter was produced from pyrite in Polk County.

Lead.—The Tennessee Copper Co. recovered lead as a byproduct from smelting copper-zinc ores; production declined 50 percent below that in 1952.

TABLE 3.—Mine production of recoverable gold, silver, copper, lead, and zinc, 1944-48 (average) and 1949-53

Year	Gold		Silver		Copper		Lead		Zinc		Total value
	Fine ounces	Value	Fine ounces	Value	Short tons	Value	Short tons	Value	Short tons	Value	
1944-48 (average) . . .	185	\$6,468	43,631	\$39,488	7,020	\$2,395,010	40	\$8,875	32,001	\$7,700,298	\$10,149,839
1949	171	5,985	41,833	37,861	6,489	2,556,666	257	81,212	29,788	7,387,424	10,069,148
1950	160	5,600	39,958	36,164	6,851	2,850,016	113	30,510	35,326	10,032,584	12,954,874
1951	108	3,780	24,980	22,590	7,069	3,421,396	14	4,844	38,639	14,064,596	17,517,206
1952	241	8,435	57,569	52,103	7,820	3,688,080	18	5,796	38,020	12,622,640	16,377,054
1953	293	10,255	68,935	62,390	7,829	4,493,846	9	2,358	38,465	8,846,950	13,415,799

Manganese Ore.—Johnson and Monroe Counties were the source of Tennessee's manganese ore. All ore shipped was metallurgical grade. Shipments increased to nearly 20 times that of 1952, owing to Government stockpiling. Shipments were 2,625 short tons valued at \$201,898 compared with 126 tons in 1952, none in 1951, 133 tons in 1950, 175 tons in 1949, and an average annual production of 99 tons for period 1944-48.

Pyrite.—Pyrite was mined in Polk County by the Tennessee Copper Co. The mine-run material was milled to produce concentrates of copper, zinc, and cleaned pyrite. The pyrite concentrate was roasted, and the recovered gases used in manufacturing sulfuric acid. The iron oxide sinter was sold to the iron-ore trade.

Silver.—The Tennessee Copper Co. recovered silver as a byproduct from smelting copper-zinc ores; production increased 20 percent over that in 1952.

Zinc.—Jefferson, Knox, and Polk Counties were the source of Tennessee's zinc. The Tennessee Copper Co. recovered zinc from copper-zinc ores in Polk County, and the American Zinc Co. of Tennessee and the Tennessee Coal & Iron Division of the United States Steel Corp. recovered zinc from zinc ores in Jefferson and Knox Counties. The New Jersey Zinc Co. was developing a new zinc deposit near Jefferson City. The production of zinc increased 1 percent above 1952, but its total value declined 30 percent.

A review of all available production data indicates that since 1850, 77,444,000 tons of crude copper, lead, and zinc ores has been mined, of which 12,299,000 tons was direct-smelting ore. The remaining 65,145,000 tons when concentrated yielded 3,334,000 tons of copper, lead, and zinc concentrates. Smelting of the ores and concentrates is estimated to have yielded 22,397 troy ounces of gold, 3,390,444 ounces of silver, 435,000 tons of copper, 16,000 tons of lead, and 1,092,000 tons of zinc, having an aggregate value of \$347,489,000.

NONMETALS

Barite.—Primary barite was mined in Loudon and Monroe Counties. Production decreased 12 percent below that in 1952. Part of the barite was sold as crude, and part was crushed or ground for use in well drilling, glass manufacture, or concrete aggregate.

Cement.—Six counties produced portland cement—Davidson, Franklin, Hamilton, Knox, Marion and Sullivan. Production was about the same as in 1952, but shipments declined 2 percent.

TABLE 4.—Finished portland cement produced, shipped and in stock, 1944-48 (average) and 1949-53, in 376-pound barrels

Year	Production, barrels	Shipment from mills		Stocks at mills on Dec. 31
		Barrels	Value	
1944-48 (average).....	4,916,054	4,626,232	\$8,447,223	435,352
1949.....	6,077,549	5,992,571	12,857,600	296,677
1950.....	6,684,644	6,663,427	14,682,487	317,894
1951.....	7,221,968	7,162,841	17,203,080	377,021
1952.....	7,439,873	7,428,604	17,834,060	388,290
1953.....	7,474,604	7,276,964	18,283,366	585,930

Clays.—Ball clay mined in Henry and Weakley Counties was used for whiteware, art pottery, high-grade tile, kiln furniture, heavy clay products, enamel, rubber filler, and pastes. Production increased 1 percent over 1952.

Fire clay mined in Henry and Roane Counties was used for high-grade tile, kiln furniture and firebrick. Production declined considerably below 1952.

Fuller's earth mined in Henry County was marketed as an absorbent of impurities in the clarification of oils.

Miscellaneous clays came from nine counties (with major production from Davidson, Knox, and Sullivan), for use in the manufacture of cement, heavy clay products, high-grade tile, and kiln furniture.

TABLE 5.—Clays sold or used by producers, 1944-48 (average) and 1949-53

Year	Ball clay		Fire clay		Fuller's earth		Miscellaneous clays		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1944-48 (average).....	121,566	\$1,233,424	23,704	\$121,945	(1)	(1)	1,591,276	\$447,894	736,546	\$1,803,263
1949.....	132,337	1,660,481	41,732	205,770	(1)	(1)	1,716,230	1,507,121	890,299	2,373,372
1950.....	184,434	2,230,526	20,574	182,692	(1)	(1)	1,877,659	1,634,652	1,082,667	3,047,870
1951.....	194,191	1,782,642	23,759	226,009	(1)	(1)	1,942,621	1,287,844	1,160,571	3,296,495
1952.....	163,862	2,127,274	21,290	203,845	25,974	\$358,752	831,113	829,272	1,042,239	3,519,143
1953.....	165,822	2,075,882	(2)	(2)	30,961	427,933	(2)	(2)	1,037,450	3,478,622

¹ Fuller's earth included with miscellaneous clays.

² Figure withheld to avoid disclosure of individual company operations.

Fluorspar (Synthetic).—Synthetic fluorspar was recovered by the Tennessee Valley Authority as a byproduct in the processing of phosphate rock. The total quantity shipped increased 22 percent over 1952.

Lime.—Three operators produced lime in Knox County.

TABLE 6.—Lime sold or used by producers, 1944-48 (average) and 1949-53

Year	Quick		Hydrated		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1944-48 (average).....	133,953	\$951,571	47,171	\$414,268	181,124	\$1,365,839
1949.....	76,502	699,762	40,551	408,377	117,053	1,108,139
1950.....	69,633	620,731	28,599	337,594	98,232	958,325
1951.....	86,776	817,419	22,194	290,455	108,970	1,097,874
1952.....	80,463	791,198	19,726	214,037	100,189	1,005,235
1953.....	(1)	(1)	(1)	(1)	114,474	1,177,461

¹ Figure withheld to avoid disclosure of individual company operations.

Perlite (Expanded).—Crude perlite is not known to occur in Tennessee; however, in 1953 a plant in Nashville, using crude rock imported from deposits in Western States, produced expanded perlite for use mainly as a lightweight aggregate, replacing heavier materials in plaster and concrete.

Phosphate Rock.—The marketable production of phosphate rock increased 5 percent over 1952 and established a new high record. Brown rock was mined in Davidson, Giles, Hickman, and Maury Counties and white rock in Perry County.

TABLE 7.—Marketable production of phosphate rock, 1944-48 (average) and 1949-53

Year	Long tons	Value ¹	Year	Long tons	Value ¹
1944-48 (average) ²	1,395,946	\$7,341,880	1951.....	1,424,516	\$10,798,406
1949.....	1,403,469	9,649,749	1952.....	1,444,737	11,306,438
1950.....	1,472,017	10,739,635	1953.....	1,518,912	11,305,098

¹ Estimated from value of sold or used.

² Includes small quantity of apatite from Virginia, 1944-47.

TABLE 8.—Phosphate rock sold or used by producers, by uses, 1952-53

Use	1952		1953	
	Long tons	Value ¹	Long tons	Value ¹
Elemental phosphorus.....	925, 941	\$6, 930, 774	1, 197, 417	\$9, 254, 796
Direct application to the soil.....	237, 786	1, 781, 017	191, 440	1, 234, 808
Ordinary superphosphate.....	249, 902	1, 871, 766	79, 844	602, 822
Triple superphosphate.....			62, 376	470, 939
Other fertilizers.....			54, 876	414, 314
Stock and poultry feed.....	21, 680	162, 383	21, 365	161, 306
Fertilizer filler.....	15, 374	115, 151	13, 157	99, 335
Other uses.....	1, 825	13, 669	1, 695	12, 797
Total.....	1, 452, 508	10, 874, 760	1, 622, 170	12, 251, 117

¹ Estimated from company reports.

Sand and Gravel.—Sand and gravel production established new high records. The total quantity sold or used increased 1 percent over 1952.

TABLE 9.—Sand and gravel sold or used by producers, 1944-48 (average) and 1949-53

Year	Sand		Gravel		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1944-48 (average).....	(1)	(1)	(1)	(1)	3, 520, 285	\$3, 295, 771
1949.....	1, 537, 547	\$1, 943, 208	2, 518, 851	\$2, 111, 255	4, 056, 398	4, 054, 463
1950.....	1, 938, 970	2, 535, 322	2, 213, 714	1, 875, 783	4, 152, 684	4, 411, 105
1951.....	2, 191, 729	3, 002, 191	2, 453, 312	2, 184, 426	4, 645, 041	5, 186, 617
1952.....	2, 531, 528	3, 156, 770	2, 641, 873	2, 146, 551	5, 173, 401	5, 303, 321
1953.....	2, 603, 874	3, 288, 086	2, 627, 455	2, 341, 601	5, 231, 329	5, 629, 687

¹ Figure withheld to avoid disclosure of individual company operations.

TABLE 10.—Sand and gravel sold or used by producers, by uses, 1952-53

Use	1952		1953	
	Short tons	Value	Short tons	Value
Sand:				
Paving.....	1, 052, 717	\$882, 004	1, 095, 188	\$964, 589
Structural.....	1, 083, 696	1, 296, 831	1, 006, 132	1, 235, 398
Molding.....	256, 722	725, 584	386, 657	852, 117
Other.....	(1)	(1)	115, 897	235, 982
Gravel:				
Paving.....	1, 443, 919	800, 266	1, 325, 875	832, 260
Structural.....	980, 031	1, 151, 241	1, 052, 255	1, 294, 037
Railroad ballast.....	7, 250	5, 438	(2)	(2)
Other.....	(1)	(1)	249, 325	215, 304
Total.....	5, 173, 401	5, 303, 321	5, 231, 329	5, 629, 687

¹ Figure withheld to avoid disclosure of individual company operations; included with "Total."

² Figure withheld to avoid disclosure of individual company operations; included with "Other."

Stone.—Granite was quarried in Carter and Hancock Counties for concrete and road metal.

Fifty-two of the State's 95 counties contributed to Tennessee's crushed-limestone production, which established new records in 1953. Leading counties were Davidson, Hamilton, Knox, and Roane.

Dimension limestone quarried in Davidson and Hamilton Counties was used for rubble and rough construction.

Crushed marble from Blount and Knox Counties was used for terrazzo, riprap, and agricultural purposes.

Dimension marble was quarried in Blount and Knox Counties for rough building stone, cut and sawed dressed building stone, and dressed monumental use.

Crushed and dimension sandstone was produced in Cumberland County.

TABLE 11.—Crushed and broken stone sold or used by producers, 1944-48 (average) and 1949-53¹

Year	Limestone		Marble		Sandstone		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1944-48 (average).....	6,068,368	\$7,187,580	20,620	\$70,792	(²)	(²)	³ 6,088,988	³ \$7,258,372
1949.....	7,529,950	9,246,303	18,260	102,974	(²)	(²)	³ 7,548,210	³ 9,349,277
1950.....	7,880,040	9,971,731	20,620	112,317	-----	-----	7,900,660	10,084,048
1951.....	8,778,055	11,176,605	21,444	145,438	-----	-----	8,799,499	11,322,043
1952.....	10,250,723	12,790,302	15,381	115,424	-----	-----	10,266,104	12,905,726
1953.....	10,373,162	12,870,198	31,142	173,398	1,200	\$7,132	³ 10,405,504	³ 13,050,728

¹ Except limestone for cement or lime.

² Figure withheld to avoid disclosure of individual company operations.

³ Incomplete total; excludes sandstone, 1944-49, and granite, 1953.

TABLE 12.—Crushed limestone sold or used by producers, by uses, 1952-53¹

Use	1952		1953	
	Short tons	Value	Short tons	Value
Concrete and road metal.....	8,414,456	\$10,263,890	8,549,948	\$10,543,058
Railroad ballast.....	554,488	525,500	723,232	720,456
Agriculture.....	532,251	729,036	712,004	918,100
Other uses.....	749,528	1,271,876	387,978	688,584
Total.....	10,250,723	12,790,302	10,373,162	12,870,198

¹ Except for cement or lime.

TABLE 13.—Dimension stone sold or used by producers, 1944-48 (average) and 1949-53

Year	Limestone		Marble		Sandstone		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1944-48 (average).....	(¹)	(¹)	17,420	\$1,533,684	(²)	(²)	(¹)	(¹)
1949.....	3,040	\$3,066	37,420	3,137,786	24,860	\$536,819	65,320	\$3,677,671
1950.....	3,710	3,604	36,800	2,933,878	37,420	780,758	77,930	3,718,240
1951.....	1,082	835	38,215	3,443,110	(²)	(²)	(²)	(²)
1952.....	3,226	5,926	42,940	3,870,006	46,769	846,684	92,935	4,722,616
1953.....	2,214	1,739	24,826	2,743,733	52,785	1,151,853	79,825	3,897,325

¹ Data not available.

² Figure withheld to avoid disclosure of individual company operations.

TABLE 14.—Dimension marble sold or used by producers, by uses, 1952-53

Use	1952		1953	
	Cubic feet	Value	Cubic feet	Value
Building:				
Interior, cut, dressed.....	146,302	\$2,322,069	117,803	\$1,970,683
Interior, rough.....	235,176	566,359	85,966	260,949
Interior, sawed, dressed.....	41,596	351,473	28,170	217,467
Monumental: Cut, dressed.....	4,977	65,441	3,754	56,922
Other uses.....	77,122	564,664	56,377	237,712
Total.....	505,173	3,870,006	292,070	2,743,733

MINERAL FUELS

Coal.—Coal was mined in 18 counties, of which Anderson, Campbell, and Marion were the largest producers. More details of coal production will be found in volume II of Minerals Yearbook, 1953.

TABLE 15.—Production of coal, 1944-48 (average) and 1949-53

Year	Short tons	Value	Year	Short tons	Value
1944-48 (average).....	6,379,324	\$26,762,604	1952.....	5,264,954	\$25,559,740
1949.....	4,172,272	21,894,594	1953.....	5,466,569	25,151,682
1950.....	5,069,800	27,360,273	Total production, earliest records to date.....	345,515,000	(1)
1951.....	5,400,946	26,956,174			

¹ Data not available.

Natural Gas.—Production of natural gas was 89 million cubic feet compared with 107 million cubic feet in 1952.

Petroleum.—Production of crude petroleum was 16,000 barrels compared with 15,000 barrels in 1952.

REVIEW BY COUNTIES

ANDERSON

Coal production was 730,400 tons valued at \$3,396,300 compared with 518,300 tons valued at \$2,555,300 in 1952. The Anderson County Highway Department operated Dail & Taylor's quarries, and Ralph Rogers & Co., Inc., operated a quarry; production of crushed limestone for concrete and road metal was considerably less than in 1952.

BEDFORD

The Bedford County Highway Department continued as the only producer of crushed limestone in the county; the total quantity was 47,900 tons valued at \$38,300 compared with 48,000 tons valued at \$38,400 in 1952.

TABLE 16.—Value of mineral production in Tennessee, 1952-53, by counties,¹ and principal minerals² produced in 1953

County	1952	1953	Principal minerals produced in 1953 in order of value ³
Anderson.....	\$4,391,450	\$3,899,750	Coal, limestone.
Bedford.....	38,400	38,324	Limestone.
Benton.....	554,976	490,348	Sand and gravel.
Bledsoe.....	129,164	181,465	Coal.
Blount.....	866,238	835,893	Marble, limestone.
Campbell.....	(⁴)	5,091,428	Coal, limestone, sand and gravel.
Carter.....	333,610	(⁴)	Limestone, granite.
Claiborne.....	3,917,824	2,855,633	Coal.
Cocke.....	63,935	45,313	Limestone.
Cumberland.....	1,267,302	(⁴)	Sandstone, limestone, coal.
Davidson.....	4,658,229	4,344,057	Cement, limestone, sand and gravel, miscellaneous clays, phosphate rock.
Decatur.....	(⁴)	21,000	Sand and gravel.
De Kalb.....	(⁴)	25,526	Limestone.
Fayette.....	(⁴)	6,607	Sand and gravel.
Fentress.....	(⁴)	781,604	Coal, limestone.
Franklin.....	2,707,956	(⁴)	Cement, limestone, sand and gravel.
Gibson.....	1,668	(⁴)	(⁴)
Giles.....	1,869,021	1,463,393	Phosphate rock, sand and gravel.
Grainger.....	38,330	42,528	Limestone.
Grundy.....	1,626,673	913,363	Coal.
Hamilton.....	5,062,158	(⁴)	Cement, limestone, coal, miscellaneous clays.
Hancock.....	24,228	(⁴)	Limestone, granite.
Hawkins.....	41,849	60,000	Limestone.
Haywood.....	11,100	8,635	Sand and gravel.
Henry.....	1,692,703	(⁴)	Ball clay, fuller's earth, fire clay, miscellaneous clays.
Hickman.....	4270,565	(⁴)	Phosphate rock.
Humphreys.....	799,910	714,659	Limestone, sand and gravel.
Johnson.....	174,000	341,251	Manganese ore, limestone.
Knox.....	15,144,702	12,918,766	Cement, zinc, marble, limestone, lime, sand and gravel, miscellaneous clays.
Lake.....	(⁴)	119,397	Sand and gravel.
Lauderdale.....	16,837	104,005	Do.
Marion.....	8,252,319	9,852,630	Coal, cement, sand and gravel, limestone.
Maury.....	10,383,330	(⁴)	Phosphate rock, limestone.
McMinn.....	(⁴)	226,750	Limestone.
Meigs.....	45,616	(⁴)	Do.
Montgomery.....	(⁴)	297,311	Limestone, sand and gravel.
Morgan.....	1,717,800	1,592,911	Coal.
Obion.....	45,501	42,928	Sand and gravel.
Perry.....	39,372	(⁴)	Limestone, phosphate rock.
Pickett.....	44,160	45,940	Coal, limestone.
Putnam.....	1,523,197	(⁴)	Do.
Roane.....	499,233	(⁴)	Limestone, fire clay.
Robertson.....	(⁴)	208,125	Limestone.
Scott.....	1,320,967	1,230,925	Coal.
Squatchie.....	457,507	370,494	Do.
Sevier.....	245,125	(⁴)	Limestone.
Shelby.....	40,100	1,031,574	Sand and gravel, miscellaneous clays.
Stewart.....	(⁴)	(⁴)	(⁴)
Sullivan.....	3,113,916	3,722,828	Cement, limestone, miscellaneous clays.
Sumner.....	191,522	(⁴)	Limestone, sand and gravel.
Tipton.....	(⁴)	552,773	Sand and gravel.
Unicoi.....	357,877	(⁴)	Sand and gravel, limestone.
Union.....	120,000	54,000	Limestone.
Van Buren.....	62,367	(⁴)	Coal, limestone.
White.....	533,285	(⁴)	Limestone, coal.
Williamson.....	381,036	(⁴)	Limestone, sand and gravel.
Undistributed ⁴	25,904,942	43,514,866	(⁴)
Total.....	100,932,000	98,050,000	

¹ County figures exclude barite, fluorspar (synthetic), manganese ore (1952), petroleum and pyrite.

² Other than barite, fluorspar (synthetic), petroleum, and pyrite.

³ Figure withheld to avoid disclosure of individual company operations; included in "Undistributed."

⁴ Estimate.

⁵ Includes value for barite, fluorspar (synthetic), manganese ore (1952 only), natural gas, petroleum, and pyrite; also value of production for the following counties: Bradley (1952), Campbell (1952), Cannon (1953), Carter (1953), Cheatham (1953), Coffee (1953), Cumberland (1953), Decatur (1952), Fayette (1952), Fentress (1952), Franklin (1953), Green (1952-53), Hamilton (1953), Hancock (1953), Henderson (1952-53), Henry (1953), Hickman (1953), Jefferson (1952-53), Loudon (1952-53), Macon (1953), Marshall (1952-53), Maury (1953), McMinn (1952), McNairy (1953), Meigs (1953), Monroe (1952-53), Montgomery (1952), Overton (1952-53), Perry (1953), Polk (1952-53), Putnam (1953), Rhea (1952-53), Roane (1953), Robertson (1952), Rutherford (1952-53), Sevier (1953), Shelby (1952), Sumner (1953), Unicoi (1953), Van Buren (1953), Warren (1952-53), Washington (1953), Wayne (1952-53), Weakley (1952-53), White (1953), Williamson (1953), Wilson (1952-53).

BENTON

The Hardy Sand Co., Kimball's Mineral Supplies, Inc., the Memphis Stone & Gravel Co., and Porter-Warner Industries, Inc., produced sand and gravel, which was marketed as molding, structural, and furnace sand and paving gravel.

TABLE 17.—Sand and gravel sold or used by producers in Benton County, 1949–53

Year	Short tons	Value	Year	Short tons	Value
1949.....	521, 271	\$521, 271	1952.....	357, 901	\$564, 976
1950.....	372, 173	490, 954	1953.....	(¹)	490, 348
1951.....	357, 986	561, 738			

¹ Figure withheld to avoid disclosure of individual company operations.

BLEDSOE

Coal production was 51,800 tons valued at \$181,500 compared with 46,100 tons valued at \$129,200 in 1952.

BLOUNT

Sam Lambert & Son and the Blount County Highway Department crushed limestone for concrete and road metal and for agricultural purposes; production was 238,000 tons valued at \$302,000. The John J. Craig Co. opened 2 new quarries—the Crisp and the Marmor—and continued to operate the Hamil quarry; both crushed and dimension marble was produced—16,400 tons of crushed valued at \$124,000 and 8,400 tons of rough and dressed building stone valued at \$410,000.

BRADLEY

Two operators crushed limestone for concrete and road metal and for agricultural purposes; production was considerably less than in 1952.

CAMPBELL

Coal production was 850,000 tons valued at \$4,904,000 compared with 923,000 tons valued at \$5,364,000 in 1952. The Campbell County Highway Department operated the Jacksboro quarry and crushed limestone for concrete and road metal, agriculture, and other uses; production was 72,300 tons valued at \$127,100 compared with 70,400 tons valued at \$136,800 in 1952. The Silica Sand Co., Inc., mined structural, grinding, and polishing sand, production was 72,300 tons valued at \$60,000.

CANNON

S. N. McPherson reopened the Norvell quarry and crushed limestone for concrete and road metal.

CARTER

The Blue Ridge Stone Co. crushed granite for concrete and road metal; production was considerably more than in 1952. One operator crushed limestone for concrete and road metal and for railroad ballast; production increased 40 percent above 1952.

CHEATHAM

Lambert Brothers, Inc., quarried a small quantity of crushed limestone for concrete and road metal.

CLAIBORNE

Coal production was 633,200 tons valued at \$2,855,600 compared with 765,200 tons valued at \$3,917,800 in 1952.

COCKE

The Cocke County Highway Department opened the Burnett quarry and continued to operate the Briar Thicket quarry, crushing limestone for concrete and road metal; production was 31,800 tons valued at \$48,300 compared with 32,200 tons valued at \$51,500 in 1952.

COFFEE

The D & D Rock Co. opened a new limestone quarry for concrete and road metal.

CUMBERLAND

Coal production was 28,900 tons valued at \$122,900 compared with 31,200 tons valued at \$113,800 in 1952. Two operators crushed limestone for concrete and road metal, blast-furnace flux, railroad ballast, glass manufacture, paper filler, and agricultural uses; production decreased 20 percent below 1952. Crushed-sandstone production was 1,200 tons valued at \$7,100; dimension-sandstone production for rubble, rough architectural, and dressed building stone and flagging was 52,800 tons valued at \$1,151,900. Sandstone producers were: The Crab Orchard Stone Co. (Peck quarry), the Hembree Stone Co., Dock Hinch, Jr., Stella Shearer, the Tennessee Stone Co. (McGuire quarry), and Turner Bros. Stone Co., Inc.

DAVIDSON

The Marquette Cement Mfg. Co. operated its Nashville mill throughout the year; shipments of portland cement declined 8 percent below 1952. W. G. Bush & Co., Inc., and L. T. Lewis & Sons mined miscellaneous clays for heavy clay products; production increased 16 percent over 1952. Three operators crushed limestone for concrete and road metal, riprap, railroad ballast and agricultural uses; production decreased 13 percent below 1952. The Davidson County Highway Department quarried 1,800 tons of building stone valued at \$1,300. Expanded perlite was produced at the Nashville plant of Tennessee Products & Chemicals Corp. The Harsh Phosphate Co. mined brown phosphate rock for fertilizer filler; marketable production decreased 13 percent below 1952. The Cumberland River Sand Co. and the Corps of Engineers, United States Army, mined structural and paving sand and gravel; production decreased 15 percent below 1952.

DECATUR

The Tinker Sand & Gravel Co. mined 21,000 tons of structural sand and gravel valued at \$21,000.

DE KALB

The De Kalb County Highway Department reopened the Sligo quarry and crushed 23,200 tons of limestone valued at \$25,500 for concrete and road metal.

FAYETTE

The Fayette County Highway Department mined 80,500 tons of paving gravel valued at \$6,600.

FENTRESS

Coal production was 134,700 tons valued at \$602,200 compared with 177,900 tons valued at \$829,300 in 1952. Frogge & Williams, Inc. (Reagan and Wright quarries), crushed limestone for concrete and road metal and for agricultural use, production was 143,500 tons valued at \$179,400.

FRANKLIN

The Marquette Cement Mfg. Co. operated the Cowan mill throughout the year; shipments of portland cement increased 4 percent over 1952. The Cowan Stone Co. (Anderson and Cowan quarries) and the Franklin County Highway Department (Bostick quarry) crushed limestone for concrete and road metal, fluxing stone, railroad ballast, agricultural use, and glass manufacture; production was 362,300 tons valued at \$436,900, compared with 419,100 tons valued at \$495,200 in 1952. The Cumberland River Sand Co. and the Estill Springs Sand-Gravel Co. produced glass, molding, paving, engine, blast, filter, and other sand and structural sand and gravel; production declined 39 percent below 1952.

GILES

The International Minerals & Chemical Corp. (Wales mine) mined brown phosphate rock for stock and poultry feed, elemental phosphorus, direct application to the soil, and other uses. The Giles County Highway Department mined 52,900 tons of paving gravel compared with 45,400 tons in 1952.

GRAINGER

The Grainger County Highway Department mined 52,900 tons of paving gravel valued at \$5,300 compared with 45,400 tons valued at \$3,400 in 1952.

GREENE

The Greene County Highway Department (Ratcliffe quarry) and Malone Bros. crushed limestone for concrete and road metal and for agricultural use; production increased 53 percent over 1952.

GRUNDY

Coal production was 237,900 tons valued at \$913,400 compared with 375,700 tons valued at \$1,627,000 in 1952.

HAMILTON

The General Portland Cement Co. operated the Signal Mountain mill throughout the year; shipments decreased 17 percent below 1952. The Key-James Brick Co. and the B. Mifflin-Hood Co. mined miscellaneous clays for heavy clay products and high-grade tile, production increased 8 percent above 1952. Coal production was 58,000 tons valued at \$201,200 compared with 209,100 tons valued at \$744,200 in 1952. The Avondale Stone Co., the Chattanooga Rock Products Co., and the City of Chattanooga crushed limestone for concrete and road metal, asphalt filler, and agricultural use; production was 783,400 tons valued at \$1,309,000. The Avondale Stone Co. quarried 425 tons of dimension limestone for rubble valued at \$425 compared with 526 tons valued at \$526 in 1952.

HANCOCK

The Hancock County Highway Department crushed granite for concrete and road metal.

HAWKINS

The Hawkins County Highway Department crushed limestone for concrete and road metal; production was 25,000 tons valued at \$60,000 compared with 25,000 tons valued at \$40,000 in 1952.

HAYWOOD

The Haywood County Highway Department mined 97,100 tons of paving gravel valued at \$8,600 compared with 124,900 tons valued at \$11,100 in 1952.

HENDERSON

The Ayers Mineral Co. produced molding sand; production decreased 8 percent below 1952.

HENRY

The Dixie Brick & Tile Co., the Kentucky-Tennessee Clay Co., and the H. C. Spinks Clay Co. mined ball clay for whiteware and high-grade tile; production increased 4 percent above 1952. The Kentucky-Tennessee Clay Co. mined fire clay for saggars and firebrick; production was 15,300 tons valued at \$174,900 compared with 21,300 tons valued at \$203,800 in 1952. The Southern Clay Co., Inc. (Porter Creek mine), and the Tennessee Absorbent Clay Co. (Paris mine) mined fuller's earth for use as an absorbent in oil clarification; production was 31,000 tons valued at \$427,900 compared with 26,000 tons valued at \$358,800 in 1952. The Kentucky-Tennessee Clay Co. mined miscellaneous clays for kiln furniture use.

HICKMAN

The Highland Mining Co. and the Owens Agricultural Phosphate Co. mined brown phosphate rock for direct application to the soil; marketable production was considerably greater than in 1952.

HUMPHREYS

The Franklin Limestone Co. (Rock Hill quarry) crushed limestone for riprap, concrete and road metal, railroad ballast, and agricultural use; production increased 17 percent over 1952. T. L. Herbert & Sons and the Sangravel Co., Inc., mined engine sand and structural, paving, and railroad ballast sand and gravel; production decreased 34 percent below 1952.

JEFFERSON

A small quantity of lead was recovered during the smelting of zinc concentrate produced by the American Zinc Co. of Tennessee. The American Zinc Co. of Tennessee and the Tennessee Coal & Iron Division of United States Steel Corp. recovered crushed limestone as a byproduct from zinc mining; the limestone was used for concrete and road metal, railroad ballast, agricultural and other uses. The American Zinc Co. of Tennessee (Athletic, Grasselli, Jarnagin, and North Friends Station mines) and the Tennessee Coal & Iron Division of United States Steel Corp. (Davis-Bible mine) recovered zinc from zinc ores; production of recoverable metal increased 3 percent over 1952, but its total value decreased 29 percent.

JOHNSON

The Maymead Lime Co. crushed limestone for concrete and road metal and for agricultural use; production increased 3 percent over 1952. The Ore Processing Corp. of Virginia (Brettler mine) and the Valley Mining Co., Ltd. (Scott, King and McQueen mines), produced metallurgical-grade manganese ore.

KNOX

The Volunteer Portland Cement Co. operated the Knoxville mill throughout the year; shipments of portland cement increased 6 percent over 1952. The Cherokee Shale Brick Co. and the General Shale Products Corp. mined miscellaneous clays for heavy clay products; production increased 58 percent over 1952. The Knoxville Lime Manufacturing Co., the Standard Lime & Cement Co., and the Williams Lime Manufacturing Co. produced 114,500 tons of lime valued at \$1,177,000 compared with 100,200 tons valued at \$1,005,000 in 1952. The American Zinc Co. of Tennessee recovered crushed limestone as a byproduct from milling zinc ores; the American Limestone Co. (Holston quarry), Burkhart Quarry Supplies, Inc., the Knox County Highway Department (Biagotti, Freeway, Kennedy, Neuberts and Tecoa quarries), Lambert Brothers, Inc., the Oliver King Sand & Lime Co., Inc., and the Tennessee State Highway Department produced crushed limestone. The limestone produced by these companies was used for concrete and road metal, railroad ballast, and agricultural and other applications. The Appalachian Marble Co. (Appalachian and Bond Pink quarries), the Gray Knox Marble Co., the Knoxville Crushed Stone Co., and Tennessee Marble, Inc., produced crushed marble for riprap and terrazzo and dimension marble for rough and dressed interior building stone and cut, dressed, monumental stone; crushed-marble production was 14,800 tons valued at

\$49,400 and dimension-marble output 17,100 tons valued at \$2,334,000. The Holston Sand & Materials Co., the Knoxville Sangravel Material Co., and the Oliver King Sand & Lime Co., Inc., produced molding, polishing, and engine sand, and structural and paving sand and gravel, production increased 5 percent over 1952. The American Zinc Co. of Tennessee operated the Mascot No. 2 mine; recoverable zinc was about the same as in 1952, but its total value decreased 31 percent.

TABLE 18.—Crushed limestone sold or used by producers in Knox County, 1949-53¹

Year	Short tons	Value	Year	Short tons	Value
1949-----	1,315,483	\$1,731,463	1952-----	1,725,685	\$2,251,609
1950-----	1,254,340	1,794,722	1953-----	1,291,678	1,801,016
1951-----	(?)	1,830,596			

¹ Except for cement or lime.

² Figure withheld to avoid disclosing individual company operations.

LAKE

The United States Army Corps of Engineers mined 159,200 tons of paving sand valued at \$119,400.

LAUDERDALE

The United States Army Corps of Engineers mined 174,100 tons of paving sand and gravel valued at \$104,000 compared with 227,300 tons valued at \$16,800 in 1952.

LOUDON

Crude barite was mined by B. C. Wood (Sandy mine); production decreased 40 percent below 1952. The Old Hickory Brick Co. (Maryville mine) mined clays for heavy clay products; production was 20,000 tons valued at \$6,900 compared with 18,000 tons valued at \$18,000 in 1952. Lambert Brothers, Inc. (Greenback quarry), crushed limestone for concrete and road metal; production decreased 81 percent below 1952.

MACON

One operator crushed limestone for concrete and road metal.

MARION

The Pennsylvania-Dixie Cement Corp. operated the Richard City mill throughout the year; shipments of portland cement decreased 1 percent below 1952. Coal production was 1,209,000 tons valued at \$6,056,000 compared with 869,200 tons valued at \$4,807,000 in 1952. The Campbell Limestone Co. crushed limestone for concrete and road metal. The Dixie Sand & Gravel Corp. mined structural and paving sand and gravel; production was considerably greater than in 1952.

MARSHALL

The Lewisburg Limestone Co. crushed limestone for concrete and road metal and for agricultural use; production increased 21 percent over 1952.

MAURY

The Tennessee Valley Authority recovered synthetic fluorspar as a byproduct from processing phosphate rock; shipments were 426 tons compared with 348 tons in 1952. The Columbia Rock Products Corp. (Theta Pike quarry) crushed limestone for concrete and road metal and for agricultural and other uses; production increased 1 percent over 1952. Brown phosphate rock for superphosphate, triple superphosphate, metaphosphate, direct application to the soil, fertilizer filler, stock and poultry feed, pig-iron blast furnaces, and elemental phosphorus was mined by the Armour Fertilizer Works (McKennon mine), the International Minerals & Chemical Corp. (Mount Pleasant mine), the Mine Equipment Co., the Monsanto Chemical Co. (Monsanto mine), J. T. Prince, the Tennessee Valley Authority, the Victor Chemical Works, the Virginia-Carolina Chemical Corp., and several small producers.

TABLE 19.—Marketable production of phosphate rock in Maury County, 1949-53

Year	Long tons		Value ¹	Year	Long tons		Value ¹
	Rock	P ₂ O ₅ content			Rock	P ₂ O ₅ content	
1949.....	1, 262, 073	345, 265	\$8, 765, 305	1952.....	1, 260, 235	331, 156	\$9, 921, 803
1950.....	1, 285, 657	361, 184	9, 589, 923	1953.....	1, 259, 241	326, 052	9, 558, 237
1951.....	1, 256, 955	341, 027	9, 679, 470				

¹ Estimated from value of sold or used.

McMINN

The McMinn County Highway Department and Floyd D. Webb crushed 170,000 tons of limestone valued at \$226,800 for concrete and road metal and for agriculture.

McNAIRY

Worsham Bros. mined glass sand and paving gravel.

MEIGS

W. D. Carter and Posey & Caldwell crushed limestone for concrete and road metal and for agricultural use; production was considerably more than in 1952.

MONROE

L. A. Wood (Stephens & Ballard mine) mined crude barite; production increased 4 percent over 1952. The Monroe Mining Co. (Lindermann mine) mined 12,800 long tons of brown iron ore valued at \$82,500 for blast-furnace use. The Monroe County Highway Department (Tallent quarry) crushed limestone for concrete and road metal; production was 72,100 tons valued at \$90,100 compared with 84,600 tons valued at \$76,200 in 1952. The Consolidated High Grade Ore Co. (Heiskell mine) mined metallurgical-grade manganese ore; shipments were considerably larger than in 1952.

MONTGOMERY

The Clarksville Stone Co. and the Simpson Stone Co. crushed limestone for concrete and road metal and for agricultural use; production was considerably larger in 1952. The Cumberland River Sand Co. mined structural and paving sand and gravel; production decreased 46 percent below 1952.

MORGAN

Coal production was 305,700 tons valued at \$1,593,000 compared with 327,200 tons valued at \$1,718,000 in 1952.

OBION

The Gibson County Highway Department and the Obion County Highway Department mined paving gravel; production was 130,600 tons valued at \$42,900 compared with 122,900 tons valued at \$45,500 in 1952.

OVERTON

Coal production was 141,800 tons valued at \$486,500 compared with 60,200 tons valued at \$215,100 in 1952. The Arnold Rock Co. crushed limestone for concrete and road metal and for agricultural use; production increased 25 percent over 1952.

PERRY

Charlie Elkins crushed limestone for concrete and road metal and for agricultural use; production increased 17 percent over 1952. The Perry County Phosphate Co. mined white phosphate rock for elemental phosphorus.

PICKETT

Coal production was 6,200 tons valued at \$30,500. The Pickett County Highway Department (Amonette quarry) crushed limestone for concrete and road metal; production was 10,300 tons valued at \$15,500 compared with 17,700 tons valued at \$22,100 in 1952.

POLK

The Tennessee Copper Co. (Boyd, Burra-Burra, Galloway-Mary, and Eureka mines) mined sulfide ores, which yielded copper concentrate, pyrite concentrate, and zinc concentrate; small quantities of gold, lead, and silver were recovered as byproducts from smelting the copper and zinc concentrates. The Tennessee Copper Co. recovered 7 tons of lead valued at \$1,800 compared with 17 tons valued at \$5,500 in 1952. The Campbell Lime & Stone Co. and the Polk County Highway Department crushed limestone for concrete and road metal; production was considerably larger in 1952. Pyrite production was about the same as in 1952. Zinc recovery by the Tennessee Copper Co. decreased 7 percent below 1952, and its total value decreased 35 percent.

PUTNAM

Coal production was 456,300 tons valued at \$1,679,000 compared with 435,200 tons valued at \$1,523,000 in 1952. Two operators crushed limestone for concrete and road metal and for agricultural use.

RHEA

The W. S. Dickey Clay Manufacturing Co. (Graysville Clay mine) mined miscellaneous clays for heavy clay products; production increased 2 percent over 1952. Coal production was 6,800 tons valued at \$31,700. One operator crushed limestone for concrete and road metal; production increased 6 percent over 1952.

ROANE

Charles Ward mined a small quantity of fire clay for high-grade tile. Lambert Brothers, Inc. (Oak Ridge quarry), and the Rockwood Slag Products Co. crushed limestone for concrete and road metal; production increased 67 percent over 1952.

ROBERTSON

The Porter Brown Limestone Co. crushed limestone for concrete and road metal; production was 166,500 tons valued at \$208,100.

RUTHERFORD

The Bilbrey Lime Co. and S. N. McPherson crushed limestone for concrete and road metal; production increased 19 percent over 1952.

SCOTT

Coal production was 347,700 tons valued at \$1,231,000 compared with 327,000 tons valued at \$1,321,000 in 1952.

SEQUATCHIE

Coal production was 122,700 tons valued at \$370,500 compared with 141,200 tons valued at \$457,500 in 1952.

SEVIER

Lambert Brothers, Inc., and the United States Bureau of Public Roads crushed limestone for concrete and road metal; production decreased 35 percent below that in 1952.

SHELBY

The John A. Denie's Sons Co. mined miscellaneous clays for heavy clay products; production decreased 79 percent below 1952. Banks Bros., Inc., Hollywood Sand & Gravel Co., Inc., the Marquette Cement Manufacturing Co., and the Shelby County Highway Department mined engine sand and structural and paving sand and gravel; production decreased 21 percent below 1952.

SULLIVAN

The Pennsylvania-Dixie Cement Corp. operated the Kingsport mill throughout the year; shipments of portland cement increased 11 percent over 1952. The General Shale Products Corp. mined miscellaneous clays for heavy clay products; production increased 10 percent over 1952. The Holston Crushed Stone Co. and its successor, the

Standard Stone Co. (Kingsport quarry), and the Sullivan County Highway Department (Bluff City, Indian Springs, Orebank, and Rock Springs quarries) crushed limestone for riprap, concrete and road metal, and railroad ballast; production increased 41 percent over 1952.

SUMNER

Two operators crushed limestone for concrete and road metal and for railroad ballast; production increased 52 percent over 1952. The Sumner County Highway Department mined 84,500 tons of paving gravel valued at \$32,500 compared with 74,100 tons valued at \$22,800 in 1952.

TIPTON

The Corps of Engineers, United States Army, J. B. Michael, the Owens Sand & Gravel Co., and the Smiley Sand & Gravel Co. mined 675,200 tons of structural and paving sand and gravel valued at \$552,800.

UNICOI

The Brooks Sand & Gravel Co. and the Standard Crushed Stone Co. crushed limestone for concrete and road metal and for railroad ballast; production increased 17 percent over 1952. The Brooks Sand & Gravel Co. mined paving and railroad ballast sand and gravel; production increased 7 percent over 1952.

UNION

The Union County Highway Department (Luttrell quarry) crushed 22,500 tons of limestone for concrete and road metal valued at \$54,000 compared with 60,000 tons valued at \$120,000 in 1952.

VAN BUREN

Coal production was 121,500 tons valued at \$414,500 compared with 9,400 tons valued at \$26,400 in 1952. J. J. Simmons (Graham quarry) crushed limestone for concrete and road metal; production decreased 54 percent below 1952.

WARREN

The Warren Limestone Co. crushed limestone for concrete and road metal; production was considerably higher than in 1952.

WASHINGTON

The General Shale Products Corp. mined miscellaneous clays for heavy clay products; production increased 18 percent above 1952.

WAYNE

The Clifton Towing Co. (Baker mine) and the United States Bureau of Public Roads mined structural sand and paving sand and gravel; production was considerably greater than in 1952.

WEAKLEY

The Bell Clay Co. (Bell's Dresden and Collins mines), the Cooley Clay Co. (Greenfield mine), and the United Clay Mines Corp. (No. 6 mine) mined ball clay for art pottery, enameling, high-grade tile, kiln furniture, pastes, rubber filler, and whiteware; production decreased 2 percent below 1952.

WHITE

Coal production was 24,000 tons valued at \$81,900 compared with 28,900 tons valued at \$83,600 in 1952. Three operators crushed limestone for concrete and road metal and for whiting; production decreased 17 percent below 1952.

WILLIAMSON

The Franklin Limestone Co. and the Williamson County Highway Department (Globe quarry) crushed limestone for concrete and road metal, railroad ballast, and agricultural purposes; production decreased 14 percent below 1952. The Williamson County Highway Department mined 11,600 tons of paving gravel valued at \$4,300 compared with 6,500 tons valued at \$4,800 in 1952.

WILSON

Three operators crushed limestone for concrete and road metal, railroad ballast, and agriculture; production increased 5 percent over 1952.

UNDISTRIBUTED

Natural-gas production was 89,000,000 cubic feet compared with 107,000,000 cubic feet in 1952. Crude-petroleum production was 16,000 barrels compared with 15,000 barrels in 1952.

The Mineral Industry of Texas

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Bureau of Economic Geology of the University of Texas.

By F. F. Netzeband,¹ Harvard Eng,¹ W. G. Diamond,²
and John T. Lonsdale³

TEXAS, with a new record \$3.6 billion output of minerals in 1953, led the Nation for the 19th consecutive year, and for the 11th consecutive year output value exceeded \$1 billion. This singular endowment of an abundant supply of mineral resources resulted in Texas being the largest domestic producer of crude oil, natural gas, natural-gas liquids, helium, sulfur, magnesium metal, and bromine compounds; the third largest producer of cement; and the fourth largest producer of gypsum. Important quantities of iron ore, clay, lime, salt, sand and gravel, and stone were also produced. In all, 33 minerals and mineral fuels were produced from 220 of the State's 254 counties in 1953. Crude oil was produced in 192 counties, natural gas in 172, natural-gas liquids in 75, nonmetallic minerals in 117 and metallic minerals in 4.

An important and varied metal-extractive industry in Texas in 1953 comprised 15 plants, 3 aluminum-reduction works, 1 antimony smelter, 1 copper smelter and 1 refinery, 2 iron blast furnaces, 1 lead smelter 2 magnesium-reduction plants (1 Government-owned but privately operated), 1 tin smelter (Government owned and operated), and 3 zinc smelters (2 retort and 1 electrolytic). Two of the aluminum-reduction works were completed during 1953, and the capacity of the third was increased; all other plants operated at near capacity throughout the year.

CONSUMPTION AND MARKETS

In 1953 the value of mineral production in Texas was \$3,647,913,000, up 8 percent from 1952. The mineral industries of Texas processed a large portion of their output into finished or semifinished products, part of which were consumed within the State and the remainder were for out-of-State consumption. Some industries included oil refineries processing Texas crude oil; cement plants using local limestones and shales; brick, tile, and pottery plants using clays and shales; wall-boards and plasters from Texas gypsum; bromine and magnesium compounds and sulfur for the chemical industries; stone and sand and gravel for construction. The important and rapidly expanding petrochemical industry of the Gulf coast produced a wide variety of

¹ Commodity-industry analyst, Region IV, Bureau of Mines, Bartlesville, Okla.

² Statistical clerk, Region IV, Bureau of Mines, Bartlesville, Okla.

³ Director, Bureau of Economic Geology, University of Texas, Austin, Tex.

resins, plastics, and byproducts of the oil industry. Many of these industries used Texas natural gas in processing their raw materials into finished products.

TABLE 1.—Mineral production in Texas, 1952-53¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Abrasive stone: Pebbles, grinding.....	510	\$3, 100	400	\$5, 500
Cement..... 375-pound barrels.....	19, 849, 455	48, 042, 901	19, 140, 193	48, 497, 762
Clays.....	2, 069, 020	4, 470, 182	2, 370, 975	4, 678, 974
Copper (recoverable content of ores, etc.).....	18	8, 712		
Feldspar..... long tons.....	2, 600	31, 200		
Gold (recoverable content of ores, etc.).....				
..... troy ounces.....	39	1, 365		
Gypsum.....	1, 021, 161	2, 682, 019	1, 067, 854	2, 860, 633
Helium (shipments)..... cubic feet.....	107, 301, 332	1, 405, 096	103, 711, 334	1, 388, 670
Iron ore (usable)..... long tons, gross weight.....	787, 193	(²)	1, 014, 937	(²)
Lead (recoverable content of ores, etc.).....	56	18, 032		
Lime (open-market).....	281, 604	2, 622, 975	475, 569	4, 380, 831
Manganese ore (35 percent or more Mn).....				
..... gross weight.....	56	(²)		
Natural gas..... million cubic feet.....	4, 147, 805	257, 164, 000	4, 383, 158	333, 120, 000
Natural-gas liquids:				
Natural gasoline and cycle products				
thousand gallons.....				
LP-gases..... do.....	2, 589, 594	188, 500, 000	2, 750, 370	200, 479, 000
do.....	2, 456, 874	88, 635, 000	2, 777, 890	109, 131, 000
do.....	1, 200	12, 000	1, 375	(³)
Petroleum (crude)..... thousand 42-gallon barrels.....	1, 022, 139	2, 641, 890, 000	³ 1, 019, 164	³ 2, 777, 900, 000
Salt (common).....	2, 640, 209	4, 402, 032	2, 845, 190	5, 010, 624
Sand and gravel.....	18, 661, 403	17, 275, 255	15, 101, 226	12, 845, 561
Silver (recoverable content of ores, etc.).....				
troy ounces.....	4, 672	4, 228		
Stone (except limestone for cement and lime).....	7, 604, 468	8, 664, 633	⁴ 9, 095, 109	⁴ 8, 550, 320
Sulfur:				
Frasch-process..... long tons.....	3, 691, 724	78, 910, 000	3, 614, 838	97, 601, 000
Recovered elemental..... do.....	38, 402	872, 134	85, 058	2, 202, 381
Talc and soapstone.....	⁵ 17, 800	⁵ 216, 569	⁶ 16, 210	⁶ 70, 658
Zinc (recoverable content of ores, etc.).....	3	996		
Undistributed: Native asphalt, bromine, gem stones, graphite, magnesium chloride (for metal), magnesium compounds (except for metal), mercury (1953), pumice and pumicite, sodium sulfate, stone (crushed basalt, 1953), and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2). Excludes value of clays used for cement.....		⁷ 34, 010, 619		39, 189, 833
Total Texas.....		⁷ 3, 379, 813, 000		3, 647, 913, 000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

² Value included with "Undistributed."

³ Final figure. Supersedes preliminary figure given in commodity chapter.

⁴ Excludes certain stone, value for which is included with "Undistributed."

⁵ Sold or used by producers. Quantity and value of ground material included.

⁶ Mine production of crude material.

⁷ Revised figure.

TRENDS AND DEVELOPMENTS

Changing economic factors, rising operating and freight costs, and limited labor markets in 1953 caused a decentralization trend in established industries, many of which were in Texas.

DMEA CONTRACT IN TEXAS

Exploration in Texas under the program of the Defense Minerals Exploration Administration was continued in 1953. Systematic investigations of strategic and critical minerals were encouraged

through financial assistance extended under Government contracts. These funds were repayable from royalties on ore discovered and subsequently mined. In Texas the DMEA contract of the Amerimex Mining Co. was terminated December 18, 1953.

EMPLOYMENT, ACCIDENTS AND WAGES

Employment.—Employment in the mineral and mineral-fuels industries of Texas increased in 1953 from that in 1952. Approximately 89,000 persons were employed in the oil and gas industry—4 percent in exploration, 10 percent in drilling, 30 percent in production, 15 percent in pipeline activities, 26 percent in refining, and 15 percent in miscellaneous work; about 3,600 persons in metal mining and smelting; and nearly 5,000 in nonmetallic industries. Smelters and reduction plants employed most of the workers in the metals industries of Texas.

Accidents.—There were no major disasters (where 5 or more workers are fatally injured in any 1 accident) in any mineral or mineral-fuels industry of Texas in 1953. The oil and gas industry (mineral fuels) reported 33 fatal and totally disabling injuries; each category reported 1 or more, with drilling responsible for 12. The metallic and nonmetallic industries each reported one fatality in 1953.

Wages.—The average hourly earnings of employees in the oil, natural gas, metallic, and nonmetallic industries of Texas increased in 1953, following the national trend.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Texas remained the Nation's ranking producer of petroleum, natural gas, natural-gas liquids, and helium in 1953, as well as being a major factor in the production of their refined products.

Asphalt (Native).—Uvalde County supplied all of the native asphalt produced in Texas in 1953; output was smaller than 1952.

Coal (Lignite).—A new and important use for Texas' large reserves of lignite was developed by the Federal Bureau of Mines and the Texas Power & Light Co. in 1953. The lignite is to be treated in a two-stage process, which would recover tar oils and produce a char as fuel for an electric generating plant. The installation, when completed in 1954, will use 1,000 tons of lignite a day to produce 470 tons of char and about 15,000 gallons of tar oil. The char is to be used as fuel for the Aluminum Co. of America 300,000-kw. powerplant as energy for its new aluminum-reduction works at Rockdale, Milam County, Tex. The lignite was only dried before use as a fuel in 1953, since the carbonizer units to recover the tars were not complete.

Helium.—Texas was the chief supplier of helium in 1953, with 66 percent of the domestic production; the Government plant at Exell, Moore County, was responsible for the major part of the Texas output. The 1953 production and value of helium were slightly less than the 1952 production. Both Texas helium plants (Exell and Amarillo) operated at capacity during the year.

TABLE 2.—Helium production, 1952-53, in cubic feet

County	1952		1953	
	Production (cubic feet)	Value	Production (cubic feet)	Value
Moore.....	76, 775, 640	\$1, 008, 330	65, 973, 300	\$886, 188
Potter.....	30, 525, 692	396, 766	37, 738, 034	502, 482
Total.....	107, 301, 332	1, 405, 096	103, 711, 334	1, 388, 670

Natural Gas.—Texas continued to be the ranking natural-gas-producing State in the Nation in 1953, supplying 52 percent of the domestic output. The marketed production of natural gas amounted to 4,383,158 million cubic feet, up 6 percent over 1952. Of this 1953 output 2,216,878 million cubic feet was exported out of the State, 779,054 million cubic feet was used for repressuring, 197,030 million cubic feet was consumed in carbon-black plants, and 296,788 million cubic feet was vented or flared. Losses from venting were substantially reduced in 1953, with closing of the Spraberry Trend Area field. Facilities in the form of plants and pipes were made available to handle the casinghead gas being vented. The use of natural gas in the manufacture of carbon black continued to drop in 1953. Natural-gas production was reported from 172 of the State's 254 counties; 60 counties had production exceeding \$1 million in value. The 10 principal producing counties, in the order of their output, were: Panola, Moore, Brazoria, Nueces, Carson, Sherman, Chambers, Matagorda, Ector, and Gray.

TABLE 3.—Marketed production of natural gas, 1944-48 (average) and 1949-53¹

Year	Million cubic feet	Value	Value per thousand cubic feet (mills)	Year	Million cubic feet	Value	Value per thousand cubic feet (mills)
1944-48 (average)	1, 859, 138	\$99, 823, 000	54	1951.....	3, 781, 136	\$204,181,000	54
1949.....	2, 588, 921	118, 832, 000	46	1952.....	4, 147, 805	257, 164, 000	62
1950.....	3, 126, 402	146, 941, 000	47	1953.....	4, 383, 158	333, 120, 000	76

¹ Comprises gas either sold or consumed by producers, including losses in transmission, amounts added to storage, and increases in gas pipelines.

TABLE 4.—Gross withdrawals and disposal of natural gas, 1952-53, in million cubic feet

Year	Gross withdrawals ¹			Disposal		
	From gas wells	From oil wells	Total	Marketed production ²	Repressuring	Vented and wasted
1952.....	3, 779, 100	1, 507, 700	5, 286, 800	4, 147, 805	784, 892	354, 103
1953.....	3, 835, 000	1, 624, 000	5, 459, 000	4, 383, 158	779, 054	296, 788

¹ Marketed production plus quantities used in repressuring vented and wasted.

² Gas sold or consumed by producers, including loss in transmission, amounts added to storage, and increases in gas pipelines.

During 1953 there was an average of 9,700 producing gas wells having a daily output of 123,800,000 cubic feet compared with 9,200 wells with a daily output of 123,180,000 cubic feet in 1952. The average wellhead price in 1953 was 7.6 cents per 1,000 cubic feet, up 23 percent over the 1952 average price. The oil and gas industry of Texas drilled 17,003 wells in 1953; 9,380 of these were oil wells, 978 were gas wells, and 6,590 holes were dry.⁴

Proved natural-gas reserves (including offshore reserves) of Texas in 1953 were estimated at 106,529,626 million cubic feet and composed 50 percent of the national reserves.

Pipeline mileage, both oil and gas, continued to expand in 1953. The State had 42 common-carrier pipelines, most of which performed both gathering- and trunk-line service. In 1953, 140 companies, were operating gas pipelines. About 55 percent of the 55,000 miles of pipeline in service was trunk line, 40 percent gathering lines, and 4 percent products lines.

Natural-Gas Liquids.—Texas was the principal producer of natural-gas liquids in 1953, supplying 55 percent of the domestic output. The volume of natural gas processed in 1953 increased 10 percent over that treated in 1952, resulting in a similar increase in products produced—natural-gasoline output increasing 6 percent, LP-gases 13 percent, and other cycle products 6 percent.

There were 213 natural-gasoline and cycle plants in Texas in 1953; 181 of them were gasoline plants and 32 cycling plants. Two gasoline plants and 1 cycle plant were idle during the year. The rated daily capacity of these plants was 508,908 barrels, of which 504,729-barrel capacity was in operation as of January 1, 1954, and 4,179-barrel capacity was idle.

Peat.—An estimated 1,400 tons of peat was reported from Milam County in 1953.

TABLE 5.—Production of natural-gas liquids, 1944-48 (average) and 1949-53, in thousand 42-gallon barrels

Year	Natural gasoline and cycle products		LP-gases		Total	
	Thousand barrels	Value	Thousand barrels	Value	Thousand barrels	Value
1944-48 (average)-----	37, 713	\$94, 210, 000	19, 473	\$28, 183, 000	57, 186	\$122, 393, 000
1949-----	47, 327	138, 924, 000	29, 704	45, 108, 000	77, 031	184, 032, 000
1950-----	54, 007	156, 786, 000	39, 643	50, 266, 000	93, 650	207, 052, 000
1951-----	59, 907	189, 973, 000	48, 624	71, 943, 000	108, 531	261, 916, 000
1952-----	61, 657	188, 500, 000	58, 497	88, 635, 000	120, 154	277, 135, 000
1953-----	65, 485	200, 479, 000	66, 140	109, 131, 000	131, 625	309, 610, 000

⁴ American Gas Association; Gas Facts: 1953, 276 pp.

TABLE 6.—Production of natural-gas liquids in 1953, by types of products

Product	Thousand gallons	Value
Natural gasoline.....	1,868,496	\$123,232,000
LP-gases.....	2,777,880	109,131,000
Finished gasoline and naphtha.....	619,038	58,661,000
Other products ¹	262,336	18,586,000
Total	5,528,250	309,610,000
Natural gas processed (million cubic feet).....	3,619,335	-----

¹ Includes condensate, kerosine, distillate fuel, etc.

Petroleum.—Crude-oil production in Texas during 1953 totaled 1,019,164 thousand barrels, a production decline of 13 percent. State regulatory agencies curtailed Texas production to maintain the output within market demands. The degree of this curtailment is evident by the fact that in January the State's 136,531 producing oil wells yielded an average of 2,862,389 barrels daily, while in December 141,826 producing wells were permitted a daily yield of 2,550,616 barrels.⁵ The 1953 imports of crude oil increased nearly 14 percent over 1952 and averaged about 652,000 barrels per day.

Crude-oil production was reported from 192 of the State's 254 counties, with the 10 leading counties in the order of their production as follows: Ector, Gregg, Scurry, Andrews, Rusk, Brazoria, Harris, Wood, Upton, and Refugio.

TABLE 7.—Production of crude petroleum, 1944-48 (average) and 1949-53

Year	Thousand 42-gallon barrels	Value		Year	Thousand 42-gallon barrels	Value	
		At wells	Average per barrel			At wells	Average per barrel
1944-48 (average).....	797,066	\$1,368,500,000	\$1.72	1951.....	1,010,270	\$2,610,790,000	\$2.58
1949.....	744,834	1,932,050,000	2.59	1952.....	1,022,139	2,641,860,000	2.58
1950.....	829,874	2,147,160,000	2.59	1953.....	1,019,164	2,777,900,000	2.73

¹ Final figure. Supersedes preliminary figure in commodity chapter.

TABLE 8.—Production of crude petroleum in 1953, by months

Month	42-gallon barrels	Month	42-gallon barrels	Month	42-gallon barrels
January.....	91,000,000	June.....	86,058,000	November.....	79,181,000
February.....	80,998,000	July.....	88,942,000	December.....	80,498,000
March.....	88,192,000	August.....	88,643,000	Total.....	1,019,164,000
April.....	81,984,000	September.....	84,252,000		
May.....	85,140,000	October.....	84,276,000		

⁵ Railroad Commission of Texas, Annual Report of 1953: 387 pp.

TABLE 9.—Production of crude petroleum, 1949–53, by districts and fields

(Thousand barrels)

District and field ¹	1949	1950	1951	1952	1953
Gulf Coast:					
Amelia.....	1,080	715	1,073	1,004	1,282
Anahuac.....	7,103	6,801	7,727	7,032	6,453
Barbers Hill.....	1,964	2,110	2,038	2,192	1,862
Bay City.....	1,044	1,510	1,737	1,192	998
Bloomington.....	1,794	1,775	1,994	1,756	1,535
Bonnie View.....	856	832	965	890	813
Chocolate Bayou.....	3,529	4,272	5,166	5,028	4,531
Conroe.....	11,638	11,943	14,081	12,813	11,937
Dickinson-Gillock.....	2,368	3,493	4,090	4,105	4,235
Dyersdale.....	1,393	1,550	1,449	1,340	1,183
Esperson.....	1,220	1,508	1,496	1,474	1,365
Fairbanks.....	1,905	1,096	1,403	1,383	1,585
Falls City.....	1,048	1,101	1,341	1,232	1,059
Fannette.....	1,529	1,425	1,737	1,780	1,760
Fig Ridge.....	860	783	937	989	861
Friendswood.....	13,178	11,386	14,989	13,728	12,398
Goose Creek.....	1,766	2,451	2,873	3,143	2,692
Greta.....	3,053	2,858	3,512	3,269	2,871
Hastings.....	14,317	13,247	16,536	14,767	13,644
Heyser.....	1,109	1,288	1,671	1,491	1,361
High Island.....	1,893	2,380	2,384	2,291	2,605
Hull.....	1,781	3,534	4,612	3,388	2,680
Humble.....	1,272	1,287	1,246	1,036	958
La Rosa.....	812	716	827	704	673
Livingston.....	1,353	1,373	1,395	1,208	1,154
Lolita.....	1,482	1,502	1,803	1,589	1,476
Lovell's Lake.....	1,113	1,220	1,418	1,217	978
McFaddin.....	1,354	1,126	1,339	1,368	1,275
Manvel.....	2,108	2,011	2,393	2,166	2,058
Markham.....	1,047	1,139	1,333	1,585	1,691
Old Ocean.....	5,006	5,521	6,247	6,288	5,954
Oyster Bayou.....	2,913	2,418	3,519	3,368	3,219
Pierce Junction.....	1,285	1,444	1,782	1,591	1,349
Placedo.....	1,675	1,944	2,291	1,997	2,210
Raccoon Bend.....	1,735	1,657	1,874	1,966	2,225
Refugio-Fox.....	2,355	2,442	2,708	2,655	2,419
Silsbee.....	1,176	1,223	1,364	1,465	1,398
Sour Lake.....	1,400	1,883	2,009	1,804	1,576
South Lake.....	1,417	1,193	1,192	1,255	1,286
South Houston.....	1,339	2,064	1,665	1,626	2,011
South Liberty.....	2,645	2,288	2,336	2,360	1,936
Stowell.....	1,186	1,059	1,380	1,294	1,193
Sugarland.....	2,079	2,056	1,943	1,468	1,364
Sugar Valley.....	11,763	10,187	12,840	11,846	10,563
Thompson.....	2,394	2,212	2,444	2,204	2,095
Tomball.....	2,366	2,291	3,300	3,216	3,494
Village Mills.....	2,654	2,619	2,331	2,297	2,252
West Columbia.....	5,066	5,456	7,525	6,844	6,652
West Ranch.....	4,160	3,718	4,345	4,018	3,933
Withers-Magnet.....	49,969	56,586	70,807	74,949	80,549
Other Gulf Coast ²					
Total Gulf Coast.....	189,592	199,263	239,407	231,597	227,636
East Texas:					
East Texas proper.....	93,951	97,825	100,695	96,526	90,743
Cayuga.....	1,991	1,808	1,568	1,373	1,258
Hawkins.....	11,464	10,439	13,638	16,261	18,417
Long Lake.....	1,491	1,415	1,619	1,476	1,236
Mexia-Powell.....	1,977	1,829	1,698	1,660	1,613
New Hope.....	1,894	1,836	2,355	2,309	2,191
Quitman.....	2,886	2,740	3,078	2,848	2,941
Talco.....	6,188	5,891	6,692	6,440	5,876
Van.....	8,313	7,358	9,698	11,349	10,650
Other East Texas.....	12,462	14,050	22,205	20,195	18,973
Total East Texas.....	141,617	144,191	162,246	159,437	152,898
Central Texas:					
Charlotte.....	2,045	2,223	2,434	1,778	1,536
Darst Creek.....	2,508	2,534	2,830	2,943	3,210
Luling.....	1,387	1,608	1,951	2,385	2,410
Other Central Texas.....	2,952	3,404	4,302	4,941	6,525
Total Central Texas.....	8,892	9,769	11,517	12,047	13,681

See footnotes at end of table.

TABLE 9.—Production of crude petroleum, 1949–53, by districts and fields—Continued

(Thousand barrels)

District and field ¹	1949	1950	1951	1952	1953
North Texas ^{4 5}	69,543	79,998	87,985	96,513	111,269
Panhandle ⁶	33,076	33,131	31,287	29,272	28,080
South Texas:					
Agua Dulce	2,082	2,094	2,232	1,945	1,736
Fulton Beach	743	1,202	1,819	1,945	2,718
Garcia	1,009	1,064	1,321	1,294	1,223
Hoffman	1,049	1,069	2,154	1,983	1,841
Kelsey	2,056	2,284	3,017	3,059	3,243
London Gin	52	974	1,330	1,192	1,106
Midway	1,449	1,652	1,582	1,298	982
Saxet-Saxet Frio	1,794	1,499	1,176	980	998
Stratton	3,233	3,150	3,680	3,344	2,990
Sun	1,231	1,260	1,293	1,405	1,618
Taft	1,148	1,096	1,491	1,477	1,491
White Point	2,684	2,674	3,391	3,312	3,319
Willamer and West	2,397	2,092	2,205	3,152	2,920
Other South Texas	52,627	54,716	69,858	68,587	68,473
Total South Texas	73,554	76,826	96,549	94,973	94,658
West Texas:					
Andrews	28,043	31,860	37,308	38,225	39,305
Borden		2,978	8,981	9,614	8,888
Coke	1,971	3,852	4,790	5,817	9,397
Crane-Upton	19,345	22,973	31,557	42,500	40,282
Crockett	6,931	7,078	8,574	8,725	8,532
Dawson	1,112	1,534	2,305	2,300	2,469
Ector ⁷	53,814	57,096	69,576	69,516	59,779
Gaines-Yoakum	29,098	28,703	35,742	34,854	36,941
Garza	2,605	3,364	4,199	3,802	3,787
Glasscock-Howard-Mitchell-Scurry	⁸ 12,455	8,977	11,598	9,597	10,841
Hockley ⁹	26,503	27,597	31,338	30,263	29,832
Kent	10	3,525	7,121	6,980	7,638
King	759	863	1,090	978	806
Midland	20	873	9,598	14,885	11,054
Pecos	17,036	17,862	22,305	22,004	20,358
Reagan	2,389	2,372	2,031	3,007	3,629
Reeves	784	1,090	1,295	1,609	1,299
Runnels	860	1,063	7,703	6,052	10,205
Scurry	(⁹)	36,529	48,478	48,077	43,421
Terry	303	1,172	3,391	5,102	6,647
Tom Green	262	1,152	1,911	1,618	1,173
Ward	4,833	5,380	8,281	11,521	10,221
Winkler	18,506	17,961	19,228	16,653	16,111
Other West Texas	921	842	2,879	4,601	8,327
Total West Texas	228,560	286,696	381,279	398,300	390,942
Total Texas	744,834	829,874	1,010,270	1,022,139	1,019,164

¹ The breakdown of Texas districts, 1946–50, has been changed to agree with the Texas Railroad Commission divisions.

² A new field was created out of a portion of Hull and included in "Rest of State."

³ Includes crude oil consumed on leases and net change in stocks held on leases for entire district.

⁴ Includes the fields in and between Hardeman, Wilbarger, Wichita, Clay, Montague, and Cooke Counties on the north and San Saba, Lampasas, and Coryell on the south.

⁵ Includes crude oil consumed on leases and net change in stocks held on leases for East (exclusive of East Texas proper), Central, North, and South Texas.

⁶ Carson, Gray, Hutchinson, Moore, Sherman, and Wheeler Counties.

⁷ Includes the part of Jordan pool in Crane County.

⁸ Scurry County included with Glasscock-Howard-Mitchell before 1950.

⁹ Includes Slaughter and Levelland fields.

TABLE 10.—Oil- and gas-well drilling in Texas in 1953, by counties

County	Proved field wells			Exploratory wells			Total		
	Oil	Gas	Dry	Oil	Gas	Dry	Oil	Gas	Dry
Anderson	7		4	1		23	8		27
Andrews	179	2	17	26		24	205	2	41
Angelina						1			1
Aransas	86	10	24	6	1	15	92	11	39
Archer	259		287	23		73	282		360
Atascosa	75		34	5	1	50	80	1	84
Austin	28	4	3			2	28	4	5
Bandera						3			3
Bastrop	1		8			17	1		25
Baylor	28		14	2		19	30		33
Bee	22	13	22	5		36	27	13	58
Bell			1			10			11
Bexar	23		15			7	23		22
Borden	16		5	4		20	20		25
Bowie			1			8			9
Brazoria	72	23	55	3	3	25	75	26	80
Brewster						4			4
Brooks	25	4	4	1		10	25	4	14
Brown	206		60	3		21	209	1	81
Burleson						3			3
Caldwell	32	1	5	1		9	33	1	14
Calhoun	11	7	5	2	6	12	13	13	17
Callahan	141	2	88	8	1	72	149	3	160
Cameron					1	3		1	3
Camp			2	2		2	2		6
Carson	66	13	3	1		2	67	13	5
Cass						3			3
Castro						1			1
Chambers	47	10	15			11	47	10	26
Cherokee	4		13	3		25	7		38
Childress						2			2
Clay	137		68	9		52	146		120
Cochran	157	1	6	2		6	159	1	12
Coke	162		13	10		24	172		37
Coleman	222	1	126	21	3	142	243	4	268
Collingsworth					2	3		6	4
Colorado	1	17	6	2	1	9	3	18	15
Comanche	59		3			11	59		3
Concho	3		2	4		47	7		13
Cooke	88	1	57	7		47	95	1	104
Cottle						1			1
Crane	59		7	6		3	65		10
Crockett	68	1	12	9	4	44	77	5	56
Crosby						6			6
Culberson		1	4	1		7		1	11
Dallam						1			1
Dawson	26		3	4		14	30		17
Deaf Smith						1			1
Delta						1			1
Denton	13		8	1		8	14		16
De Witt	40	5	16	2	1	26	42	6	42
Dickens	2		2	1		2	3		4
Dimmit	2		4	1		10	3		14
Donley						1			1
Duval	81	16	27	4	5	45	85	21	72
Eastland	6	4	36	5	5	29	11	9	65
Ector	107		10	12		13	119		23
Edwards			1			5			6
Ellis	3	2	4			10	3	2	14
El Paso						2			2
Erath			4		1	10		1	5
Falls	1		1			1	1		11
Fannin						1			1
Fayette	16		14	1		15	17		29
Fisher	44		6	17		48	61		52
Floyd						2			2
Foard	5		1			5	5		6
Fort Bend	31	3	15			24	31	3	40
Franklin				1	1	1			2
Freestone	3	6	17	2		13	15	1	30
Frio	194	2	15	2	1	46	196	3	61
Gaines	134	2	13	4		21	138	3	34
Galveston	23	4	12	4	2	12	27	6	24
Garza	37		8	1		20	38		28
Gillespie						1			1
Glasscock	74		1			3	74		4
Goliad	34	12	18	4	4	27	38	16	45
Gonzales	6		4			27	6		31

TABLE 10.—Oil- and gas-well drilling in Texas in 1953, by counties—Continued.

County	Proved field wells			Exploratory wells			Total		
	Oil	Gas	Dry	Oil	Gas	Dry	Oil	Gas	Dry
Gray	51	59	9		1	2	51	60	11
Grayson	57	2	23	24		51	81	2	74
Gregg	16	18	5		1		16	19	5
Grimes				1		9	1		9
Guadalupe	56		4			10	56		14
Hale						2			2
Hamilton						1			1
Hansford	2	3	1		3	1	2	6	2
Hardeman			1						1
Hardin	62	9	30	1		12	63		42
Harris	72	15	33	4	6	42	76	21	75
Harrison	24	29	13	2	5	11	26	34	24
Hartley		5	1	1		1	1	5	2
Haskell	65		43	17		61	82		104
Hays						3			3
Hemphill						1			1
Henderson			2	1	1	11	1	1	13
Hidalgo	17	25	21	4	9	23	21	34	44
Hill	1		3	0		9	1		12
Hockley	35		5	5		12	40		17
Hopkins	2					4	2		4
Houston	7	2	2	1		11	8	2	13
Howard	94		18	5		17	99		35
Hudspeth						1			1
Hunt	2		2			15	2		17
Hutchinson	180	28	5	2		4	182	28	9
Irion	1		2	2		6	3		8
Jack	234	22	117	23	16	85	262	38	202
Jackson	39	24	27	1	12	31	40	36	58
Jasper	9	1	1	1		3	10	1	4
Jeff Davis						1			1
Jefferson	89	18	19		1	23	89	19	42
Jim Hogg	9	1	7	3		41	12	1	48
Jim Wells	53	14	21	6	4	27	59	18	48
Johnson						1			1
Jones	182		122	31	1	117	213	1	239
Karnes	7	1	5	1	1	21	8	2	26
Kaufman	17		7	3		11	20		18
Kendall						1			1
Kenedy	2	11	6		4	9	2	15	15
Kent	27			1		19	28		19
Kerr						2			2
Kimble						4			4
King	1		1	4		12	5		13
Kinney						1			1
Kleberg	49	3	4		1	5	49	4	9
Knox	14		12	6		29	20		41
Lamar						4			4
Lamb				1		1	1		1
Lampasas						3			3
La Salle			8			8			16
Lavaca	6	10	1		1	7	6	11	8
Lee			1	1		3	1		4
Leon	1	3	2			6	1	3	8
Liberty	94	15	34	3	2	29	97	17	63
Limestone	2		3		1	7	2	1	10
Lipscomb						1			1
Live Oak	36	12	11	3	2	30	39	14	41
Loving	44		8	1		12	45		20
Lubbock	4					3	4		3
Lynn	2		2	2		2	4		4
Madison	1				1	2	1	1	2
Marion	23	4	2	2		3	25	4	5
Martin	7			1		7	8		7
Matagorda	14	19	26	2	3	25	16	22	51
McCulloch				1	1	11	1	1	11
McLennan						4			4
McMullen	1	4	27		4	20	1	8	47
Medina	6		17			12	6		29
Midland	95		2	6		13	101		15
Milam	5		2		1	14	5	1	16
Mills						2			2
Mitchell	26			6		22	32		22
Montague	170		81	16		67	186		148
Montgomery	33	7	13	1	1	16	34	8	29
Moore	9	51	2			6	9	51	2
Morris						6			6
Motley						2			2

TABLE 10.—Oil- and gas-well drilling in Texas in 1953, by counties—Continued

County	Proved field wells			Exploratory wells			Total		
	Oil	Gas	Dry	Oil	Gas	Dry	Oil	Gas	Dry
Nacogdoches.....		10	11	1	1	2	1	11	13
Navarro.....	49	2	22	2	1	17	51	3	39
Newton.....	3	1	5	1		6	4	1	11
Nolan.....	112	1	19	13		20	125	1	39
Nueces.....	157	26	28	12	5	34	169	31	62
Ochiltree.....						3			3
Oldham.....		1				1		1	1
Orange.....	45	11	15	3		7	48	11	22
Palo Pinto.....	15	1	21	1	1	20	16	2	41
Panola.....	10	38	10		3	4	10	41	14
Parker.....	3		1	2	2	5	5	2	6
Parmer.....						2			2
Pecos.....	148	2	48	9	1	33	157	3	81
Polk.....	8	1	11			3	8	1	14
Potter.....		31	1					31	1
Presidio.....						2			2
Rains.....						2			2
Reagan.....	95		8	6	1	6	101	1	14
Real.....						1			1
Red River.....			2	2		8	2		10
Reeves.....	7			3		14	10		14
Refugio.....	39	24	7	8	2	16	47	26	33
Roberts.....	87	5	2	2		10	89	5	12
Robertson.....			1		1	3		1	4
Runnels.....	204		71	25	1	67	229	1	138
Rusk.....	22	2	6	1	1	7	23	3	13
Sabine.....						4			4
San Augustine.....						2			2
San Jacinto.....	1	2	2		2	6	1	4	8
San Patricio.....	119	44	38	15	9	37	134	53	75
San Saba.....						4			4
Schleicher.....	60		3	6	6	49	66	6	52
Scurry.....	106		7	4		17	110		24
Shackelford.....	73	4	98	12	2	38	85	6	136
Shelby.....	1	3	2	1		4	2	3	6
Sherman.....		11	2		2			13	2
Smith.....	13		3	3		8	16		11
Starr.....	105	18	30	5	3	21	110	21	51
Stephens.....	72	5	57	6	1	18	78	6	75
Sterling.....	16	5	1	5		14	21	6	15
Stonewall.....	232		18	13		35	245		53
Sutton.....				1		35	1		35
Taylor.....	47		36	12	1	54	59	1	90
Terrell.....		1			2	5		3	5
Terry.....	71		8	4		7	75		15
Throckmorton.....	27		25	21		34	48		59
Titus.....	3					3	3		3
Tom Green.....	16		12	9		51	25		63
Travis.....			5			12			17
Trinity.....						2			2
Tyler.....	12	2	3		1	5	12	3	7
Upshur.....	1			1		2	2		2
Upton.....	117		19	9	1	25	126	1	44
Val Verde.....						4			4
Van Zandt.....	19	1	6			13	19	1	19
Victoria.....	46	19	15	1	7	28	47	26	43
Walker.....			3	1		1	1		3
Waller.....	10	1	1			1	10	1	2
Ward.....	62		19	4	2	6	66	2	25
Washington.....	1		1			2	1		3
Webb.....	43		6	3	2	53	46	2	59
Wharton.....	40	18	50	2	4	29	42	22	79
Wheeler.....	7	5	1		1	1	7	6	2
Wichita.....	273		105	7		24	280		129
Willbarger.....	159		52	6		55	165		107
Willacy.....	4	2	3		3	8	4	5	11
Williamson.....	1		3			6	1		9
Wilson.....	12		13	3		31	15		44
Winkler.....	45	4	9	1	1	9	46	5	18
Wise.....	9	9	2	2	1	9	11	10	11
Wood.....	33		19	3		23	36		42
Yoakum.....	81	1		4		17	85	1	17
Young.....	217	2	183	40	1	75	257	3	258
Zapata.....	36	1	5	1		29	37	1	34
Zavala.....			1		1	9		1	10
Total.....	8,421	897	3,202	730	199	3,649	9,151	1,096	6,851

In 1953 there were 143,990 producing oil wells in Texas, with an average daily well production of 19.4 barrels compared with 139,530 wells producing a daily average of 20.4 barrels in 1952. The average price per barrel of crude oil at the well increased from \$2.58 in 1952 to \$2.73 in 1953, resulting in an increase in total value of crude, notwithstanding a slight decline in production.

The indicated average daily demand for total crude increased slightly.

TABLE 11.—Indicated demand for petroleum in 1953, by months

Month	Indicated demand	Month	Indicated demand	Month	Indicated demand
	42-gallon barrels		42-gallon barrels		42-gallon barrels
January.....	91,326,000	June.....	83,379,000	November.....	82,902,000
February.....	80,895,000	July.....	85,648,000	December.....	85,734,000
March.....	89,684,000	August.....	88,922,000		
April.....	81,467,000	September.....	81,776,000	Total: 1953..	1,023,902,000
May.....	88,608,000	October.....	83,461,000	1952..	1,011,609,000

Exploratory drilling by the Texas oil and gas industry in 1953 resulted in discoveries of 785 new oilfields. New pay horizons and outpost wells opened important extensions to producing areas. A few of the year's important oilfield developments follow:

Important new oilfields were opened in Anderson County, with the discovery of the Neches field and in Smith County of the Hitts Lake field. In the Gulf Coast region 24 new oilfields and 29 new gasfields were developed. Wildcat drilling brought in new oil and gas fields in Hansford and Lamb Counties of the Panhandle. An outpost well in Roberts County extended the Quinduno field over 5 miles. The secondary-oil-recovery program in the Panhandle continued to increase the output and to improve the net oil-gas ratio to 528 cubic feet per barrel compared with 887 cubic feet per barrel in 1946. In the Corpus Christi region 51 new oilfields and 50 new gasfields were developed, while in the Midland, Tex., region 109 new oilfields were discovered. The Railroad Commission's order closing the Spraberry field from April to December resulted in a significant reduction in the volume of flared casinghead gas and the construction of several natural-gasoline plants, four of which were put into operation before the close of the year, as well as a considerable mileage of gathering pipelines to service them.

Crude-oil stocks at Texas refineries as of December 31 were estimated at 16,315,000 barrels, with a 80,722,000-barrel supply in pipelines and tank farms. Texas refineries received 712,477,000 barrels of crude in 1953, of which 127,006,000 barrels was imported from the following States: 71,820,000 barrels from Louisiana, 44,718,000 barrels from New Mexico, and 10,468,000 barrels from Oklahoma. Pipelines carried most of the crude oil shipped to Texas refineries; tank cars, trucks, and boats transported the remaining small fraction of the volume, as reported below:

Type of transportation:	Quantity shipped, barrels	
	Intrastate	Interstate
Pipelines.....	528,310,000	91,278,000
Tank cars and trucks.....	9,426,000	-----
Boats.....	45,719,000	35,878,000

TABLE 12.—Capacity of petroleum refineries and cracking plants, barrels per day

Company	Location	Crude-oil capacity			Cracked-gasoline capacity		
		Operating	Shut-down	Building	Operating	Shut-down	Building
Inland:							
American Liberty Oil Co.	Mount Pleasant	15,000			2,500		3,100
Bryson Pipe Line & Refining Co.	Bryson	1,100					
Col-Tex Refining Co.	Colorado City	10,000			3,000		
Continental Oil Co.	Wichita Falls	7,700			3,795		
Corpus Christi Refining Co.	Tucker (Palestine)	2,000			1,500		
Cosden Petroleum Corp.	Big Spring	24,000			12,500		
Danaho Refining Co.	Pettus	4,000		8,000	500		5,000
G & B Oil Co.	Graham	500					
Gladewater Refining Co.	Gladewater	2,500			2,000		
Gulf Oil Corp.	Fort Worth	8,500			1,975		
Do	Sweetwater	8,000			1,950		
Levelland Consumers Co-operative Assn.	Levelland		4,237			789	
Roger Lacy, Inc.	Big Sandy	4,000			2,000		
LaSalle Petroleum Corp.	Burkburnett		1,500				
Magnolia Petroleum Co.	Fort Worth	12,000			4,600		
McBride Refining Co.	La Blanca	2,000		500	750		
McMurrey Refining Corp.	Tyler	11,000		11,000	3,400		9,650
Monarch Refining Co.	San Antonio	2,500					
Onyx Refining Co.	Abilene	6,000			3,120		
Panhandle Oil Corp.	Wichita Falls	7,500			1,700		
Petroleum Products Refg. & Prod. Co.	Lueders	1,500			600		
Phillips Petroleum Co.	Phillips	68,000			33,000		
Phoenix Refining Co.	San Antonio	2,750					
Port Fuel Oil Co., Inc.	Brownsville	7,500					
Premier Petroleum Co.	Arp	5,000			2,800		
Premier Oil Refining Co. of Texas.	Baird	2,250			450		
Do	Fort Worth	7,500			2,500		1,900
Do	Longview (Willow Springs)	4,500			2,000		
Rado Refining Co.	McAllen	2,500					
Shamrock Oil & Gas Corp.	Sunray	11,000			6,050		
Skelly Oil Co.	Longview	7,000			3,550		
Standard Oil Co. of Texas.	El Paso	25,000	5,000		6,650		
The Texas Co.	Amarillo	8,500			3,000		
Do	El Paso	5,500			1,500		
Three Rivers Refinery	Three Rivers	1,200					
The Tydal Co.	Gainesville	1,500					
Wickett Refining Co.	Wickett	3,500					
Gulf:							
The Atlantic Refining Co.	Atreco (Port Arthur)	61,000			9,400		6,480
Corpus Christi Refining Co.	Corpus Christi	1,700		5,800			
Crown Central Petroleum Corp.	Houston (Pasadena)	32,500			26,550		
Eastern States Petroleum, Co., Inc.	Houston	47,000			13,400		
Eddy Refining Co.	do	2,600					
Gulf Oil Corp.	Port Arthur	245,000			74,200		
Humble Oil & Refining Co.	Baytown	260,000	3,300	4,400	54,500		
Magnolia Petroleum Co.	Beaumont	180,000			42,300	400	
Pan American Refining Corp.	Texas City	118,000		11,000	42,000		29,000
Phillips Petroleum Co.	Sweeney	79,000			11,000		
Pontiac Refining Corp.	Corpus Christi	19,000			5,400		
The Pure Oil Co.	Nederland	58,200		20,700	18,800		8,000
Republic Oil Refining Co.	Texas City	36,000	5,000		14,000		
Shell Oil Co., Inc.	Deer Park (Houston)	125,000			35,000	3,400	
Sid Richardson Refining Co.	Texas City	20,000			5,500		
Sinclair Refining Co.	Corpus Christi	28,000			12,000		
Do	Houston	125,000			44,500	6,000	
Southwestern Oil & Refining Co.	Corpus Christi	45,000			7,000	5,000	
Suntide Refining Co.	do	25,000			12,500		
Taylor Oil & Gas Co.	do	41,000			9,500		
Do	Port Isabel	10,000			4,500		
Texas City Refining Co.	Texas City	30,000			6,140		
The Texas Co.	Port Arthur	210,000			86,000		
Do	Port Neches	40,000					
Total		2,132,000	19,037	61,400	641,580	15,589	63,130

Two major trunklines to carry oil from the West Texas field to the Gulf coast were completed in 1953. One was a 26-inch line from Colorado City to the Port Arthur area, the other a 24-inch line from McCamey to the Houston area.

At the end of 1953, 59 of the 61 oil refineries in Texas were operating, at a daily rated capacity of 2,132,000 barrels, with 19,037-barrel capacity idle. The industry was adding 61,400-barrel daily capacity to this total by expanding existing installations. Cracking plants had an additional daily capacity of 657,169 barrels, of which 641,580 barrels capacity was operating. A daily capacity of 63,130 barrels was under construction at cracking plants.

TABLE 13.—Sales of petroleum products, 1949–53, in thousand 42-gallon barrels

Product	Quantity sold				
	1949	1950	1951	1952	1953
Gasoline.....	65,531	70,322	83,668	93,663	109,848
Kerosine.....	5,164	5,790	5,482	4,802	4,408
Range oil.....	1,964	2,064	2,826	2,386	2,205
Distillate fuel oil.....	9,238	12,790	16,183	19,022	19,046
Residual fuel oil.....	47,840	47,924	49,750	44,631	40,981

METALS

Production of metallic minerals in Texas remained at a low ebb in 1953, as all nonferrous metal mining continued idle through the year owing to low metal prices; activity in other metallic minerals was limited to iron ore, magnesium (recovered from sea water), and mercury. Texas had a significant smelting and refining industry, a major portion of the materials consumed being imported from other States and from foreign countries. (See list of smelters in table 14).

TABLE 14.—Smelters, refineries, and reduction plants in 1953

Product, company, and plant	County	Material treated	Source of material
Aluminum:			
Aluminum Co. of America:			
Point Comfort.....	Calhoun.....	Alumina.....	Domestic and imports.
Rockdale.....	Milam.....	do.....	Do.
Reynolds Reduction Co.: San Patricio.....	San Patricio.....	do.....	Imports.
Antimony: National Lead Co.: Laredo.....	Webb.....	Ore.....	Do.
Copper:			
American Smelting & Refining Co.: El Paso.....	El Paso.....	Concentrate and ore...	Domestic and imports.
Phelps Dodge Corp.: Nichols Refinery.....	do.....	Bliстер.....	Domestic.
Iron:			
Lone Star Steel Co.....	Morris.....	Ore.....	Do.
Sheffield.....	Harris.....	do.....	Domestic and imports.
Lead: American Smelting & Refining Co.: El Paso.....	El Paso.....	Concentrate and ore...	Do.
Magnesium: Dow Chemical Co.:			
Freeport.....	Brazoria.....	Sea water.....	
Velasco (Government-owned).....	do.....	do.....	
Tin: Tin Processing Corp.: Longhorn (Government-owned).	Galveston.....	Concentrate and ore...	Imports.
Zinc:			
American Smelting & Refining Co.:			
Amarillo.....	Potter.....	Concentrate.....	Domestic and imports.
Corpus Christi.....	Nueces.....	do.....	Imports.
American Zinc, Lead & Smelting Co.: Machovec.....	Moore.....	Ore.....	Do.

Aluminum.—Although there are no known bauxite deposits in Texas, there are three important aluminum-reduction plants in the State.

The 80,000-ton annual-capacity San Patricio reduction works of the Reynolds Reduction Co. was completed. The adjoining company La Quinta alumina plant was nearly completed as the year ended. Rated capacity of the alumina plant was reported as 365,000 tons annually. These two installations would give the State its first alumina plant, as well as a completely integrated bauxite-to-aluminum operation. It is on the north shore of Corpus Christi Bay, and several unique features of the La Quinta alumina works are: Installing all equipment out-of-doors, dividing the plant into two sections that could be operated independently or together, and designing operations to process Jamaican ore. Ocean ore boats bring the ore through the 32-foot-deep, 6½-mile ship canal across Corpus Christi Bay, to the new pier erected on the waterfront side of the plant, where the ore is unloaded for storage. The San Patricio reduction works uses special electrolytic cells or pots designed for 105,000 amperes, 2 to 3 times the normal size. High-pressure boilers fired by natural gas provide steam for the electric generators, furnishing energy to the reduction works. The exhaust steam from the electric generating plant is returned to the alumina plant, where it is used in the processing.

Aluminum Co. of America expansion at its Point Comfort works in 1953 brought the rated annual capacity to 85,000 tons annually. Electric energy for this plant was supplied from generators powered by natural-gas-fired internal-combustion engines. The plant output was changed from aluminum pigs to ingots to permit shipments of ready alloyed metal. The Aluminum Co. of America completed its new Rockdale plant during the year, with an annual output of 85,000 tons of metal. A unique feature of this plant was the use of treated lignite as fuel for the electric generating plant. The process, developed by the Federal Bureau of Mines, produced a char that retains 72 percent of the raw lignite's heating value but only 47 percent of its weight, while allowing recovery of a crude coal tar from which drugs, dyes, explosives, plastics, and other byproducts may be produced. The lignites of Milam County yield 14 to 15 gallons of tar oil per ton of lignite treated.

Iron Ore.—Mine production of iron ore in Texas increased 29 percent to 1,014,937 long tons of usable ore in 1953, as the expanding iron and steel industry on the Gulf coast increased its output. Open-pit operations in Cass, Cherokee, and Morris Counties supplied the State's entire output. Blast furnaces were operated by the Lone Star Steel Co. at Daingerfield and by the Sheffield Steel Co. at Houston, Tex.

TABLE 15.—Mine production of gold, silver, copper, lead, and zinc, 1944-48 (average), 1949-53, and total 1885-1953, in terms of recoverable metals ¹

Year	Ore		Gold		Silver		Copper	
	Short tons	Fine ounces	Value	Fine ounces	Value	Short tons	Value	
1944-48 (average).....	3,992	22	\$777	19,031	\$15,280	40	\$11,875	
1949.....	2,140	40	1,400	2,691	2,435	24	9,456	
1950 ²	³ 935	49	1,715	2,454	2,221	2	832	
1951 ³	750	32	1,120	1,381	1,250	1	433	
1952.....	1,270	39	1,365	4,672	4,228	18	8,712	
1953.....								
1885-1953.....	(⁴)	8,552	233,265	33,303,173	23,446,564	1,383	402,028	

Year	Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	
1944-48 (average).....	59	\$18,714	13	\$3,212	\$49,858
1949.....	132	41,712			55,003
1950 ²	129	34,830			39,598
1951 ³	43	14,878	24	8,736	26,467
1952.....	56	18,032	3	996	33,333
1953.....					
1885-1953.....	5,443	692,471	837	132,283	24,906,611

¹ Includes recoverable metal content of ore shipped during the calendar year indicated.

² All of 1950 production was from 1 mine in Presidio County, which produced lead ore.

³ Does not include zinc and lead recovered by the slag-fuming plant at the El Paso smelter from old accumulated slag resulting from operations in previous years.

⁴ Data not available.

Magnesium.—The Dow Chemical Co. continued operating both its Freeport plant and the Government-owned Velasco plant in 1953, recovering magnesium from sea water. The Velasco plant had a rated capacity of 36,000 short tons of metal annually. Five other Government-owned plants reactivated during 1951 were closed in 1953 by order of the Munitions Board.

Manganese.—Several exploratory projects on manganese deposits were initiated late in 1953, with the principal interest centering in Jeff Davis County. No production was reported.

Mercury.—The Amerimex Mining Co. operated a mercury exploratory project with DMEA assistance, resulting in the recovery of some mercury.

Uranium.—A plant to recover uranium concentrate from Florida phosphate rock was being built by the Texas City Chemicals, Inc.

NONMETALS

Nonmetallic minerals comprised 6 percent of the total value of Texas minerals in 1953. The five principal nonmetallic minerals in Texas, in order of their value, were: Sulfur, cement, bromine, magnesium chloride for metal, and sand and gravel.

Abrasives.—A small quantity of grinding pebbles was reported from Travis County in 1953.

Barite.—Crude barite from other States was processed in Cameron County by Magcobar, Inc.; in Harris County by the Milwhite Co.; and in Nueces County by the Baroid Sales Division of National Lead Co.

Bromine.—Texas was the leading State in the Nation in the recovery of bromine in 1953. The Ethyl-Dow Chemical Co., which recovered the bromine from sea water at its Freeport plant in Brazoria County was the leading producer in the Nation. The major portion of the commodity was consumed as ethylene dibromide, as an additive in tetraethyl lead antiknock compounds.

Cement.—Texas produced the third largest amount of cement in the United States in 1953; output originated in 8 counties from 13 plants. Harris County was the largest producer, followed by Dallas, Bexar, Tarrant, Nolan, El Paso, Nueces, and McLennan. Production was greater than shipments during the year, so that December stocks at mills increased from 1,135,000 barrels in January to 1,248,000 at the end of the year. Oystershells rather than limestone were used by four plants in the Gulf Coast region.

TABLE 16.—Portland cement produced and shipped, 1944-48 (average) and 1949-53, in 376-pound barrels

Year	Production (barrels)	Shipments			Year	Production (barrels)	Shipments		
		Barrels	Value				Barrels	Value	
			Total	Average per barrel				Total	Average per barrel
1944-48 (average)	10,209,733	10,356,527	\$20,068,021	\$1.94	1951.....	18,132,373	17,642,654	\$42,648,536	\$2.42
1949.....	14,949,812	14,741,805	33,409,347	2.27	1952.....	19,997,933	19,849,455	48,042,901	2.42
1950.....	17,150,293	17,281,521	39,677,804	2.30	1953.....	19,253,677	19,140,193	48,497,762	2.53

Clays.—Clay production in Texas established a new record in 1953, exceeding the previous 1952 record 15 percent in quantity and 5 percent in value. Increases were reported in both quantity and value for bentonite, fuller's earth, and miscellaneous clays; fire clay alone reported declines from 1952.

The production of fire clay decreased less than 1 percent in 1953, with Bastrop, Denton, Henderson, Rusk, and Harris the major producing counties. Heavy clay products consisting of building and paving brick, drain tile, sewer pipe, and kindred commodities, consumed 70 percent of this production, with refractories comprising 27 percent and stoneware and pottery the remaining 3 percent.

Miscellaneous clays output in 1953 increased 18 percent in quantity and 1 percent in value, when 1,860,000 tons valued at \$1,815,000 was produced. Five counties (Gonzales, Ellis, Eastland, Harrison, and Parker) supplied most of the production. About 92 percent of this clay was used in manufacturing heavy clay products, with rotary-drilling muds and high-grade tile the remaining 8 percent.

Production of fire clay decreased less than 1 percent in 1953, with Bastrop, Denton, Henderson, Rusk, and Harris the major producing counties. Heavy clay products, consisting of building and paving brick, drain tile, sewer pipe, and kindred commodities, consumed 70

percent of this production; refractories accounted for 27 percent and stoneware and pottery the remaining 3 percent.

Bentonitic clay production in 1953 increased 53 percent from 1952, with Fayette County the one producer. Clays for rotary-drilling muds consumed 80 percent of the total; the remaining 20 percent was used as filtering and decolorizing agents.

Texas remained one of the 3 top sources of fuller's earth, with a 1-percent increase over its 1952 production. It produced 106,400 short tons valued at \$1,278,000 in 1953, with Walker, Fayette, Angelina, Trinity, and Briscoe Counties supplying the output. A major portion of this material (67 percent) was used for decolorizing mineral and vegetable oils. Rotary-drilling muds used 13 percent, fillers another 12 percent and filtering and clarifying, other than oils, and insecticides the remaining 8 percent.

TABLE 17.—Clays sold and used by producers, 1944-48 (average) and 1949-53, by kinds

Year	Bentonite		Fire clay		Fuller's earth		Miscellaneous clays		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1944-48 (average).....	23,743	\$217,183	178,790	\$448,514	104,038	\$1,073,598	961,067	\$970,839	1,267,638	\$2,710,134
1949.....	27,598	302,384	243,373	537,144	100,745	1,242,558	1,358,460	1,198,063	1,730,176	3,280,149
1950.....	24,574	321,345	307,026	674,770	112,466	1,393,773	1,595,211	1,625,503	2,039,277	4,105,391
1951.....	38,425	212,670	320,238	764,228	142,273	1,952,304	1,716,117	2,015,763	2,217,053	4,944,965
1952.....	31,386	584,938	358,466	1,064,005	105,565	1,030,005	1,573,603	1,791,234	2,069,020	4,470,182
1953.....	47,887	670,300	356,211	915,575	106,437	1,277,670	1,860,440	1,815,429	2,370,975	4,678,974

Gem Stones.—A small quantity of gem stones and semi-precious stones was reported in 1953. Agate was reported from the Alpine-Big Bend region, and a small quantity of topaz was found in Mason County.

Graphite.—The Southwestern Graphite Co. produced and refined natural crystalline graphite in Burnet County. Production decreased during the year.

Gypsum.—Crude gypsum production in 1953 increased 5 percent, while value increased 7 percent compared with 1952; however, calcined output and value increased 3 and 18 percent, respectively, from 1952. Comparison of the crude production and values in 1953 with 1948 shows a 19-percent increase in production and a 33-percent gain in value over 1948, but the calcined output in 1953 increased 17 percent while the value increased 2 percent from 1948.

Lime.—Lime production for 1953 was 475,600 short tons valued at \$4,381,000 compared with 281,600 short tons valued at \$2,623,000 in 1952. This represented a production increase of 69 percent and a value increase of 67 percent over 1952. Lime production from oyster-shells was 58 percent of the total gross production in 1953. Seven counties (Nueces, Harris, Comal, Travis, Johnson, and El Paso) were the largest producers. Much of the production along the Gulf coast utilized oyster-shells as raw material instead of limestone.

TABLE 18.—Gypsum mined and calcined gypsum produced, 1944-48 (average) and 1949-53

Year	Short tons	Crude gypsum mined, value		Short tons	Calcined gypsum produced, value	
		Total	Average per ton		Total	Average per ton
1944-48 (average)-----	649,909	\$1,355,263	\$2.09	440,426	\$2,683,482	\$6.09
1949-----	843,292	2,178,569	2.58	561,778	3,930,599	7.00
1950-----	1,076,251	2,771,812	2.58	752,615	5,566,132	7.40
1951-----	1,136,824	2,987,890	2.63	793,562	6,509,550	8.20
1952-----	1,021,161	2,682,019	2.63	707,654	5,960,375	8.42
1953-----	1,067,854	2,860,633	2.68	730,083	7,020,270	9.50

TABLE 19.—Lime (quick and hydrated) sold by producers, 1944-48 (average) and 1949-53

Year	Quick-lime (short tons)	Hydrated lime (short tons)	Total		Year	Quick-lime (short tons)	Hydrated lime (short tons)	Total	
			Short tons	Value				Short tons	Value
1944-48 (average)-----	81,510	43,552	125,062	\$1,095,157	1951-----	212,784	67,173	279,957	\$2,532,387
1949-----	121,267	52,457	173,724	1,739,185	1952-----	209,904	71,700	281,604	2,622,975
1950-----	163,268	53,171	216,439	2,074,367	1953-----	256,000	219,569	475,569	4,380,831

Perlite.—Perlite was expanded for use mainly as a lightweight aggregate in concrete and plaster by Texas Lightweight Products Co. and Perlite Products Corp. in Dallas County; Perlite Industries, Inc., in Midland County; Perlite of Houston, Inc., in Harris County; and Texas Perlite Corp., in Tarrant County.

Phosphate Rock.—The Texas City Chemicals, Inc., was building a plant to process phosphate rock into dicalcium phosphate for use as a commercial fertilizer.

Pumice and Pumicite.—A small quantity of prepared pumicite was produced in 1953. Production declined slightly from 1952.

Salt.—Salt production continued to rise in 1953. Production increased 8 percent in quantity and 14 percent in value over 1952. Texas ranked fifth in the country as a salt producer and produced 14 percent of the Nation's total, with brine a source of most of this tonnage. Seven counties—Brazoria, Duval, Fort Bend, Harris, Terry, Van Zandt, and Yoakum—contributed to this production.

Sand and Gravel.—The gross tonnage of commercial sand and gravel was 11,867,000 short tons valued at \$12,427,000. The total production and value in 1953 decreased 19 and 26 percent, respectively, from 1952, while commercial production decreased 26 percent in tonnage and 25 percent in value from 1952. Noncommercial output increased 21 percent, and the value was down 38 percent from 1952.

Texas was the eighth largest producing State of sand and gravel in the Nation. Sand and gravel were produced in about 100 counties. Over 57 percent of the sand produced in Texas was used for structural purposes and 33 percent for paving. Paving consumed 54 percent of the gravel, and 40 percent was used for structural needs.

TABLE 20.—Salt sold or used by producers, 1944–48 (average) and 1949–53

Year	Short tons	Value		Year	Short tons	Value	
		Total	Average per ton			Total	Average per ton
1944–48 (average).....	1,178,501	\$1,567,772	\$1.33	1951.....	2,401,063	\$4,000,100	\$1.67
1949.....	1,641,171	2,419,963	1.47	1952.....	2,640,209	4,402,032	1.67
1950.....	1,852,138	2,846,789	1.54	1953.....	2,845,190	5,010,624	1.76

TABLE 21.—Sand and gravel sold or used by producers in Texas, 1949–53

Year	Commercial		Noncommercial		Total sand and gravel		
	Short tons	Value	Short tons	Value	Short tons	Value	
						Total	Average per ton
1949.....	13,395,066	\$12,998,174	1,602,440	\$469,675	14,997,506	\$15,707,724	\$0.86
1950.....	15,725,012	15,273,384	2,247,093	434,340	17,972,105	15,697,624	.87
1951.....	14,657,441	14,775,101	3,831,022	876,430	18,488,463	15,651,531	.85
1952.....	15,998,314	16,602,593	2,663,089	672,662	18,661,403	17,275,255	.93
1953.....	11,866,963	12,426,922	3,234,263	418,639	15,101,226	12,845,561	.85

TABLE 22.—Uses of sand and gravel produced in 1953

Use	Short tons	Value		Use	Short tons	Value	
		Total	Average per ton			Total	Average per ton
Sand:				Gravel:			
Blast sand.....	132,980	\$477,855	\$3.59	Paving gravel.....	5,344,787	\$3,186,546	\$0.60
Engine sand.....	50,326	31,905	.63	Railroad ballast			
Molding sand.....	8,812	10,804	1.23	gravel.....	436,465	393,898	.90
Paving sand.....	1,730,221	1,103,437	.64	Structural gravel...	3,958,250	4,459,298	1.13
Structural sand...	3,029,298	2,353,773	.78	Other gravel.....	79,971	97,902	1.22
Other sand.....	120,741	59,772	.50	Total.....	9,819,473	8,137,644	.83
Undistributed ¹	209,375	665,371	.....			
Total.....	5,281,753	4,707,917	.89				

¹ Includes filter sand and glass sand; figures withheld to avoid disclosure of individual company operations.

Stone.—The total quantity of stone produced in 1953 was 9,095,000 short tons valued at \$8,550,000 compared with 7,604,000 short tons valued at \$8,665,000 in 1952. This represented an increase of 19 percent in production and a decrease of 4 percent in value compared with 1952.

Dimension stone was produced from sandstone, limestone, and granite, with 32,800 tons valued at \$732,800. This was a decrease of 31 percent in tonnage and 6 percent in value. Most of the dimension stone was cut from limestone.

Crushed stone in 1953 increased 19 percent in quantity, while its market value decreased 26 percent compared with 1952. Crushed limestone composed 69 percent of the output. Limestone was mined in Bexar, Brown, Comal, El Paso, Jones, Travis, Uvalde, Williamson, and Wise Counties. Crushed marble was produced in Travis County and granite in Burnet County.

TABLE 23.—Stone sold or used by producers, 1949–53, in short tons

Year	Marble		Limestone		Sandstone	
	Short tons	Value	Short tons	Value	Short tons	Value
1949.....	10,000	\$200,000	3,574,380	\$4,745,885	-----	-----
1950.....	10,550	278,500	3,800,700	4,682,090	127,290	\$124,642
1951.....	10,675	303,500	5,928,140	6,464,008	376,957	276,847
1952.....	16,500	350,000	5,343,324	6,634,047	879,561	667,671
1953.....	(¹)	(¹)	6,246,994	6,404,938	(¹)	(¹)

Year	Miscellaneous		Total stone	
	Short tons	Value	Short tons	Value
1949.....	450,470	\$202,224	¹ 4,158,430	¹ \$5,289,647
1950.....	954,610	495,231	² 4,893,150	² 5,580,463
1951.....	1,035,297	581,767	² 7,351,069	² 7,626,122
1952.....	1,265,484	739,670	² 7,604,468	² 8,664,633
1953.....	2,022,271	1,090,319	9,095,109	8,550,320

¹ Includes 123,580 tons of basalt and granite valued at \$141,538.

² Excludes certain stone; Bureau of Mines not at liberty to publish.

³ Includes 99,599 tons of granite valued at \$273,245.

⁴ Bureau of Mines not at liberty to publish; included in total.

Concrete aggregate consumed most of the crushed-stone tonnage. Other important uses were for flux, railroad ballast, and riprap.

Sulfur.—Frasch-sulfur production and shipments declined slightly in 1953, but byproduct sulfur from natural gas increased 107 percent over 1952. Nine plants produced 99,900 long tons of byproduct sulfur and shipped 85,100 long tons valued at \$2,202,000. Shipments of Frasch and byproduct sulfur combined totaled 3,700,000 gross tons.

TABLE 24.—Sulfur produced and shipped from Frasch mines, 1944–48 (average) and 1949–53

Year	Production	Shipments			Year	Production	Shipments		
		Long tons	Value				Long tons	Value	
			Total	Average per ton				Total	Average per ton
1944–48 (average)	3,191,249	3,414,281	\$57,631,867	\$16.88	1951.....	3,966,956	3,835,280	\$81,900,000	\$21.35
1949.....	3,610,829	3,678,196	66,208,000	18.00	1952.....	3,784,595	3,691,724	78,910,000	21.37
1950.....	3,949,164	(¹)	(¹)	(¹)	1953.....	3,514,771	3,614,838	97,601,000	27.00

¹ Figure withheld to avoid disclosure of individual company operations.

Talc and Ground Soapstone.—Talc and soapstone output in 1953 decreased 7 percent over 1952 (from 17,495 short tons) to 16,210 short tons. The value of the crude ore in 1953 was \$70,700. Comparable data on value were not obtained in 1952. Sales of crude and ground talc and soapstone increased 10 percent to 19,928 short tons. The talc was produced in Hudspeth County, and the soapstone in Gillespie County. Both the talc and soapstone were ground in a mill in Llano County.

The Southwestern Talc Corp. modernized and expanded its talc mill in Llano County in 1953, increasing its capacity threefold.

REVIEW BY COUNTIES

Two major new tables have been added in this State review for 1953. Table 26 lists major new oilfield discoveries, and table 27 lists oilfields that produced over 1 million barrels of petroleum in 1953. A cross reference is made to these important fields in the county discussion.

ANDERSON

Mineral fuels, crude oil, natural gas, and natural-gas liquids valued at over \$11 million were produced in Anderson County in 1953. One major new oilfield was discovered in 1953. Two oilfields produced over 1 million barrels each in 1953. Over 13 billion cubic feet of sweet and sour natural gas was produced. Natural-gas liquids were recovered at the Royal Cone plant of B. C. Byars; the Ware plant of Sylvian S. Price; and the Cayuga, Long Lake, and Royal Cone plants of Tide Water Associated Oil Co.

ANDREWS

Andrews County ranked fourth largest in value of minerals produced in Texas in 1953. Crude oil was the major commodity, followed by natural-gas liquids and natural gas. Twenty-five new oilfields were discovered in 1953; the most important *new fields* are listed in table 26. There were 10 oilfields, each of which produced over 1 million barrels. Approximately 3 percent of the total State capacity of natural-gas liquids was recovered at 6 gasoline plants: The Andrews of Charleston Petroleum Co., the Martinpool of Martinpool Gasoline Co., the Fullerton of Phillips Petroleum Co., the Dollarhide of Pure Oil Co., and the South Fullerton and Three Bar of the Stanolind Oil & Gas Co. The Texas Highway Department produced crushed miscellaneous stone for road surfacing in 1953.

ANGELINA

Angelina County was the major clay producer in Texas in 1953. Bentonitic clays were produced by Magnet Cove Barium Corp. at Zavalla and used for rotary-drilling muds. Fuller's earth was produced by Bennett-Clark Co., Inc., near Rockland and used in oil refining, both vegetable and mineral. Oil was produced. The United Carbon Co., Inc., operated its Kosmos "A" channel-type carbon-black plant in 1953.

ARANSAS

Aransas County was an important source of crude oil and natural gas, with a combined production valued at nearly \$12 million. Nine major oilfields and 1 new gasfield were developed in 1953.

ARCHER

Archer County furnished over \$27 million in value of the mineral production of Texas in 1953, with mineral fuels responsible for the major portion. Two oilfields produced over a million barrels each in 1953. Three major oilfield discoveries were made in 1953. Natural-gas liquids were recovered at the Madden gasoline plant of Warren Petroleum Corp. Natural gas was produced in the county. Non-commercial crushed sandstone was produced by the Texas State Highway Department for road construction.

TABLE 25.—Value of mineral production in Texas, by counties, 1952-53

County	1952	1953	Principal minerals produced in 1953, in order of value
Anderson	\$12,927,010	\$11,183,044	Petroleum, natural gas, natural-gas liquids.
Andrews	113,061,468	126,573,263	Petroleum, natural-gas liquids, natural gas.
Angelina	575,605	749,204	Clays, petroleum.
Aransas	8,509,724	11,720,466	Petroleum, natural gas.
Archer	28,571,451	27,488,801	Petroleum, natural-gas liquids, natural gas.
Atascosa	10,075,559	10,884,489	Petroleum, natural-gas liquids, sand and gravel.
Austin	7,813,969	8,451,879	Petroleum, natural gas, sand and gravel.
Bastrop	727,722	600,744	Petroleum, clays, stone.
Baylor	1,828,075	2,368,431	Petroleum, natural gas.
Bee	13,216,511	13,486,659	Petroleum, natural-gas liquids, natural gas.
Bell	63,555	123,702	Sand and gravel, stone.
Bexar	8,643,965	8,790,573	Cement, stone, sand and gravel.
Blanco	6,968		
Borden	20,009,263	21,724,470	Petroleum, natural gas, stone.
Bowie	1,213,833	1,309,168	Sand and gravel, petroleum, natural gas.
Brazoria	137,052,757	155,010,611	Petroleum, natural gas, bromine.
Brazos	31,901	58,250	Natural gas.
Brooks	18,457,056	20,752,754	Petroleum, natural-gas liquids, natural gas.
Brown	1,900,235	2,165,545	Petroleum, stone, natural gas.
Burleson	5,118	4,630	Petroleum.
Caldwell	6,932,232	7,296,705	Petroleum, natural gas.
Callahan	7,007,533	7,999,688	Do.
Callahan	1,804,697	3,223,665	Do.
Cameron	(1)	288	Do.
Camp	339,940	346,083	Do.
Carson	22,345,468	26,360,576	Natural gas, petroleum, natural-gas liquids.
Cass	2,417,422	2,206,058	Petroleum, iron ore, natural gas.
Chambers	56,422,361	59,423,709	Petroleum, natural gas, natural-gas liquids.
Cherokee	1,394,494	2,158,584	Petroleum, iron ore, natural gas.
Childress	144,380		
Clay	13,463,590	14,450,912	Petroleum, stone, natural gas.
Cochran	23,045,314	24,446,448	Petroleum, natural gas.
Coke	16,166,401	29,040,398	Petroleum, natural-gas liquids, natural gas.
Coleman	7,255,584	10,744,372	Petroleum, sand and gravel, natural gas.
Collingsworth	179,725	171,567	Natural gas, petroleum.
Colorado	11,984,267	15,521,328	Natural gas, natural-gas liquids, sand and gravel.
Comal	2,043,918	1,837,807	Stone, lime, sand and gravel.
Comanche	836,589	1,002,494	Petroleum, natural gas.
Concho	44,049	62,191	Do.
Cooke	21,240,788	23,655,907	Petroleum, natural-gas liquids, natural gas.
Crane	47,770,730	55,185,886	Petroleum, natural gas, natural-gas liquids.
Crockett	23,006,942	24,179,054	Petroleum, natural gas, stone.
Culberson		14,018	Do.
Dallas	11,730,282	11,293,467	Cement, sand and gravel, clays.
Dawson	6,145,747	6,625,673	Petroleum, natural gas.
Denton	1,019,426	960,286	Petroleum, clays, stone.
De Witt	8,217,752	10,053,475	Petroleum, natural gas, natural-gas liquids.
Dickens		109,991	Petroleum, natural gas.
Dimmit	41,851	62,973	Do.
Duval	34,993,844	36,050,276	Petroleum, natural gas, salt.
Eastland	5,984,676	6,097,070	Petroleum, natural-gas liquids, natural gas.
Ector	178,038,678	181,257,423	Do.
Edwards	5,782	6,094	Petroleum.
Ellis	72,269	90,334	Clays, petroleum.
El Paso	4,501,651	4,807,539	Cement, stone, sand and gravel.
Erath	129,545	191,349	Natural gas, petroleum, stone.
Falls	100,137	54,692	Petroleum, stone.
Fayette	2,118,778	2,195,878	Petroleum, sand and gravel, clays.
Fisher	11,479,469	14,495,812	Petroleum, gypsum, natural gas.
Floyd	(1)	36,953	Petroleum, sand and gravel, natural gas.
Foard	183,292	187,265	Petroleum, natural gas.
Fort Bend	53,819,580	51,137,112	Petroleum, sulfur, natural gas.
Franklin	12,819,581	12,801,678	Petroleum, natural gas.
Freestone	1,412,775	1,332,149	Petroleum, natural gas, clays.
Frio	4,450,897	8,301,182	Petroleum, natural-gas liquids, natural gas.
Gaines	47,094,207	54,311,306	Petroleum, natural gas, natural-gas liquids.
Galveston	24,605,590	27,741,475	Petroleum, natural gas, sand and gravel.
Garza	9,891,067	10,532,786	Petroleum, natural gas.
Gillespie	205,021	60,607	Stone, sand and gravel.
Glasscock	18,188,164	13,707,367	Petroleum, natural gas.
Goliad	9,240,371	10,592,277	Do.
Gonzales	120,311	368,746	Clays, petroleum, stone.
Gray	46,276,834	48,557,248	Petroleum, natural gas, natural-gas liquids.
Grayson	9,442,382	15,506,792	Petroleum, natural gas.
Gregg	163,045,573	168,760,408	Petroleum, natural-gas liquids, natural gas.
Grimes	72,198	180,897	Petroleum, natural gas.
Guadalupe	8,670,473	9,924,629	Petroleum, clays, natural gas.
Hale	7,076,103	7,320,949	Petroleum, natural gas.

TABLE 25.—Value of mineral production in Texas, by counties, 1952-53—Con.

County	1952	1953	Principal minerals produced in 1953, in order of value
Hamilton	\$105,525	\$109,362	Natural gas, petroleum.
Hansford	4,371,094	5,289,470	Natural-gas liquids, natural gas, petroleum.
Hardeman	550,537	521,127	Gypsum, natural-gas liquids, petroleum.
Hardin	28,381,897	32,373,756	Petroleum, natural gas, natural-gas liquids.
Harris	104,780,578	106,584,382	Petroleum, natural-gas liquids, cement.
Harrison	11,381,613	14,873,111	Natural gas, petroleum, natural-gas liquids.
Hartley	1,675,758	1,760,910	Natural gas, petroleum.
Haskell	6,095,867	8,962,415	Petroleum, natural gas.
Hays	(¹)	1,233,030	Natural-gas liquids, sand and gravel.
Henderson	5,942,621	5,768,859	Natural-gas liquids, petroleum, clay.
Hidalgo	12,308,805	8,903,300	Natural gas, natural-gas liquids, petroleum.
Hockley	54,230,941	55,506,600	Petroleum, natural-gas liquids, natural gas.
Hopkins	7,492,726	7,904,412	Do.
Houston	2,857,226	3,287,161	Do.
Howard	28,140,147	34,020,294	Do.
Hudspeth	(¹)	240,368	Stone, gypsum, soapstone.
Hunt	129,741	123,240	Petroleum.
Hutchinson	88,632,609	95,686,543	Natural-gas liquids, petroleum, natural gas.
Irion	352,493	252,455	Petroleum, natural gas.
Jack	18,230,935	20,905,835	Petroleum, natural gas, stone.
Jackson	39,192,333	40,149,567	Petroleum, natural gas, natural-gas liquids.
Jasper	133,902	492,747	Petroleum, clays, natural gas.
Jefferson	26,231,676	34,964,495	Petroleum, natural gas, sulfur.
Jim Hogg	6,071,990	5,789,685	Petroleum, natural-gas liquids, natural gas.
Jim Wells	60,730,236	55,369,505	Petroleum, natural gas, natural-gas liquids.
Johnson	269,851	105,733	Lime.
Jones	21,711,885	22,795,325	Petroleum, natural gas, stone.
Karnes	7,469,100	7,023,920	Petroleum, natural-gas liquids, natural gas.
Kaufman	3,519,201	4,350,458	Petroleum, stone, natural gas.
Kenedy	577,814	4,539,020	Petroleum, natural gas.
Kent	14,590,887	17,658,023	Do.
King	3,054,210	3,774,999	Do.
Kleberg	7,548,513	8,183,276	Petroleum, natural gas, stone.
Knox	2,179,879	3,368,965	Petroleum, natural gas.
Lamb		8,879	Do.
La Salle	269,453	187,630	Do.
Lavaca	2,527,721	5,001,718	Natural gas, petroleum, stone.
Lee	14,737	41,111	Stone, petroleum, natural gas.
Leon	1,438,071	2,303,736	Natural gas, petroleum.
Liberty	41,000,491	41,009,064	Petroleum, sulfur, natural gas.
Limestone	844,522	1,492,025	Petroleum, natural gas, clays.
Live Oak	2,891,390	4,076,273	Natural gas, petroleum.
Llano	499,839	598,887	Graphite, soapstone.
Loving	3,317,739	4,076,900	Petroleum, natural gas.
Lubbock	547,247	676,844	Petroleum.
Lynn	44,106	398,036	Petroleum, natural gas.
Madison	92,948	312,715	Natural gas, petroleum.
Marion	1,176,767	3,182,801	Natural gas, petroleum, natural-gas liquids.
Martin	1,204,595	1,488,032	Petroleum, natural gas.
Matagorda	22,477,634	28,289,052	Petroleum, natural gas, natural-gas liquids.
McCulloch	2,273	4,066	Petroleum.
McLennan	2,612,984	2,445,477	Cement, sand and gravel, clays.
McMullen	1,702,533	2,535,777	Petroleum, natural gas.
Medina	(¹)	48,116	Petroleum, clays.
Midland	49,649,362	32,217,035	Petroleum, natural-gas liquids, natural gas.
Milam	(¹)	127,229	Petroleum, sand and gravel.
Mitchell	1,913,567	2,411,236	Petroleum, natural gas.
Montague	24,866,472	27,880,104	Petroleum, natural-gas liquids, natural gas.
Montgomery	41,149,730	41,330,958	Do.
Moore	30,124,382	29,602,246	Natural gas, natural-gas liquids, helium.
Nacogdoches	401,689	1,173,285	Natural gas, clays, petroleum.
Navarro	3,150,813	4,436,837	Petroleum, natural gas.
Newton	2,511,125	3,444,303	Do.
Nolan	6,398,993	11,641,302	Petroleum, cement, gypsum.
Nueces	70,617,875	74,996,609	Petroleum, natural gas, natural-gas liquids.
Ochiltree	81,031	94,336	Petroleum, natural gas.
Orange	11,598,577	15,706,373	Do.
Palo Pinto	1,295,185	1,700,635	Petroleum, natural-gas liquids, natural gas.
Panola	40,788,239	58,136,771	Natural gas, natural-gas liquids, petroleum.
Parker	1,468,265	1,308,274	Natural-gas liquids, petroleum, clays.
Pecos	56,702,640	55,090,483	Petroleum, natural gas, stone.
Polk	6,646,496	6,065,402	Petroleum, natural gas, sand and gravel.
Potter	6,225,315	5,004,277	Natural gas, natural-gas liquids, helium.
Reagan	17,588,939	20,754,721	Petroleum, natural-gas liquids, natural gas.
Red River	1,008	17,113	Petroleum.

TABLE 25.—Value of mineral production in Texas, by counties, 1952-53—Con.

County	1952	1953	Principal minerals produced in 1953, in order of value
Reeves.....	\$3,342,619	\$2,388,869	Petroleum, sand and gravel, natural gas.
Refugio.....	63,404,208	64,468,514	Petroleum, natural gas, natural-gas liquids.
Roberts.....	234,448	2,034,633	Petroleum, natural gas.
Runnels.....	17,007,644	25,745,645	Petroleum, natural-gas liquids, natural gas.
Rusk.....	97,964,389	98,457,874	Do.
San Jacinto.....	2,466,023	2,555,824	Petroleum, natural gas, sand and gravel.
San Patricio.....	52,307,702	56,590,598	Petroleum, natural gas, natural-gas liquids.
Schleicher.....	6,207,417	9,107,917	Petroleum, natural gas.
Secury.....	141,013,727	144,095,693	Petroleum, natural-gas liquids, natural gas.
Shackelford.....	5,713,590	6,432,953	Petroleum, natural gas, natural-gas liquids.
Shelby.....	945,776	1,460,959	Natural gas, petroleum.
Sherman.....	8,823,363	9,767,228	Do.
Smith.....	7,341,973	3,133,513	Natural-gas liquids, petroleum, natural gas.
Starr.....	24,429,267	24,995,940	Petroleum, natural gas, natural-gas liquids.
Stephens.....	11,286,650	11,919,460	Petroleum, natural-gas liquids, natural gas.
Sterling.....	641,473	1,340,376	Petroleum, natural gas.
Stonewall.....	13,260,340	20,366,456	Do.
Sutton.....	31,538	446,283	Natural gas, petroleum.
Tarrant.....	6,047,873	6,030,293	Cement, sand and gravel, sulfur.
Taylor.....	3,792,839	4,571,962	Petroleum, natural-gas liquids, clays.
Terry.....	11,669,590	16,192,664	Petroleum, salt, natural gas.
Throckmorton.....	3,669,245	3,547,082	Petroleum, natural gas.
Titus.....	14,322,158	14,056,230	Petroleum, natural-gas liquids, natural gas.
Tom Green.....	4,691,441	3,200,547	Petroleum, sand and gravel, natural gas.
Travis.....	1,585,264	2,067,426	Stone, lime, petroleum.
Tyler.....	1,547,561	2,113,863	Petroleum, natural gas.
Upstaur.....	11,101,076	10,635,155	Do.
Upton.....	66,042,260	66,344,759	Petroleum, natural-gas liquids, natural gas.
Uvalde.....	3,752,564	1,026,826	Native asphalt, stone, basalt.
Val Verde.....	12,935	-----	Natural gas.
Van Zandt.....	31,981,373	32,938,179	Petroleum, salt, natural-gas liquids.
Victoria.....	27,247,213	29,851,158	Petroleum, natural gas, sand and gravel.
Walker.....	505,429	590,521	Clays, petroleum.
Waller.....	3,000,494	1,226,809	Petroleum, natural gas, sand and gravel.
Ward.....	32,305,160	30,922,297	Petroleum, natural-gas liquids, natural gas.
Washington.....	1,299,291	1,253,040	Petroleum, natural gas.
Webb.....	5,904,241	6,069,630	Petroleum, sand and gravel, natural gas.
Wharton.....	75,718,423	92,729,808	Sulfur, petroleum, natural gas.
Wheeler.....	6,815,135	6,883,208	Petroleum, natural-gas liquids, natural gas.
Wichita.....	33,162,217	37,751,780	Do.
Wilbarger.....	7,861,231	9,769,750	Do.
Willacy.....	8,947,500	9,114,190	Petroleum, natural gas.
Williamson.....	463,137	644,627	Lime, stone, petroleum.
Wilson.....	696,986	852,564	Petroleum, clays, natural gas.
Winkler.....	49,382,026	49,487,318	Petroleum, natural-gas liquids, natural gas.
Wise.....	4,087,710	3,626,178	Stone, petroleum, natural gas.
Wood.....	66,213,038	75,938,928	Petroleum, natural-gas liquids, natural gas.
Yoakum.....	54,238,923	59,054,968	Do.
Young.....	14,858,736	16,988,035	Do.
Zapata.....	1,330,172	1,948,949	Petroleum, natural gas.
Zavala.....	79,652	144,521	Natural gas, petroleum.
Undistributed ¹	7,261,435	4,306,975	
Total.....	² 3,379,813,000	3,647,913,000	

¹ Includes production from the following counties: Brewster (mercury, stone), Briscoe (clays), Burnet (stone), Collin (stone, 1953 only), Coryell (stone, 1953 only), Hill (stone, petroleum), Kerr (sand and gravel), Kimble (sand and gravel, petroleum), Mason (sand and gravel), Morris (iron ore), Robertson (sand and gravel, petroleum), Rockwall (stone, 1953 only), Terrell (stone), Trinity (clays, natural gas).

² Revised figure.

TABLE 26.—New oilfield discoveries in 1953 that produced at the rate of over 10,000 barrels a year, by counties¹

Anderson: Neches (Woodbine).	Clay:
Andrews:	Alcorn (Simpson sand).
Andrews (Wolfcamp section).	Burns-Midway (Strawn).
Magutex (Devonian).	Joy (3,300 ft. Strawn).
Midland Farms (Fusselman).	McKinlay (Strawn second zone).
Midland Farms, North (Grayburg).	Dillard (Caddo).
Prichard (Devonian).	Gowan (Lower Caddo).
Shafter Lake (San Andres).	McKinlay (3,500 ft. Strawn).
Andrews, South (Devonian).	Coke:
Andrews, Northeast (Ellenberger).	Rawlings (4,500 ft.).
Andrews, South (Wolfcamp).	Rawlings (5,100 ft.).
Block 12, East (Ellenberger).	Rawlings (5,500 ft.).
C-Ranch (Devonian).	Wendkirk (Cisco).
Emma (Ellenberger).	Bronte (Ellenberger).
Emma (Glorietta).	Fuller (Strawn).
Fasken (Ellenberger).	Rawlings (4,100 ft.).
Wemack (Wolfcamp).	Rawlings (4,200 ft.).
Glasco (Devonian).	Coleman:
Hutex (Devonian).	Banks (Morris sand).
Lowe (Silurian).	Kroc (Breneke sand).
Parker (Wolfcamp).	Lake Scarbrough (Morris sand).
Prichard (Ellenberger).	Whitley (Jennings sand).
Tripple "N" (McKnight).	Whitley (Gray sand).
University Block 9 (Wolfcamp).	Wigner (Morris sand).
Midland Farms, Northeast (Ellenberger).	Cresswell (Strawn).
Aransas:	Hovgard-Johnson (Gray sand).
Fulton Beach, East (B-2 sand).	Mary Opal (Morris sand).
Fulton Beach, East (B-3-A sand).	Templeton (Crosscut sand).
Fulton Beach, North (Segment -A).	Colorado:
Fulton Beach (A-3 sand).	Cecil Noble (Housh).
Fulton Beach, East (D sand).	Cecil Noble (B sand).
Fulton Beach, West (E-1 sand).	Concho: Speck (Strawn).
Fulton Beach, West (lower H sand).	Cooke:
Fulton Beach, West I (1-SW sand).	Kidd (Upper Muenster sand).
Goose Island (F sand).	Kimbell-Sims (Sims sand).
Archer:	Kimbell-Sims (Titch sand).
Lake Kickapoo, South (Caddo).	Crane:
Duke (Caddo).	Abell (Devonian).
Prideaux, North (3,000-ft. Strawn).	Gulfstano (Ellenberger).
Baylor:	Jordan (Pennsylvanian).
Y. B. (upper Gunsite).	Lea (Ellenberger).
Rendham (Mississippian).	Lea (Connell).
Bee: San Domingo (Vicksburg).	Crockett:
Brazoria:	Farmer (San Andres).
Damon Mound (Fault Block No. 1).	Midway Lane (1,300 ft.).
Bailey's Prairie (Frio J-sand).	Ranch (Strawn).
Bonny (upper Frio).	Toe Nail (Strawn).
Chocolate Bayou (Banfield XIV sand).	Dawson:
Danbury Dome (8,200 ft. sand).	Spraberry Deep, West.
Juliff (Bingham sand).	Cedar Lake, Southeast (San Andres).
Stratton Ridge, South.	Spraberry, West (Pennsylvanian).
Brooks:	De Witt:
Kelsey Deep (zone 23).	Christmas (7,300 ft. sand).
Mills Bennett (D sand).	Helen Gohlke, West (Wilcox "A"-2 sand).
Mills Bennet (E sand).	Helen Gohlke, West (B-1 sand).
Callahan:	Dickens: Girard (Tannehill).
Dykes (Cook sand).	Dimmit: Elaine.
St. Patrick (Hope).	Duval:
Three Aces (Flippen).	Hagist Ranch (Queen sand).
War-Kirk (Cross Plains sand).	Crestonia (Crestonia zone).

TABLE 26.—New oilfield discoveries in 1953 that produced at the rate of over 10,000 barrels a year, by counties¹—Continued

Ector:	Haskell:
Headlee (Ellenberger).	Haskell (Crossect).
Penwell (Wichita Albany).	Humphrey-Chapman, East (Canyon sand).
Addis (Wolfcamp).	Paint Creek (Lower Strawn).
Addis (San Andres).	Stamford, Northwest (Canyon lime).
Goldsmith, East (Pennsylvanian).	
Headlee (Devonian).	Hidalgo:
Penwell (Clearfork).	Coastal, East (Sullivan).
Penwell (Fusselman).	Tabasco (F-sand).
Penwell (Glorietta).	Hockley: Ropes, West (Cisco sand).
Fisher:	Houston: Fort Trinidad (Woodbine).
Royston (Canyon).	Howard:
Tolar (Canyon sand).	Luther, Southeast.
Ida (Flippen).	Oceanic (Pennsylvania).
Judy Gail (Canyon sand).	Vincent (upper Canyon).
Paul Hunt (Canyon Reef).	
Round top (Flippen lime).	Jack:
Ida (Strawn).	Ada (Strawn).
Fort Bend:	Alco (Marble Falls).
Blue Ridge (Frio).	Burns-Garner (Strawn).
Fulshear (Hillebrenner sand).	Dearing (Strawn).
Thompson (Vicksburg).	Doug Johnson (upper Strawn).
Gaines:	Leatherwood-Barham (upper Strawn).
Russell (6,100 ft. Glorietta).	Lodge Creek (Strawn).
Jones Ranch, South (Devonian).	Bryson, South (Mississippian).
Galveston:	Avis, West (Buttram).
Caplen (Block 1-Res. 5-A).	Jupiter (4th conglomerate).
Caplen (Block 2-Res. 9-A).	Karper (Mississippian).
Caplen (Block 2-Res. 10-X).	Winn (Caddo).
Caplen (Block 5-Res. 9-A).	Jackson: Steward, Deep.
Caplen (Block 1-Res. 10-X).	Jasper: Buna, North.
Caplen (Block 5-Res. 10).	Jefferson:
League City, North (Butner sand).	Big Hill (Hackberry).
Goliad:	Big Hill (upper Frio).
Barvo (Pettus sand).	Big Hill, West (Discorbis).
Boyce (Slick).	Jim Hogg: Silver Lake (Pettus sand).
Terrell Point, West (4,000 ft. sand).	Jim Wells:
Grayson:	Magnolia City, North (Roberts sand).
McMillan (Pennsylvanian).	Seeligson (zone 20-G-R Southwest).
Big Mineral Creek ("U" sandstone).	Alfred Deep (5,300 ft. sand).
Handy, Southeast (2,400 ft. Strawn).	Rowe (upper Stilwell 5,300 ft. sand).
Hester (Strawn).	Seeligson (zone 20-F southwest).
■ Mackoy (lower Strawn).	Sharp Ranch (Frio).
■ Mackoy (4,400 ft. sand).	Sharp Ranch (6,700 ft. sand).
■ Sherman (Mott sand).	
Mulder (Pennsylvanian).	Jones:
Sadler (Huff).	Betty Dell (Flippen lime).
Sandusky (Dornick Hills).	Belcher (4,500 ft.).
■ Whitesboro (Oil Creek sand).	Doty (Bluff Creek).
Grimes: Madisonville, South (9,300 ft.).	Milstead (Flippen lime).
Hardin: Hampton, South (F-3 Yegua).	Stamford, South (Flippen lime).
Harris:	B. M. W. (King sand).
Huff Smith (Petrich sand).	Doty (King sand).
Indian Hills (Cockfield).	Neianda, Southeast (Swastika).
Harrison:	Kaufman: Ham Gossett (Williams).
Waskom (Hammond).	Kent: S. M. S. (Canyon Reef).
Waskom (Upper Pettit).	King: Tap (Pennsylvanian).
Waskom (T. P. Smith zone).	
Waskom (Princess Smith-Huffman zone).	

TABLE 26.—New oilfield discoveries in 1953 that produced at the rate of over 10,000 barrels a year, by counties¹—Continued

Kleberg:	Nueces—Continued
Borregos (zone D-3).	Robstown, East (5,800 ft. sand).
Borregos (zone L-3).	Chapman Ranch (C-3 sand).
Borregos (zone L-9-11).	Clara Driscoll, South (5,620 ft.).
Knox:	Corpus Channel.
Benjamin, Southwest (Tannehill).	Ransom Island (sand No. 8).
Bush (upper Strawn).	Robstown, South (5,600 ft. sand).
Knox City, West (Strawn).	White Point, East (Nueces Bay).
Munday Bend (conglomerate).	Orange: Echo, Northeast.
Truscott Bend (conglomerate).	Panola: Bethany (Travis Peak).
Live Oak:	Pecos:
Mount Lucas (McIver).	Brown-Thorp (Ellenberger).
Mount Lucas (Vicksburg).	Wentz (Clearfork).
Lubbock: Cravens.	Pecos Valley (Fusselman).
Lynn: Tahoka (Pennsylvanian Strawn lime).	Reagan:
Matagorda:	Big Lake (Ellenberger).
Cummins (Frio).	Big Lake, West (Ellenberger).
Midfields Townsite (Frio).	Refugio: Mary Ellen O'Conner (5,900 ft. sand).
Midland:	Runnels:
Bonanza (Pennsylvanian lime).	Hall (upper Gardner).
Spraberry trend area.	Lindemann (Morris sand).
Virey (Pennsylvanian).	Winters (Palo Pinto).
Mitchell: Jameson, North (Strawn).	Ballinger (Serrett).
Montague:	Cree-Stephens (lower Fry).
McNabb, Northwest (upper conglomerate).	Cree-Sykes (Morris sand).
Ringold, East (5th conglomerate).	Enoch Johnson (Morris sand).
Aries (Caddo).	Hull Dobbs (Gray).
Bowie, Southwest (Marble Falls).	Hull Dobbs (Morris sand).
Bowie, Southwest (1st conglomerate).	Hull Dobbs, North (upper Gardner).
Bowie, Southwest (conglomerate H-zone).	Jim Burt (Goen lime).
Engle (1st conglomerate).	Jim Burt, South (McMillan).
Hewitt Stray (conglomerate).	Jim Burt, South (upper Gardner).
Hildreth (lower conglomerate).	Sykes, West (Morris sand).
Hildreth (Reese).	Hull Dobbs, North (Fry).
Jockey (conglomerate).	San Patricio:
Lewis-Stuart (Strawn).	Ewing (Horn sand).
Lone Prairie (upper Ellenberger).	Ewing (Hartzell).
Nacona, North (Crinoidal sand).	North Pasture (7,400 ft. sand).
Richardson-Mueller (Viola lime).	Ewing (Sims sand).
Ritchie, North (conglomerate).	Ewing (Parks sand).
Threadgill (conglomerate).	Schleicher:
Sanders (lower conglomerate).	Cox-Brown (Strawn).
Sanders (upper conglomerate).	Hulldale, South.
Montgomery: Bender (Yegua Y-5 sand).	Tillery (Pennsylvanian sand).
Nacogdoches: Trawick (Rodessa).	Shackelford:
Navarro: Reka (6,800 ft.).	Harry Hines (1,600 ft.).
Newton: R. E. (Bob) Smith.	Windham (Gardner).
Nolan:	Clemmer (Lower Tannehill sand).
Blackwell, North (Ellenberger).	Cook Ranch (3,160 ft.).
Dora, North (Ellenberger).	Mugginsville, West (Ellenberger).
Group (4,000 ft.).	Smith:
White Flat (Strawn).	Hitts Lake (Paluxy).
Faver, North (Ellenberger).	Wright Mountain (lower Pettit).
Hat Top Mountain (Goen lime).	Starr:
Lake Trammel, West (Canyon).	El Benadito (Neblett).
Mary Neal (Cisco sand).	Strong (4,700 ft. sand).
Nueces:	Ware (O'Hern sand).
Cayo Del Oso.	El Benadito (5,900 ft. sand).
Petronilla (4,300 ft. sand).	Kelsey, South (6,400 ft.).
	Kennard (Vicksburg).
	Rincon, North (4,060 ft. sand).

TABLE 26.—New oilfield discoveries in 1953 that produced at the rate of over 10,000 barrels a year, by counties¹—Continued

Stephens: Rickles (conglomerate).	Ward:
Stonewall:	H. S. A. (lower O'Brien sand).
Alexander (lower Canyon).	Quito (Delaware sand).
Corsica (Bend conglomerate).	Washington: Arthur Harvey (Wilcox
Corsica (Strawn).	8,600 ft. B sand).
Ashmore (conglomerate).	Webb:
Boyd (Ellenberger).	De Spain (Bruni).
Taylor:	St. Joseph (3,100 ft. sand).
Atwood, West (Gardner).	Wichita:
Bull (Gardner).	Krohn (3,800 ft. sand).
Cal-Ham (Ellenberger).	Madden, East (Strawn).
Dudley (Flippen sand).	T. W. G. (Strawn).
Landers (Gardner).	Wilbarger:
Robertson Griffin (Gray sand).	King, North (1,600 ft. sand).
Terry: Alsabrook (Devonian).	Streit (lower Dyson).
Throckmorton:	Wilson: Denhawken (Basil Wilcox zone
Dickie (Canyon).	2).
Gover (Marble Falls conglomerate).	Wise: Hodge (upper conglomerate).
Lendra (Strawn).	Wood:
Burgess (Caddo).	Winnsboro (Byrd zone).
Coon (Mississippian).	Winnsboro (Young zone).
McConnell (lower Caddo).	Yoakum:
Marshall (Mississippian).	Ownby, West (San Andres).
Marshall, North (Caddo).	Tokio, South (Wolfcamp).
Mills (Strawn).	Young:
Parminter (upper Caddo).	Easterly (1,900 ft. sand).
Tom Green:	Graham (2,100 ft. Strawn).
Floyd G. Miller (upper Pennsyl-	Henning Basin (1,075 ft. sand).
vanian).	Beth (Mississippian).
Pecan Station (Canyon lime).	Biggers (Strawn).
Rust, South (Strawn lime).	Hall (conglomerate).
Tyler: Hillister, East (EY-E north	Holcomb (Upper Strawn).
segment).	Hunt (Mississippian).
Upton:	Langston-Kleiner (2,900 ft.
Adame (Devonian).	Strawn).
Adame (Ellenberger).	Langston-Kleiner (3,200 ft.
Adame (Silurian).	Strawn).
Amacker-Tippett (Ellenberger).	Langston-Kleiner, West (3,200 ft.
Rodman-Noel (Grayburg).	Strawn).
Victoria:	McClusky (2,900 ft. sand).
Battle, North (fault block, Gutman	Ming Bend (Marble Falls).
sand).	Novi (Mississippian).
Placedo (5,700 ft. sand).	Orth (Mississippian).
Placedo (6,200 ft. sand).	Wilton (Strawn).
Placedo (5,880 ft. sand).	Wilton (2,800 ft. Strawn).

¹ Railroad Commission of Texas, Annual Report of 1953: 387 pp.

TABLE 27.—Oilfields producing over 1 million barrels of petroleum in 1953, by counties

Anderson:	Andrews—Continued
Cayuga.	Martin (Ellenberger).
Long Lake.	Means.
Andrews:	Shafter Lake (Devonian).
Dollarhide (Clearfork).	Three Bar (Devonian).
Dollarhide (Devonian).	Archer:
Dollarhide (Silurian).	Archer County.
Fuhrman-Mascho.	Hall-Silk-Sykes.
Fullerton.	Atascosa: Charlotte.
Fullerton (4,500 ft. sand).	Austin: Raccoon Bend (Cockfield).

TABLE 27.—Oilfields producing over 1 million barrels of petroleum in 1953.
by counties—Continued

Borden:	Fort Bend:
Good.	Sugarland.
Hobo (Pennsylvanian).	Thompson, North.
Reinecke.	Thompson, South.
Von Roder.	Thompson.
Vealmoor.	Franklin: Talco.
Brazoria:	Freestone: Long Lake.
Hastings.	Frio: Big Foot.
Chocolate Bayou (upper Frio).	Gaines:
Manvel.	Wasson.
Old Ocean (Armstrong).	Cedar Lake.
West Columbia (New).	Russell, North (Devonian).
Caldwell: Luling Branson.	Seminole (San Andres).
Calhoun: Heyser.	Seminole, West.
Carson: Carson County.	Galveston:
Chambers:	Gillock (Big Gas sand).
Anahuac.	Gillock, South.
Barber Hill.	High Island.
Oyster Bayou.	Garza: Garza.
Cherokee: East Texas.	Glasscock:
Cochran:	Spraberry trend area.
Levelland.	Howard-Glasscock.
Slaughter.	Gray: Gray County.
Coke:	Grayson: Sadler (Pennsylvanian).
Jameson.	Gregg: East Texas.
Jameson (Strawn).	Guadalupe: Darst Creek.
Cooke:	Hale: Anton-Irish.
Cooke County.	Hardin:
Walnut Bend.	Sour Lake.
Walnut Bend (Hudspeth).	Village Mills, East.
Crane:	Harris:
Block 31 (Devonian).	Dyersdale.
Jordan.	Fairbanks.
Sand Hills (Tubb).	Goose Creek.
Waddell.	Houston, South.
McElroy.	Pierce Junction.
Crockett:	Tomball.
Elk Horn (Ellenberger).	Webster.
Todd Deep (Ellenberger).	Haskell: Sojourner.
World.	Henderson: Cayuga.
Vaughn.	Hockley:
Dawson: Welch.	Slaughter.
De Witt: Helen Gohlke (Wilcox).	Levelland.
Duval:	Hopkins: Pickton.
Government Wells.	Howard:
North.	Vealmoor.
Seven Sisters.	Howard-Glasscock.
Ector:	Iatan, East Howard.
Andector (Ellenberger).	Vealmoor, East.
Cowden, North.	Hutchinson: Hutchinson County.
Cowden, South.	Jack:
Foster.	Rusmag.
Goldsmith.	Worsham-Steed.
Goldsmith (Clearfork).	Jackson:
Goldsmith (5,600 ft.).	Lolita.
Jordan (Ellenberger).	West Ranch (Ward zone).
T. X. L. (Devonian).	West Ranch (41-A zone).
T. X. L. (Ellenberger).	West Ranch (98-A).
Yarbrough & Allen.	Jefferson:
Fisher: Round Top (Palo Pinto Reef).	Amelia.
	Fannett.
	Stonewall.

TABLE 27.—Oilfields producing over 1 million barrels of petroleum in 1953, by counties—Continued

Jim Wells:	Shackelford: Shackelford County.
Seeligson (zone 19-B).	Starr:
Seeligson (zone 19-C).	Garcia.
Seeligson (zone 20).	Rincon.
Stratton.	Rincon-Vicksburg.
Karnes: Falls City.	Stephens: Stephens County.
Kent:	Stonewall:
Salt Creek.	Katz.
Cogdell area.	Old Glory.
King: Katz.	Terry:
Kleberg:	Wellman.
Seeligson (zone 19-B).	Adair (Wolfcamp).
Seeligson (zone 19-C).	Slaughter.
Seeligson (zone 20).	Titus:
Stratton.	Pewitt Ranch.
Knox: Katz.	Taleo.
Liberty:	Upshur: East Texas.
Liberty, South.	Upton:
Hull.	McCamey.
Matagorda: Sugar Valley.	Weiner-Floyd (Spraberry).
Midland:	Wilshire (Ellenberger).
Midland Farms.	Benedum (Spraberry).
Pegasus (Ellenberger).	Spraberry trend area.
Pegasus (Pennsylvanian).	McElroy.
Mitchell: Iatan East Howard.	Van Zandt: Van.
Montague: Montague County.	Victoria:
Montgomery: Conroe.	Bloomington (4,600 ft.).
Nueces:	McFadden.
Aqua Dulce.	Placedo.
Mustang Island (8 sand).	Ward: Ward, South.
Red Fish Bay (zone 5-B).	Wharton:
Stratton.	Magnet Withers.
Orange: Orange.	Withers, North.
Pecos:	Wheeler: Wheeler County.
Yates.	Wichita:
Torberg.	Wichita County.
Fort Stockton.	K. M. A.
Reagan:	Wilbarger: Wilbarger County.
Benedum (Spraberry).	Willacy:
Spraberry trend area.	Willamar.
Reeves: Tunstill.	Willamar, West.
Refugio:	Winkler:
Tom O'Connor.	Hendricks.
Greta.	Kermit.
Runnels:	Keystone (Ellenberger).
Cree-Sykes (upper Gardner).	Keystone-Holt.
Fort Chadbourne.	Ward, North (Estes).
San Patricio:	Wheeler (Ellenberger).
Plymouth.	Wood:
Portilla (7,400-ft. sand).	Hawkins.
Portilla (8,100-ft. sand).	Quitman.
White Point, East.	Yoakum:
Schleicher: Huldale (Pennsylvanian Reef).	Prentice.
Scurry:	Wasson.
Diamond M (Canyon lime area).	Young: Young County.
Kelly Snyder.	
Kelly Snyder (Cisco).	
Cogdell area.	

ATASCOSA

Crude oil was the most important mineral commodity in value in Atascosa County in 1953. One oilfield produced over 1 million barrels. Humble Oil & Refining Co. produced natural gasoline at its Jourdanton plant. Natural gas was produced from several fields. The Espey Silica Sand Co. near San Antonio produced the following types of sands: Glass, molding, blast, building, filter, and sands for other uses. The West Land Security Co. produced glass sand at Poteet.

AUSTIN

Crude oil, natural gas, and sand and gravel valued at \$8 million were produced in Austin County. One field produced over 20 billion cubic feet of natural gas. Sand and gravel were produced for use by a railroad.

BASTROP

Significant quantities of crude oil and natural gas were produced in the county in 1953. The Elgin Standard Brick Mfg. Co. and the Elgin Butler Brick Co. mined plastic clay for manufacturing heavy clay products, such as brick, face brick, face tile, and sewer tile. The Texas Highway Department produced crushed limestone for road construction.

BAYLOR

Crude oil and natural gas valued at over \$2 million were produced in 1953. Two oilfields were discovered during the year.

BEE

Crude oil and natural gas and natural-gas liquids accounted for most of the \$13 million in value of Bee County's mineral production in 1953. One new field was brought into production in 1953. Natural-gas production totaled 16 billion cubic feet. Miscellaneous crushed stone was produced by Heldenfels Bros. for use in concrete and as road metal. Natural-gas liquids were recovered at cycle plants of the Gasoline Production Corp. and the Stanolind Oil & Gas Co.

BELL

Railroad sand and gravel were produced in the county. The Texas State Highway Department crushed limestone for paving purposes.

BEXAR

Portland cement was produced by the Longhorn Portland Cement Co. at Longhorn and the San Antonio Portland Cement Co. at Cementville. Crushed limestone was produced by Colglazier & Hoff, Inc., on Pinn Road, for concrete, road metal, and screenings. The McDonough Bros., Inc., crushed limestone at Beckman Quarry for use as riprap, concrete, road metal, and railroad ballast and for chemical use in an alkali works. Sand and gravel were produced by the Acme Gravel Co. near Von Ormy for use as structural sand,

paving sand, and paving gravel. Structural gravel was produced by the Ames Gravel Co. The City of San Antonio produced paving sand and gravel for road building. The Alamo Clay Products Co. mined plastic fire clay near San Antonio. Miscellaneous clays were produced by the Southern Co. for wall and face tile. Significant quantities of crude oil were produced from existing fields.

BORDEN

Crude oil and natural gas composed all of Borden County's mineral production, amounting to nearly \$22 million in value in 1953. Five oilfields in the county produced over 1 million barrels each in 1953.

BOSQUE

Bosque County was the second largest producer of noncommercial crushed limestone in Texas in 1953. The Texas State Highway Department crushed this limestone for concrete aggregate and road metal.

BOWIE

Sand and gravel, produced at two plants of Gifford Hill & Co., Inc., were used for structural, paving, and filtering purposes. Considerable quantities of crude oil and natural gas were produced from developed fields.

BRAZORIA

Five oilfields in Brazoria County produced over 1 million barrels of petroleum each in 1953. The Hastings field was the fifth largest producing field in the State with an output exceeding 13 million barrels. Seven major oilfields were discovered in 1953. Brazoria County was the second largest Texas producer of natural gas, with 215 billion cubic feet output. Three gasfields were discovered in 1953: Rowan, North; Drum Point; and Velasco. Ethyl-Dow Chemical Co., the Nation's largest producer of bromine, produced ethylene dibromide at its Freeport plant, as well as magnesium metal and magnesium chlorides. Natural-gas liquids were recovered at four gasoline plants: Old Ocean plant of J. S. Abercrombie Co., Bayou plant of Phillips Petroleum Co., Pledger plant of Southern Production Co., Inc., and Hastings plant of Stanolind Oil & Gas Co. Native sulfur was produced by Freeport Sulphur Co., Jefferson Lake Sulphur Co., and Standard Sulphur Co. Salt was produced by Dow Chemical Co. for use at its Freeport plant, as was lime made from oystershells. The Peerless Carbon Black Co. operated its Sweeney carbon-black plant in 1953.

BRAZOS

Natural gas was produced from existing fields in the county.

BREWSTER

Noncommercial crushed limestone was produced by the National Park Service and used as riprap.

BRISCOE

Sliverton Clay Products Co. produced fuller's earth for oil-refining purposes.

BROOKS

Mineral fuels supplied all of Brooks County mineral output in 1953. Three major oilfields were discovered in 1953. Natural-gas liquids were recovered from natural gas in the county. The Dixie plant of the United Carbon Co., Inc., with a 25-million-cubic-foot throughput, produced carbon black in 1953.

BROWN

Crude oil, natural gas, and crushed stone were reported from Brown County. The Rising Star gasoline plant of Rudco Oil & Gas Co. recovered natural-gas liquids in 1953. G. C. McBride crushed limestone for riprap, concrete, road metal, railroad ballast, and agricultural purposes. Natural-gas production amounted to 1 billion cubic feet in 1953. Ross & Son produced structural sand and gravel. Miscellaneous clays were mined by the Texas Brick Co. for heavy clay products.

BURLESON

Crude-oil output was reported from existing oilfields in Burleson County.

BURNET

Dimension granite was produced in Burnet County by the Texas Pink Granite Corp. of Marble Falls and used as dressed monumental stone.

CALDWELL

Crude oil and natural gas were reported in the county. One oilfield produced over 1 million barrels of oil in 1953.

CALHOUN

The mineral production of Calhoun County consisted of crude oil, natural gas, and limestone as oystershells, valued at nearly \$8 million. Crude oil was the most important mineral; 1 field produced over 1 million barrels in 1953. Natural-gas production amounted to 37 billion cubic feet; 2 gasfields—Sand Point and one not named—were discovered in 1953. Oystershells were produced by dredging operations of Smith Bros. and Bauer & Smith. Humble Oil & Refining Co. recovered natural-gas liquids at its Heyser gasoline plant, with production credited to other counties.

CALLAHAN

Callahan County reported production of crude oil and natural gas, with four major oilfields developed in 1953. One new gasfield, 7 miles north of Clyde was developed during the year.

CAMERON

Small quantities of crude oil and natural gas were produced in Cameron County in 1953. A new gasfield—Point Isabel, West—was reported. Barite imported from other States was processed for heavy drilling muds by Magcobar, Inc.

CAMP

Camp County reported its output of crude oil and natural gas.

CARSON

Carson County continued to be an important producer of crude oil, natural gas, and natural-gas liquids, with a 1953 output valued at \$26 million. One field produced over 1 million barrels of oil in 1953. Natural-gas liquids were recovered at the Bryan No. 17 plant of Shell Oil Co. and the Schafer plant of Skelly Oil Co. The Cabot Carbon Co. operated its Schafer carbon-black plant in 1953.

CASS

Crude oil, natural gas, and iron ore were reported from Cass County in 1953. Crude oil was the major commodity, followed by natural gas and iron ore. The Breckenridge Gasoline Co. recovered natural-gas liquids at its Lode plant, production from which was assigned to other counties. Brown ore was mined at the Kildare mine of Sheffield Steel Corp.

CHAMBERS

Crude oil, natural gas, natural-gas liquids, and oystershells accounted for the \$59 million in value of mineral output of Chambers County. Three oilfields produced over 1 million barrels in 1953. Chambers County was eighth in the production of sweet and sour natural gas, with 103 billion cubic feet in 1953. The Humble Oil Co. recovered natural-gas liquids at its Anahuac gasoline plant. Oystershells were produced from dredging operations by W. D. Haden Co.

CHEROKEE

An output of crude oil, natural gas, and iron ore was reported from Cherokee County. The rich East Texas field, discovered in 1931, extending into Cherokee County, was the largest producing oilfield in the State, with over 90 million barrels in 1953. Iron ore was produced by Sheffield Steel Co. at its Rush and Kildare mines.

CLAY

Crude oil was the principal mineral in value in Clay County, followed by stone and natural gas. Seven major oilfields were discovered in 1953. Natural-gas liquids were recovered at the Ringgold gasoline plant of Otha M. Grimes. This production was credited to other counties. Crushed sandstone was produced by the Texas State Highway Department for use as flexible road base.

COCHRAN

Over 8 million barrels of crude oil and 9 billion cubic feet of natural gas were produced in Cochran County. Two fields each produced over 1 million barrels of petroleum in 1953.

COKE

Crude oil, natural gas, and natural-gas liquids valued at \$29 million were reported from Coke County in 1953. Oil production was increased by the discovery of eight major fields. Two fields reported production of over 1 million barrels of oil each. Recovery of natural-gas liquids was obtained at the Jameson gasoline plant of Sun Oil Co.

COLEMAN

Coleman County was an important source of crude oil, natural gas, natural-gas liquids, clays, and sand and gravel. Ten major oilfields were discovered in 1953. Coleman County produced 2 billion cubic feet of natural gas in 1953, and 2 new gasfields were reported. Natural-gas liquids were recovered in two plants—the Overall of the Anzac Oil Corp. and the Glen Cove of the Glen Cove Gasoline Co. The Martin Brick Co. mined miscellaneous clays for heavy clay products. The Santa Anna Silica Sand, Inc., produced high-grade glass and molding sands.

COLLIN

The Texas State Highway Department crushed limestone for road construction.

COLLINGSWORTH

Collingsworth County's 1953 natural-gas output was augmented by the East Sweet natural-gas field discovered that year. Petroleum was produced from existing fields in the county.

COLORADO

Natural gas, natural-gas liquids, crude oil, and sand and gravel, valued at over \$15 million, were produced in Colorado County in 1953. Natural-gas liquids were recovered at two plants—the Chesterville gasoline plant of Tennessee Production Co. and the Sheridan cycle plant of Shell Oil Co. A gas-condensate field, not named, was discovered in 1953. Colorado County was first in tonnage and value for the production of commercial sand and gravel, with 4 producers in 8 operations. Horton & Horton operated fixed plants near Columbus and near Eagle and a dredge at Eagle Lake to produce molding, structural, paving, blast, and engine sands, and structural and paving gravels. Parker Bros. produced structural sand with a portable plant near Columbus. The Texas Construction Material Co. operated 2 portable plants at Eagle Lake and 1 portable plant near Columbus to produce blast and paving sands and paving gravel. Structural sand and gravel were produced by Thorstenberg & Tamborello at Eagle Lake near Columbus. Oil production and reserves were increased by the discovery of two major fields.

COMAL

Stone, lime, and sand and gravel were produced in Comal County. The Servtex Materials Co. crushed limestone for use as riprap, metallurgical flux, concrete, road metal, and railroad ballast and for chemical and agricultural purposes. At the New Braunfels quarry, United States Gypsum Co. crushed limestone for concrete, road metal, and chemical uses. Lime was produced at the Dittlinger plant at New Braunfels by United States Gypsum Co. for chemical and industrial purposes. The Comal Highway Department produced sand and gravel for paving.

COMANCHE

Oil and natural gas produced from existing fields in the county increased in 1953 compared with 1952 output.

CONCHO

Crude-oil production in Concho County was augmented by the discovery of one major field in 1953. Significant volumes of natural gas were also produced.

COOKE

The 1953 value of mineral production in Cooke County increased to more than \$23 million from \$21 million in 1952. Crude oil, natural gas, and natural-gas liquids were produced. Three fields each produced over 1 million barrels of oil in 1953. Three major fields were discovered. Natural-gas liquids were recovered by two plants—the Sivells Bend of Standard Oil Co. of Texas and the Walnut Bend of the Texas Natural Gasoline Corp. Natural gas was produced from existing gas fields in the county.

CRANE

Minerals produced in Crane County increased in value from \$48 million in 1952 to \$54 million in 1953. Crude oil, natural gas, natural-gas liquids, and recovered sulfur were produced. Five oilfields each produced over 1 million barrels of oil in 1953. Five oilfields were discovered in 1953. Natural-gas liquids were recovered at two plants—the Waddel of Gulf Oil Corp. and the Crane of Phillips Petroleum Co. Byproducts sulfur was recovered from sour gas by Gulf Oil Corp. and Phillips Petroleum Co.

CROCKETT

Crude oil, natural gas, and stone were reported from Crockett County in 1953. Over 1 million barrels of crude oil was produced from each of 4 fields in 1953. Adding to the existing oil production of Crockett County were four major oilfields discovered in 1953. Two gas-condensate fields—Block 38 and Ozona, East (Ellenberger)—and two gasfields—Noelke, Northeast, and Pandale—were discovered in 1953 to increase production and reserves in this county. The Todd Ranch gasoline plant of Continental Oil Co. recovered natural-gas liquids. Limestone was crushed by the Texas State Highway Department for use in concrete and as road metal.

CULBERSON

Culberson County reported crude-oil and stone production. The Texas State Highway Department crushed limestone for paving purposes.

DALLAS

Cement, sand and gravel, and clays valued at \$11 million were reported from Dallas County in 1953. Dallas County was the second largest cement producer in Texas. Cement was produced by the Lone Star Cement Corp. at Cement City and by the Trinity Portland Cement Division of General Portland Cement Co. at Eagle Ford. The commercial production of sand and gravel was fourth in the State in quantity and value. There were 5 producers with 6 operations: John G. Corder, southwest of Kleberg; Gifford Hill & Co., Inc., at Bobwyn near Kleberg; Lagow Gravel Co., near Seagoville; J. W. and Roy McGinty, near Dallas; and J. Fred Smith Gravel Co., which had 2 operations that produced structural and paving sand and gravel. Ferris Brick Co. manufactured heavy clay products from shale at Mesquite. Expanded perlite was produced by the Texas Lightweight Products Co. of Irving and Perlite Products Corp. of Dallas for use in plaster and concrete aggregates.

DAWSON

Crude oil and natural gas valued at over \$6 million were produced in Dawson County in 1953. The Welch oilfield, discovered in 1941, produced over 1 million barrels of crude oil in 1953. Three oilfields were discovered in 1953.

DENTON

Denton County reported the output of crude oil, clay, and stone in 1953. Acme Brick Co. mined plastic fire clay for firebrick and block near Denton. Limestone was crushed by the Texas State Highway Department for use in concrete and as road metal. The Texas State Highway Department also crushed miscellaneous stone.

DE WITT

De Witt County produced crude oil, natural gas, natural-gas liquids, and stone. One oilfield produced over 1 million barrels in 1953. Three major fields were discovered. Natural-gas production amounted to 8 billion cubic feet, with 1 new gasfield, not named, discovered in 1953. The Wescol Oil & Gas Co. recovered natural-gas liquids from gas of the Nordheim field at its Nordheim cycle plant. Texas State District Engineers Division 13 crushed sandstone for road base.

DICKENS

The Girard (Tannehill) oilfield, discovered in 1953, added to Dickens County existing crude production.

DIMMIT

Dimmit County reported crude-oil and natural-gas production in 1953, one new oilfield, discovered in 1953, added to the county output and reserves.

DUVAL

Mineral production valued at over \$36 million and consisting of crude oil, natural gas, natural-gas liquids, and salt was reported from Duval County in 1953. Three oilfields each produced over 1 million barrels of crude in 1953. Two major oilfields were reported. Natural-gas production amounted to 33 billion cubic feet; and 5 new gasfields—the Labbe, Copita, Selesco Creek, and 2 not named—were discovered in 1953. Natural-gas liquids were recovered at two plants—the Duval gasoline and cycle plants of the Duval Gasoline Co. The Columbia-Southern Chemical Corp. pumped salt brine 61 miles to its chemical plant at Corpus Christi.

EASTLAND

Eastland County reported the production of crude oil, natural gas, natural-gas liquids, and clays valued at over \$6 million in 1953. Six gasoline plants—the Consolidated of the IbeX Co., the Pueblo and Plant No. 108 of Lone Star Producing Co., the Desdemona and Olden of Magnolia Petroleum Co., and the Pioneer of Ike Rudman-Pioneer Gasoline Co.—recovered natural-gas liquids. The production of natural gas totaled 4 billion cubic feet; and 1 new gasfield, not named, was discovered in 1953. Texas Industries, Inc., mined miscellaneous clays for the manufacture of lightweight aggregates.

ECTOR

Ector County continued to be the major source of crude oil and an important source of natural gas in Texas in 1953. Recovery of natural-gas liquids and of elemental sulfur from sour gas was also reported. Eleven oilfields each produced over 1 million barrels of crude in 1953. Nine major oilfields were discovered in the county. Five gasoline plants—the Odessa of Odessa Natural Gasoline Co., the Goldsmith and Judkins of Phillips Petroleum Co., the T. X. L. of Shell Oil Co., and the North Cowden of Stanolind Oil & Gas Co.—recovered natural-gas liquids. Noncommercial crushed miscellaneous stone production was third in quantity for the State. Byproduct sulfur was recovered by Odessa Natural Gasoline Co., using the German Troupe process; Phillips Petroleum Co., using the Modified Claus process; and Stanolind Oil & Gas Co., using both the Modified Claus and the German Troupe processes. The Odessa A, B, and C plants of the Sid W. Richardson Carbon Co. produced carbon black in 1953. This was the largest carbon-black plant in Texas and had a daily throughput of 100 million cubic feet of gas.

EDWARDS

Edwards County reported 1953 crude-oil production from existing fields.

ELLIS

Clays and crude oil were produced in Ellis County in 1953. Shale was mined near Palmer by the Barron Brick Co. and the Acme Brick Co. and near Ferris by the Ferris Brick Co. This clay production was

used in manufacturing heavy clay products, such as common brick, face brick, paving brick, drain and sewer tile, sewer pipe, and kindred products.

EL PASO

Cement, stone, sand and gravel, and lime, with a total value of more than \$4 million, were produced in El Paso County in 1953. The Southwestern Portland Cement Co., El Paso, was the only producer of cement in this county. Hugh McMillan and Vowell Material Co. crushed limestone at plants in El Paso for use in concrete, road metal, and railroad ballast. Sand and gravel were produced by Bowden Sand & Gravel Co. and El Paso Sand Products Co. for use in structural sand, engine sand, and various gravel uses. The Vowell Material Co. produced structural gravel, paving gravel, and gravel for other uses. Lime, used for building, chemical, and industrial purposes, was produced near El Paso by the Atlas Building Products Co. and El Paso Building Materials Co.

ERATH

Erath County reported production of crude oil, natural gas, and stone in 1953. A new gasfield discovered in 1953 increased the existing natural-gas production. The Texas State Highway Department crushed limestone for concrete and road-metal purposes.

FALLS

The value of crude oil and stone produced in 1953 decreased in Falls County compared with the 1952 value of these commodities. Crude oil was produced from existing fields in the county. The Texas State Highway Department crushed limestone for use in concrete and as road metal.

FAYETTE

Mineral output valued at over \$2 million was reported from Fayette County in 1953. Production consisted of crude oil, sand and gravel, and clays. Thorstenberg & Tamborella produced sand and gravel for structural and paving purposes from two pits near Fayetteville. Bentonite was produced by the Texas Co. at West Point and the National Lead Co. at Houston for use in rotary-drilling muds, filtering and decolorization of oils, and other uses. The Milwhite Co., Inc., and Flatonia Fuller's Earth Co. mined fuller's earth for oil refining, fillers, rotary-drilling mud, and various other uses. The Texas State District Engineers Division 13 crushed sandstone for road base.

FISHER

Mineral-production value in Fisher County increased to over \$14 million in 1953 from nearly \$13 million in 1952. Crude-oil production represented the major portion of the value, followed by gypsum and natural gas. Seven major oilfields were reported in 1953. Gypsum was produced by the Celotex Corp. at Longworth and by the National Gypsum Co. at Rotan.

FLOYD

Floyd County reported an output of crude oil and sand and gravel in 1953. Quintaque Sand & Gravel Co. produced a small quantity of paving gravel.

FOARD

Crude oil and natural gas were produced from existing fields in Foard County.

FORT BEND

Mineral output valued at over \$49 million and consisting of crude oil, sulfur, natural gas, and salt, was reported from Fort Bend County in 1953. Four oilfields each produced over 1 million barrels of petroleum in 1953. Three major oilfields were discovered in 1953. There were four sulfur producers—Duval Sulphur & Potash Co., Orchard; Jefferson Lake Sulphur Co., Guy; Lone Star Sulphur-Needville; and Texas Gulf Sulphur Co., Needville. Natural-gas production amounted to over 23 billion cubic feet. The Gulf Salt Co. produced evaporated salt at its plant in Missouri City. The California-Spray Chemical Co. recovered byproduct sulfur at its Foster plant.

FRANKLIN

Franklin County produced crude oil and natural gas valued at over \$12 million in 1953. A gas-condensate field, the New Hope, was discovered.

FREESTONE

The value of minerals produced in Freestone County in 1953—\$1.3 million—approximated the 1952 value. Minerals produced were crude oil, natural gas, and clays. Production of natural gas amounted to 8 billion cubic feet. Teague Brick & Tile Co. manufactured heavy clay products from miscellaneous clays mined near the Teague plant.

FRIO

The value of minerals produced in Frio County in 1953 nearly doubled that in 1952; crude oil was the major portion of the value. One oilfield produced over 1 million barrels in 1953. The production of natural gas totaled 1 billion cubic feet.

GAINES

The mineral output in Gaines County was valued at over \$54 million in 1953 and consisted of crude oil, natural gas, and natural-gas liquids. The third largest producing oilfield in Texas—the Wasson—discovered in 1937 and shared with Yoakum County, produced over 18 million barrels in 1953. Other fields that produced over 1 million barrels are listed. Two major oilfields were discovered in 1953. Natural gas was produced; and one plant, the Seminole of Phillips Petroleum Co., recovered natural-gas liquids. The Seminole No. 66 plant of Columbian Carbon Co., the fifth largest carbon-black plant in Texas in 1953 with a daily throughput of 35 million cubic feet of gas, was active in 1953.

GALVESTON

Crude oil was the principal mineral produced in Galveston County in 1953. Three oilfields each produced over 1 million barrels in 1953. Seven major oilfields were reported. Eleven billion cubic feet of natural gas was produced in Galveston County. The city of Galveston produced sand for paving. W. D. Haden dredged oyster-shells near Galveston.

GARZA

Crude oil and natural gas were produced in Garza County in 1953; 1 oilfield—the Garza field, discovered in 1942—produced over 1 million barrels.

GILLESPIE

The Texas State Highway Department crushed limestone for paving. Weirich Bros. produced paving sand and gravel from pits near Fredericksburg. Soapstone was mined by Southwestern Talc Corp.

GLASSCOCK

Crude oil and natural gas were produced. Two fields each produced over 1 million barrels of crude oil in 1953.

GOLIAD

Goliad County reported three major oilfields in 1953. Natural-gas production totaled 43 billion cubic feet. Two new gasfields—the Husky and one not named—were found.

GONZALES

Clay output of the Sunset Brick & Tile Co., Inc., was the largest in Texas in 1953. The State District Engineers Division 13 crushed sandstone for road base. Fred Halamicek produced a small quantity of pumicite at Gonzales for use in floor sweeping.

GRAY

The value of minerals produced in Gray County increased to over \$48 million in 1953 and consisted of crude oil, natural gas, and natural-gas liquids. The Gray County field, discovered in 1921, was the eighth largest producer in the State, with over 12 million barrels of petroleum for 1953. Natural-gas production reached 72 billion cubic feet. Nine gasoline plants—the Pampa of Cities Service Oil Co., the 78-1 plant of Coltexo Corp., the No. 6 plant of Kerr-McGee Oil Industries, Inc., and the Gray, Lefors, North, Pampa, and Pampa No. 15 of Phillips Petroleum Co.—recovered natural-gas liquids in the county. Paving gravel was produced by the Gray County Highway Department. Carbon-black plants were operated by the Cabot Carbon Co., the Coltexo Corp., the Columbian Carbon Co., and the Peerless Carbon Black Co. in 1953.

GRAYSON

Crude oil and natural gas produced in Grayson County in 1953 amounted to over \$15 million. One oilfield produced over 1 million barrels of crude in 1953. Twenty-three new oilfields were discovered in 1953; the important ones are listed in table 26. One billion cubic feet of natural gas was produced.

GREGG

The value of minerals produced in Gregg County, which amounted to more than \$168 million, was second largest in Texas in 1953; crude oil accounted for the largest portion. The East Texas field, discovered in 1931, shared by Gregg, Cherokee, and Upshur Counties, alone produced over 90 million barrels of oil. Natural-gas production was 18 billion cubic feet of sweet and sour gas. Six gasoline plants operated by five companies recovered natural-gas liquids: East Texas plant of Arkansas Fuel Oil Corp., Sabine of Magnolia Petroleum Co., Nine Oaks of Nine Oaks Gasoline Corp., Plant No. 18 of Sinclair Oil & Gas Co., and Plants No. 31 and 47 of Warren Petroleum Co.

GRIMES

Crude oil and natural gas were produced in Grimes County in 1953; one new oilfield was discovered.

GUADALUPE

Guadalupe County mineral value increased over \$1 million to nearly \$10 million in 1953 over 1952 value. Over 1 million barrels of oil production for 1953 was recorded for the Darst Creek field, discovered in 1928. Heavy clay products were manufactured by the Fraser Brick Co. from miscellaneous clays mined at McQueeney. A small amount of natural gas was produced.

HALE

Hale County reported the output of crude oil and natural gas valued at over \$7 million in 1953. The Anton-Irish field, discovered in 1944, in Hale and Lamb Counties, produced over 1 million barrels of oil in 1953.

HAMILTON

Crude oil and natural gas were reported in Hamilton County in 1953.

HANSFORD

Production of crude oil, natural gas, and natural-gas liquids valued in excess of \$5 million was reported from Hansford County in 1953. Natural-gas liquids were recovered at two plants in the county—the Hansford and the Sherman of Phillips Petroleum Co. Sixteen billion cubic feet of natural gas was produced.

HARDEMAN

Hardeman County reported production of gypsum, natural-gas liquids, and crude oil in 1953. The Certain-teed Products Corp. produced crude and calcined gypsum.

HARDIN

Mineral output valued at over \$32 million in 1953—\$4 million greater than in 1952—was reported from Hardin County. Two oilfields each produced over 1 million barrels in 1953. One major oilfield was discovered in 1953. Natural-gas production amounted to 28 billion cubic feet. Natural-gas liquids were recovered at the Silsbee cycle plant of American Republic Co.

HARRIS

Harris County reported its output of minerals valued at more than \$106 million in 1953—\$1.6 million greater than in 1952. Crude-oil output had the highest value, followed by natural-gas liquids, cement, natural gas, and clays. Seven fields had over 1 million barrels of crude-oil production in 1953. Two major oilfields discovered in 1953 added to the large production of oil in the county. Natural-gas liquids were produced from 4 gasoline and 2 cycle plants. The gasoline plants were: Clear Lake and Tomball of Humble Oil & Refining Co., Satsuma of Russell Engineering Co., and Fairbanks of Warren Petroleum Corp. Cycle plants were the North Houston of Distillate Production Corp., and the Ehrhardt of H. M. Harrell. The Alco-Mag and Rankin, South, gas-condensate fields and one not named added to the natural-gas production. A new gasfield not named was discovered. Harris County was the largest producer of cement in Texas. The Gulf Portland Cement Division of Ideal Cement Co., Lone Star Cement Co., and Trinity Portland Cement Division of General Portland Cement Co. produced cement at mills near Houston. Lime production (all from oystershells) ranked second in the State. Crude barite from other States was processed by the Milwhite Co. Inc. Nyotex Chemical Co. produced commercial lime at Houston, and Champion Paper & Fiber Co. produced lime for use in digesting liquor for the manufacture of pulp. Harris County was fifth in total tonnage for the State production of commercial sand and gravel. Horton & Horton dredged the San Jacinto River for sand for paving, structural, blast, engine, and molding uses. Parker Bros. & Co., Inc., operated a dredge on the San Jacinto River for sand employed for structural purposes. Fred T. Slack produced sand near Channelview for building and paving. Diamond Alkali Co., Pasadena, evaporated brine for salt. The Texas Brine Co. evaporated brine to produce salt in Houston. The Acme Brick Co. mined fire clay and miscellaneous clays near Houston for common brick, face brick, and tile. White clay was mined near Houston by J. M. Cordell & Sons for the manufacture of sewer brick, structural clay tile, and face brick. Houston Brick & Tile Co. produced fire clay for heavy clay products. Natural-gas production from sweet and sour natural gas totaled 48 billion cubic feet in 1953. Byproduct sulfur was produced from sour gas by Consolidated Chemical Co. and Shell Chemical Corp. Ex-

panded perlite was produced by Perlite of Houston, Inc. W. D. Haden Co., Horton & Horton, and Parker Bros. & Co., Inc., dredged oystershells in the Houston area. The Fortune No. 61 carbon-black plant of the Columbian Carbon Co., with a daily throughput of 8 million cubic feet of gas, operated throughout 1953.

HARRISON

Harrison County reported minerals valued at over \$14 million, consisting of natural gas, crude oil, natural-gas liquids, and clays. Sixty billion cubic feet of natural gas was produced. A new gas-condensate field—Blacker—was discovered. Natural-gas liquids were recovered at four plants—The Waskom plant of Arkansas Louisiana Gas Co., Whelan of H. L. Hunt, Waskom of Waskom Natural Gas Corp., and Whelan of D. E. & R. J. Whelan. Four major oilfields were discovered in 1953. The Marshall Brick Co. manufactured heavy clay products at Marshall. Face brick was made at Waskom by the Tri-State Brick & Tile Co.

HARTLEY

Natural gas amounting to 28 billion cubic feet and crude oil were produced from existing wells in Hartley County.

HASKELL

The mineral value of crude oil and natural gas increased \$2.9 million to almost \$9 million in Haskell County in 1953. One oilfield produced over 1 million barrels of crude in 1953. Four major oilfields were discovered.

HAYS

Hays County reported the output of natural-gas liquids and sand and gravel in 1953. Natural-gas liquids were recovered from natural gas of the county. Near San Marcos the Green Valley Gravel Co. produced sand and gravel for structural purposes.

HENDERSON

Natural-gas liquids were recovered at the Opelika cycle and Trinidad gasoline plants of the Lone Star Production Co. and the Midco gasoline plant of the Midco Gasoline Co. The Cayuga gas-condensate field, discovered in 1953, boosted the natural-gas-liquid production for this county. One oilfield produced over 1 million barrels in 1953. Harbison-Walker produced plastic fire clay at its Coleman, Browning, and Keaton pits for the manufacture of firebrick refractories. Athens Tile & Pottery Co. mined plastic fire clay for use in art pottery and flowerpots. Flint clay was mined by General Refractories for making firebrick and block. The Texas Clay Products Co. produced clay for heavy clay products at Malakoff.

HIDALGO

Natural gas, the county's principal commodity, was increased by the discovery of 6 new fields—Monte Cristo, Klump, Santa Anita, San

Carlos, and 2 not named. The Taylor-Mayfair cycle plant of Taylor Oil & Gas Co. recovered natural-gas liquids. Two major oilfields were discovered and increased the reserves and production. Pumicite was produced by the Valley Brick & Tile Co. at Matador. Heldenfels Bros. crushed stone at Corpus Christi for use in concrete and as road metal.

HILL

The Texas State Highway Department crushed limestone for use in concrete and as road metal. Crude oil was also produced in the county.

HOCKLEY

Hockley County reported the production of minerals, valued at over \$55 million in 1953. The Slaughter oilfield, discovered in 1937 in Hockley, Cochran, and Terry Counties, was the sixth largest producing field for the State, with over 13 million barrels in 1953. The Levelland oilfield, discovered in 1945, in Hockley and Cochran Counties, was the 13th largest producing field, with over 11 million barrels of petroleum production in 1953. One major oilfield was discovered in 1953. Natural-gas liquids were recovered at three plants in the county—The Ropes of Honolulu Oil Corp. and the Levelland and Slaughter of Stanolind Oil & Gas Co. Natural gas was produced. Byproduct sulfur was recovered from sour gas by Stanolind Oil & Gas Co. at its Slaughter plant, using the Modified Claus process.

HOPKINS

Over 1 million barrels of petroleum was produced from the Pickton field during 1953. Natural-gas liquids were recovered at the Pickton plant of the Humble Oil & Refining Co. Natural gas was produced.

HOUSTON

The Fort Trinidad (Woodbine) oil field was discovered in 1953. The Grier-Jackson cycle plant of Grier-Jackson, Inc., recovered natural-gas liquids. Over 10 billion cubic feet of natural gas was produced in the county.

HOWARD

Crude oil, natural gas, natural-gas liquids, and sand and gravel valued at over \$34 million were reported from Howard County. Four fields each produced over 1 million barrels of crude in 1953. Three major new fields were discovered. Natural-gas liquids were recovered at the East Vealmoor plant of Reef Fields Gasoline Corp. The West Texas Sand & Gravel Co. produced sand and gravel.

HUDSPETH

Miscellaneous stone was crushed by Gifford Hill & Co., Inc., for riprap, concrete, road metal, railroad ballast, and other uses. Southwestern Talc Corp. produced talc from the Rossman mine near Sierra Blanca. The talc was sold for use in the ceramic and rubber industries. The Southwestern Portland Cement Co. produced crude and calcined gypsum near Finlay.

HUNT

Crude oil was produced from existing fields in the county.

HUTCHINSON

Natural-gas liquids were recovered at seven plants in Hutchinson County—the Sanford of Frank C. Henderson Trust, Gasoline of J. M. Huber Corp., Fritch No. 151 of Natural Gas Pipe Line Co., and Canadian, Pantex, Rock Creek, and Sanford of Phillips Petroleum Co. One oilfield produced over 1 million barrels of oil in 1953. The production of sweet and sour natural gas amounted to 61 billion cubic feet. Five carbon-black plants, 3 of the United Carbon Co., Inc., and 2 of the J. M. Huber Corp., were operating in 1953.

IRION

Crude oil and natural gas were produced in Irion County in 1953.

JACK

Minerals valued at over \$20 million were reported from Jack County in 1953. Two oilfields each produced over 1 million barrels of oil in 1953. Crude-oil production for this county was increased by the discovery of 12 major oilfields. Natural-gas production amounted to 7 billion cubic feet, with added production from 8 new gasfields discovered in 1953—the Jacksboro, South; Cundiff, South (5,150 feet); Riggs (Upper Conglomerate); Avis, North (Conglomerate); Alco (Caddo); and 3 not named. The Texas State Highway Department crushed limestone for concrete and road metal.

JACKSON

Jackson County reported minerals valued at over \$40 million in 1953 and including crude oil, natural gas, and natural-gas liquids. Over 1 million barrels of oil were produced from each of 4 fields. One major oilfield was discovered in 1953. Seven new gasfields were discovered in 1953—Miller; Morales, South; Morales, East and 4 not named. These new fields increased the natural gas production to 31 billion cubic feet in 1953. Three new gas-condensate fields—Lasso, Appling, and one not named—were found. Natural-gas liquids were recovered at the Francitas Gas Co. cycle plant and at the Magnolia Petroleum Co. gasoline plant.

JASPER

Crude oil, natural gas, and clays were produced in Jasper County. One new oilfield was discovered. Bennett-Clark Co., Inc., mined bentonite at Brookeland for filtering purposes. Sweet and sour natural gas was produced.

JEFFERSON

Jefferson County produced crude oil, sulfur, natural gas, 'sand' and gravel, and clays valued at over \$34 million in 1953—an increase of \$8.6 million over the 1952 value. Three oilfields each produced

over one million barrels of crude oil in 1953. There were 3 major oilfields discovered in 1953. Sweet and sour natural gas production was 51 billion cubic feet. The Lovells Lake, North, gas-condensate field was discovered. Natural-gas liquids were recovered at the gasoline plant of the Texas Gas Corp. Native sulfur was produced by the Frasch process by the Texas Gulf Sulphur Co. and byproduct sulfur was recovered at the Port Arthur plant of the Gulf Oil Corp. Structural sand was produced from dredging operations on the Neches River near Beaumont by C. A. McKinley and Sons, Inc. Clays were produced for heavy clay products by Beaumont Brick Co., Inc. W. T. Burton dredged oystershells from the Texas side of Sabine Lake.

JIM HOGG

Crude oil, natural gas, and natural-gas liquids were produced in Jim Hogg County in 1953. One major oilfield was reported. Natural-gas liquids were recovered from natural gas.

JIM WELLS

Crude oil, natural gas, and natural-gas liquids valued at over \$55 million were reported from Jim Wells County in 1953. Four oilfields each produced over 1 million barrels of crude in 1953. Seven major oil discoveries were reported. Three new gasfields—Hoffines and two not named—were discovered in 1953. Natural gas produced in this county totaled 55 billion cubic feet. Natural-gas liquids were recovered at the La Gloria cycle plant of the La Gloria Corp. and the Seeligson cycle plant of Magnolia Petroleum Corp.

JOHNSON

Lime for building, chemical, and industrial uses was produced by the Texas Lime Co. at Cleburne.

JONES

Jones County reported the output of crude oil, natural gas, natural-gas liquids, and stone in 1953. Eight major oilfields were discovered in 1953. The Wimberly gasoline plant of Texas Natural Gasoline Corp. recovered natural-gas liquids in 1953. Natural-gas production was increased by the Phantom Hill gasfield discovery in 1953. The West Texas Stone Co. quarried cut, sawed, and rough architectural dimension limestone for building purposes at Lueders.

KARNES

Crude oil was the most important mineral produced in Karnes County, followed by natural-gas liquids and natural gas. The Falls City oilfield, discovered in 1944, produced over 1 million barrels of crude in 1953. Production of natural gas amounted to 1 billion cubic feet. United Gas Pipe Line Co. recovered natural-gas liquids at its Karnes City gasoline plant.

KAUFMAN

The production of crude oil was increased by the discovery of one major oilfield. The Texas State Highway Department crushed limestone for use in concrete and as road metal. Natural gas was also produced.

KENEDY

Crude oil and natural gas were produced. The Murdoch Pass and Julian North gasfields were discovered in 1953.

KENT

Kent County reported crude-oil and natural-gas production valued at over \$17 million in 1953. Two oilfields each produced over 1 million barrels of petroleum in 1953, and one field was discovered.

KERR

Sand and gravel were produced near Kerrville for structural and paving purposes by A. Schwartz & Sons and Weirich Bros.

KIMBLE

Weirich Bros. produced paving gravel with a portable plant near Junction. Crude oil was produced in the county.

KING

Crude oil and natural gas were produced. One oilfield was discovered, and 1 field produced over 1 million barrels in 1953.

KLEBERG

Minerals valued at over \$8 million, consisting of crude oil, natural gas, and stone, were reported from Kleberg County in 1953. Four oilfields each produced over 1 million barrels of crude in 1953. Three major oilfields were discovered. One new gasfield—the Del Grullo—was discovered. One billion cubic feet of natural gas was produced. Heldenfels Bros. crushed miscellaneous stone for concrete and road metal.

KNOX

Crude oil and natural gas valued at over \$3 million in 1953 and \$1.2 million greater than the 1952 value were reported from Knox County. Five major oilfields were discovered in 1953.

LAMB

Crude oil was produced in Lamb County in 1953.

LAMPASAS

Rough architectural blocks and flagging were quarried from sandstone by the Southwest Ledge Stone Co. near Lampasas.

LA SALLE

Petroleum and natural gas were produced from existing fields in La Salle County.

LAVACA

The total value of minerals produced in Lavaca County amounted to nearly \$6 million in 1953, almost double that in 1952. One gasfield, not named, was discovered in 1953. Sweet and sour natural-gas production was 32 billion cubic feet for the county in 1953. Natural-gas liquids were recovered at the Provident City plant of the Shell Oil Co. The Texas State District Engineers Division 13 crushed sandstone for road base.

LEE

Lee County reported mineral output of stone, natural gas, and crude oil in 1953. The Texas State Highway Department crushed limestone and miscellaneous stone for paving purposes.

LEON

Natural gas and crude oil were reported from Leon County in 1953. Natural-gas production reached 15 billion cubic feet.

LIBERTY

Liberty County continued as an important source of crude oil, sulfur, natural gas, natural-gas liquids, and sand and gravel in 1953. Two fields each produced over 1 million barrels in 1953. The Texas Gulf Sulphur Co. produced sulfur by the Frasch process. Gas production from sweet and sour natural gas was 15 billion cubic feet. Paving, blast, and filter sands and paving gravel were dredged near Romayor by Texas Construction Materials Co. Natural-gas liquids were recovered at the Hull gasoline plant of West Gasoline Co. The Raywood and Cleveland, South, gas-condensate fields were discovered in 1953.

LIMESTONE

Crude oil was produced from existing fields. Six billion cubic feet of natural gas was produced. Shale for manufacturing brick products was mined by the Barron Brick Co. near Broebeck.

LIVE OAK

The total mineral value of crude oil and natural gas of Live Oak County in 1953 almost doubled the 1952 value. A new gasfield, not named, was discovered in 1953. Natural-gas production reached 43 billion cubic feet. Two major oil fields, were discovered in 1953.

LLANO

Crystalline graphite was mined by the Southwestern Graphite Co. Talc and soapstone were ground by Southwestern Talc Corp.

LOVING

Loving County reported crude-oil and natural-gas production in 1953.

LUBBOCK

Crude oil and natural gas were produced from existing fields in Lubbock County in 1953.

LYNN

The 1953 mineral value of Lynn County increased nearly ninefold over the reported 1952 value. One new oilfield was discovered in 1953. Natural gas was produced from developed fields in the county.

MADISON

Two billion cubic feet of natural gas was produced in 1953.

MARION

The value of minerals produced in Marion County in 1953 was more than twice that in 1952. The production of sweet and sour gas totaled 15 billion cubic feet. Natural-gas liquids were recovered at two plants—the Jefferson and the Southland of the Arkansas Louisiana Gas Co.

MARTIN

Crude oil and natural gas were produced in Martin County.

MASON

Weirich Bros., with a portable plant at Mason, produced sand and gravel for paving.

MATAGORDA

The 1953 value of mineral production in Matagorda County increased \$5.8 million over the 1952 value to \$28 million. Crude oil, natural gas, and natural-gas liquids were produced. Two major oilfields were discovered in 1953. Sweet and sour natural-gas production amounted to 89 billion cubic feet in Matagorda County. A gas-condensate field—Kain—was discovered in 1953. The Markham gasoline plant of Ohio Oil Co. and the Blessing cycle plant of American Liberty Oil Co. recovered natural-gas liquids. Matagorda County produced railroad sand and gravel. Oystershells were dredged at Bay City by the Matagorda Shell Co.

MAVERICK

Natural gas was produced from developed fields in 1953.

McCULLOCH

McCulloch County reported an output of crude oil and natural gas in 1953.

McLENNAN

Cement was produced by Universal Atlas Cement Co. at its Waco plant. Railroad sand and gravel production was second in quantity for the State. Crude oil was produced from existing fields.

McMULLEN

Crude oil and natural gas were produced from existing fields. Three new gasfields were discovered. The county production of natural gas was 7 billion cubic feet in 1953.

MEDINA

Crude oil and clays were produced in Medina County. Heavy clay products were manufactured from shale by D'Hanis Brick & Tile Co.

MIDLAND

Crude oil composed the major portion of the \$32 million mineral value of Midland County in 1953, followed by natural-gas liquids, natural gas, and stone. Three fields each produced over 1 million barrels of oil in 1953. Three major oilfields were discovered. Natural-gas liquids were recovered at the Sweetie Peck plant of El Paso Natural Gas Co., Spraberry of Phillips Petroleum Co., and Tex-Harvey of Tex-Harvey Gasoline Co. The Texas Highway Department crushed stone for road purposes. The Perlite Industries, Inc., produced expanded perlite at Terminal for use in oil-well cement.

MILAM

Crude oil was the principal mineral commodity produced in Milam County in 1953. Commercial sand and gravel were produced by Mrs. W. A. Robinson.

MITCHELL

One major field was discovered in 1953. Crude oil and natural gas were produced.

MONTAGUE

The mineral output of Montague County increased \$3 million in value in 1953 to nearly \$28 million. Crude oil was the major mineral commodity. Crude-oil output was augmented by the discovery of 19 major fields. Natural-gas liquids were recovered at two plants in the county—the Bowie and the Nocona of the Bowie Gasoline Co. Natural gas was produced from existing fields. The Texas State Highway Department District 3 crushed sandstone for road base.

MONTGOMERY

Montgomery County produced mineral commodities valued at over \$41 million in 1953; crude oil was the major commodity, followed by natural-gas liquids and natural gas. The Conroe field, discovered in 1931, ranked ninth in production by fields in the State, with over 11 million barrels produced in 1953. One major oilfield and one gas-condensate field, not named, were discovered. The Conroe gasoline plants of Humble Oil & Refining Co. and Midland Gasoline Co. and the Lake Creek cycle plant of Superior Oil Co. recovered natural-gas liquids. Natural-gas production amounted to 27 billion cubic feet. Columbian Carbon Co. operated Conroe No. 63 carbon-black plant in 1953, treating 11 million cubic feet of gas a day.

MOORE

The total value of minerals in Moore County amounted to more than \$29 million in 1953; these minerals were natural gas, natural-gas liquids, helium, and crude oil. The production of natural gas ranked third in the State; and the production of sweet and sour natural gas, excluding natural gas produced as casinghead gas, was second in the State, with 350 billion cubic feet. Natural-gas liquids were recovered at seven plants—the Bivins and Four Way of Colorado Interstate Gas Co., Cactus 12 of Kerr McGee Oil Industries, Inc., Station No. 152 of Natural Gas Pipeline Co., Dumas and Sneed of Phillips Petroleum Co., and McKee-Sunray of Shamrock Oil & Gas Corp. Moore County was the largest producer of helium in the Nation. Helium was recovered from natural gas at the Government-operated plant at Exell. The Continental Carbon Co. operated its channel- and furnace-type carbon-black plant, and the Crown Carbon Co. operated a channel-type plant in 1953.

MORRIS

Morris County produced the largest quantity of brown iron ore in Texas in 1953; it was mined by Lone Star Steel Co.

NACOGDOCHES

Nine billion cubic feet of natural gas was produced. A new oilfield discovered in 1953 added to the existing production of crude. The Acme Brick Co. mined miscellaneous clays at Garrison for heavy clay products.

NAVARRO

Crude-oil production was increased by the discovery of one field in 1953. Natural gas was produced from known and developed fields.

NEWTON

One oilfield discovered in 1953 increased the oil production for the year. Natural gas was produced from existing fields.

NOLAN

Increase in Nolan County crude-oil output was due largely to the discovery of eight major oilfields. Cement was produced by the Lone Star Cement Corp. at Maryneal. Crude and calcined gypsum was produced at the Sweetwater plant of United States Gypsum Co. Natural gas was produced from existing fields.

NUECES

The value of minerals produced in Nueces County, consisting of crude oil, natural gas, natural-gas liquids, cement, lime, and sand and gravel, amounted to nearly \$75 million in 1953, an increase of \$4.3 million over 1952 value. Four oil fields each produced over 1 million barrels in 1953. Nine major oilfields were discovered in 1953. Nueces County ranked sixth in Texas in the production of sweet and

sour natural gas, with 146 billion cubic feet. Four new gasfields—Corpus Channel, Cayo Del Oso, Corpus Christi, East, and one not named—were discovered in 1953. Twelve plants (6 cycling plants and 6 gasoline plants) recovered natural-gas liquids. Halliburton Portland Cement Co. produced cement at its Corpus Christi plant. Lime produced by Columbia-Southern Chemical Corp. was used for chemical, building, and industrial purposes. Some of this lime production consumed oystershells as a raw material. Heldenfels Bros. produced structural sand and gravel in a plant near Calallen. Oystershells were produced by dredging operations by Corpus Christi Shell, General Dredging Co., Heldenfels Bros., and Lloyd W. Richardson. The Columbian Carbon Co. operated its Corpus Christi No. 56 channel-type carbon-black plant during 1953. Baroid Sales Division of National Lead Co. processed barite, imported from Western States, for drilling muds for the oil industry.

ORANGE

Crude oil and natural gas valued at more than \$15 million were produced in Orange County in 1953. Orange County produced 51 billion cubic feet of natural gas.

PALO PINTO

An output of crude oil, natural-gas liquids, natural gas, clay, stone, and sand and gravel was reported from Palo Pinto County in 1953. Natural-gas liquids were recovered at the Gordon gasoline plant of the Lone Star Co. Two billion cubic feet of natural gas was produced; and 1 new gas field, not named, was discovered in 1953. Mineral Wells Sand & Gravel Co. produced structural and paving sands and structural and paving gravels near Mineral Wells. Texas Vitrified Pipe Co. mined clay for heavy clay products. High-grade tile was manufactured by Texeramics Co. in Mineral Wells. The Texas State Highway Department produced noncommercial crushed limestone for use in concrete and as road metal.

PANOLA

Panola County reported the production of minerals valued at more than \$58 million in 1953—up \$17.3 million over 1952. The county was an important source of crude oil, natural gas, and natural-gas liquids. The production of natural gas was the largest in Texas, amounting to 363 billion cubic feet. Natural-gas liquids were recovered at six plants—Carthage cycle plant of Lone Star Producing Co., Carthage and Panola plants of Arkansas Fuel Oil Corp., and Carthage plants of the Carthage Co., Chicago Corp., and United Gas Pipe Line Co.

PARKER

Natural-gas liquids, crude oil, and clays were produced. The county had one gasoline plant—the Springtown of the Lone Star Co.—recovering natural-gas liquids. The Acme Brick Co. near Millsap, and Mineral Wells Clay Products Co. at Mineral Wells mined shale

for heavy clay products. Gas production was increased by the discovery of a new gasfield, not named. Rough dimension sandstone for construction purposes was produced by Ben Row Gholson at Millsap.

PECOS

The value of mineral production of Pecos County amounted to \$55 million in 1953. Three oilfields produced over 1 million barrels each, and 3 major oilfields were discovered in 1953. The Yates field was 10th in production, by fields, in Texas, with over 11 million barrels produced. Six new gasfields were discovered in 1953—Fort Stockton (Lower Yates); Garvin, South (Tubbs); Krasner (Ellenberger); Pecos Valley (Fusselman); Pecos Valley (5,400-foot Devonian); and Wentz (Clearfork). Natural-gas liquids were recovered at the Santa Rosa plant of Santa Rosa Gas Products Co. Natural-gas production amounted to 3 billion cubic feet. Stone was produced by the Texas Highway Department.

POLK

Crude oil, natural gas, and sand were produced. Polk County natural-gas production totaled 6 billion cubic feet. Blast sand was produced by Texas Construction Materials Co. at Corrigan.

PÖTTER

The Amarillo gasoline plant of Amarillo Oil Co. and the Turkey Creek plant of the West Texas Gas Co. recovered natural-gas liquids in 1953. The production of natural gas in Potter County totaled 73 billion cubic feet in 1953. Helium was produced from natural gas by a Government plant near Amarillo. The Panhandle Gravel Corp. produced structural and paving sands and structural and paving gravels at its Amarillo plant.

REAGAN

Reagan County continued to be an important source of crude oil, natural gas, and natural-gas liquids in 1953. The Big Lake, West (Fusselman), gas-condensate field was discovered in 1953. Natural-gas liquids were recovered at the Barnhart gasoline plant of Barnhart Hydrocarbon Corp. One billion cubic feet of natural gas was produced. The Barnhart Hydrocarbon Corp. produced carbon black at its Barnhart plant.

RED RIVER

Crude oil was produced in Red River County in 1953.

REEVES

Crude oil continued to be the major mineral commodity in Reeves County in 1953, followed by sand and gravel, natural gas, and stone. Natural-gas liquids were recovered at the Orla gasoline plant of Pecos Petroleum Co. F. M. Reeves & Sons, Inc., produced structural sand and gravel, paving gravel, and other sand and gravel near Pecos.

The county production of natural gas reached 2 billion cubic feet. Crushed stone was produced by the Texas Highway Department.

REFUGIO

Mineral output in 1953 valued at over \$64 million was reported from Refugio County. Crude oil continued to be the major commodity. The Tom O'Conner field was the 11th largest producing field in the State, with over 11 million barrels of production. One major oilfield was discovered during the year. Sweet and sour natural-gas production was 89 billion cubic feet. Natural-gas liquids were recovered at gasoline plants of the Humble Oil Co., the Stanolind Oil & Gas Co., and Wyrich & Hughes plant.

ROBERTS

The value of mineral production increased 10-fold during 1953; minerals produced included crude oil and natural gas.

ROBERTSON

Commercial sand and gravel were produced by Gifford Hill & Co., Inc., for structural sand and gravel, paving sand, paving gravel, railroad ballast, and other sand uses. Crude oil was produced from existing fields.

ROCKWALL

The Texas State Highway Department crushed limestone for concrete and road metal. Miscellaneous crushed stone was produced.

RUNNELS

The total value of minerals produced in Runnels County increased \$8.7 million to almost \$26 million in 1953; crude oil and natural-gas liquids were the principal mineral commodities. The county's petroleum production was supplemented by the discovery of 15 major oilfields. Natural-gas liquids were recovered at two plants in the county—Fort Chadbourne, of Lone Star Producing Co. and Sykes of Runnels Gas Products Co. One new gas field, not named, was discovered in 1953. Runnels County Highway Department produced sand for paving purposes.

RUSK

Rusk County mineral production in 1953 was valued at over \$98 million, with crude oil the major commodity. Six gasoline plants—the Cashen and Spear plants of Gulf Oil Corp., the East Texas of Humble Oil & Refining Co., the Giles of the Parade Co., and Plants No. 19 and No. 21 of Sinclair Oil & Gas Co.—recovered natural-gas liquids in Rusk County. The Minden gas-condensate field was discovered in 1953, and 1 billion cubic feet of natural gas was produced. Henderson Clay Products Co. mined plastic fire clay near Henderson for the manufacture of heavy clay products. Miscellaneous clays were mined by J. M. Cordell & Sons for its heavy-clay-products kilns.

SAN JACINTO

Petroleum was produced from existing fields. The Urbana natural-gas-condensate field was discovered in 1953. San Jacinto County production of natural gas totaled 5 billion cubic feet. Railroad sand and gravel were produced.

SAN PATRICIO

Crude oil, natural gas, natural-gas liquids, and stone valued at more than \$56 million were reported from San Patricio County in 1953. Five major oilfields were discovered in 1953. The county's natural-gas production (33 billion cubic feet) was increased by discovery of the Broughton and Pasture, North, gasfields. Natural-gas liquids were recovered at Plant No. 20 of Sinclair Oil & Gas Co. and Plymouth & Rooke plant of Plymouth Oil Co. Heldenfels Bros. crushed miscellaneous stone for use in concrete and as road metal. The Corpus Christi Shell, General Dredging Co., and Heldenfels Bros. dredged oystershells in San Patricio County.

SCHLEICHER

The total value of minerals produced in Schleicher County increased to \$9 million in 1953, up \$2.9 million over 1952 value. Three major oilfields were discovered. Natural-gas production was increased by the discovery of Tillery gasfield. Two gas-condensate fields—Fort Makavitt and Eldorado, Southwest—were discovered.

SCURRY

Scurry County ranked fourth as a mineral producer in Texas in 1953, when mineral output valued at over \$144 million was reported. Petroleum production in Scurry County was third in the State. The Kelly Snyder field was third in the State for producing fields with over 23 million barrels production, and the Diamond M field produced over 10 million barrels. Scurry County was sixth in the State in the production of natural-gas liquids, with four plants—Lion Oil Co. gasoline plant, North Snyder of Standard Oil of Texas, Snyder of Sunray Oil Corp., and Fuller of the Texas Co. Natural-gas production amounted to 48 billion cubic feet.

SHACKELFORD

Crude oil, natural gas, and natural-gas liquids were produced. Five major oilfields were discovered. The Reg gas field and one not named were discovered in 1953. Natural-gas production was 1 billion cubic feet. Natural-gas liquids were recovered at two gasoline plants—the Ibex of the Ibex Co. and Plant No. 1 of Marshall R. Young.

SHELBY

Natural-gas production for the county totaled 16 billion cubic feet in 1953. Crude-oil production was increased.

SHERMAN

Natural-gas production in Sherman County ranked sixth in the State. Crude oil was produced from developed fields.

SMITH

Natural-gas liquids were recovered at two plants—Chapel Hill plants of the Extexas Producers Gas Co. and Lone Star Producing Co. Crude oil and 5 billion cubic feet of natural gas were produced in Smith County. Two major oilfields were discovered.

STARR

Minerals valued at more than \$24 million were reported from Starr County in 1953. Seven major oilfields were discovered in 1953. Natural-gas production was 11 billion cubic feet; and 1 new gasfield, not named, was discovered. Natural-gas liquids were recovered at the Rincon gasoline plant of Continental Oil Co. and the Sun gasoline plant of Sun Oil Co.

STEPHENS

Stephens County reported production of minerals valued at nearly \$12 million in 1953. One major oilfield was discovered. Four natural-gasoline plants—Eliasville of the Breckenridge Gasoline Co., Brooks of Lone Star Producing Co., Caddo of Texas Pacific Coal & Oil Co., and Plant No. 30 of Warren Petroleum Corp.—recovered natural-gas liquids. Gas production was 4 billion cubic feet; and 1 new gas field, 3½ miles south of Caddo, was discovered in 1953.

STERLING

Crude oil and natural gas were produced in the county.

STONEWALL

Mineral value in Stonewall County amounted to \$20 million in 1953, up \$7 million over the 1952 value. Crude oil and natural gas were produced. Five major fields were discovered.

SUTTON

Four billion cubic feet of natural gas was produced from existing fields. Petroleum production was increased.

TARRANT

Cement was produced by the Trinity Portland Cement Division of General Portland Cement Co. at its plant near Fort Worth. Tarrant County was first in the production of noncommercial sand and gravel for the State. The city engineers of Fort Worth produced sand and gravel for paving purposes. Commercial sand and gravel were produced by the Fort Worth Sand & Gravel Co., Inc., and Jefferies & Betts, Inc., for structural and paving sand and gravel and other uses. Expanded perlite was produced at Fort Worth by the Texas Perlite Corp.

TAYLOR

Six major oilfields were discovered in 1953. Natural-gas liquids were recovered at the Eskota plant of Otha H. Grimes. Miscellaneous clays were mined by Abilene Brick Co. near Abilene for heavy clay products. The county production of natural gas was increased by the discovery of a new gasfield, not named.

TERRELL

Crushed miscellaneous stone was produced.

TERRY

Crude oil, salt, and natural gas were produced. The Slaughter field was sixth in production, by fields, in the State, with over 13 million barrels. The Frontier Chemical Co. evaporated brine at its Brownfield plant by the vacuum-pan process to produce salt. Natural gas was produced from existing fields. The Seagraves No. 64 carbon-black plant of the Columbian Carbon Co. operated in 1953.

THROCKMORTON

Ten major oilfields were discovered in Throckmorton County in 1953. Crude oil and natural gas were produced.

TITUS

Crude oil and natural gas were produced from existing fields.

TOM GREEN

Crude oil, natural-gas liquids, and sand and gravel were produced. Three major oilfields were discovered in 1953. Tom Green County was the largest producer of noncommercial sand and gravel, which was produced by the city engineer of San Angelo for paving purposes.

TRAVIS

Stone, lime, and crude oil were produced. Dezendorf Marble Co. crushed marble for terrazzo, pulverized-stone, and other uses. This was the only production of marble in the State. Lime output was fourth in tonnage and value for the State. The Austin White Lime Co. produced lime for agricultural, building, chemical, and industrial purposes at McNeil. Travis County had the only producer of grinding pebbles for the State—Dezendorf Marble Co. Noncommercial sand and gravel were produced by the Director of Public Works of Texas in Austin for paving purposes. This county was the largest producer, both in quantity and value, of noncommercial crushed limestone, which was crushed by the State Highway Department. Dimension limestone was sawed and quarried by the Texas Quarries, Inc., at Austin for rubble and dressed stone. The Texas Crushed Stone Co. crushed limestone for flux, concrete, road metal, railroad ballast, and agricultural uses.

TRINITY

Fuller's earth was produced by Trinity Clay Products Co. for use in rotary-drilling mud, crevice seal (in oil-field drilling), filtering, absorbents, and insecticides. Natural gas was produced from existing fields.

TYLER

One major oilfield was discovered in 1953 to augment the county production. Natural-gas production reached 5 billion cubic feet. The Pavey gas-condensate field was discovered. Natural-gas liquids were recovered at the Joes Lake gasoline plant of the American Republics Corp.

UPSHUR

The East Texas field, discovered in 1931 in Upshur, Gregg, and Cherokee Counties, was the largest producing field in the State, with over 90 million barrels production in 1953. Natural gas was produced in the county.

UPTON

Upton County reported crude oil, natural gas, and natural-gas liquids valued at over \$63 million in 1953. Over 1 million barrels of oil was produced from each of six fields. Five major fields were discovered. Four natural-gas-liquids plants operated in the county during 1953—the McElroy-Wilshire plant of Lone Star Producing Co. and the Benedum plants of Phillips Petroleum Co., Plymouth Oil Co., and Texas Gas Products Corp. The Jack Herbert gas-condensate field was discovered. Natural-gas production was 9 billion cubic feet. Noncommercial crushed miscellaneous stone was produced.

UVALDE

The Uvalde Rock Asphalt Co. and White's Uvalde Mines produced asphalt from asphaltic limestone. This production decreased slightly from 1952. Limestone was crushed by White's Uvalde Mines for use in concrete and as road metal. This crushed-limestone production ranked second in value in the State. The Southwest Stone Co., the only producer for the State, crushed basalt for riprap, concrete, road metal, and railroad ballast. D & D Gravel Co. produced sand and gravel near Uvalde for structural and paving sand and structural and other gravel purposes.

VAN ZANDT

Crude oil, salt, and natural-gas liquids were produced. Van Zandt County was first in the value of salt produced in Texas in 1953. Morton Salt Co. manufactured evaporated salt (open pan), vacuum-pan salt, rock salt, and pressed blocks at its plant in Grand Saline. Natural-gas liquids were recovered at the Van plant of the Pure Oil Co. Natural-gas production amounted to 4 billion cubic feet.

VICTORIA

Three oilfields in Victoria County each produced over 1 million barrels of petroleum in 1953. Four major fields discovered in 1953 increased oil reserves and production for the county. Six new gasfields—Rob Welder, Helen Gohlke, Southwest, Nursery, East, and 3 not named—contributed to the 73 billion cubic feet of natural gas produced in the county. Structural sand and gravel were produced by Heldenfels Bros., and railroad sand and gravel were also produced. Natural-gas liquids were recovered at one plant in the county.

WALKER

Fuller's earth was mined at Riverside by the Milwhite Co., Inc., and the Texas Co., for use in oil refining, filler (other than paper), filtering and clarifying, absorbents, and other uses. This output of fuller's earth ranked second in production value in the State.

WALLER

Natural-gas production was 32 billion cubic feet. Crude-oil output was reported from existing fields. Noncommercial sand and gravel output ranked third in quantity for the State, with 57,000 short tons; it was produced by the Waller County Road and Bridge Department for paving purposes.

WARD

Crude oil was produced in the county. Two major oilfields were discovered in 1953 in the county. Natural-gas liquids were recovered at three plants in the county—Estes plant of Cabot Carbon Co., Sealy Smith of El Paso Natural Gas Co., and Monahans plant of Gulf Oil Corp. One billion cubic feet of natural gas was produced in 1953. A natural saline, natural sodium sulfate, was produced by Ozark-Mahoning Co. from well brine and dry-lake brine at Monahans. Noncommercial miscellaneous crushed stone was reported.

WASHINGTON

Crude oil and sweet and sour natural gas were produced. One major oilfield was discovered in 1953.

WEBB

Two major oilfields and two gasfields (Aguilares and one not named) were discovered. Railroad sand and gravel were produced. Miscellaneous clays were mined by Ricardo Chavana, Laredo Brick Co., and Ligarde Brick & Tile Co. for heavy clay products.

WHARTON

The value of mineral production in Wharton County was \$78 million in 1953. Frasch-process sulfur was produced by the Texas Gulf Sulphur Co. Sweet- and sour-gas production totaled 76

billion cubic feet. The Wharton County Highway Department produced gravel for paving purposes.

WHEELER

Crude oil was produced. Natural-gas liquids were recovered at two plants in the county—the Shamrock No. 16 of Columbian Gasoline Corp. and the McLean No. 28 of Warren Petroleum Corp. Natural-gas output was 19 billion cubic feet. Carbon black was produced at the Norrich plant of the United Carbon Co.

WICHITA

Wichita County mineral production in 1953 was valued at over \$37 million—up \$4.6 million over the 1952 value. Crude-oil reserves and production were increased by the discovery of three fields. Natural-gas liquids were recovered at five plants—K.M.A. of Continental Oil Co., Burkburnett of Magnolia Petroleum Co., Mankins of Phillips Petroleum Co., Electra of the Texas Co., and Madden of Warren Petroleum Corp. Natural-gas production totaled 11 billion cubic feet. Foley Sand & Gravel Co. produced sand and gravel near Wichita Falls for structural and paving sand and gravel and other sand uses. Noncommercial crushed sandstone was produced by Texas State Highway Department District 3 for use in flexible road bases.

WILBARGER

Two major oilfields were discovered in 1953. Natural-gas liquids were recovered in the county at two plants—Electra of Magnolia Petroleum Co. and Rock Crossing of the W. T. Waggoner Estate. Natural gas was produced from existing fields. Texas State Highway Department District 3 crushed sandstone for paving purposes.

WILLACY

Crude oil and natural gas were produced. Three new gasfields discovered during the year were—Tenerias, Willamar, Southeast, and Corbett. The natural-gas production was 2 billion cubic feet.

WILLIAMSON

Round Rock White Lime Co. produced quick and hydrated lime for building, chemical, and industrial purposes at its mill in Round Rock. Near Austin, Texas Quarries, Inc., sawed and cut dimension limestone for architectural purposes. Round Rock White Lime Co. crushed limestone for concrete and road metal. Crude oil and natural gas were produced.

WILSON

Crude oil, clays, and natural gas were produced. The W. S. Dickey Clay Mfg. Co. mined miscellaneous clays at Sasparamco for heavy clay products.

WINKLER

Mineral production in Winkler County was valued at nearly \$50 million in 1953, mostly from crude oil, natural gas, and natural-gas liquids. Natural-gas liquids were recovered at four plants in the county—the Walton-Keystone of Cabot Carbon Co., Lyman of C. V. Lyman, Kermit of Magnolia Petroleum Co., and Keystone of Sid Richardson Gasoline Corp. The output of natural gas in the county reached 6 billion cubic feet. Byproduct sulfur was produced by Sid Richardson Gasoline Co. The Cabot Carbon Co. operated its Kermit plant for carbon black in 1953. This channel-type plant, with a daily throughput of 40 million cubic feet of gas, was the fourth largest operation in the State.

WISE

The Oran Speer Quarry and the Southwest Stone Co., near Chico crushed limestone for flux, riprap, concrete, road metal, railroad ballast, agricultural, and other uses. This production ranked second in tonnage and first in value for the State. One crude-oil discovery increased the county oil production during the year. The Chico gasoline plant of Cities Service Oil Co. recovered natural-gas liquids. Natural-gas production reached 5 billion cubic feet; one new gasfield, not named, contributed to this output. Shale was mined at Bridgeport by the Acme Brick Co. for heavy clay products.

WOOD

Wood County continued to be an important source of crude oil and natural gas. Mineral output valued at nearly \$76 million was reported up \$9 million over the 1952 values. Two plants—the Caska plant of the Caska Corp. and the Hawkins plant of the Natural Gasoline Corp.—recovered natural-gas liquids in the county. Gas production (increased by the discovery of one gasfield, not named) reached 3 billion cubic feet. Two new oilfields were discovered.

YOAKUM

Yoakum County reported minerals valued at more than \$59 million in 1953, up \$4.8 million over the 1952 value. Crude oil and natural gas were produced. Two new fields were discovered during the year. Salt was evaporated from brine by the Frontier Chemical Co.

YOUNG

Crude oil, natural gas, natural-gas liquids, and crushed stone were produced. Seventeen major oilfields were discovered during the year. Natural-gas liquids were recovered at four gasoline plants—LeBus of LeBus Bros., South Bend and Peters of Nash Gasoline Co., and Turner & West of Turner & West gasoline plant. The Alco (Mississippian) gasfield was discovered in 1953, and the natural-gas production was 1 billion cubic feet. Texas State Highway Department District 3 crushed sandstone for road bases.

ZAPATA

Crude oil was produced. Natural-gas output for the county was 3 billion cubic feet.

ZAVALA

The Plumly gasfield, discovered in 1953, increased the county production of natural gas to 1 billion cubic feet. Petroleum was produced from existing fields.

The Mineral Industry of Utah

By Paul Luff¹



THE TRENDS of mining operations in Utah in 1953 included a continued decline in production of lead, silver, and zinc caused by a diminishing market for lead and zinc; curtailment in production of copper during the last half of the year owing to easing in the demand for the metal; continued increase in the production of iron ore, manganiferous ore, molybdenum, petroleum, and sand and gravel; a record output of phosphate rock and tungsten concentrate; and new discoveries that increased uranium-ore reserves.

The total value of the State mineral production, exclusive of uranium and shipments of manganese ore to the Government Purchase Depot at Butte, Mont., rose to \$298,629,000 in 1953, the highest in any year and a 13-percent gain over \$265,501,000 produced in 1952. This advance resulted mainly from a higher average price of copper (\$0.287 per pound in 1953 compared with \$0.242 in 1952) and from substantial increases in production of clays, coal, gold, iron ore, manganiferous ore, molybdenum, natural gas, petroleum, phosphate rock, silica (quartzite), sand and gravel, stone, tungsten concentrate, and vanadium. The quantities of copper, lead, and zinc produced decreased. Of the total value in 1953, copper contributed 52 percent, coal 13, iron ore 9, gold 6, lead 4, zinc 2, silver 2, and other minerals—mainly molybdenum, petroleum, and cement—12. Five metals—copper, gold, lead, silver, and zinc—with a combined value of \$195,289,000, contributed 65 percent of the total value.

The value of the metal production in 1953 was \$239,336,000, 80 percent of the total; nonmetallics, \$16,638,000, 6 percent of the total; and mineral fuels, \$42,655,000, 14 percent of the total. The value of the metals recovered from copper ore (including precipitate)—copper, gold, lead, molybdenum, and silver—was \$188,511,000, or 63 percent of the total; and the value of the metals recovered from lead-zinc ore was \$21 million, or 7 percent of the total.

In 1953 Utah continued to produce the most gilsonite in the United States and ranked second in copper, gold, molybdenum, and silver; third in lead and potash; fourth in iron ore; and ninth in coal and zinc. It was also a large producer of cement, clays, gypsum, sand and gravel, stone, uranium, and vanadium. Regulations of the Atomic Energy Commission will not permit publication of uranium production, and because of the close relationship between the output of vanadium and uranium production figures on vanadium have not been published since 1947.

Despite a high consumption of lead and zinc in 1953, the market prices for the metals dropped, owing to an influx of foreign material. The year opened with lead quoted at 14.75 cents per pound in New

¹ Commodity-industry analyst, Region IV, Bureau of Mines, Denver, Colo.

York and zinc at 12.50 cents per pound in East St. Louis, but the price of zinc advanced to 13 cents on January 2. On February 2 the price of lead dropped to 13.5 cents, and April 20 it reached a low of 12 cents; however, the price began to strengthen at the end of April and by July 23 had risen to 14 cents—from September 16 to the end of the year it remained at 13.50 cents. The price of zinc declined gradually through January and February until it reached a low of 11 cents per pound March 5; it dropped again September 2 to 10.5 cents and to 10 cents September 11, where it remained to the end of the year. The Government copper-control price of 24.50 cents per pound established January 26, 1951, was decontrolled February 25, 1953. The price advanced immediately to 27.825 cents and after fluctuating nearly 2 months became stabilized at 29.7 cents April 21 for the rest of the year.

The labor supply, both skilled and unskilled, was adequate throughout the year. An average of 14,000 employees was maintained in the mineral industries in Utah. At major operations the workweek was 7 days and at others 6 days.

DEFENSE MINERALS EXPLORATION ADMINISTRATION PROJECTS

The Federal Government's assistance in financing exploration projects in search of reserves of strategic and critical minerals, authorized by the Defense Production Act of 1950, continued throughout 1953. From January 1951 through December 31, 1952, the Government has assisted in financing 35 projects in Utah. The cost of these projects totaled \$3,098,873, of which the Government provided \$1,732,224 and private industry \$1,366,649. In 1953, 21 projects were approved, as follows: Beryl (1), copper-lead-zinc (1), lead (2), lead-zinc (3), tungsten (3), and uranium (11). The total cost of these projects was \$713,464, of which the Government provided \$479,005 and private industry \$234,459. Details of the various 1953 projects are given in table 3.

GENERAL REVIEW

Mills, Smelters, Refineries, and Purchase Depots.—Eight custom mills operated in Utah in 1953; 3—Midvale 1,700-ton concentrator of the United States Smelting, Refining & Mining Co., Tooele 1,500-ton concentrator of the International Smelting & Refining Co., and Bauer 700-ton concentrator of the Combined Metals Reduction Co.—treated 573,000 tons of lead-zinc material in 1953; 3—Atomic Energy Commission plant at Monticello, Vanadium Corporation of America plant at Hite, and Vitro Chemical Co. plant at Salt Lake City—treated uranium ore; and 2—H. M. & S. Milling Co. plant and Salt Lake Tungsten Co. plant at Salt Lake City—treated tungsten materials. Tungsten mills were operated also at Beaver by Y. Z. Mining Co., at Callao by Spider-Uranium Mining Co., at Ibabah by Star Dust Mines, Inc., and at Gold Hill by Gold Hill Exploration Co. A 300-ton tungsten mill was being erected 50 miles southwest of Delta by Rare Metals Mining Co. Copper ore was treated in two 40,000-ton flotation mills at Arthur and Magna; iron and manganese ores were smelted at the Ironton and Geneva plants.

The Combined Metals Reduction Co. operated a plant to recover resin from coal (including a resin plant) and a plant to produce expanded perlite at Bauer. A perlite plant was operated by Utco Products Co. at Salt Lake City. Other plants that operated in 1953 were: A plant to produce dry ice at Wellington by Carbon Dioxide & Chemical Co.; cement at Devils Slide and Salt Lake City by Ideal Cement Co. and Portland Cement Co. of Utah; gypsum at Sigurd by United States Gypsum Corp. and Western Gypsum Co.; lime at Grantsville and Magna by Utah Lime & Stone Co. and Kennecott Copper Corp.; potash at Wendover by Bonneville, Ltd.; clays at Salt Lake City by Filtrol Corp.; bentonite and fuller's earth at Ivie by Western Clay & Metals Co.; and ground talc at Ogden by Tri-State Minerals Co.

At Garfield a copper smelter and a copper-anode plant were operated by American Smelting & Refining Co., a copper refinery by Kennecott Copper Corp., a cobalt refinery by Howe Sound Co., and a sulfuric acid plant by Garfield Chemical & Manufacturing Corp. The copper refinery reached its capacity rate of 16,000 tons per month in May, and a unit was being built to produce 250 tons of sulfuric acid per day and increase acid plant daily capacity to 700 tons early in 1954. At Midvale the United States Smelting, Refining & Mining Co. operated a lead smelter, and at Tooele the International Smelting & Refining Co. operated a lead smelter and a zinc-slag fuming plant. Utah had no zinc smelter; most zinc concentrates were shipped to the electrolytic zinc plants of the Anaconda Copper Mining Co. at Anaconda and Great Falls, Mont., and most of the oxide-zinc fume produced at the Tooele fuming plant was shipped to plants at Bartlesville, Okla., Hillsboro, Ill., and Great Falls, Mont.

The United States Steel Corp. operated its steel plant at Geneva and the pig-iron plant at Ironton all year. Uranium ore-purchasing depots were operated at Hite, Marysvale, Monticello, and Thompson.

A new \$5 million plant to produce triple superphosphate and phosphoric acid, using low-grade phosphate shales from Leefe, Wyo., and sulfuric acid from the plant at Garfield, Utah, was being constructed at Garfield by Western Phosphates, Inc.

Six oil refineries operated, included those of Utah Oil Refining Co. at Salt Lake City, Salt Lake Refining Co. and Western States Refining Co. at North Salt Lake, and Phillips Petroleum Co. at Woods Cross.

Copper-, Lead-Zinc-, and Silver-Ore Output.—The total ore (excluding copper precipitates), old tailings, slag, and cleanings treated was 30,682,662 short tons in 1953, 7 percent less than in 1952; most of the decrease was in output of copper ore. Of the total, 29,922,200 tons (97.5 percent) was copper ore from the Utah Copper mine and 526,215 tons (1.7 percent) lead-zinc ore from the Ophir, Rush Valley, Tintic, and West Mountain (Bingham) districts; the remainder was largely silver ore and old tailings from the Park City region and Tintic district. The total output of lead-zinc ore in 1953 was 526,554 tons, a drop of 134,037 tons (20 percent) from 1952. Of the total lead-zinc ore output, 365,456 tons (69 percent) came from the West Mountain (Bingham) district; 81,442 (15 percent) from the Park City region; 36,640 (7 percent) from the Tintic district; and 42,823 (8 percent) from the Ophir and Rush Valley districts. The United States & Lark group of the United States Smelting, Refining & Mining

TABLE 1.—Mineral production in Utah, 1952-53¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Asphalt and related bitumens, native: Gilsonite.....	60,740	\$1,779,815	60,505	\$2,184,328
Carbon dioxide, natural (estimated) thousand cubic feet.....	84,500	10,000	(?)	(?)
Clays.....	189,723	1,125,299	198,348	1,457,515
Coal.....	6,140,305	32,410,303	6,544,145	37,689,144
Copper (recoverable content of ores, etc.).....	282,894	136,920,696	269,496	154,690,704
Fluorspar.....	17,304	438,699	15,527	374,944
Gold (recoverable content of ores, etc.)..... troy ounces.....	435,507	15,242,745	483,430	16,920,050
Iron ore (usable)..... long tons, gross weight.....	3,990,505	15,025,899	4,617,288	26,496,950
Lead (recoverable content of ores, etc.).....	50,210	16,167,620	41,522	10,878,764
Manganese ore (35 percent or more Mn)..... gross weight.....	95	(?)	550	(?)
..... do.....	3,397	(?)	5,155	82,316
Natural gas (marketed production)..... million cubic feet.....	3,006	225,000	7,075	807,000
Petroleum (crude)..... thousand 42-gallon barrels.....	1,737	(?)	* 1,807	(?)
Pumice and pumicite.....	(?)	(?)	3,880	4,385
Salt (common).....	136,125	522,721	154,088	772,035
Sand and gravel.....	3,260,044	2,350,412	4,627,808	3,179,690
Silver (recoverable content of ores, etc.)..... troy ounces.....	7,194,109	6,511,032	6,725,807	6,087,195
Stone (except limestone for cement and lime).....	* 852,351	* 1,123,108	997,330	1,446,594
Tungsten concentrate..... 60-percent WO ₃ basis.....	3	9,449	35	123,445
Zinc (recoverable content of ores, etc.).....	32,947	10,938,404	29,184	6,712,320
Undistributed: Cement, gypsum, lime, molybdenum, natural gasoline, perlite, phosphate rock (1953), po- tassium salts, stone (crushed marble, 1952), vana- dium, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2). Excludes value of clays used for cement.....		* 24,699,578		28,722,045
Total Utah.....		* 265,501,000		298,629,000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers). Excludes uranium and monazite.

² Value included with "Undistributed."

³ Final figure. Supersedes preliminary figure given in commodity chapter.

⁴ Excludes certain stone, value for which is included with "Undistributed."

⁵ Revised figure.

TABLE 2.—Average prices¹ of certain mineral commodities in Utah, 1952-53

Commodity	1952	1953
Clays:		
Fire and common..... short ton.....	\$2.300	\$2.605
Other..... do.....	11.589	13.889
Coal..... do.....	5.280	5.680
Copper ² pound.....	.242	.287
Fluorspar..... short ton.....	25.352	24.148
Gold ³ troy ounce.....	35.000	35.000
Gilsonite..... short ton.....	29.302	36.102
Gypsum (crude)..... do.....	3.204	3.217
Iron ore..... long ton.....	3.765	5.738
Lead ² pound.....	.161	.131
Perlite (crude)..... short ton.....	5.101	3.500
Pumice and pumicite..... do.....	1.000	1.130
Salt (common)..... do.....	3.840	5.010
Sand and gravel..... do.....	.721	.687
Silver ⁴ troy ounce.....	.905+	.905+
Stone:		
Dimension..... short ton.....		17.622
Crushed and broken..... do.....	1.414	1.426
Tungsten..... short ton unit of WO ₃ contained in 60-percent concentrate.....	57.970	57.720
Zinc ² pound.....	.166	.115

¹ Prices are based on average value f. o. b. mines or mills reported by the producers, except as otherwise noted.

² Yearly average weighted price of all grades of primary metal sold by producers.

³ Price under authority of Gold Reserve Act of Jan. 31, 1934.

⁴ Treasury buying price for newly mined silver July 1, 1946, to date—\$0.9050505 (\$0.905 used in 1947 for calculating purposes).

Co. in the West Mountain (Bingham) district was by far the largest producer of lead-zinc ore. The number of lead-zinc producers declined from 23 in 1952 to 14 in 1953 and lead producers from 19 to 15; the number of copper producers increased from 9 to 16. The

TABLE 3.—DMEA contracts in 1953 and total value of contracts from January 1951 through December 31, 1953

Name of commodity and contractor	Property	County	Date of contract	Participation	
				Government	Private
<i>Beryl</i>					
The Brush Beryllium Co.....	10 unpatented mining claims.	Tooele.....	Apr. 27, 1953	\$65,988	\$7,332
<i>Copper-lead-zinc</i>					
United States Smelting, Refining & Mining Co.	-----	Salt Lake.....	Jan. 16, 1953	74,763	74,763
<i>Lead</i>					
Willard Cleghorn.....	5 patented lode-mining claims.	Utah.....	Mar. 20, 1953	9,177	9,177
Nalldriver Mining Co.....	Nalldriver mine.....	Wasatch.....	Oct. 15, 1953	¹ 38,885	¹ 38,885
<i>Lead-zinc</i>					
Chief Consolidated Mining Co.	Chief No. 1 mine.....	Juab.....	June 16, 1953	¹ 27,310	¹ 27,310
Combined Metals Reduction Co.	Butterfield unit.....	Salt Lake.....	July 22, 1953	¹ 32,000	¹ 32,000
New Quincy Mining Co.....	New Quincy.....	Wasatch.....	Mar. 24, 1953	¹ 13,421	¹ 13,421
<i>Tungsten</i>					
F. F. Hintze.....	4 unpatented mining claims.	Tooele.....	July 10, 1953	17,960	5,987
Midstate Devel., Inc.....	7 unpatented lode-mining claims.	Millard.....	Oct. 28, 1953	13,688	4,563
Timco, Inc.....	3 unpatented lode-mining claims.	Tooele.....	Oct. 5, 1953	1,688	563
<i>Uranium</i>					
Beaver Uranium Co.....	7 unpatented mining claims.	Beaver.....	Aug. 19, 1953	29,880	3,320
Calvin Black & Keith Jones.	Whirlwind mines.....	San Juan.....	Dec. 15, 1953	6,480	720
Excalibur Uranium Corp.....	Spring Canyon and Bow Knot area group of mining claims.	Grand and Emery.	Feb. 17, 1953	34,410	3,823
Glenn Mining Co.....	Potts & Heatherly No. 8 claims.	Piute.....	Aug. 21, 1953	¹ 8,264	¹ 918
Gramlich Minerals, Inc.....	60 unpatented mining claims.	San Juan.....	Aug. 6, 1953	31,770	3,530
Kay Hunt & Andrew Hunt..	2 unpatented lode-mining claims.	Emery.....	Apr. 9, 1953	6,631	737
Mineral Uranium Corp.....	2 unpatented lode-mining claims.	Grand.....	Aug. 25, 1953	1,215	135
Frank L. Morgan & Erma R. Morgan.	7 unpatented lode-mining claims.	Emery.....	Mar. 23, 1953	2,106	234
Red Canyon Mines, Inc.....	2 unpatented lode-mining claims.	San Juan.....	Nov. 16, 1953	21,600	2,400
Jesse Glen Shumway & Grant Lee Shumway.	Shay uranium claims; 2 unpatented mining claims.	---do.....	Feb. 6, 1953	4,050	450
Thornburg Mining Co.....	Shinarump claims; Vance Thornburg & Garar claims.	Grand.....	Nov. 13, 1953	37,719	4,191
Total—1953.....	-----	-----	-----	479,005	234,459
Total of contracts through Dec. 31, 1952.	-----	-----	-----	1,732,224	1,366,649
Grand total through 1953.	-----	-----	-----	2,211,229	1,601,108

¹ Amended contract.

output of lead ore dropped from 14,195 tons in 1952 to 5,818 in 1953; most of it in both years came from 1 mine in the West Mountain (Bingham) district.

The output of gold-silver ore and silver ore and old tailings increased from 148,891 tons in 1952 to 204,740 in 1953. Details on the production of metals, by class of ore, are given in table 7.

Of the total ore, old tailings, etc., produced in Utah in 1953, 29,922,200 tons was copper ore and 526,305 tons lead-zinc ore treated at mills; 230,606 tons was crude ore, copper precipitate, old tailings, slag, and cleanings shipped direct to smelters; and 19,693 tons was old zinc slag treated at a fuming plant.

REVIEW BY MINERAL COMMODITIES

METALS

Arsenic.—A small quantity of arsenic was produced in Utah as a byproduct of lead smelting at the Midvale plant of the United States Smelting, Refining & Mining Co.

Cobalt.—Cobalt was produced in Utah for the first time in 1953, when Howe Sound's new refinery at Garfield began commercial production of cobalt metal in March from concentrate shipped from Calera Mining Co. (subsidiary of Howe Sound Co.) at Cobalt, Idaho. However, the plant operated at only 20 percent of capacity owing largely to difficulties encountered in handling the corrosive solution employed in the refining process.

Copper.—Because of a reduced output of copper ore at the Utah Copper open pit at Bingham (Salt Lake County) in 1953, Utah's 1953 production of recoverable copper (269,496 short tons) was the lowest since 1949 and 13,398 tons (5 percent) less than in 1952. Nevertheless, the State remained the second largest producer of copper in the United States following Arizona. The Kennecott Copper Corp. reported that, as a result of the easing in demand for copper in the second half of 1953, production of ore at the Utah Copper open pit dropped, as it was no longer necessary to strive for capacity production. The corporation operated its two 40,000-ton copper concentrators at Arthur and Magna and its copper-leaching plant at the mouth of Bingham Canyon all year. The copper concentrate and precipitate were hauled to the nearby Garfield smelter of the American Smelting & Refining Co. The United States & Lark group of the United States Smelting, Refining & Mining Co., also at Bingham, was the only other Utah property to produce over 1 million pounds of recoverable copper in 1953. These 2 producers contributed 99.6 percent of the State 1953 copper production. Statistical details of copper ore mined, metal produced, and method of recovery are given in the following section under gold.

Gold.—Utah continued to rank second to South Dakota in gold production in the United States despite production of 483,400 fine ounces, the largest for any year in its history and 47,900 ounces (11 percent) more than in 1952. This gain resulted mainly from an increased gold content of copper ore mined at the Utah Copper

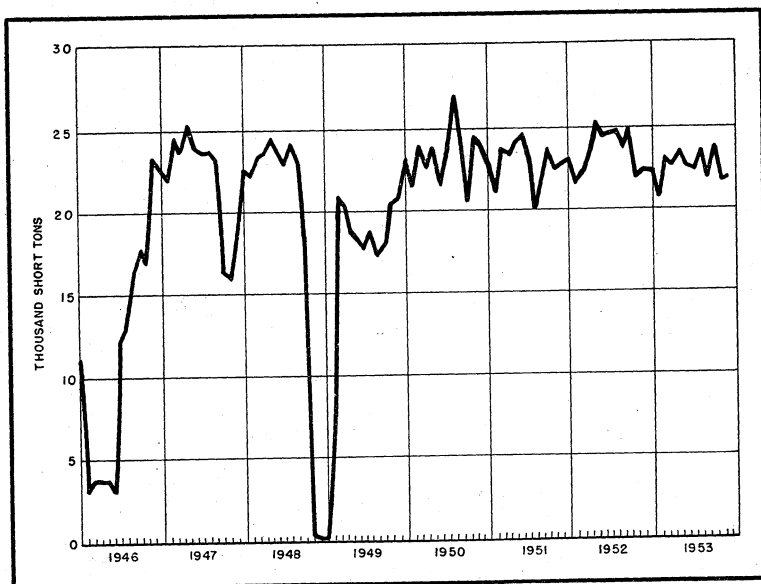


FIGURE 1.—Mine production of copper in Utah, 1946-53, by months, in terms of recoverable metals.

property and of lead-zinc ore mined at the New Park property. Of the total gold produced in Utah in 1953, 91 percent was recovered from copper ore and 7 percent from lead-zinc ore; the remainder was recovered largely from siliceous silver ore and old tailings. In 1953 copper ore yielded 441,600 ounces of gold—38,300 ounces (10 percent) more than in 1952; and lead-zinc ore yielded 36,000 ounces—8,200 ounces (30 percent) more. Nearly all of the gold recovered from copper ore and 23 percent of the gold recovered from lead-zinc ore came from the West Mountain (Bingham) district, Salt Lake County. Most (72 percent) of the gold recovered from lead-zinc ore came from the Park City region, Wasatch County.

The West Mountain (Bingham) district supplied 93 percent of the State total gold in 1953, the Park City region 6, and the Tintic and Rush Valley districts 1. The gold production in the West Mountain (Bingham) district was 33,275 ounces—8 percent more than in 1952; in the Park City region 14,092 ounces—102 percent more; and in the Tintic district 322 ounces—11 percent more.

The Utah Copper property at Bingham continued as by far the largest gold producer in Utah, and its production in 1953 was 38,564 ounces (10 percent) more than in 1952. Next in order of output were the New Park property in the Park City region; United States & Lark group at Bingham; Chief No. 1 mine in the Tintic district; and West Calumet mine in the Rush Valley district. These 5 properties supplied 99 percent of the State 1953 gold production.

TABLE 4.—Mine production of gold, silver, copper, lead, and zinc, 1944-48 (average), 1949-53, and total 1864-1953, in terms of recoverable metals ¹

Year	Mines producing		Material sold or treated ² (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1944-48 (average)	102	1	25,006,821	318,564	\$11,149,733	6,728,687	\$5,478,404
1949	93	2	21,993,467	314,058	10,992,030	6,724,880	6,086,356
1950	84	2	31,855,601	457,551	16,014,285	7,083,808	6,411,204
1951	82		31,356,837	432,216	15,127,560	7,310,665	6,616,521
1952	63		32,875,034	435,607	15,242,745	7,194,109	6,511,032
1953	55	1	30,682,662	483,430	16,920,050	6,725,807	6,087,195
1864-1953			774,491,314	13,555,824	374,678,880	770,037,149	570,120,428

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1944-48 (average)	223,355	\$76,981,937	45,939	\$11,292,337	37,216	\$9,026,797	\$113,929,208
1949	197,245	77,714,530	53,072	16,770,752	40,670	10,086,160	121,649,828
1950	278,630	115,910,080	44,753	12,083,310	31,678	8,996,552	159,415,431
1951	271,086	131,205,624	50,451	17,456,046	34,317	12,491,338	182,897,139
1952	282,894	136,920,696	50,210	16,167,620	32,947	10,938,404	185,780,497
1953	269,496	154,690,704	41,522	10,878,764	29,184	6,712,320	195,289,033
1864-1953	6,693,332	2,199,297,021	4,764,696	596,957,190	1,236,970	208,801,971	3,949,855,490

¹ Includes recoverable metal content of gravel washed (placer operations), ore milled, old tailings or slimes re-treated, and ore, old tailings, or copper precipitate shipped to smelters during the calendar year indicated.

² Does not include gravel washed or tonnage of precipitate shipped.

³ Figures estimated for certain years before 1901.

TABLE 5.—Mine production of gold, silver, copper, lead, and zinc in 1953, by months, in terms of recoverable metals ¹

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January	34,210	545,000	22,215	3,690	2,650
February	38,735	528,916	20,755	3,850	2,533
March	41,035	573,646	23,020	4,190	2,850
April	42,215	590,700	22,520	4,295	2,785
May	40,470	579,445	23,467	3,495	2,600
June	39,100	596,335	22,580	3,860	2,719
July	38,420	505,000	22,335	2,140	1,730
August	42,870	564,200	23,553	3,060	2,080
September	40,805	593,798	21,800	3,550	2,503
October	44,560	613,270	23,720	3,540	2,500
November	40,105	483,374	21,728	2,330	1,780
December	40,615	552,123	21,803	3,522	2,454
Total	483,430	6,725,807	269,496	41,522	29,184

¹ Mine production comprises ore, gravel, or other mineral material sold or treated and metal recovered as natural gold or as bullion from cyanidation or amalgamation and the estimated recoverable metals (or gross metal as indicated) contained in concentrates, ores, tailings, and other mineral materials shipped directly to smelters or sold to ore buyers during the year.

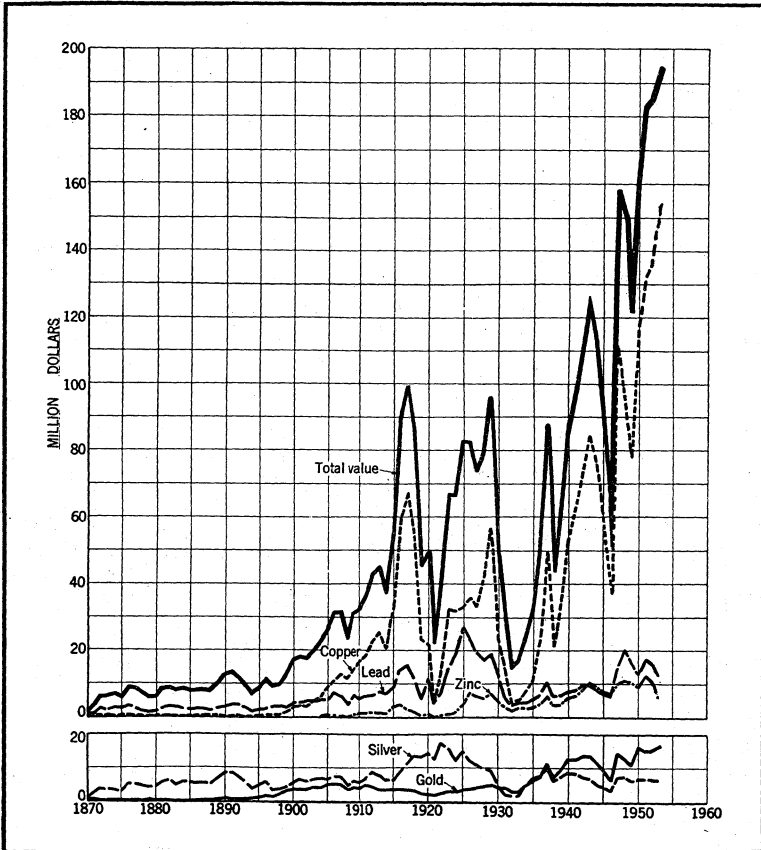


FIGURE 2.—Value of mine production of gold, silver, copper, lead, and zinc in Utah, 1870–1953.

Iron, Steel, and Iron Ore.—A pig-iron plant at Ironton and a steel plant at Geneva, Utah County, were operated all year by the Columbia-Geneva Steel Division of United States Steel Corp.; production of both pig iron and steel was greater than in 1952. Part of the pig iron was consumed in the open hearth at Geneva, and part was shipped to California steel plants; most of the steel produced was shipped to finishing mills and fabricating plants in California. Most of the coke produced at Ironton was used in blast-furnace charges there, although small amounts were consumed in the open hearth at Geneva.

Owing to a demand for more iron ore at the pig iron and steel plants in Utah in 1953, shipments of iron ore from mines in the State were 626,783 long tons (16 percent) greater than in 1952.

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc in 1953, by counties, in terms of recoverable metals

County	Mines producing		Material sold or treated ¹ (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
Beaver.....	4		298	6	\$210	695	\$629
Box Elder.....	1		200	1	35	74	67
Grand.....	1		74	1	35	137	124
Juab.....	10		120,000	3,141	109,935	562,667	509,242
Millard.....		1		9	315	1	1
Piute.....	3		511	19	665	2,496	2,259
Salt Lake.....	6		30,298,718	450,886	15,781,010	5,027,651	4,550,278
Summit.....	6		111,583	1,992	69,720	401,855	363,699
Tooele.....	11		65,825	1,323	46,305	309,712	280,305
Utah.....	8		3,324	1,125	4,375	17,862	16,166
Wasatch.....	2		81,822	25,927	907,445	400,181	362,184
Washington.....	3		307			2,476	2,241
Total: 1953.....	55	1	30,682,662	483,430	16,920,050	6,725,807	6,087,195
1952.....	63		32,875,034	435,507	15,242,745	7,194,109	6,511,032

County	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
Beaver.....	9	\$5,166	1	\$262			\$6,267
Box Elder.....	13	7,462					7,564
Grand.....	2	1,148					1,307
Juab.....	102	58,548	3,590	940,580	2,433	\$559,590	2,177,895
Millard.....							316
Piute.....	2	1,148	8	2,096	5	1,150	7,318
Salt Lake.....	268,514	154,127,036	29,312	7,679,744	19,669	4,523,870	186,661,938
Summit.....	103	59,122	720	188,640	86	19,780	700,961
Tooele.....	207	118,818	4,245	1,112,190	2,227	512,210	2,069,828
Utah.....	2	1,148	106	27,772	1	230	49,691
Wasatch.....	527	302,498	3,515	920,930	4,762	1,095,260	3,588,317
Washington.....	15	8,610	25	6,550	1	230	17,631
Total: 1953.....	269,496	154,690,704	41,522	10,878,764	29,184	6,712,320	195,289,033
1952.....	282,894	136,920,696	50,210	16,167,620	32,947	10,938,404	185,780,497

¹ Does not include gravel washed or tonnage of precipitates shipped.

Shipments in 1953—4,617,288 long tons—approached the record shipments—4,637,239 tons—of 1951. The value of the 1953 shipments was \$11,471,051 (76 percent) more than in 1952, due to a rise of \$1.97 a ton in the average price. Most of the output in 1953 was magnetite ore averaging 54.15 percent natural iron that came from 7 open pits in Iron County; however, 1 mine in Box Elder County produced a few thousand tons of limonite ore that was sold to the Atomic Energy Commission. Table 12 gives the shipments of iron ore, in long tons, from Utah mines from 1906–53.

The iron ore, limestone, dolomite, and manganese ore used for charging blast furnaces were mined in Utah; also, most of the coal for making coke was obtained from mines in the State.

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in 1953, by classes of ore or other source materials, in terms of recoverable metals

Source	Number of mines ¹	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Ore:							
Dry gold-silver.....	9	13, 646	1, 164	52, 638	344, 635	235, 990	
Dry silver.....	11	133, 536	3, 048	533, 990	178, 335	2, 644, 760	
Total.....	17	147, 182	4, 212	586, 628	522, 970	2, 880, 750	
Copper.....	16	29, 923, 397	441, 623	3, 412, 050	509, 376, 250	500	
Lead.....	15	5, 818	252	39, 344	55, 090	1, 668, 300	13, 710
Lead-zinc.....	14	526, 554	36, 008	2, 487, 330	3, 122, 345	76, 692, 940	56, 300, 690
Total.....	40	30, 455, 769	477, 883	5, 938, 724	512, 553, 685	78, 361, 740	56, 314, 400
Other "lode" material:							
Old tailings ²		57, 558	1, 053	183, 359	128, 675	1, 148, 510	124, 800
Copper precipitate.....		16, 142			25, 521, 370		
Old slag, mill cleanings and smelter cleanings ³		22, 153	273	17, 095	265, 300	653, 000	1, 928, 800
Total.....		95, 853	1, 326	200, 454	25, 915, 345	1, 801, 510	2, 053, 600
Total "lode" material.....	55	30, 698, 804	483, 421	6, 725, 806	538, 992, 000	83, 044, 000	58, 368, 000
Gravel (placer operations).....	1		9	1			
Total, all sources.....	56	30, 698, 804	483, 430	6, 725, 807	538, 992, 000	83, 044, 000	58, 368, 000

¹ Detail will not add to totals because some mines produce more than 1 class of ore.

² Gold-silver, 369 tons; silver, 57,189 tons.

³ Old slag: Copper, 1,963 tons; zinc, 20,143 tons. Mill cleanings: Copper, 35 tons. Smelter cleanings: Copper, 4 tons; lead, 8 tons.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1953, by methods of recovery and types of material processed, in terms of recoverable metals

Method of recovery and type of material processed	Material treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode:						
Concentration and smelting of concentrates ¹	30, 448, 505	477, 603	5, 896, 071	512, 370, 105	76, 645, 380	56, 266, 490
Direct smelting:						
Ore.....	154, 446	4, 492	629, 281	706, 550	4, 597, 110	47, 910
Old tailings.....	57, 558	1, 053	183, 359	128, 675	1, 148, 510	124, 800
Copper precipitates ²	16, 142			25, 521, 370		
Old slag, mill and smelter cleanings.....	22, 153	273	17, 095	265, 300	653, 000	1, 928, 800
Total.....	250, 299	5, 818	829, 735	26, 621, 895	6, 398, 620	2, 101, 510
Placer.....		9	1			
Grand total.....	30, 698, 804	483, 430	6, 725, 807	538, 992, 000	83, 044, 000	58, 368, 000

¹ Ore only; no old tailings, etc., processed by this method in Utah in 1953.

² All from Salt Lake County.

Lead.—Despite a decrease of 8,688 tons (17 percent) in lead production in 1953 compared with 1952, Utah continued to rank third in lead in the United States. The 1953 production—41,522 short tons—was 16 percent less than the yearly average of the 10-year period 1943–52. The drop in lead production in 1953 resulted from a reduced output of lead-zinc ore at the principal producers and from closing in 1952 of several lead-zinc producers, caused by continued declines in the market prices of lead and zinc. The year began with lead quoted at 14.75 cents a pound and zinc 12.50 cents a pound, but the price of zinc advanced to 13 cents on January 2; at the end of the year lead was quoted at 13.50 cents a pound and zinc at 10.00 cents a pound. Of the total lead produced in the State in 1953, the West Mountain (Bingham) district supplied 29,311 short tons, a decrease of 5,017 tons (15 percent); the Park City region 4,235 tons, a decrease of 3,259 tons (43 percent); the Tintic district 3,693 tons, a decrease of 585 tons (14 percent); and the Ophir and Rush Valley districts 3,910 tons, an increase of 456 tons (13 percent).

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1953, by methods of recovery and classes of material processed, in terms of recoverable metals¹

A. For ore treated at mills

	Material treated (short tons)	Concentrate shipped to smelters and recoverable metals					
		Concentrate (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES							
Juab.....	36,640	9,835	631	229,207	50,500	4,737,000	4,856,200
Plute.....	22	7		36		2,500	3,000
Salt Lake.....	30,287,468	939,461	449,852	4,980,954	511,163,085	57,233,190	39,310,800
Summit.....	250	116	4	1,273	2,670	20,690	45,890
Tooele.....	42,922	9,130	1,206	284,848	147,850	7,619,700	2,524,600
Utah.....	11	4		141		2,300	2,000
Wasatch.....	81,192	19,409	25,910	399,612	1,006,000	7,030,000	9,524,000
Total: 1953.....	30,448,505	977,962	477,603	5,896,071	512,370,105	76,645,380	56,266,490
1952.....	32,699,373	1,090,607	430,792	6,474,234	547,615,179	92,774,295	64,941,485
BY CLASSES OF ORE							
Copper.....	29,922,200	840,869	441,599	3,410,028	509,250,000		
Lead-zinc.....	526,305	137,093	36,004	2,486,043	3,120,105	76,645,380	56,266,490
Total 1953:.....	30,448,505	977,962	477,603	5,896,071	512,370,105	76,645,380	56,266,490
BY CLASSES OF CONCENTRATE SHIPPED TO SMELTERS							
Copper.....		840,869	441,599	3,410,028	509,250,000		
Iron (from lead-zinc ore).....		8,257	2,374	27,646	28,465	157,700	149,580
Lead.....		75,608	29,600	1,986,376	2,162,215	70,697,480	1,042,420
Lead-zinc.....		807	70	46,603	4,540	519,600	854,900
Total to copper and lead plants.....		925,541	473,643	5,470,653	511,445,220	71,374,780	2,046,900
Zinc concentrate to zinc plants.....		52,421	3,960	425,418	924,885	5,270,600	54,219,590
Total: 1953.....		977,962	477,603	5,896,071	512,370,105	76,645,380	56,266,490
1952.....		1,090,607	430,792	6,474,234	547,615,179	92,774,295	64,941,485

See footnotes at end of table.

TABLE 9.—Mine production of gold, silver, copper, lead, and zinc in 1953, by methods of recovery and classes of material processed, in terms of recoverable metals ¹—Continued

B. For materials shipped directly to smelters

	Material shipped (short tons)	Recoverable metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
BY COUNTIES						
Beaver.....	298	6	695	18,000	2,000	-----
Box Elder.....	200	1	74	26,000	-----	-----
Grand.....	74	1	137	4,000	-----	-----
Juab.....	83,360	2,510	333,460	153,500	2,443,000	9,800
Piute.....	489	19	2,460	4,000	13,500	7,000
Salt Lake.....	27,392	1,034	46,697	*25,864,915	1,390,810	27,200
Summit.....	111,333	1,988	400,582	203,330	1,419,310	126,110
Tooele.....	22,903	117	24,864	266,150	870,300	1,929,400
Utah.....	3,313	125	17,721	4,000	209,700	-----
Wasatch.....	630	17	569	48,000	-----	-----
Washington.....	307	-----	2,476	30,000	50,000	2,000
Total: 1953.....	250,299	5,818	829,735	*26,621,895	6,398,620	2,101,510
1952.....	175,661	4,715	719,875	*18,172,821	7,645,705	952,515
BY CLASSES OF MATERIAL						
Dry gold-silver:						
Crude ore.....	13,646	1,164	52,638	344,635	235,990	-----
Old tailings.....	369	14	964	500	5,500	-----
Dry silver:						
Crude ore.....	133,536	3,048	533,990	178,335	2,644,760	-----
Old tailings.....	57,189	1,039	182,395	128,175	1,143,010	124,800
Copper:						
Crude ore.....	1,197	24	2,022	126,250	500	-----
Precipitates.....	16,142	-----	-----	25,521,370	-----	-----
Old slag; mill and smelter cleanings.....	2,002	259	11,839	259,400	101,900	-----
Lead:						
Crude ore.....	5,818	252	39,344	55,090	1,668,300	13,710
Smelter cleanings.....	8	1	108	100	2,400	-----
Lead-zinc.....	249	4	1,287	2,240	47,560	34,200
Total to copper and lead plants.....	230,156	5,805	824,587	26,616,095	5,849,920	172,710
Zinc: Old slag to zinc plant.....	20,143	13	5,148	5,800	548,700	1,928,800
Total 1953.....	250,299	5,818	829,735	26,621,895	6,398,620	2,101,510

¹ No bullion produced in 1953.

² Includes copper recovered from smelting mine-water precipitates as follows: 1953—25,521,370 pounds; 1952—17,349,440 pounds.

The United States & Lark property at Bingham remained by far the largest lead producer in Utah, but its production in 1953 was 12 percent less than in 1952; it was followed by the Chief No. 1, New Park, and West Calumet properties, and the Ophir unit of the United States Smelting, Refining & Mining Co. These 5 producers supplied 95 percent of the State 1953 lead production.

Manganese and Manganiferous Ores.—No manganese ore (35 percent or more Mn) was shipped from properties in Utah in 1953, but 4,603 long tons of manganiferous ore averaging 25.24 percent Mn was shipped from 8 mines in Juab, Millard, and Tooele Counties to the Ironton pig-iron plant and Geneva steel plant, and several hundred tons of similar ore was shipped to the plant of the Western Electro-

TABLE 10.—Mine production of gold, silver, copper, lead, and zinc in 1953, by methods of recovery and classes of material processed, in terms of gross metal content

Class of material	Quantity shipped or treated (short tons)	Gross metal content				
		Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
ORES AND OLD TAILINGS TREATED AT MILLS						
Copper.....	29,922,200	625,338	3,750,382	559,164,590		
Lead-zinc.....	526,305	49,948	2,902,120	4,732,951	87,491,872	73,336,390
Zinc slag-fumed.....	19,693	81	11,316	95,667	575,442	2,346,043
Total: 1953.....	30,468,198	675,367	6,663,818	563,993,208	88,087,314	75,682,433
1952.....	32,699,373	598,298	7,432,537	610,380,706	106,951,962	86,653,628
CONCENTRATES SHIPPED TO SMELTERS						
Copper.....	840,869	441,599	3,410,028	519,647,217		
Iron (from lead-zinc ore).....	8,257	2,374	27,646	33,461	164,176	211,080
Lead.....	75,608	29,600	1,986,376	2,738,943	73,299,501	9,342,813
Lead-zinc.....	807	70	46,603	5,486	558,757	885,772
Total to copper and lead plants.....	925,541	473,643	5,470,653	522,425,107	74,022,434	10,439,665
Zinc concentrate to zinc plants.....	52,421	3,960	425,418	1,088,313	5,667,573	56,186,111
Total: 1953.....	977,962	477,603	5,896,071	523,513,420	79,690,007	66,625,776
1952.....	1,090,607	430,794	6,474,608	559,511,051	96,752,532	79,121,474
ORES, OLD TAILINGS, ETC., SHIPPED DIRECTLY TO SMELTERS						
Dry gold-silver:						
Crude ore.....	13,646	1,164	52,638	351,842	394,814	
Old tailings.....	369	14	964	519	9,223	
Dry silver:						
Crude ore.....	133,536	3,048	533,990	182,172	4,410,191	26
Old tailings.....	57,189	1,039	182,395	132,051	1,845,425	157,165
Copper:						
Crude ore.....	1,197	24	2,023	129,798	933	
Precipitate.....	16,142			25,911,603		
Old slag, mill and smelter cleanings.....	2,002	259	11,839	265,092	169,852	
Lead:						
Crude ore.....	5,818	252	39,344	73,453	1,733,574	18,176
Smelter cleanings.....	8	1	108	157	2,545	
Lead-zinc.....	249	4	1,287	2,687	48,367	44,256
Total to copper and lead plants.....	230,156	5,805	824,588	27,049,374	3,614,924	219,623
Zinc: Old slag to zinc plant.....	20,143	83	11,616	98,658	588,163	2,409,894
Total: 1953.....	250,299	5,888	836,204	27,148,032	9,203,087	2,629,517
1952.....	175,661	4,715	719,875	18,507,595	10,279,811	1,902,311

chemical Corp. at Henderson, Nev., where it was processed to synthetic battery-grade manganese. In addition, 1,596 long tons averaging 28.20 percent Mn was shipped to the Government low-grade stockpile depot at Butte, Mont., from Staats' property in the Drum Mountains (Detroit) district, Juab County, and the Kramer property in Tooele County. The largest producer in 1953 was the Black Rock mine in the Erickson district, Tooele County, operated by H. H. Ellerbeck. Other producers were the Chief No. 1 and Dyke mines in Juab County; Black Boy and Little Willie mines in Millard County; and Deer Trail and Kramer properties in Tooele County.

TABLE 11.—Mine production of gold, silver, copper, lead, and zinc in 1953, by counties and districts, in terms of recoverable metals

County and district	Mines producing		Material sold or treated ¹ (short tons)	Gold (fine ounces)		Silver (fine ounces)			Copper (pounds)	Lead (pounds)	Zinc (pounds)	Total value
	Lode	Placer		Lode	Placer	Lode	Placer	Total				
Beaver County:												
Beaver Lake.....	2		11			29		500	2,000		\$431	
Box Elder County: Lucin.....	2		287	6		666		17,500			5,836	
Grand County: La Sal.....	1		200	1		74		26,000			7,564	
Juab County:												
Drum Mountain.....	1		8	1		18		800			281	
Tropic.....	9		119,992	3,140	9	562,649		203,200	7,150,000	4,866,000	2,177,614	
Millerd County: House Mountains.....											316	
Piute County:												
Mount Baldy.....	1		430	16		1,632		2,000	13,000	7,000	5,119	
Ohio.....	2		81	3		864		2,000	3,000	3,000	2,199	
Salt Lake County:												
Big Cottonwood.....	1		34	1		57		1,700	100		575	
Little Cottonwood.....	1		6			40		2,200			630	
Smelter.....	(²)		12	3		135		2,100	2,700		1,184	
West Mountain (Bingham).....	4		30,298,666	450,882		5,027,419		537,022,000	58,621,200	39,338,000	186,659,499	
Summit County: Uintah.....	6		111,983	1,992		401,855		206,000	1,440,000	172,000	700,961	
Tooele County:												
Blue Bell.....	1		5			62			3,100		462	
Columbia.....	1		2			52			1,700		270	
Erickson.....	2		100			105		400	14,500	15,100	3,921	
Opiah.....	2		19,185	71		87,773		116,700	2,313,200	1,383,100	577,642	
Rush Valley.....	2		24,423	1,145		204,793		37,000	5,006,500	1,127,000	1,057,051	
Smelter.....	4		22,106	102		16,915		236,400	650,300	1,928,500	400,328	
Willow Springs.....	(²)		4			12		500			154	
Utah County:												
American Fork.....	3		15	1		302		4,000	5,400	2,000	1,245	
Tintic.....	5		3,309	124		17,560			206,600		48,446	
Wasatch County:												
Blue Ledge.....	1		81,192	25,910		399,612		1,006,000	7,030,000	9,524,000	3,873,431	
Snake Creek.....	1		630	17		2,476		45,000			14,886	
Washington County: Tutsagubet.....	3		307					30,000	50,000	2,000	17,631	
Total.....	55	1	30,682,662	483,421	9	6,725,806	1	538,992,000	83,044,000	58,368,000	195,289,033	

¹ Does not include gravel washed or tonnage of precipitate shipped. Tintic district lies in both Juab and Utah Counties.

² Production came from old mill cleanings and old smelter cleanings; not counted as a mine.

TABLE 12.—Shipments of iron ore from mines, 1906-53, in long tons

Year	Quantity	Value	Year	Quantity	Value
1906-48.....	16,707,899	\$24,060,973	1951.....	4,637,239	\$10,141,653
1949.....	2,698,632	4,403,767	1952.....	3,990,505	15,025,899
1950.....	3,111,167	5,746,808	1953.....	4,617,283	26,496,950

Molybdenum.—Utah was again the second largest producer of molybdenum in the United States following Colorado, and its production in 1953 was the greatest in any year since 1936, when the output of molybdenite concentrate was begun at the Arthur and Magha concentrators of Kennecott Copper Corp. The concentrate was recovered as a byproduct from the treatment of copper ore produced at the Utah Copper property in Salt Lake County. The corporation reported shipments of 16,309 tons of molybdenite concentrate in 1953. The gain over 1952 shipments resulted from improved recovery of molybdenite. Most of the concentrate was shipped to eastern points for consumption or for export.

Selenium and Tellurium.—Some selenium and tellurium were produced as byproducts at the Garfield copper refinery operated by Kennecott Copper Corp.

Silver.—Although Utah's 1953 silver production (6,726,000 ounces) was 6 percent below the yearly average of the 10-year period (1943-52) and 7 percent less than in 1952, the State continued to rank second in silver production in the United States following Idaho. A decrease of 709,807 ounces in silver production from lead-zinc ore more than offset an increase of 294,241 ounces from copper ore and siliceous silver ore and old tailings. Copper ore supplied 3,412,000 ounces of the State silver production in 1953, lead-zinc ore 2,487,000 ounces, and siliceous silver ore and old tailings 716,400 ounces. The remainder came chiefly from gold-silver ore and lead ore. Nearly all of the silver recovered from copper ore came from the West Mountain (Bingham) district, and nearly all of the silver recovered from lead-zinc ore came from the Park City region, Ophir and Rush Valley districts, Tintic district, and West Mountain (Bingham) district, and nearly all of the silver recovered from siliceous silver ore and old tailings came from the Park City region and Tintic district. In 1953 the West Mountain (Bingham) district supplied 75 percent of the total silver, the Park City region 12, the Tintic district 9, and the Ophir and Rush Valley districts 4 percent. Silver production decreased 13 percent in the Tintic district, 7 in the Park City region, and 6 in the West Mountain (Bingham) district; however, it increased 15 percent in the Ophir and Rush Valley districts.

The Utah Copper mine at Bingham continued as by far the largest silver producer in Utah; it was followed by the United States & Lark group, Chief No. 1 mine, New Park property, Ontario waste dump, West Calumet mine, and Butterfield group. These 7 producers supplied 94 percent of the State 1953 silver production.

Tungsten.—Tungsten production in Utah in 1953 was nearly 13 times greater than in 1952; it increased from 163 units to 2,078. This marked gain resulted largely from the treatment of several thousand tons of tailings accumulated during World War II at the United

States Vanadium Corp. plant at Salt Lake City. In 1953, 5,200 tons of these old tailings was treated in plants operated by H. M. & S. Milling Co. and Salt Lake Tungsten Co. In addition to tailings, the plants treated several hundred tons of tungsten ores and concentrate produced from mines and mills in Idaho, Montana, Nevada, and Utah. A report² on the Salt Lake Tungsten Co. plant was published in November 1953. Tungsten concentrate produced at mills in Utah was sold also to buyers in Bishop, Calif., and a little crude ore was hauled to the Getchell mill at Red House, Nev. All tungsten produced at the Salt Lake Tungsten Co. refinery in 1953 was sold to the General Services Administration at Denver, Colo. The following counties in Utah produced tungsten in 1953: Beaver 74 units, Box Elder 13, Juab 205, Millard 11, Salt Lake 1,388, and Tooele 387.

Uranium.—As a result of provisions of the Atomic Energy Act of 1946, as amended, and the regulations based upon it, the Bureau of Mines is not at liberty to publish statistical data on uranium. However, production of uranium in Utah in 1953 was much greater than in 1952, due principally to a full year's operation of Steen's Mi Vida claim (Utex Exploration Co.) in the Big Indian district, San Juan County, where a large primary uranium ore body was opened in 1952 in the Chinle formation. The ore produced from the mine was hauled to ore-buying depots at Monticello and Thompson, Utah, and Grand Junction, Colo. A report³ on uranium operations of the Utex Exploration Co. was published in 1953.

Other important producers of uranium in 1953 were the Consolidated Uranium Co. and Vernon Pick's Delta mine in the San Rafael district of Emery County; the Bullion Monarch Mining Co. and Vanadium Corporation of America in the Marysvale district of Piute County; and the Happy Jack mine in the White Canyon district of San Juan County. The ore from Emery County was asphaltite (nonvanadium), and the ore from Piute County was autunite (nonvanadium); both types were shipped to the Vitro Chemical Co. mill at Salt Lake City for processing. The copper-bearing uranium ores from claims in the White Canyon district were shipped to the Vanadium Corp. plant at Hite, where the uranium was recovered and attempts made to recover copper from the tailings by flotation. Some uranium ore was produced also from the Silver Reef mine (a famous producer of silver from 1875 to 1900) near Leeds, Washington County. Uranium operations expanded greatly in 1953 at properties in Emery, Garfield, Grand, Piute, San Juan, and Wayne Counties.

Besides greater activity in exploration and development by private companies, assistance in various forms was afforded uranium operators in 1953 by the Atomic Energy Commission, Federal Geological Survey, and Federal Bureau of Mines.

Ore-purchasing depots were operated at Hite, Marysvale, Monticello, and Thompson. Uranium plants that treated ore in 1953 from the Colorado Plateau in Colorado and Utah were the United States Vanadium Corp. at Durango and Naturita, Colo., and Hite, Utah; Atomic Energy Commission at Monticello, Utah; Climax Uranium at Grand Junction, Colo.; and Vitro Chemical at Salt Lake City, Utah.

² Mining World, Salt Lake Tungsten Co.'s Refinery: November 1953, p. 111.

³ Steen, Charles A., Dix, George P., Jr., Hazen, Scott W., Jr., and McLellan, Russell R., Uranium Operations of the Utex Exploration Co. in the Big Indian District: Bureau of Mines Inf. Circ. 7669, October 1953, 13 pp.

Anaconda Copper Mining Co. had a plant nearly completed at Bluewater, N. Mex.; and construction was begun on a \$3 million plant at Shiprock, N. Mex., by Kerr-McGee Oil Industries, Inc.

Vanadium.—For security reasons, because of the close connection in production between vanadium and uranium, production figures on vanadium have not been published since 1947. However, since World War II production of vanadium has greatly expanded as a result of the demand for uranium. Utah's vanadium production in 1953 was much greater than in 1952, due mainly to an increased output of uranium-vanadium ores from mines in the Big Indian district, San Juan County. The largest producer in 1953 was Steen's Mi Vida claim near Moab. According to Bureau of Mines Information Circular 7669, the ore from the claim averaged 1.26 percent V_2O_5 .

Zinc.—Utah's production of recoverable zinc declined to 29,200 short tons in 1953—3,800 tons (11 percent) less than in 1952 and 8,100 tons (22 percent) less than the yearly average of the 10-year period 1943–52. This loss resulted mainly from closing in 1952 of the Park Utah Consolidated lead-zinc property in the Park City region—the third largest zinc producer in Utah—and from a marked decrease in output of lead-zinc ore from the Butterfield group in the West Mountain (Bingham) district. Due to the depressed condition of the domestic zinc market, the workweek at the United States & Lark property of the United States Smelting, Refining & Mining Co.—the largest zinc producer in the State—was reduced to an average of 5½ days August 17. Of the total zinc produced in the State in 1953, the West Mountain (Bingham) district supplied 19,669 short tons, a decrease of 726 tons (4 percent); the Park City region 4,848 tons, a decrease of 2,898 tons (37 percent); the Tintic district 2,433 tons, a decrease of 517 tons (18 percent); and the Ophir and Rush Valley districts 1,255 tons, an increase of 82 tons (7 percent). The remainder came principally from old zinc slag from the Smelter (Tooele) district.

The United States & Lark property at Bingham remained by far the largest zinc producer in Utah; it was followed by the New Park property, Chief No. 1 mine, and International old slag dump. These 4 properties furnished 94 percent of the State 1953 zinc production.

NONMETALS

Cement.—Although Utah's two cement plants—Portland Cement Co. of Utah at Salt Lake City (Salt Lake County) and Ideal Cement Co. at Devils Slide (Morgan County)—operated all year, cement shipments were 7 percent less than in 1952. On the other hand, the total value of the 1953 shipments was 16 percent greater than in 1952 because the average sales price increased from \$2.60 a barrel to \$3.24.

Clays.—Clays production, including bentonite and fuller's earth, increased to 198,000 short tons in 1953, valued at \$1,458,000. Of the total output, 35 percent was halloysite clay produced from the Dragon mine at Eureka, Juab County, and shale from an open pit in Salt Lake County. The halloysite clay was shipped to the Filtrrol Corp. plant at Salt Lake City for processing for use at catalytic cracking units at petroleum refineries, and the shale was used for making cement. The remainder was chiefly miscellaneous clays produced in Morgan, Salt Lake, Tooele, Utah, and Weber Counties for use in

making brick and fire clay produced in Summit, Tooele, and Utah Counties for use in making firebrick and sewer pipe. About 4,500 tons of fuller's earth and 1,738 tons of bentonite were produced from an open pit in Sevier County by Western Clay & Metals Co. After grinding in a mill, the fuller's earth was shipped to oil refineries for filtering mineral oils, and the bentonite was shipped to laundries for filtering water.

Fluorspar.—Seven mines produced 15,977 short tons of fluorspar in 1953 compared with 17,304 tons in 1952; all of it was metallurgical grade, shipped to various steel plants from 6 mines near Joy (Topaz Mountain district), Juab County, and from 1 mine in Millard County. The most important producers were the Bell Hill Mining Co., Chesley & Black, and Willden Bros., all operating claims in Juab County. Some operators reported that they were forced to close after July 1, because they could not compete with lower priced imported fluorspar.

Gypsum.—In 1953, as in 1952, all gypsum produced in Utah came from open pits near Sigurd, Sevier County, operated by United States Gypsum Corp. and Western Gypsum Co.; production increased over 1952. The crude gypsum was processed in plants at Sigurd for use in manufacturing Keene's cement, wallboard, plaster, and other building materials.

Lime.—Lime was produced at 2 plants in 1953. Of the total production 84 percent was quicklime produced at a plant at Magna, Salt Lake County, and used as a reagent in milling copper ore. The remainder was chiefly hydrated lime produced at a plant near Grantsville, Tooele County, and used mainly as a reagent in milling base-metal ores and as an aggregate in making silica brick; some was used also for fluxing material at steel and lead plants, for petroleum refining, and for water purification and softening.

Perlite.—Perlite production in Utah has been declining since 1951, when 5 mines produced 3,422 short tons. The 1953 production was approximately half that in 1952, as the number of producers dropped to 1—the Utco Products Co. property near Milford, Beaver County. The crude perlite was shipped to the company plant at Salt Lake City, where it was processed for use as an aggregate in making plaster and concrete blocks. Another plant for processing crude perlite was operated in 1953 at Bauer, Tooele County, by Combined Metals Reduction Co.; the source of the crude perlite was a property near Pioche, Nev.

Phosphate Rock.—Utah's 1953 sales of phosphate rock were approximately 21 times greater than that in 1952; however, the 1952 sales were small—from 1 producer near Woodruff, Rich County. The marked increase in sales in 1953 resulted from new production from a property near Thistle, Utah County, operated by John M. Uren; the phosphate rock was needed for fluxing material. A little phosphate rock continued to be produced from the Pearl property in Rich County.

Potash (Potassium Salts).—Sales of potassium chloride (95–98 percent KCl) in 1953 were slightly more than in 1952. All of the potash was recovered at the Bonneville, Ltd., plant near Wendover, Tooele County, from the treatment of potassium-bearing brines of Salduro Marsh on the Bonneville salt flats.

Pumice and Pumicite (Volcanic Ash).—Three mines—1 in Beaver County, 1 in Tooele County, and 1 in Utah County—produced pumice and pumicite in 1953, compared with 1 mine in Utah County that produced in 1952. Of the total 1953 output, the major portion was pink pumice from Wm. H. Prince & Sons property at Cedar Fork, Utah County. The pumice was shipped to the company plant at Salt Lake City, where it was used as an aggregate in making light-weight concrete blocks.

Quartzite.—Quartzite for use in making refractory brick was produced in Utah in 1953 from two properties near Eureka, Juab County, and was shipped to the General Refractories Co. plant at Lehi and Murray Refractories Co. plant at Murray.

Salt (Sodium Chloride).—Salt production increased to 154,100 short tons in 1953, a 13-percent gain over 1952; 148,100 tons was derived from lake brine by solar evaporation from 3 properties in Salt Lake and Tooele Counties, and 6,000 tons was rock salt produced from 2 mines in Sanpete and Sevier Counties. The Morton Salt Co. property on the shores of Great Salt Lake, Salt Lake County, was by far the largest salt producer in Utah. Producers of rock salt were Royal Crystal Salt Co. at Axtell, Sanpete County, and Poulson Bros. Salt Co. at Redmond, Sevier County.

Sand and Gravel.—The total output of sand and gravel in 1953 was 4,627,800 short tons, 1,367,800 tons (42 percent) more than in 1952. Of the total output, 2,512,000 tons valued at \$1,764,000 was commercial (produced by private companies), and 2,116,000 tons valued at \$1,416,000 was noncommercial (used by county highway departments). The largest consumer was the Utah State Road Commission. Of the total output, 3,237,008 tons was consumed in paving, 1,040,075 tons in structural building, and 201,633 tons for railroad ballast. The remainder was largely oölitic lime sand used for fluxing at copper and lead smelters. Twenty-four counties, of a total 29 in Utah, produced sand and gravel in 1953; Salt Lake County, with an output of 1,888,383 tons, was the largest producer. Table 13 gives the sand and gravel marketed from pits in Utah, 1908–53, in short tons.

TABLE 13.—Production of sand and gravel, 1908–53

Year	Short tons	Value	Year	Short tons	Value
1908-48.....	52, 100, 958	\$25, 461, 329	1951.....	2, 971, 268	\$2, 268, 750
1949.....	2, 331, 688	1, 553, 408	1952.....	3, 260, 044	2, 350, 412
1950.....	3, 435, 277	2, 251, 515	1953.....	4, 627, 808	3, 179, 690

Stone.—Production of various types of stone was 17 percent more in 1953 than in 1952; a total of 997,300 short tons was produced from 8 counties in 1953. Of the total output, 947,000 tons (95 percent) was crushed limestone, including some calcite and aragonite, from quarries in Cache, Sanpete, Tooele, Utah, and Wasatch Counties. The largest output—589,600 tons—came from Utah County, where it was used mostly as fluxing material at the Ironton pig-iron blast furnace and the Geneva steel open-hearth furnaces. Crushed limestone from Cache and Utah Counties (240,300 tons) was used as an aggregate for concrete and road metal; 59,200 tons from Wasatch

County was used as riprap by the Bureau of Reclamation; 47,400 tons from Tooele County for pH control; 42,500 tons from Cache, Sanpete, and Tooele Counties for sugar refining; 31,000 tons from Utah County for refractory material at open-hearth steel furnaces; 22,800 tons from Tooele and Utah Counties for dust at coal mines; and 13,100 tons from Utah County for railroad ballast. Some crushed calcite and aragonite were produced from a quarry in Tooele County; the calcite was sold as grit to poultry and livestock operators and the aragonite for facing exterior and interior buildings and for roofing granules. Miscellaneous stone (16,600 tons) was produced from a quarry in Box Elder County and used for riprap along the Southern Pacific Railroad right-of-way. Dimension sandstone (1,200 tons) was produced from quarries in Iron and Summit Counties and used mainly for decorative purposes in and around buildings.

Sulfur.—No sulfur was produced in Utah in 1953. In 1952 some sulfur ore was produced from an open pit at Sulphurdale, Millard County, and tested in a new 200-ton pilot flotation mill erected by Chemical Corporation of America.

Talc.—A mill for processing crude talc was operated in 1953 at Ogden, Utah, by Tri-State Minerals Co., a wholly owned subsidiary of Southern California Minerals Co.; the source of the talc was the Treasure State and Smith-Dillon mines near Dillon, Mont., operated by Tri-State Minerals Co. The talc was processed for use mainly by the ceramic and paint industries.

MINERAL FUELS

Asphalt and Related Bitumens (Gilsonite and Wurtzilite).—No native asphalt or wurtzilite was produced in Utah in 1953; 60,500 short tons of gilsonite, valued at \$2,184,000, was produced and sold by 3 companies operating properties in Duchesne and Uintah Counties. The largest producer was Bonanza Mines of American Gilsonite Co. in Uintah County. The average sales value per ton of gilsonite at the mines increased from \$29.30 in 1952 to \$36.10 in 1953. Table 14 gives the total shipments of asphalt and related bitumens in short tons from mines in Utah from 1903-48 and shipments of gilsonite only from 1949-53.

TABLE 14.—Shipments of asphalt and related bitumens (gilsonite and wurtzilite), 1903-48, and shipments of gilsonite only, 1949-53

Year	Short tons	Value	Year	Short tons	Value
1903-48.....	1,760,551	\$33,981,676	1951.....	65,521	\$1,895,000
1949.....	51,462	1,303,534	1952.....	60,740	1,779,815
1950.....	66,186	1,774,330	1953.....	60,505	2,184,328

Carbon Dioxide (Natural Dry Ice).—Carbon dioxide was produced at 2 wells at Farnham Dome in Carbon County; production increased in 1953. The two wells were operated by Carbon Dioxide & Chemical Co. and Equity Oil Co.; however, both wells are connected to the pipeline of the Carbon Dioxide & Chemical Co. The pipeline runs to Wellington, where dry ice was produced at the plant of the Carbon Dioxide & Chemical Co.

Coal.—Coal was by far the most important of the mineral fuels as regards production, and the value in 1953 (\$37,689,000) represented 13 percent of the State total. Fifty-eight mines produced 6,544,000 short tons of coal in 1953—403,840 tons (7 percent) more than in 1952. Of the total output in 1953, 73 percent came from Carbon County; the remainder came largely from Emery, Sevier, Iron, and Summit Counties. Most of the coal was shipped to pig-iron and steel plants in Utah, electrical generating plants in Utah, and steel plants in California. Tables 15 and 16 give the shipments of coal in short tons from Utah mines from 1865–1953 and by counties in 1952 and 1953. The State reached its peak output of coal in 1947, when 7,429,000 tons was produced.

TABLE 15.—Production of coal, 1865–1953, in short tons

Year	Short tons	Value	Year	Short tons	Value
1865–1948.....	191,706,350	\$482,176,155	1951.....	6,135,957	\$32,643,291
1949.....	6,159,592	29,357,488	1952.....	6,140,305	32,410,303
1950.....	6,670,000	32,050,000	1953.....	6,544,145	37,689,144

TABLE 16.—Production of coal, 1952–53, by counties ¹

County	1952			1953		
	Production (short tons)	Value		Production (short tons)	Value	
		Total	Average per ton		Total	Average per ton
Carbon.....	4,452,257	\$23,756,150	\$5.34	4,749,123	\$27,640,499	\$5.82
Emery.....	1,552,246	7,999,923	5.15	1,669,445	9,433,292	5.65
Garfield.....	1,547	8,771	5.67	1,418	6,736	4.75
Grand.....	5,991	28,936	4.83	1,983	9,919	5.00
Iron.....	22,069	104,697	4.75	31,241	140,233	4.49
Kane.....	2,774	16,810	6.06	1,905	12,535	6.58
Sevier.....	77,533	403,682	5.21	66,099	365,709	5.53
Summit.....	24,888	84,984	3.42	21,931	73,351	3.34
Uintah.....	1,000	6,350	6.35	1,000	6,870	6.87
Total.....	6,140,305	32,410,303	5.28	6,544,145	37,689,144	5.76

¹ Excludes mines producing less than 1,000 tons.

Coke and Coke Breeze.—Production of coke and coke breeze increased from 1,365,000 short tons in 1952 to 1,651,688 tons in 1953; most of it was produced at the Columbia plant at Ironton, Utah County, where it was used at the pig-iron blast furnace.

Natural Gas.—The production of natural gas increased from 3,006 million cubic feet valued at \$225,000 in 1952 to 7,075 million cubic feet valued at \$806,550 in 1953. This marked increase resulted from new production from the Clear Creek field west of Price, Carbon, and Emery Counties and to a gain in production from the Clay Basin field in Daggett County. Completion in October of an 18-inch pipeline connected the Clear Creek field with the distribution system at Salt Lake City. Production from the Clear Creek field and that from the Clay Basin field accounted for all of Utah's 1953 natural-gas

production. Natural-gas production in Utah began in September 1929, and up to 1953 all of it came from the Clay Basin field.

Natural Gasoline.—The State continued to produce some natural gasoline, and production in 1953 was 71 percent greater than in 1952; however, output in each year was small.

Petroleum.—Petroleum, with a production of 1,807,000 barrels in 1953 (70,000 barrels (4 percent) more than in 1952), ranked second in importance in mineral fuels. Most came from wells in the Uintah Basin area in northeastern Utah; the principal producing fields were the Roosevelt and Red Wash in Uintah County.

REVIEW BY COUNTIES

BEAVER

The value of the mineral production of Beaver County in 1953 was \$58,112, a marked decline from \$211,643 in 1952. The loss resulted mainly from suspension in June 1952 of the mining of lead-silver-zinc ore at the old Horn Silver mine near Milford. The principal county production in 1953 was 76,250 short tons of paving and road gravel valued at \$41,163; none was produced in 1952. The gravel was used for constructing and maintaining Beaver County roads and highways. Other county production included perlite from the Utco Products Co. property near Milford, 287 tons of copper ore from the Old Hickory and Montreal groups in the Rocky district, 74 units of tungsten from the Garnet-South Pass claims near Beaver operated by Y. Z. Mining Co., 200 tons of pumice from Perlite, Inc., quarry near Milford, and 5 tons of lead ore and 6 tons of copper ore from claims in the Beaver Lake district. The 25-ton gravity mill at the Garnet-South Pass claims treated 449 tons of ore averaging 0.45 percent tungsten.

BOX ELDER

The value of the mineral output of Box Elder County increased from \$110,855 in 1952 to \$393,315 in 1953 owing to a notable gain in the production of sand and gravel and to the production of iron ore; no iron ore was produced in 1952. The most important mineral commodity in 1953 was 403,803 short tons of sand and gravel valued at \$254,786, used largely for resurfacing highways by the Utah State Road Commission and Box Elder County Highway Department. Approximately 62,400 tons of the total was sand and gravel produced from a pit at Brigham City by Allen C. Hunsaker and used for constructing buildings. Next in importance was limonite iron ore produced from the open pit at the Copper Mountain mine near Lucin by the Thorndyke Corp. and 16,556 short tons of miscellaneous crushed stone used for riprap in maintenance of railroad right-of-way. In addition to iron ore, the Copper Mountain mine produced 199 tons of copper ore averaging 6.52 percent copper. Other county production was principally 11 units of tungsten recovered from 10 tons of scheelite ore, which was produced from the Little Boy and Rocky Pass claims in the Grouse Creek district.

TABLE 17.—Value of mineral production in Utah, 1952-53, by counties and minerals¹ produced in 1953

County	1952	1953	Minerals produced in 1953 in order of value
Beaver.....	\$211, 643	\$58, 112	Gravel, perlite, copper, tungsten, silver, pumice, lead, gold.
Box Elder.....	110, 855	393, 315	Sand and gravel, iron ore, stone, copper, tungsten, silver, gold.
Cache.....	271, 766	388, 181	Stone, sand and gravel.
Carbon.....	23, 775, 169	28, 066, 220	Coal, natural gas, gravel, carbon dioxide.
Daggett.....	225, 000	456, 014	Natural gas, gravel.
Davis.....	129, 569	2, 342, 894	Sand and gravel.
Duchesne and Uintah.....	1, 786, 165	2, 248, 140	Gilsonite, gravel, coal.
Emery.....	7, 996, 194	9, 485, 648	Coal, gravel.
Garfield.....	8, 771	6, 736	Coal.
Grand.....	38, 645	30, 142	Gravel, coal, copper, silver, gold.
Iron.....	15, 168, 179	26, 566, 642	Iron ore, coal, gravel, stone.
Juab.....	4, 244, 450	3, 722, 628	Clays, lead, zinc, silver, fluorspar, gold, silica (quartzite), copper, gravel, tungsten, manganiferous ore.
Kane.....	29, 933	78, 935	Gravel, coal.
Millard.....	32, 470	109, 169	Gravel, manganiferous ore, fluorspar, tungsten, placer gold.
Morgan.....	3, 056, 915	3, 539, 691	Cement, clays.
Piute.....	15, 412	8, 018	Silver, lead, zinc, copper, gold, gravel.
Rich.....	(²)	(²)	Phosphate rock.
Salt Lake.....	191, 700, 870	206, 470, 524	Copper, molybdenum, gold, lead, silver, zinc, cement, sand and gravel, salt, lime, tungsten, clays.
San Juan.....	5, 117	57, 085	Gravel.
Sanpete.....	34, 186	41, 865	Salt, limestone, sand.
Seriver.....	1, 110, 068	1, 219, 605	Gypsum, coal, sand and gravel, clays, salt.
Summit.....	3, 376, 924	932, 441	Silver, lead, sand and gravel, coal, gold, copper, clays, zinc, stone.
Tooele.....	3, 978, 254	4, 259, 543	Potash, lead, zinc, stone, silver, salt, manganiferous ore, lime, clays, gold, sand and gravel, tungsten, pumice and pumicite.
Utah.....	799, 638	1, 068, 415	Limestone, sand and gravel, clays, phosphate rock, lead, silver, gold, pumice, copper, zinc.
Wasatch.....	3, 213, 722	3, 728, 751	Zinc, lead, gold, silver, copper, limestone, gravel.
Washington.....	7, 012	85, 935	Gravel, copper, lead, silver, zinc.
Weber.....	80, 665	204, 892	Sand and gravel, clays.
Undistributed ³	4, 093, 408	5, 059, 259	
Total.....	265, 501, 000	298, 629, 000	

¹ Exclusive of uranium produced in 1952-53 and manganese ore shipped in 1952-53 to the Government Purchase Depot at Butte, Mont. County figures also exclude asphalt, natural gasoline, and petroleum.

² Included with "Undistributed."

³ Includes value of natural gasoline, petroleum, vanadium, and some sand and gravel that cannot be assigned to specific counties, and the value of phosphate rock produced in Rich County.

CACHE

The mineral output of Cache County in 1953 was 306,936 short tons of sand and gravel valued at \$190,326 and 219,795 short tons of crushed limestone valued at \$197,855. Most of the sand and gravel was produced by contractors for the Utah State Road Commission and by the Cache County Road Department for resurfacing highways. The remainder was produced chiefly by Kloefer Sand & Gravel and Johnson Ready Mix Concrete Co. for use in constructing buildings. Of the total limestone, 182,000 tons was produced by the Cache County Road Department for use in constructing roads, and 37,795 tons was produced from the Providence quarry for use in refining sugar.

CARBON

Carbon County was the largest coal-producing area in Utah, and the only producer of carbon dioxide in the State; in 1953 it became a large producer of natural gas from the Clear Creek field west of Price. In addition, 32,365 short tons of gravel was produced in 1953 by contractors for the Utah State Road Commission for use in resurfacing

Carbon County highways. Of the county total mineral value in 1953 (\$28,066,220), \$27,644,500 (98 percent) was the value of the coal output; coal production increased from 4,452,257 short tons in 1952 to 4,749,123 in 1953. Carbon dioxide was produced from wells at Farnham Dome by Carbon Dioxide & Chemical Co. and Equity Oil Co. The carbon dioxide (114,000 cubic feet in 1953) was piped to the Carbon Dioxide & Chemical plant at Wellington, where it was converted to dry ice.

DAGGETT

Natural gas from wells in the Clay Basin field continued to be the principal mineral commodity in Daggett County; 3,860 million cubic feet valued at \$440,040 was produced in 1953 compared with 3,006 million and \$225,000 in 1952. Paving and road gravel totaling 30,200 short tons was produced in 1953 and used by the United States Department of Commerce (Bureau of Public Roads). A report on the Yellow Canary uranium deposits on the west side of Red Creek Canyon, Daggett County, was published.⁴

DAVIS

Oil refining at three plants—Phillips Petroleum Co. at Woods Cross and Salt Lake Refining Co. and Western States Refining Co. at North Salt Lake—continued to be by far the principal mineral industry in Davis County. Most of the crude petroleum that supplied the plants was from fields in northwestern Colorado, northeastern Utah, and western Wyoming. The county sand and gravel output increased from 183,263 short tons valued at \$129,569 in 1952 to 436,036 tons valued at \$342,894 in 1953, owing to greater demand for sand and gravel for constructing highways. Of the total output in 1953, 367,119 tons was consumed in constructing highways and nearly all the remainder in constructing buildings.

DUCHESNE AND UINTAH

In 1953, as in 1952, the principal mineral production in Duchesne and Uintah Counties was petroleum from wells in the Uintah Basin, chiefly from the Red Wash and Roosevelt fields in Uintah County and Flat Mesa field in Duchesne County; the total production in 1953 was 1,807,000 barrels compared with 1,737,000 in 1952. Next in importance was gilsonite from 2 properties near Roosevelt, Duchesne County, and from 3 properties at Bonanza, Uintah County. The total production declined from 60,740 short tons in 1952 to 60,505 in 1953; however, the value of the production increased from \$1,779,815 to \$2,184,328, as the average price rose from \$29.30 a ton to \$36.10. Other Duchesne County production was 26,071 tons of gravel produced by contractors for use in resurfacing county highways. Other Uintah County production was 44,704 tons of gravel produced by contractors for use in constructing and maintaining county highways, and 1,000 tons of coal.

⁴ Wilmarth, V. R., Yellow Canary Uranium Deposits, Daggett County, Utah; Geol. Survey Circ. 312, 1953, 8 pp.

EMERY

Emery County was one of the chief coal-producing areas in Utah, was a large producer of uranium ore, and in October became a producer of natural gas from production of the new Clear Creek field, which lies in Carbon and Emery Counties. In 1953 the county produced 1,669,445 short tons of coal valued at \$9,434,670 compared with 1,552,246 tons valued at \$7,990,726 in 1952; most of the coal came from mines in the Huntington-Mohrland area. Uranium ore (asphaltite) was produced mainly from Consolidated Uranium Mines, Inc., Temple Mountain deposit and from Vernon Pick's Delta mine in the San Rafael district; the ore from both mines was shipped to the Vitro Chemical Co. mill at Salt Lake City for processing. Exploration for uranium ore was done in the Bow Knot district by Excalibur Uranium Corp., and in other areas southeast of Emery by various operators. Other county output was 66,825 short tons of gravel produced by contractors for the Utah State Road Commission and by the Emery County Highway Department for use in resurfacing county highways.

GARFIELD

The mineral output of Garfield County in 1953 was coal and uranium; coal output decreased from 1,547 short tons valued at \$8,771 in 1952 to 1,418 tons valued at \$6,736 in 1953. A little uranium ore was produced from claims near Hite.

GRAND

Mineral production in Grand County in 1953 included 1 ounce of gold, 137 ounces of silver, 2 tons of copper, 1,983 tons of coal, and 16,000 tons of gravel, valued in all at \$30,100. In addition, some uranium ore was produced from claims near Moab. The gold, silver, and copper were recovered from smelting 74 tons of copper ore from the Cliff Dweller mine near Moab in the La Sal district.

IRON

The total value of the mineral production in Iron County in 1953 was \$26,566,642 compared with \$15,168,179 in 1952. Of the total value in both years 99 percent was the value of iron ore shipped to pig-iron and steel plants in Utah and steel plants in California. The total iron ore shipped in 1953 was 4,617,000 long tons valued at \$26,497,000 compared with 3,991,000 tons valued at \$15,026,000 in 1952. The ore mined in 1953 averaged 56.75 percent natural iron and came from open pits from 7 mines in the Desert Mound and Iron Springs areas. The chief producers were the Columbia Iron Mining Co., Colorado Fuel & Iron Corp., and Utah Construction Co. Other county production was 31,241 short tons of coal valued at \$140,272, 36,000 tons of paving gravel used for constructing and maintaining county highways, and a small quantity of dimension sandstone.

JUAB

Juab County, in which part of the Tintic (Eureka) district is situated, was one of the most important mineral areas in Utah. In 1953 the county production comprised 3,141 ounces of gold, 562,667 ounces of silver, 66,554 short tons of clays, 102 tons of copper, 15,527 tons of fluorspar, 27,824 tons of gravel, 3,590 tons of lead, 1,544 long tons of low-grade manganese ore shipped to the Government Purchase Depot at Butte, Mont., 154 long tons of manganiferous ore, 32,217 short tons of quartzite, 205 units of tungsten, and 2,433 short tons of zinc. All of the clays, lead, quartzite, and zinc production and nearly all of the copper, gold, and silver production in 1953 came from properties at Eureka, which are reviewed under the Tintic district. All fluorspar was metallurgical grade, shipped to steel plants, from 6 mines in the Topaz Mountain area; however, production dropped from 17,304 short tons valued at \$438,699 in 1952 to 15,400 tons valued at \$372,200 in 1953. The decrease resulted mainly from an influx of foreign fluorspar after July 1, which caused some domestic producers to close and others to curtail production. The principal fluorspar producers in 1953 were the Bell Hill, Fluoride Queen, and Willden properties. All of the gravel was produced and used by the Utah State Road Commission in constructing and maintaining Juab County highways. The manganese ore, averaging 28.20 percent Mn, came from Staat's mine near Joy in the Drum Mountains (Detroit) district. The manganiferous ore was produced from the Chief No. 1 mine at Eureka and Dyke claims near Joy; the ore was shipped to the Geneva steel plant in Utah County for use as fluxing material. Tungsten concentrate was recovered from ore produced at Jenkins' claim near Jericho and the Spider-Uranium Mining Co. mine near Callao; ore from Jenkins' claim was treated in custom mills in Utah and California, and ore from the Spider-Uranium mine was treated in the company mill near Callao.

Tintic District.—The Tintic district lies in both Juab and Utah Counties.

TABLE 18.—Mine production of gold, silver, copper, lead, and zinc in Tintic district, Juab and Utah Counties, 1949–53, and total 1869–1953, in terms of recoverable metals

Year	Mines producing	Ore and old tailings (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)	Total value
1949	15	160,448	5,133	914,150	263	6,676	6,082	\$4,728,346
1950	18	189,870	3,277	924,722	149	6,520	5,985	4,474,031
1951	15	193,123	4,932	944,818	208	5,553	3,410	4,292,771
1952	15	124,442	2,942	666,345	133	4,279	2,951	3,127,613
1953:								
Juab County	9	119,992	3,140	562,649	102	3,590	2,433	2,177,614
Utah County	5	3,309	124	17,560	2	103	-----	48,446
Total 1953	14	123,301	3,264	580,209	104	3,693	2,433	2,226,060
Total 1869–1953	-----	16,013,126	2,634,363	266,046,159	123,281	970,786	63,008	421,591,472

¹ Figures estimated for certain years before 1901.

The Chief No. 1 mine of the Chief Consolidated Mining Co. at Eureka in the Juab part of the district remained by far the most important metal producer in the entire district. In 1953 the mine ranked second in lead production in the State, third in silver and zinc, and fourth in gold. The company reported that the mine produced 36,640 tons of lead-zinc ore, 73,538 tons of siliceous silver ore, and 227 tons of lead ore in 1953; the total ore contained 2,862 ounces of gold, 546,509 ounces of silver, 171,421 pounds of copper, 9,334,690 pounds of lead, and 6,105,584 pounds of zinc. The lead-zinc ore was shipped to custom milling plants at Bauer and Midvale and the silver ore to the copper smelter at Garfield. According to the company annual report to stockholders, the year ended December 31, 1953, was disappointing due to low prices for lead and zinc during the entire year. Major development programs had reached a point where an increase in tonnage was expected soon, depending on firmer prices for lead and zinc. The new underground hoist was installed and in operation March 30; it eliminated the bottleneck at the main underground shaft. The shaft was extended an additional 200 feet during the year. On June 29, 1953, a development contract with the DMPA was signed. The contract, involving 8 distinct projects, calls for a total expenditure of \$1,182,544 over a period of 3 years. The Federal Government will provide 25 percent of the amount on a loan basis and will be repaid as the development ore is mined. The Chief Consolidated Mining Co. also worked the American Star mine at Eureka and shipped 3,279 tons of siliceous silver ore to the smelter at Garfield. Lessees worked the Empire group near Eureka all year and shipped 2,942 tons of gold-silver ore. The old Mammoth mine at Mammoth—a large producer of gold-silver ore in the past—became active again September 1. The Mammoth Mining Co. operated the mine the last 4 months of the year and shipped 2,187 tons of gold-silver ore. Lessees worked other mines in the Juab County part of the district; shipments in 1953 included 617 tons of gold-silver ore and 53 tons of lead ore from the Centennial-Beck-Victoria group; 52 tons of lead-silver ore from the Eureka Hill mine; 59 tons of silver ore from the Dragon waste dump; 386 tons of silver ore from the Plutus mine; and 12 tons of copper ore from the Rockwell claim.

Halloysite clay continued to be produced from the Dragon Consolidated Mining Co. property at Eureka; in 1953 several thousand tons was shipped to the Filtrol Corp. plant at Salt Lake City, where the clay was processed for use at catalytic cracking units of petroleum refineries.

Quartzite was produced from two quarries near Eureka in 1953; the Murray Refractories Co. and General Refractories Co. shipped to plants at Murray and Lehi for use in making high-grade firebrick.

Output from the Utah County part of the Tintic district was 2,895 tons of silver ore and gold-silver ore and 414 tons of lead ore, which altogether contained 124 ounces of gold, 17,560 ounces of silver, 5,330 pounds of copper, and 286,964 pounds of lead. Shipments included 1,710 tons of silver ore and 106 tons of lead ore from the Iron Blossom mine; 1,140 tons of gold-silver ore from the Mountain View, Sioux, and Yankee mines; and 308 tons of lead ore and 45 tons of silver ore from the Tintic Standard mine.

KANE

The mineral output of Kane County in 1953 was 1,905 short tons of coal valued at \$12,535 and 68,780 short tons of paving gravel valued at \$66,400. Most of the gravel came from a pit at Kanab for use in constructing and maintaining Kane County highways. Exploration for uranium ore was conducted throughout the year at claims east of Kanab.

MILLARD

The mineral production of Millard County in 1953 included 9 ounces of placer gold, 120 short tons of fluorspar, 122,425 short tons of paving gravel, 1,299 long tons of manganiferous ore, and 57 tons of tungsten ore. No sulfur was produced in 1953 from the Cove Creek deposit at Sulphurdale. Fluorspar from the Harrisite property near Delta was shipped to the Geneva steel plant. Alluvial material at the Amasa Valley placer in the House Mountains district was tested in 1953 by Rare Metals Mining Co., and 9 ounces of gold was recovered by gravity concentration. The company also explored tungsten claims and began building a 300-ton gravity mill. Other district production was 57 tons of tungsten ore from the Queen of the Hills mine operated by E. L. Moody. Most of the gravel was produced from pits by contractors for the Utah State Road Commission for use in constructing and maintaining Millard County highways. All of the manganiferous ore, which averaged 23.33 percent Mn, was shipped from 3 mines to the Ironton pig-iron and Geneva steel plants in Utah County; the principal producer was the Black Boy mine near Joy in the Detroit district operated by L. J. Price.

MORGAN

The principal mineral production in Morgan County continued to be cement, produced at the Devil's Slide plant of the Ideal Cement Co.; however, shipments in 1953 were 12 percent less than in 1952, but the value was greater, as the average sales price rose from \$2.45 a barrel to \$3.22. Other county production was 18,877 short tons of shale mined and used by the Interstate Brick Co. for making common brick.

PIUTE

The most important mineral output in Piute County continued to be uranium (autunite) ore produced from mines near Marysvale; the ore was shipped to the Vitro Chemical Co. mill at Salt Lake City for processing. Other types of ore were produced in 1953 from mines in the Mount Baldy and Ohio districts.

Mount Baldy District.—Lead-zinc ore (61 tons) was produced from the New Deer Trail (Deep Tunnel) group near Marysvale by Deer Trail Mines, and 369 tons of old tailings, containing 14 ounces of gold, 964 ounces of silver, 519 pounds of copper, and 9,223 pounds of lead, was shipped from the old Deer Trail dump.

Ohio District.—Leasing operations at the Shamrock claim produced 59 tons of copper-silver ore, and a test lot (22 tons) of lead-zinc ore was shipped from the Copper Belt group.

Other county production was 1,350 tons of gravel produced by a contractor for the Piute County Highway Department for use in maintaining highways.

RICH

In 1953, as in 1952, phosphate rock was the only mineral sold in Rich County; a few hundred tons was produced from the Pearl property near Woodruff and used for stock and poultry feed.

SALT LAKE

Salt Lake County, in which the West Mountain (Bingham) district is situated, is one of the most important mining, milling, and smelting areas in the United States. The total value of the county mineral production in 1953 was \$206,470,524 (69 percent of the State value) and an 8-percent gain over the 1952 value—75 percent of the total value was for copper. The county's 1953 mineral production included 450,886 ounces of gold, 5,027,651 ounces of silver, 2,230 short tons of clays, some cement, 268,500 short tons of copper, 29,312 tons of lead, 27,112 tons of lime, shipment of 16,309 tons of molybdenite concentrate, salt, 1,888,383 tons of sand and gravel, 1,388 units of tungsten (no tungsten was produced in 1952), 19,669 tons of zinc, and some byproduct arsenic, selenium, and tellurium; all of the molybdenite and zinc and nearly all of the copper, gold, lead, and silver came from the West Mountain (Bingham) district. Substantial increases were attained in the production of cement, gold, and molybdenite. On the other hand, sharp decreases were recorded in the production of clays, copper, lead, silver, sand and gravel, and zinc. The Garfield copper smelter and copper-anode plant of the American Smelting & Refining Co. operated continuously in 1953, mainly on copper concentrates from the Arthur and Magna mills. The copper refinery of the Kennecott Copper Corp. at Garfield operated all year; copper bars, gold bars, and silver bars constituted the principal production of the refinery. The refinery also produced byproduct selenium and tellurium; byproduct arsenic was produced at the Midvale lead smelter. Cobalt was produced at the new Howe Sound Co. refinery at Garfield from concentrate shipped in from Idaho. Sulfuric acid was produced at the plant of the Garfield Chemical & Manufacturing Corp.; production in 1953 was much greater than in 1952. A large part of the acid was sold to companies operating uranium mills in Utah and Colorado for use in leaching uranium ores. Western Phosphates, Inc., continued constructing at Garfield a triple superphosphate plant. The Midvale lead smelter and 1,700-ton custom lead-zinc mill of the United States Smelting, Refining & Mining Co. operated all year. The Arthur and Magna concentrators (40,000 tons rated capacity each) of the Kennecott Copper Corp. operated continuously on copper ore produced from the Utah Copper property at Bingham. The concentrator of the Vitro Chemical Co. at Salt Lake City processed uranium ores received largely from mines in the Marysvale and San Rafael districts. Two tungsten plants—Salt Lake Tungsten Co. and H. M. & S. Milling Co.—at Salt Lake City began operating in September on old tailings and custom ores. The Filtrol Corp. operated its plant at Salt Lake City all year, processing clay received from the Dragon mine at Eureka, Juab

County. The petroleum refinery of the Utah Oil Refining Co. at Salt Lake City operated all year, and the wax refinery of the Sure-Seal Corp. at Woods Cross operated intermittently. The chief mining activity in the county was open-pit mining of copper ore at the Utah Copper property and underground mining of lead-zinc ore at the United States & Lark group, both at Bingham. These operations are reviewed under West Mountain (Bingham) district, which follows.

Big and Little Cottonwood Districts.—The only mineral output in 1953 was 34 tons of copper ore from the Great Western claim at Brighton and 6 tons of copper ore from the West Toledo claim at Alta.

Cement production in Salt Lake County in 1953 was 30 percent greater than in 1952; the plant of the Portland Cement Co. of Utah at Salt Lake City was the only producer. The county clays output dropped from 33,732 tons to 2,230; all of it was common clay mined from a pit at Salt Lake City by the Interstate Brick Co. All of the county lime production was quicklime produced at the Magna plant of the Kennecott Copper Corp. for use as a reagent in milling copper ore. Salt production declined 2 percent; all of it was produced by solar evaporation of brine at the property of the Morton Salt Co. on the shores of Great Salt Lake near Saltair. Of the total sand and gravel produced in 1953, 957,381 tons was used for constructing and resurfacing Salt Lake County highways and 635,477 tons for constructing buildings; 200,283 tons was gravel used for ballast along railroad rights-of-way, and 13,437 tons was gravel used for fluxing material. In addition, several thousand tons of lime sand was hauled from the beach at Garfield by the American Smelting & Refining Co. for use as fluxing material at the Garfield copper smelter. Sand was produced and used also for grinding and polishing, for blasting, for filtering, for linings, and for engine use. Tungsten was produced in Salt Lake County in 1953 for the first time since the close of World War II; concentrate was recovered from the treatment of old tailings deposited during the years of World War II at the Salt Lake City milling site of United States Vanadium Corp. Part of the old tailings was processed in 1953 in a mill operated by H. M. & S. Milling Co. and part in the new refinery of the Salt Lake Tungsten Co. In July and August 1953 the H. M. & S. Milling Co. reconditioned a mill built in 1950 and during the last 4 months of the year treated old tailings and custom ores; the custom ores came mainly from mines near Gold Hill and Jericho. The mill produced concentrate that was hauled to the Salt Lake Tungsten plant for treatment. The new refinery of the Salt Lake Tungsten Co. began operating in September and during the last 4 months of the year treated old tailings and custom concentrate; the concentrate came from milling plants in Montana, Nevada, and Utah. The refinery produced concentrate that was sold to the General Services Administration, Denver, Colo.

West Mountain (Bingham) District.—In 1953 the West Mountain district produced 93 percent of the State gold, 75 percent of the silver, 99.6 percent of the copper, 71 percent of the lead, 67 percent of the zinc, and all of the molybdenum (a byproduct of copper ore). The district total value of the first 5 metals was \$186,659,499 (62 percent of the State total). Output in 1953 comprised 29,922,200 tons of copper ore, 365,456 tons of lead-zinc ore, 16,142 tons of copper precipitate, 16,072 tons of molybdenite concentrate, 6,950 tons of

siliceous gold-silver ore, 4,025 tons of lead ore, and 35 tons of old mill cleanings. All of the copper ore and molybdenite concentrate and nearly all of the precipitate came from the Utah Copper property, and all of the lead ore, nearly all of the gold-silver ore, and most of the lead-zinc ore came from the United States & Lark group. Gold production in 1953 was 8 percent greater than in 1952 and molybdenum 7 percent greater; on the other hand, copper production was 5 percent less, lead 15 percent less, silver 6 percent less, and zinc 4 percent less.

TABLE 19.—Mine production of gold, silver, copper, lead, and zinc in West Mountain (Bingham) district, Salt Lake County, 1949–53 and total 1865–1953, in terms of recoverable metals

Year	Number of mines	Material ¹ (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)	Total value
1949.....	5	21,405,489	286,155	4,316,378	196,101	32,600	22,311	\$107,020,080
1950.....	6	31,405,801	423,313	4,963,586	277,655	27,472	16,120	146,983,284
1951.....	4	30,863,391	407,196	4,923,249	270,183	29,120	18,286	166,208,080
1952.....	4	32,484,298	417,607	5,338,291	282,098	34,328	20,395	173,807,807
1953.....	4	30,298,666	450,882	5,027,419	268,511	29,311	19,669	186,659,499
Total 1865–1953.....		2723,957,147	3,551,184	177,204,731	6,454,408	1,771,695	619,001	2,854,904,649

¹ Does not include tonnage of precipitates shipped.
² Figures estimated for certain years before 1901.

In 1953 the Utah Copper Division of the Kennecott Copper Corp. operated its 2 flotation-concentrators at Arthur and Magna and its copper-precipitating plant at Bingham 7 days per week throughout the year. In addition, the corporation operated a lime plant and its own electrical power plant at Magna. The 2 concentrators treated 29,922,200 tons of ore averaging 0.934 percent copper and containing small quantities of gold, silver, and molybdenum, compared with 32,036,100 tons of ore averaging 0.945 percent copper in 1952. In addition to copper concentrate (840,869 tons), the corporation shipped 16,309 tons of molybdenite concentrate and 16,049 tons of copper precipitate. The property continued to be the largest producer of copper and the second largest producer of gold and molybdenum in the United States and remained the largest producer of silver in Utah. From 1904, when production began, to the end of 1953 the Utah Copper Division has removed 846 million tons of overburden, milled 682 million tons of ore, and produced 6,081,657 tons of copper. According to the corporation 1953 annual report to stockholders, the decreased quantity of ore mined resulted from the easing in demand for copper during the second half of 1953. On the other hand, more overburden was removed in 1953 than in 1952, and the total tonnage of material handled increased from 78,946,676 tons to a record total of 79,214,104 tons. However, production of copper dropped from 283,372 short tons in 1952 to 270,775 in 1953. The installation of new flotation equipment in the Arthur and Magna mills during the year resulted in recovery of approximately 1 percent more copper, 1 percent more gold, 5 percent more silver, and 11 percent more molyb-

denite; and a new electrical distribution system reduced operating costs. Ore trains began using the new 7,042-foot haulage tunnel March 30.

Operations at the United States & Lark group of the United States Smelting, Refining & Mining Co., by far the largest lead and zinc producer in the State, were slowed part of the year by "quickie" strikes, and a diminishing market for domestic lead and zinc caused a reduction in the average workweek from 6 days to 5½ beginning August 17. The output of lead-zinc ore from the property dropped 11 percent—from 400,418 tons in 1952 to 355,955 tons in 1953; other 1953 output included 4,025 tons of lead ore, 6,904 tons of gold-silver ore, and 88 tons of copper precipitate. According to the company 1953 annual report to stockholders, operations were satisfactory despite low prices for lead and zinc and some labor disturbances; the daily rate of ore production was maintained at about the same tonnage as in 1952. Development of new ore more than paced extraction, and development of several new ore showings disclosed in 1952 has been gratifying.

Lead-zinc ore was mined throughout the year at the Butterfield group by Combined Metals Reduction Co.; however, production dropped from 21,389 tons in 1952 to 8,904 in 1953. Other district production was mainly 264 tons of lead-zinc ore from the National Tunnel property (Apex-Delaware group) and 333 tons of material (lead-zinc) cleaned up from loading ramps.

SAN JUAN

The principal mineral output in San Juan County in 1953 was uranium-vanadium ore from the La Sal (Big Indian) district and copper-uranium ore from the White Canyon district. The chief producer in the La Sal district was Steen's Mi Vida claim and in the White Canyon district the Happy Jack group. The ore-bearing deposit at the Mi Vida claim was in the Chinle formation and was mined by a modified room-and-pillar method. According to Bureau of Mines Information Circular 7669, the claim produced 15,969 short tons of ore averaging 0.51 percent U_3O_8 and 1.26 percent V_2O_5 from December 1952 to July 15, 1953. The ore was hauled by trucks to processing mills in Utah and Colorado. Copper-uranium ore from the Happy Jack group and other claims in White Canyon was hauled to the pilot concentrator at Hite operated by Vanadium Corporation of America.

Other county output was 78,853 short tons of gravel, most of which was produced by Utah State Road Commission contractors for use in resurfacing San Juan County highways. Improved highways to the uranium districts were especially needed.

SANPETE

In 1953, as in 1952, the chief mineral production in Sanpete County was rock salt from the Royal Crystal Salt Co. mine at Axtell. The salt was shipped to various destinations in the Western States for use by the cattle industry. Other county production in 1953 was 3,000

short tons of limestone valued at \$8,700, quarried from a pit near Redmond for local consumption at sugar factories; and 5,400 tons of sand valued at \$4,000, used locally in constructing buildings.

SEVIER

Mineral production in Sevier County in 1953 comprised 1,738 short tons of bentonite, 66,099 tons of coal, 4,494 tons of fuller's earth, some gypsum and rock salt, and 95,118 tons of sand and gravel, valued at \$1,219,605. The most important production continued to be gypsum, and production in 1953 was 10 percent greater than in 1952. All gypsum produced in the county and State in 1953 came from two properties—United States Gypsum and Western Gypsum—near Sigurd. The crude gypsum rock was processed in plants at Sigurd for use in the manufacture of Keene's cement, plaster, wallboard, and other building materials. Coal production was next in importance, even though shipments dropped from 77,533 tons valued at \$403,777 in 1952 to 66,099 tons valued at \$365,527 in 1953. All of the bentonite and fuller's earth came from open pits at Ivie operated by Western Clay & Metals Co. After being processed in a mill the fuller's earth was shipped to destinations for use in refining mineral oils, and most of the bentonite was shipped for filtering use at laundries. The rock salt was shipped from Poulson Bros. Salt Co. deposit at Redmond to various destinations in the Western States for use by the cattle industry. Of the total sand and gravel, 73,133 tons was gravel produced from a pit by Whiting & Haymond for use in construction and maintenance of Sevier County highways and 21,614 tons was sand and gravel produced from pits by Marwood J. Hale and Elmo R. Herring for use in constructing buildings.

SUMMIT

The total value of the mineral production in Summit County dropped from \$3,376,924 in 1952 to \$932,441 in 1953. This marked loss resulted from the closing of two large lead-silver-zinc producers in 1952—Park Utah Consolidated and Silver King Coalition. The county production in 1953 included 1,992 ounces of gold, 401,855 ounces of silver, 11,482 short tons of clays, 21,931 tons of coal, 103 tons of copper, 720 tons of lead, 152,051 tons of sand and gravel, 934 tons of dimension sandstone, and 86 tons of zinc. The most important production was 57,189 tons of old tailings and 54,060 tons of waste-dump ore containing mainly gold, silver, and lead from the Park City region.

PARK CITY REGION

The Park City region, one of the most important nonferrous producing areas in the State, includes the Uintah district in Summit County and the Blue Ledge and Snake Creek districts in Wasatch County. Table 20 shows the production and total value of gold, silver, copper, lead, and zinc in 1953 compared with 1949-52 and the total from 1870-1953.

TABLE 20.—Mine production of gold, silver, copper, lead, and zinc in Park City region, Summit and Wasatch Counties, 1949-53 and total 1870-1953, in terms of recoverable metals

Year	Number of mines	Ore and old tailings (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)	Total value
1949.....	10	318,341	19,443	1,061,902	451	8,583	8,359	\$6,604,858
1950.....	12	209,640	24,125	952,632	417	7,538	7,425	6,023,922
1951.....	12	230,607	18,476	1,131,360	470	11,719	10,209	9,668,591
1952.....	12	198,804	13,827	861,563	456	7,494	7,746	6,469,147
1953.....	8	193,405	27,919	802,036	630	4,235	4,848	4,280,278
Total 1870-1953.....	.....	¹ 16,699,964	701,735	242,640,805	37,910	1,267,448	402,769	417,866,023

¹Figures estimated for certain years before 1901.

The Judge, Keetley, and Silver King Coalition units of the United Park City Mines Co., formerly Park Utah Consolidated Mines Co. and Silver King Coalition Mines Co., large producers of lead-zinc ore in Summit County, remained idle throughout the year, owing to labor difficulties and to low market prices of lead and zinc. According to the 1953 annual report of the United Park City Mines Co., labor difficulties (including a strike) were settled through agreement to a new contract, effective December 1, 1953. However, ore production was not to be resumed until the prices of lead and zinc permit profitable operation.

Production in the Summit County part of the Park City region in 1953 was largely 57,189 tons of old tailings containing 1,039 ounces of gold, 182,395 ounces of silver, 132,051 pounds of copper, 1,845,425 pounds of lead, and 157,165 pounds of zinc from the Atkinson, Big Four, Grasselli (Pacific Bridge), and Gilmore properties and 54,060 tons of waste-dump ore containing 948 ounces of gold, 217,697 ounces of silver, 75,798 pounds of copper, and 438,263 pounds of lead from the Ontario property. Other production was 250 tons of lead-zinc ore and 84 tons of lead ore from the Silver King Western mine and 934 tons of dimension stone produced and cut from a sandstone quarry by New Park Mining Co. Other Summit County production in 1953 comprised 152,051 tons of sand and gravel produced by contractors for use by the Summit County Highway Department, Utah State Road Commission, and United States Department of Commerce (Bureau of Public Roads); 21,931 tons of coal produced from mines at Coalville; and 11,482 tons of clays produced from a pit near Henefer and used by the Utah Fire Clay Co. for making brick.

The New Park Mining Co. in Wasatch County was the only large producer of lead-zinc ore in the region in 1953. The company operated its mine continuously all year and shipped 81,192 tons of ore (containing 31,824 ounces of gold, 455,131 ounces of silver, 1,391,143 pounds of copper, 8,370,186 pounds of lead, and 11,198,576 pounds of zinc) to the custom-flotation mill of the Combined Metals Reduction Co. at Bauer. The mine ranked second in gold and zinc production in the State in 1953, third in lead, and fourth in silver. According to the company 1953 annual report to stockholders, the gold content of the ore increased with increasing depth of the veins;

development was accelerated, resulting in a large tonnage of ore blocked out from fissure branches on the upper levels; and work was begun on the 1755 ore pocket preparatory to developing ore below the present lowest level. At 1953 lead and zinc prices, reserves of ore were estimated sufficient for 2 years operation; however, a rise in price of these metals would increase reserves. The company chose to offset the effect of falling metal prices by expanding ore production—81,192 tons was produced in 1953 compared with 75,118 tons in 1952. The greatest increase in production in 1953 was in gold and silver. Other production in the Wasatch County part of the region was 630 tons of copper ore from the Green Monster and West Park mines in the Snake Creek district.

TOOELE

Tooele County was one of the principal mining, milling, and smelting areas in Utah; and in 1953 a mild boom was begun in exploration for tungsten ore in the Clifton (Gold Hill) district, owing to the Government's guaranteed tungsten price. The lead smelter, 1,500-ton lead-zinc custom mill, and zinc-slag fuming plant of the International Smelting & Refining Co. near Tooele were closed the first 4 months of the year, owing to a supply of ore and concentrate inadequate for maintaining efficient operations. The Combined Metals Reduction Co. operated its 700-ton lead-zinc custom mill at Bauer all year; however, the company plant to recover resin from coal, the resin plant, and the perlite-expanding plant were operated intermittently. The International zinc-slag fuming plant, operated in conjunction with the lead smelter, treated 44,273 tons of current hot zinc slag from the lead blast furnaces in 1953, 19,693 tons of old zinc slag from the International dump, and 744 tons of zinc middlings from the Combined Metals Bauer mill. The fuming plant yielded 8,615 tons of zinc fume and 1,731 tons of lead fume in 1953 compared with 18,520 and 2,397 tons, respectively, in 1952. Most of the zinc fume was shipped to plants at Bartlesville, Okla., Hillsboro, Ill., and Great Falls, Mont., and most of the lead fume to the Tooele smelter. The International custom-flotation mill treated 20,159 tons of lead-zinc-iron material received from operators in Colorado, Idaho, Montana, and Utah; the mill yielded 2,228 tons of lead concentrate, 3,777 tons of zinc concentrate, and 4,321 tons of iron concentrate. The Combined Metals Bauer mill treated 152,504 tons of lead-zinc ore and concentrate received from operations in Colorado, Guatemala, Idaho, and Utah; the mill yielded 17,913 tons of lead concentrate, 21,980 tons of zinc concentrate, 774 tons of zinc middlings, and 6,675 tons of iron concentrate. In 1953, as in 1952, crude perlite from a property in Nevada was processed at the Bauer expanding plant of the Combined Metals Reduction Co.

The potash plant near Wendover was operated by Bonneville, Ltd., on potassium-bearing brines of Salduro Marsh area of the Bonneville salt flats. Slightly more potash (K_2O) was sold in 1953 than in 1952. Clay production increased to 24,148 short tons, a 77-percent gain over 1952; 12,826 tons was fire clay produced and used by the Utah Fire Clay Co. for making brick and tile and 11,322

was common clay produced and used by the Interstate Brick Co. for making brick. Crushed-limestone production declined to 75,373 short tons in 1953; most of it came from the Utah Lime & Stone Co. quarry near Grantsville and was sold mainly for pH control, dust for coal mines, cement manufacture, and fluxing material at smelters. In addition, the company produced 5,048 tons of lime, most of which was sold for use in making silica brick, as a reagent at lead-zinc milling plants, for water purification and softening, for petroleum refining, and for fluxing material at steel furnaces. Crushed limestone (calcite and aragonite) was produced at the Delle plant of Utah Calcium Products Co.; most of it was shipped to poultry associations in the Western States for use as chicken feed and to building contractors for use as roofing chips. Shipments of manganiferous ore increased from 1,171 long tons to 4,464; the principal producer in 1953 was the Black Rock mine near Vernon in the Erickson district, operated by H. H. Ellerbeck. The ore was shipped largely to the Geneva steel plant in Utah; however, some ore averaging 29.73 percent Mn was shipped to the Western Electrochemical Co. plant at Henderson, Nev., where it was processed into synthetic battery-grade manganese. Other Erickson district production was 99 tons of lead-zinc ore from the Ida, Black Jack, and Desert View groups, operated by United Mining & Development Co. The county production of sand and gravel increased from 3,480 short tons to 37,441, salt from 5,500 short tons to 26,000, and tungsten from 106 units to 387. Of the total sand and gravel produced in 1953, 30,000 tons was lime sand from an open pit near Grantsville used for fluxing material at the Midvale and Tooele lead smelters; the remainder was chiefly sand and gravel produced from a pit near Tooele by England Bros. and used for constructing buildings. Salt was produced by solar evaporation of brine on the shores of Great Salt Lake by the Deseret Salt Co. and Stansbury Salt Co., Inc.; the Deseret Salt Co. is a new producer. The salt was sold for use largely for processing uranium ore, for refrigeration, for livestock feed, for softening water, for tanning hides, and for ice control during winter months. All the output of tungsten was recovered from approximately 800 tons of scheelite ore produced from three properties—Fraction, Star Dust, and Yellow Hammer—in the Clifton (Gold Hill) district; the largest producer was the Star Dust group operated by Star Dust Mines, Inc., and Timco, Inc. Ore from the Star Dust group was treated in the new Star Dust mill, ore from the Yellow Hammer mine was treated in the Gold Hill Exploration Co. mill, and ore from the Fraction claim was shipped to the H. M. & S. custom mill at Salt Lake City. A small quantity of pumicite was produced in 1953 for testing purposes from the Mower Bros. deposit near Faust by the Harborlite Corp. Most of the county gold, silver, lead, and zinc production was recovered from lead-zinc ore mined in the Ophir and Rush Valley districts and from old zinc slag mined in the Smelter (Tooele) district; most of the copper was recovered from old copper slag mined in the Smelter (Tooele) district.

Ophir District.—In 1953, 2 mines—Hidden Treasure and Ophir unit of the United States Smelting, Refining & Mining Co.—produced 19,185 tons of ore containing 134 ounces of gold, 103,456 ounces of silver, 185,292 pounds of copper, 2,602,891 pounds of lead, and

1,860,305 pounds of zinc. The Ophir mine operated all year and was the principal producer; the Hidden Treasure mine was operated under lease from January 1 to August 31 by McFarland & Hullinger.

Rush Valley District.—Four mines—Gisborn-Muirbrook, Honorine, Silver Eagle, and West Calumet—produced 24,423 tons of ore containing 1,407 ounces of gold, 233,370 ounces of silver, 51,083 pounds of copper, 6,552,790 pounds of lead, and 1,325,954 pounds of zinc; all except 50 tons was lead-zinc ore treated in the Bauer flotation mill of the Combined Metals Reduction Co. The company worked the West Calumet mine all year and produced 22,918 tons of lead-zinc ore compared with 20,295 tons in 1952. The Calumet lease worked the Honorine mine and produced 1,216 tons of lead-zinc ore. Other production was 239 tons of lead-zinc ore from the Silver Eagle mine and 50 tons of lead ore from the Gisborn-Muirbrook group.

Smelter District.—The mineral output of the Smelter district in 1953 was 20,143 tons of old zinc slag, most of which was treated in the International zinc-fuming plant, and 1,963 tons of old copper slag shipped direct to a smelter by the International Smelting & Refining Co. In addition, the company produced lead bullion at its smelter near Tooele, lead and zinc fume at its zinc-fuming plant, and lead, zinc, and iron concentrates at its custom flotation mill also near Tooele.

UINTAH

Details on mining operations and production in Uintah County are combined with those of Duchesne County.

UTAH

Utah County is noted mainly for its pig-iron production at Ironton and steel production at Geneva. The Ironton plant also produced coke and coke breeze and various byproducts; cast-iron pipe was produced at Ironton by the Pacific States Cast Iron Pipe Co. In addition, 46,240 short tons of clays were produced in the county in 1953, as well as 2 tons of copper, 125 ounces of gold, 106 tons of lead, 589,625 tons of crushed limestone, some phosphate rock, 3,639 tons of pumice, 263,069 tons of sand and gravel, 17,862 ounces of silver, and 1 ton of zinc. All of the copper production and nearly all of the gold, lead, and silver production came from five mines in the Tintic district, which are reviewed under Juab County, where a large part of the Tintic district is situated. All of the zinc production and a small quantity of gold, silver, and lead production came from three claims in the American Fork district.

Of the total clays produced in 1953, 34,226 tons (74 percent) was shale from 2 pits at American Fork and Lehi operated by Interstate Brick Co. and Utah Fire Clay Co.; the shale was used mainly for making common brick. The remainder was chiefly plastic clay from a pit at Lehi produced by Murray Refractories Co. for making fire-clay mortar. More limestone was produced and used in 1953 than in 1952; it came from 2 quarries—1 near Payson operated by the Columbia-Geneva Steel Division of United States Steel Corp. and 1 at Lehi operated by Lakeside Lime & Stone Co. Most of the limestone was used as flux material at the pig-iron blast furnace at Ironton and at the

Geneva steel open-hearth furnaces, as refractory material at the Geneva steel open-hearth furnaces, as an aggregate for concrete and road metal, and for dust in coal mines. Phosphate rock was produced in the county for the first time in several years; it came from a property near Thistle operated by John M. Uren. The phosphate rock was needed for fluxing material at the Geneva steel plant. In 1953, as in 1952, all of the pumice came from the Wm. H. Prince & Sons property at Cedar Fork. The pumice was shipped to the company plant at Salt Lake City, where it was used as an aggregate in making light-weight concrete blocks. Production of sand and gravel increased from 125,844 short tons in 1952 to 263,069 in 1953. Of the total 1953 production, 140,983 tons (54 percent) was sand and gravel produced from 3 pits for use in constructing buildings; the remainder was gravel for use in constructing and maintaining Utah County highways. The chief producers were Thorn Rock Products Co. of Springville and Lee Sand & Gravel Co. of Provo Canyon.

WASATCH

Wasatch County's mineral production in 1953 comprised 25,927 ounces of gold, 400,181 ounces of silver, 527 tons of copper, 3,515 tons of lead, 4,762 tons of zinc, 59,221 tons of limestone, and 47,207 tons of gravel; no limestone or gravel was produced in 1952. The production of each metal in 1953 was greater than in 1952, due to increased output of lead-zinc ore from the New Park property in the Blue Ledge district (Park City region), which is reviewed under Summit County. The limestone was produced from a quarry by Gibbons & Reed Co. for use as riprap for a Bureau of Reclamation project. The gravel was produced by contractors for the Utah State Road Commission for use in resurfacing Wasatch County highways.

WASHINGTON

The principal mineral production in Washington County in 1953 was 102,191 short tons of gravel valued at \$68,304; only 2,700 tons was produced in 1952. Other 1953 production was 2,476 ounces of silver, 15 tons of copper, 25 tons of lead, 1 ton of zinc, and some uranium. Most of the gravel was produced from pits by contractors for the Utah State Road Commission, Washington County Highway Department, Zion National Park Road Department, and United States Department of Commerce (Bureau of Public Roads) for use in constructing and maintaining Washington County highways. Nearly all of the metal production was recovered from 214 tons of lead ore and 77 tons of copper ore shipped from the Dixie-Apex mine near St. George in the Tutsagubet district. The Western Gold & Uranium Co. shipped some uranium ore from the Silver Reef mine near Leeds. A report on the Bull Valley iron-ore deposits near Enterprise was published in 1953.⁵

WAYNE

The only mineral production in Wayne County in 1953 was uranium ore from claims near Hanksville. The Vanadium Corporation of America leased 65 uranium claims in the Capitol Reef region.

⁵ Zoldak, S. W., and Wilson, S. R., Bull Valley Iron-Ore Deposits, Washington County, Utah: Bureau of Mines Rept. of Investigations 4948, 1953, 17 pp.

WEBER

Mineral production in Weber County in 1953 was 262,523 short tons of sand and gravel valued at \$194,599—an increase of 130,401 tons over 1952—and 12,585 short tons of clays valued at \$10,293; no clay was produced in 1952. Of the total sand and gravel, 210,910 tons (80 percent) was produced from 7 pits for use in construction and maintenance of Weber County highways; nearly all of the remainder came from 1 pit and was used for constructing buildings. The principal producers were Holley Sand & Gravel Co., and Clarence Waterfall Co. All of the clay was produced and used by the Harrisville Brick Co. for making common brick. A mill for processing crude Montana talc was operated at Ogden by Tri-State Minerals Co.

The Mineral Industry of Vermont

By Robert D. Thomson ¹



MINERAL production in Vermont in 1953 reached a record high of \$20,302,000, a 13-percent increase over 1952. Nonmetallic minerals dominated the State mineral economy, representing 89 percent of the total value. The remaining production was copper, gold, and silver. Eleven minerals were produced in 1953; every county except Essex and Orleans had production. In order of decreasing value the five leading counties were Rutland, Washington, Lamoille, Orange, and Franklin.

TABLE 1.—Mineral production in Vermont, 1952-53 ¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Copper (recoverable content of ores, etc.)-----	3, 774	\$1, 826, 616	3, 947	\$2, 265, 578
Gold (recoverable content of ores, etc.)-----				
troy ounces.....	162	5, 670	171	5, 985
Pyrites-----	17, 892	(?)	19, 486	(?)
long tons.....	1, 264, 490	749, 835	1, 113, 607	690, 073
Sand and gravel-----				
Silver (recoverable content of ores, etc.)-----				
troy ounces.....	45, 361	41, 054	43, 128	39, 033
Stone (except limestone for lime)-----	404, 391	6, 016, 530	527, 150	8, 859, 703
Talc-----	² 71, 027	³ 926, 646	⁴ 80, 209	⁴ 240, 627
Undistributed: Asbestos, clays, lime, slate, and minerals whose value must be concealed for particular years (indicated in appropriate col- umn by footnote reference 2)-----		⁵ 8, 324, 329		8, 201, 333
Total Vermont-----		17, 891, 000		20, 302, 000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

² Included with "Undistributed."

³ Sold or used by producers. Quantity and value of ground material.

⁴ Mine production of crude material.

⁵ Revised figure.

REVIEW BY MINERAL COMMODITIES

METALS

Copper.—Copper production in 1953 increased 5 percent compared with 1952. The only active mine was the Elizabeth, Orange County, operated by the Vermont Copper Co., Inc. Ore containing pyrrhotite, chalcopyrite, and some silver, zinc, and gold was mined by both open-pit and underground methods.² Daily production was about 800 tons.

¹ Commodity-industry analyst, Region VIII, Bureau of Mines, Pittsburgh, Pa.

² Lutjen, G. P., and Kearney, J. H., New Life for Vermont's 160-year-Old Copper Mine: Eng. and Min. Jour., vol. 154, No. 10, October 1953, pp. 72-75.

Gold and Silver.—Gold and silver were recovered as byproducts of smelting copper concentrate obtained from the flotation plant operated by Vermont Copper Co., Inc. The quantity of gold recovered at Phelps Dodge Refining Corp. Laurel Hill, New York, smelting plant and from Vermont Copper Co. copper concentrate increased 6 percent, but recovery of silver decreased 5 percent.

NONMETALS

Asbestos.—Production of asbestos in Vermont, the principal producing State in 1953, declined 6 percent from 1952. Chrysotile was produced by Vermont Asbestos Mines, Division of the Ruberoid Co., from open-pit mines near Eden and Lowell, Lamoille County. The company mill produced 19 different grades, selling at prices ranging from \$22 to \$504 per short ton.

Prices per short ton for asbestos, f. o. b. Hyde Park or Morrisville, Vt., remained constant all year, except for Grade 6D, which was reduced from \$78 to \$77.

Clays.—A small tonnage was produced in Bennington County for manufacturing brick.

Lime.—Production of lime was estimated to have decreased 18 percent. The Vermont Associated Lime Industries, Inc., marketed both quicklime and hydrated lime.

Pyrites.—Recovery of pyrrhotite concentrate from copper-bearing ore increased 9 percent in 1953 over 1952. Vermont Copper Co., Inc., continued as the State's only producer.

Sand and Gravel.—Output of sand and gravel in 1953 decreased 12 percent in tonnage and 8 percent in value compared with 1952. Twelve companies reported producing in 9 counties, the largest of which, in order of decreasing value, were Washington, Caledonia, Windham, Rutland, and Bennington.

Slate.—Vermont continued as the second largest slate-producing State but showed a 5-percent decrease in 1953 compared with 1952. Of the total tonnage, slate for granules represented 83 percent and for roofing materials 7 percent. All the slate produced in 1953 came from 20 quarries in Rutland County.

Stone.—Stone quarrying was the most important mineral industry in Vermont during 1953, representing 44 percent of the total value of the State mineral production. Output increased 30 percent in 1953 compared with 1952. Ten commercial producers were active in 1953, producing various stone products, as shown in table 2. Stone was mined in Washington, Rutland, Orange, Franklin, Addison, Bennington, Grand Isle, and Chittenden Counties, in order of decreasing value. Five active marble quarries were working in 1953, 1 each in Franklin, Grand Isle, and Washington Counties and 2 in Rutland County. Granite was produced at 2 quarries in Washington County and 1 in Orange County. Six limestone quarries were active, 1 each in Addison, Bennington, Franklin, and Chittenden Counties and 2 in Rutland County.

TABLE 2.—Stone sold or used by producers, 1952-53, by uses

Use	1952		1953	
	Short tons	Value	Short tons	Value
Dimension stone: Monumental granite.....	1 48, 563	1 \$3, 010, 130	1 79, 035	1 \$5, 043, 890
Crushed and broken stone:				
Concrete and road metal.....	1 98, 643	1 135, 451	1 103, 741	1 143, 310
Riprap, railroad ballast, furnace flux, and agricultural.....	129, 896	428, 417	136, 106	431, 873
Other uses ²	110, 344	774, 653	139, 146	1, 010, 222
Undistributed.....	16, 945	1, 667, 879	69, 122	2, 230, 408
Total.....	404, 391	6, 016, 530	527, 150	8, 850, 703

¹ Incomplete to avoid disclosure of individual company operations. The portion not included is combined with "Undistributed."

² Includes stone used in the manufacture of paper, glass, and sugar, for acid neutralization, as terrazzo, and filler for paints, putty, rubber, and other products.

Talc.—Vermont in 1953 continued to be the fourth ranking State in combined mine production of talc, soapstone, and pyrophyllite. All Vermont production was talc and amounted to 80,209 short tons. The quantity of talc sold by producers in 1953 (table 3) increased 6 percent in tonnage but decreased 20 percent in value, reflecting a drop in the average selling price for two of the producing companies. Three companies were active in Lamoille, Washington, Windham, and Windsor Counties.

TABLE 3.—Talc, pyrophyllite, and ground soapstone sold by producers, 1944-48 (average) and 1949-53

Year	Short tons	Value	
		Total	Average per ton
1944-48 (average).....	69, 626	\$863, 881	\$12. 41
1949.....	64, 508	788, 341	12. 22
1950.....	72, 135	906, 396	12. 57
1951.....	78, 694	998, 792	12. 69
1952.....	71, 027	926, 646	13. 05
1953.....	75, 194	743, 558	9. 88

REVIEW BY COUNTIES

ADDISON

In 1953 stone, lime, and sand and gravel, in order of decreasing value, were produced in Addison County. Vermont Associated Lime Industries, Inc., sold crushed limestone for agricultural, concrete, road metal, and screening purposes. Quicklime and hydrated lime also were produced by Vermont Associated Lime Industries, Inc. Most of the lime output was for building construction and for insecticides and fungicides. Peter Cusino produced washed sand and gravel for the construction industry.

BENNINGTON

Bennington Brick Co. produced clay from an open pit near Bennington. Crushed limestone for use mainly in concrete and road metal and as screenings was marketed by William E. Dailey, Jr. Paving gravel was produced at a portable crushing plant at Sunderland by W. H. Hinman, Inc.

CALEDONIA

Sand and gravel was the only mineral commodity produced in Caledonia County in 1953. Caledonia Sand & Gravel Co. washed sand and gravel at a portable plant near Waterford for use in building and road construction.

TABLE 4.—Value of mineral production in Vermont, 1952-53, by counties

County	1952	1953	Principal minerals in 1953, in order of value
Addison.....	\$318, 742	\$277, 492	Stone, lime, sand and gravel.
Bennington.....	114, 817	123, 211	Stone, sand and gravel, clays.
Chittenden.....	95, 548	100, 287	Lime, sand and gravel, stone.
Grand Isle.....	68, 824	57, 157	Stone.
Undistributed ¹	17, 292, 749	19, 744, 185	
Total.....	17, 891, 000	20, 302, 000	

¹ Includes Caledonia, Franklin, Lamoille, Orange, Rutland, Washington, Windham, and Windsor and a quantity unspecified by county.

CHITTENDEN

The Champlain Valley Co., Division of Vermont Associated Lime Industries, Inc., Winooski, marketed quicklime for a variety of uses. The city of Burlington quarried and crushed limestone for road maintenance. George C. Stanley & Sons produced building, paving, and road sand from pits near Burlington. The Rutland Railroad Corp. produced engine sand for its own consumption from a pit at Colchester.

FRANKLIN

Stone, the only mineral product of Franklin County in 1953, was produced by Swanton Lime Works, Inc., and Vermont Marble Co. Limestone was crushed by Swanton Lime Works, Inc., at its Swanton plant for a variety of uses, including paving, agricultural purposes, flux, railroad ballast, and riprap. Vermont Marble Co. quarried marble at St. Albans for interior use in buildings.

GRAND ISLE

Marble was produced from the Isle La Motte quarry of Vermont Marble Co. Output was sold for interior use in buildings and for monuments.

LAMOILLE

During 1953 asbestos, talc, and sand and gravel were mined in Lamoille County. Vermont Asbestos Mines Division of the Ruberoid Co. operated its open-pit mines and mill near Hyde Park. Graded

fibers were used by the company in the manufacture of asbestos products.

Eastern Magnesia Talc Co., Inc., operated its No. 4 mine and grinding mill at Johnson. The ground-talc output in 1953 was sold for various uses, of which insecticides, paper, rubber, and asphalt filler were the largest. A small quantity of crude talc was sold to an out-of-State consumer. Paving gravel was produced by Valney C. Farr from a pit and plant near Morrisville.

ORANGE

Orange County continued to be the fourth-ranking county in the State. The major mineral product was copper, followed by stone, pyrites, silver, and gold, in order of decreasing value. The Vermont Copper Co., Inc., operated the Elizabeth mine 2 miles south of South Strafford. All ore was milled at the company flotation plant, which operated 7 days per week on a 3-shift-per-day basis. Eight flotation cells were added to the plant in 1953, bringing the daily capacity to 950 tons. Mine development was confined to 5,000 feet of drift and 10,000 feet of diamond drilling.

Granite dimension stone was produced by J. K. Pirie from a quarry near Williamstown.

RUTLAND

In terms of value, Rutland County ranked first among Vermont counties in mineral output in 1953. Minerals produced, in order of decreasing value, were slate, stone, and sand and gravel.

Rutland was the only slate-producing county in Vermont during 1953. Nineteen companies reported producing slate, of which, Staso Milling Division (quarry and crusher at Castleton), Vermont-Structural Slate Co., Inc. (quarries at Poultney and Fair Haven), Rising & Nelson Slate Co., Inc. (quarries at Poultney and Pawlet), Pedro Bros. Slate Co. (quarry at Fair Haven), and Covino Bros. Slate Co. (quarry at Wells) were the principal companies. These 5 companies supplied 96 percent of the tonnage and 91 percent of the value of slate production from Vermont in 1953. Slate was sold for various uses, the principal being as granules, roofing material, and flagging.

Limestone was produced by Vermarco Lime Co. at West Rutland and by White Pigment Corp. at Florence. Vermarco Lime Co. sold crushed and broken limestone, mainly for metallurgical flux, agricultural purposes, flooring, and acid neutralizer. White Pigment Corp. prepared limestone for use as pigments and fillers.

The Green Mountain Marble Corp. produced rough and dressed building stone and dressed monumental stone from a quarry near West Rutland. Vermont Marble Co. was the largest producer of marble in the State during 1953. The output from its West Rutland quarry was sold as rough and dressed building and monumental stone.

In 1953 the Vermont Marble Co. operated pits at Brandon, Proctor, and West Rutland, and Clark & Hayes operated pits at East Poultney. Paving gravel and structural sand were produced by both companies, but Vermont Marble Co. also produced grinding and polishing sand and Clark & Hayes paving sand.

WASHINGTON

Washington County ranked first in the State in value of stone, talc and sand and gravel production in 1953.

The Rock of Ages Corp. produced rubble and rough monumental granite at its Graniteville quarry in 1953. Rough monumental granite also was produced by Wells-Lamson Quarry Co. at Websterville. The Roxbury quarry of Vermont Marble Co. yielded sawed marble for building interiors and cut marble for monumental use.

Eastern Magnesia Talc Co., Inc., operated its underground talc mine near Waterbury. The crude talc was ground and sawed in an adjacent mill.

Unwashed sand and gravel was produced by W. D. Lovie and C. J. Lepage near Barre. The city of Barre and Vermont State Highway Department also produced sand and gravel as paving material.

WINDHAM

Talc and sand and gravel were the only mineral commodities produced in Windham County during 1953.

Talc mined by Vermont Talc Co. at Windham was ground at its mill near Chester Depot, Windsor County. Ground talc was sold for use in insecticides, paper, and paint, as a filler in rubber, and for insulation of wire and cable. Vermont Sand & Gravel Co. sold some molding sand in 1953, but the largest sales were for sand and gravel for paving and structural purposes.

WINDSOR

Vermont Mineral Products, Inc., mined talc at its Reading mine. The crude talc was ground in the company mill at Chester Depot and sold to the rubber industry. Sand and gravel was produced by Colonial Sand & Gravel, Inc., at Sharon and sold as paving material.

The Mineral Industry of Virginia

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the Virginia Geological Survey.

By Norwood B. Melcher¹ and Alvin Kaufman²

THE VALUE of mineral production in Virginia in 1953 decreased 7 percent from 1952 owing mainly to a 11-percent drop in the value of coal output. Buchanan, Dickenson, Tazewell, and Wise Counties, primarily coal-producing areas, supplied approximately 60 percent of the total value. Important among Virginia's mineral products in 1953 were coal, stone, cement, sand and gravel, and lead and zinc; however, fuels (coal, petroleum, and natural gas) amounted to 68 percent of the total value. Fuel production was concentrated in the Appalachian Plateau in the southwestern part of the State. Nonmetallics ranked second in importance and comprised 28 percent of the total value in 1953; metals contributed 4 percent additional.

TABLE 1.—Mineral production in Virginia, 1952-53¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays.....	940,496	\$996,351	952,266	\$927,571
Coal.....	21,579,368	114,861,137	19,119,050	102,022,118
Lead (recoverable content of ores, etc.).....	3,792	1,221,024	2,788	730,456
Lime (open-market).....	442,845	4,448,924	477,384	4,947,418
Manganese ore (35 percent or more Mn)				
gross weight.....	1,011	(²)	8,454	635,926
million cubic feet.....	1,133	279,000	3,697	954,000
Petroleum (crude).....thousand 42-gallon barrels.....	10	(²)	8	(²)
Sand and gravel.....	7,136,112	5,556,953	5,276,350	5,160,564
Silver (recoverable content of ores, etc.)				
troy ounces.....			1,169	1,058
Stone (except limestone for cement and lime).....	9,670,961	16,969,952	9,091,907	16,258,620
Zinc (recoverable content of ores, etc.).....	13,409	4,451,788	16,676	3,835,480
Undistributed: Aplite, cement, feldspar, gypsum, iron ore (usable), kyanite, marl, calcareous (except for cement), mica, pyrites, salt, ground sand and sandstone, slate, talc and soapstone, titanium concentrate, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2). Excludes value of clays used for cement.....		4,15,893,790		17,505,609
Total Virginia.....		164,679,000		152,979,000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

² Value included with "Undistributed."

³ Final figure. Supersedes preliminary figure given in commodity chapter.

⁴ Revised figure.

¹ Chief, Division of Mineral Industries, Region VIII, Bureau of Mines, Pittsburgh, Pa.

² Commodity-industry analyst, Division of Mineral Industries, Region VIII, Bureau of Mines, Pittsburgh, Pa.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal.—The Commonwealth of Virginia remained the sixth largest producer of bituminous coal in the United States in 1953. In all, 293 mines producing over 1,000 tons each were active, including 27 strip mines. The low number of stripping operations was indicative of the small part that surface production (1,304,000 tons) played in total coal output. However, in 1953, 3 auger mines were active in the State, with a total production of 271,900 tons. These mines produced an average of 26.69 tons per man per day. The average production for all mines in Virginia during the year was 65,300 tons compared with the United States average of 68,500 tons. About 93 percent of the underground production was by machine cutting; 53 percent of the underground output was mechanically loaded. Less than 1 percent of the underground production was produced by continuous miners. Revised estimates of the State's coal reserves were published.³

It was estimated that Virginia's original reserves consisted of 12,051 million tons of bituminous coal and semianthracite (355 million tons). Of this quantity, retrievable coal, as of January 1, 1953, assuming 50-percent recovery, was estimated at 5,417 million tons.

TABLE 2.—Production and average value at bituminous-coal mines in 1952-53, by counties

County	1952 production (net tons)	1953				
		Production (net tons)	Average value per ton ¹	Tons per man per day	Number of strip pits	Strip production
Buchanan.....	6,364,855	5,641,091	\$5.29	6.89	3	95,281
Dickenson.....	5,108,779	4,330,097	5.24	8.93	2	610,311
Lee.....	745,357	722,688	6.19	4.88	1	31,150
Montgomery.....	103,285	71,950	6.33	3.67	-----	-----
Russell.....	892,067	920,202	5.10	8.16	1	12,974
Scott.....	32,000	27,663	5.33	3.95	-----	-----
Tazewell.....	3,190,233	2,454,197	6.11	5.39	-----	-----
Wise.....	5,142,792	4,951,162	5.00	6.87	20	553,932
Total.....	21,579,368	19,119,050	5.34	7.04	27	1,303,648

¹ Value received or charged for coal f. o. b. mine, including selling cost. (Includes a value for coal not sold but used by producer).

Petroleum and Natural Gas.—Virginia was a relatively minor producer of petroleum and natural gas in 1953. The output of the latter commodity almost tripled that in the previous year, whereas petroleum production declined 20 percent. Natural gas was obtained from the Early Grove field in Scott County and the newly discovered Slate Creek and Keen Mountain fields in Dickenson County, the Nora field in Buchanan County, and scattered wells in Wise County. The Rose Hill field in Lee County, discovered in 1941, yielded petroleum.

³ Averitt, P., Berryhill, L. R., and Taylor, D. A., Coal Resources of the United States: Geol. Survey Circ. 293, 1954, p. 5.

METALS

Iron Ore.—The only iron-ore producer in 1953 was American Pigment Corp., which mined residual lump ore from its property near Pulaski, Pulaski County. The output was utilized for paint pigments, consisting of natural yellows, sienna, ochre, and umber.

Lead and Zinc.—Zinc production from mines in Virginia in 1953 rose 24 percent over 1952. Despite the rise in zinc output, lead production dropped 26 percent. In Wythe County the Austinville mine and 2,400-ton mill of the New Jersey Zinc Co. operated throughout the year. Zinc concentrate produced was sent to smelters at Palmerton, Pa., and Depue, Ill. Lead concentrate was shipped to smelters at Alton, Ill. The New Jersey Zinc Co. reported completion of the first stage of development at its Ivanhoe mine 2½ miles southwest of Austinville. The three-compartment vertical shaft begun January 1952 was completed in April 1953; it was sunk to a depth of 1,050 feet. Construction was begun later in the year on a permanent steel headframe, completion of which was planned to coincide with the installation of hoisting engines, cables, drums, and other hoisting equipment. The property was expected to produce a substantial quantity of zinc ore to be concentrated at the Austinville mill. Ore will be transported underground to Austinville through a 13,300-foot tunnel, 1,000 feet of which was completed in 1953. It was anticipated that the Ivanhoe mine would be in production sometime in 1955. Late in 1953 the New Jersey Zinc Co. announced that it had purchased the inactive Arminius mine near Mineral, Louisa County; drilling results at this zinc-lead property led to the decision to purchase the mine, which the company has had under option since 1951. Pumping and mining equipment will be installed to facilitate continued exploration. The mine had been idle since 1911.

TABLE 3.—Mine production of recoverable lead and zinc, 1944-48 (average) and 1949-53

Year	Lead		Zinc		Year	Lead		Zinc	
	Short tons	Value	Short tons	Value		Short tons	Value	Short tons	Value
1944-48 (average)	4,351	\$1,038,662	17,063	\$4,118,691	1951	1,508	\$521,768	7,332	\$2,668,848
1949	3,313	1,046,908	13,166	3,265,168	1952	3,792	1,221,024	13,409	4,451,788
1950	3,254	878,580	12,396	3,520,464	1953	2,788	730,456	16,676	3,835,480

Manganese.—Virginia ranked third among the States in 1953 in production of manganese ore containing 35 percent or more manganese. Output was obtained from residual deposits derived from manganeseiferous sediments. All the Commonwealth's 1953 output consisted of metallurgical-grade material sold primarily to the General Services Administration for stockpiling. Major producers were Union Manganese Co., Smyth County; Old Dominion Manganese Co., Frederick County; Glade Mountain Manganese Co., Smyth County; and Bland Mining & Manganese Corp., Bland County.

Titanium.—Ilmenite was produced in Nelson County by American Cyanamid Co. from an open pit near Piney River.

TABLE 4.—Manganese and manganiferous ores shipped from mines, 1944-48 (average) and 1949-53, in short tons

Year	Metal-lurgical manganese ore	Ferru-ginous manga-nese ore	Total	Year	Metal-lurgical manga-nese ore	Ferru-ginous manga-nese ore	Total
1944-48 (average)---	5, 784	2, 714	8, 498	1951.....	-----	-----	-----
1949.....	-----	1, 279	1, 279	1952.....	1, 011	-----	1, 011
1950.....	56	-----	56	1953.....	8, 454	-----	8, 454

NONMETALS

Cement.—Riverton Lime & Stone Co., Inc., produced natural cement in its six-pot-kiln plant at Riverton, Warren County. Local shale was used as raw material. Portland cement was produced at plants of the Lone Star Cement Corp., South Norfolk, Norfolk County, and Cloverdale, Botetourt County; and Lehigh Portland Cement Co., Fordwick, Augusta County. The South Norfolk plant of the Lone Star Cement Corp. utilized marl as raw material; the other plants used limestone.

Clays.—Virginia clay output increased slightly in 1953. Production consisted of miscellaneous clays for use in manufacturing brick, tile, and cement, as well as a small tonnage of kaolin. The only producer of the latter commodity was Cold Spring Mining Division, Yarra Engineering Corp., Greenville, Augusta County. Major clay-producing companies in the Commonwealth during the year were United Brick Corp., Woodbridge Station; Woodbridge Clay Products Co., Woodbridge; Roanoke-Webster Brick Co., Inc., Roanoke; and Redford Brick Co., Richmond. Counties having the largest clay output were, in order of decreasing value, Rockbridge, Botetourt, and Albemarle.

Feldspar.—Bedford County was Virginia's only source of feldspar in 1953. The major producer was Clinchfield Sand & Feldspar Corp., operator of the Coles, May, Creswell, and Peaksville mines. The output was used by the ceramic industries. Virginia was the only State to report production of aplite, a granite consisting of quartz and feldspar. Dominion Minerals, Inc., and Carolina Mineral Co., Inc., operated aplite mines near Piney River in Nelson and Amherst Counties. Crude aplite was ground and sold as a low-cost source of alumina for glass manufacture.

Gypsum.—The only producer of gypsum in Virginia in 1953 was United States Gypsum Co., which operated a mine, mill, and plaster-board plant at Plasterco, Washington County. The company also operated a calcining plant at Norfolk for preparing domestic and imported gypsum.

Kyanite.—Virginia kyanite production was primarily from the Wissahickon formation. The kyanite occurs as bluish, long-bladed crystals, embedded in a biotite-feldspar schist. The only producer in 1953 was Kyanite Mining Corp., operators of a mine on Baker Mountain near Farmville, Prince Edward County.

Lime.—Virginia continued in 1953 to be one of the leading sources of chemical lime in the United States; nearly 94 percent of the State total output consisted of this type of lime. The Old Dominion's

prominent position among lime-producing States was due largely to the great abundance of high-quality deposits in the Shenandoah Valley and other valleys in the counties west of the Blue Ridge. Lime was also produced from the soft limestones of the Coastal Plain, which consists mostly of shell marl. Several plants in Norfolk and Isle of Wight Counties used oystershells as raw material. There were in all, 12 plants active in 1953, operating in 9 counties. The major producers were the National Gypsum Co. and the Standard Lime & Stone Co., both active near Kimballton, Giles County.

TABLE 5.—Lime (quick and hydrated) sold by producers, 1944-48 (average) and 1949-53, by types

Year	Agricultural		Building		Chemical and other industrial		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
1944-48 (average).....	23,359	\$209,082	13,004	\$124,625	183,146	\$1,414,415	219,509	\$1,748,122
1949.....	21,430	255,561	12,404	142,313	315,298	2,816,023	349,132	3,213,897
1950.....	21,878	273,411	7,258	86,125	399,203	3,502,396	428,339	3,861,932
1951.....	22,840	285,443	6,309	81,005	423,531	4,185,208	452,680	4,551,656
1952.....	20,151	241,139	11,566	126,428	411,128	4,081,357	442,845	4,448,924
1953.....	19,215	243,030	10,819	117,477	447,350	4,586,911	477,384	4,947,418

Marl, Calcareous.—In 1953 Virginia was one of the largest producers of calcareous marl in the country. Virtually the entire output was utilized for agricultural purposes. Production was centered in Clarke County, with a small output from Surry County. The output of Clarke County consisted of travertine marl; Surry County producers dredged their material from local areas on the Coastal Plain. Active producers were Aimee Strother & Bro., Berryville; J. C. Digges & Sons, Berryville (operators of the Old Chapel marl plant); and Paul Miller, Claremont.

Mica.—A small quantity of full-trimmed, punch and scrap mica was produced in Powhatan County in 1953.

Pyrites.—Virginia ranked as the third largest pyrite-producing State in 1953. General Chemical Division, Allied Chemical & Dye Corp., the sole producer, operated its Gossan mine in Carroll County and produced lump and fine pyrites for utilization at the company sulfuric acid plant in Pulaski and for use in the iron and steel industry.

Salt.—Artificial brines from underground rock-salt beds were utilized in manufacturing chlorine, caustic soda, liquid carbon dioxide, and dry ice by Mathieson Chemical Corp. at Saltville, Smyth County. This company was the only producer of salt in Virginia in 1953.

Sand and Gravel.—The sand and gravel output decreased 26 percent in 1953 compared with 1952. The decline was due mainly to a decrease in road-building activity in the Commonwealth, with a resultant drop in the demand for paving material. Although Virginia's 29 sand and gravel producers reported virtually every type of material, 94 percent of the State output was used for building and paving material. The sand and gravel industry was concentrated on the Coastal Plain. The major producing counties, in order of decreasing output, were Chesterfield, Henrico, and Fairfax. The principal producers were Southern Materials Co., Inc., Chesterfield County; Com-

monwealth Sand & Gravel Corp., Henrico County; and Northern Virginia Construction Co., Inc., and Virginia Sand & Gravel Co., Inc., both in Fairfax County. Shenandoah Silica Co., Inc., Gore, produced a substantial tonnage of ground sand from sandstone for use in pottery, porcelain, and tile manufacture.

TABLE 6.—Sand and gravel sold or used by producers, 1952–53, by classes of operations and uses

	1952			1953		
	Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per ton
COMMERCIAL OPERATIONS						
Sand:						
Molding.....	17,649	\$13,241	\$0.75	(1)	(1)	(1)
Building.....	1,171,018	948,620	.81	943,661	\$828,068	\$0.88
Paving.....	915,573	462,639	.51	914,104	493,615	.54
Other.....	78,513	69,654	.89	79,129	94,826	1.20
Gravel:						
Building.....	1,292,339	1,922,983	1.49	1,490,271	1,718,954	1.15
Paving.....	1,432,245	1,536,154	1.07	1,259,916	1,537,286	1.22
Other.....						
Undistributed ²	285,924	295,764	1.03	234,037	274,377	1.17
Total commercial sand-and-gravel operations.....	5,193,261	5,249,055	1.01	4,921,118	4,947,126	1.01
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand:						
Building.....	45,299	15,210	.34			
Paving.....	29,716	26,040	.88	68,981	45,534	.66
Gravel:						
Paving.....	1,867,836	266,648	.14	286,251	167,904	.59
Total Government-and-contractor sand and gravel.....	1,942,851	307,898	.16	355,232	213,438	.60
Grand total.....	7,136,112	5,556,953	.78	5,276,350	5,160,564	.98

¹ Included with "Undistributed" to avoid disclosure of individual company operations.

² Includes glass, molding, grinding, and polishing, fire or furnace, and engine sand and railroad-ballast gravel to avoid disclosing individual company operations.

Slate.—Virginia slates are not suited for mill stock and consequently were utilized for roofing, roofing granules, flagging, and light-weight aggregate. Usually, they are dark gray with faintly greenish or brownish tints.

Soapstone, Ground.—Virginia soapstone deposits are in Albemarle and Franklin Counties. The State continued in 1953 to be one of the major sources of ground soapstone in the United States. The output was used in foundry facings, insecticides, roofing, and rubber manufacture. Producers active during the year were Alberene Stone Corp. of Virginia, Schuyler; operators of a pit just across the border in Albemarle County; and Blue Ridge Talc Co., Inc., Henry, Franklin County.

Stone.—The output of stone in Virginia declined 6 percent from the previous year, paralleling a general decline in the stone-quarrying industry. Concrete aggregate and road material represented 55 percent of the stone output.

Virginia quarries yield virtually every type of stone. Rock types produced, in order of decreasing tonnage, included limestone, granite,

diabase, sandstone, quartzite, dimension soapstone, greenstone, and marble. Limestone and dolomite, which composed 74 percent of the tonnage in 1953, were utilized predominantly for concrete aggregate, road material, agricultural stone, and fluxes. These carbonate rocks were quarried by 38 active producers in 18 counties. Granite was recovered by 4 producers active in 5 counties, predominantly in the Piedmont region. Diabase, which is classified by the Bureau of Mines as basalt, is found mostly in the Triassic basins of the Piedmont and was produced at 5 quarries in 5 counties. Quarrying of quartzite was concentrated on the northwestern slope of the Blue Ridge Mountains in Rockbridge County. Output was utilized chiefly for refractory ganister. Four companies operating in three counties quarried dimension soapstone and greenstone. Crushed marble, principally for terrazzo, was produced near Harrisonburg, Rockingham County.

TABLE 7.—Stone sold or used by producers, 1952–53, by kinds and uses

Kind and use	1952		1953	
	Short tons	Value	Short tons	Value
Dimension stone: Sandstone, all uses.....	3, 600	\$36, 900	3, 600	\$36, 900
Crushed and broken stone:				
Granite:				
Riprap.....	45, 413	95, 744	1, 000	1, 500
Concrete and road metal.....	1, 519, 185	2, 345, 393	1, 276, 159	1, 882, 450
Railroad ballast.....	277, 672	337, 817	253, 077	303, 409
Other uses.....	63, 064	63, 939	47, 082	43, 339
Basalt and related rocks: Concrete and road metal.....	697, 164	1, 105, 059	590, 437	962, 669
Limestone:				
Riprap.....	67, 743	126, 896	72, 941	136, 319
Fluxing stone.....	301, 030	441, 501	429, 108	660, 190
Concrete and road metal.....	3, 765, 784	4, 957, 557	3, 753, 294	4, 844, 350
Railroad ballast.....	589, 916	664, 616	501, 493	557, 731
Agriculture.....	925, 392	1, 552, 349	808, 147	1, 388, 442
Miscellaneous.....	1, 152, 855	2, 453, 234	1, 150, 923	2, 474, 150
Sandstone, all uses.....	160, 126	388, 746	185, 939	443, 230
Miscellaneous stone:				
Concrete and road metal.....	85, 024	152, 915		
Other uses.....				
Undistributed ¹	16, 993	2, 247, 286	18, 707	2, 523, 941
Total.....	9, 670, 961	16, 969, 952	9, 091, 907	16, 258, 620

¹ Includes miscellaneous dimension stone and crushed and broken marble.

REVIEW BY COUNTIES

ALBEMARLE

Stone, slate, and clay were produced in Albemarle County in 1953. The one source of slate was Blue Ridge Slate Corp., Charlottesville, which produced roofing granules at its plant near Esmont. A substantial tonnage of soapstone was recovered by Alberene Stone Corp. of Virginia from its Schuyler mine for use in manufacturing laboratory equipment, as roofing and rubber filler, and for mine-dusting purposes. Charlottesville Stone Corp., Charlottesville, and Superior Stone Co., Red Hill, operated quarries for producing greenstone and granite, respectively. These were utilized for concrete aggregate, road material, railroad ballast, and stone sand. United Brick Corp., the largest clay producer in Virginia in 1953, mined clay from its open pit near Woodbridge Station for heavy clay products manufacture.

AMHERST

Aplite for use in glass manufacture was produced by Carolina Mineral Co., Inc. W. K. Smiley & Son operated a building-sand pit near Lynchburg.

APPOMATTOX

Limestone for concrete aggregate, road material, and agricultural purposes was produced by Appomattox Stone Corp.

AUGUSTA

Augusta Stone Corp. and Belmont Traprock Co., Inc., both of Staunton, produced substantial quantities of limestone, which was crushed or broken for use as concrete aggregate, road material, agricultural stone, and riprap. Miscellaneous clays and shales were mined by North Mountain Brick Co., Inc., Swoope, and Staunton Shale Brick Co. and T. A. Eamore, both of Staunton. A small quantity of kaolin was produced near Greenville by Cold Spring Mining Division, Yarra Engineering Corp. This mine was closed early in 1953. Lehigh Portland Cement Co. operated a portland-cement plant near Fordwick.

BEDFORD

Bedford was the only feldspar-producing county in Virginia in 1953. Output, which was used for ceramic and glass products, was obtained from the Clinchfield Sand & Feldspar Corp. Coles and Peaksville mines near Bedford and from the May and Creswell mines near Forest. Consolidated Feldspar Department of International Mineral & Chemical Corp. operated for approximately half of 1953, then discontinued operations.

BLAND

Bland Mining & Manganese Corp. and Winslow B. Van Deventer operated manganese mines near Stange on the Byrnes Heir tract.

BOTETOURT

Cement, lime, limestone, and clay were produced in Botetourt County in 1953. Roanoke-Webster Brick Co., Inc., one of the largest producers of miscellaneous clays in Virginia, continued to work its pit near Roanoke. The output was used in manufacturing brick and other heavy clay products. Eagle Rock Lime Co., Eagle Rock, produced building and chemical lime at its kiln near Clifton Forge. This company and Blue Ridge Stone Corp. (Blue Ridge), James River Hydrate & Supply Co. (Buchanan), and Liberty Limestone Corp., operators of the Sherwood and Rocky Point quarries, produced limestone for concrete aggregate, road material, railroad ballast, riprap, whiting, and filler.

BUCHANAN

In 1953 Buchanan County was the largest coal-producing area in Virginia. The bulk of this production resulted from underground mining operations. Approximately 3,551 men were employed underground and 41 in strip pits, with an additional 677 men in various capacities on the surface. A substantial quantity of natural gas was recovered from the Slate Creek and Keen Mountain gas fields.

BUCKINGHAM

Slate was the only mineral commodity produced in Buckingham County in 1953. Blue Ridge Slate Corp., Charlottesville, operators of a quarry near Dutch Gap, produced roofing granules. Other active producers in 1953 were Arvoniam Buckingham Slate Co., Inc., Arvoniam; Le Seur-Richmond Slate Corp., Ore Bank; and Williams Slate Co., Arvoniam. The output of these quarries was utilized for roofing and flagging.

CAMPBELL

Rough and dressed building stone, as well as flagging, was produced by Virginia Greenstone Co. from its Greenstone quarry near Lynchburg.

CARROLL

Pyrites was produced from the Gossan mine in Carroll County by the General Chemical Division, Allied Chemical & Dye Corp. The entire output of the mine was utilized at the Pulaski sulfuric acid plant of the parent corporation.

CHESTERFIELD

A substantial tonnage of miscellaneous clays was produced by Daniels Brick & Tile Co., Inc., and South Side Brick Works, Inc., both of Richmond. Building and paving sand and gravel were produced from a dredge on the James River near Dutch Gap by Southern Materials Co., Inc.

CLARKE

J. C. Digges & Sons operated the Old Chapel marl plant in Clarke County.

CULPEPER

Ralph E. Mills Co., Salem, produced crushed limestone for concrete aggregate and road material in Culpeper County. The plant was closed toward the end of the year.

DICKENSON

Dickenson County ranked third as a coal-producing area in 1953. The mines of the county reported output exceeding 4 million tons by underground, strip, and auger mining. A small quantity of natural gas was obtained from the Nord gas field.

FAIRFAX

Fairfax County ranked third among Virginia counties in sand and gravel output in 1953. Producers were Northern Virginia Construction Co., Inc., Virginia Sand & Gravel Co., Inc., and Modern Sand & Gravel Corp., all of Alexandria. These three organizations produced substantial quantities of building sand and gravel. Fairfax Quarries, Inc., operated a stone quarry for the production of basalt. This material was used as concrete aggregate and road base.

FAUQUIER

Concrete aggregate, road material, building stone, and flagging were produced in Fauquier County, by Millbrook Quarries, Inc., Broad

Run; W. W. Sanders, Warrenton; Amie B. Kennard, Haymarket; and W. D. Sisler & Sons. The Sanders quarry was in basaltic rock; Millbrook Quarries produced limestone. W. D. Sisler & Sons operated a sandstone quarry, and Amie B. Kennard produced miscellaneous stone.

FRANKLIN

Blue Ridge Tale Co. continued to produce soapstone at its King-Ramsey quarry near Henry. The output was ground for use mainly as foundry facing and insecticide filler.

FREDERICK

Glass sand, burnt lime, clay, ground silica, manganese ore, and limestone were produced in Frederick County. Steward M. Perry, Inc., Winchester, and M. J. Grove Lime Co., Stephens City and Middletown, operated limestone quarries. Their output was utilized for concrete aggregate, road material, blast-furnace flux, open-hearth plants, agricultural uses, and various miscellaneous purposes. The Stephens City underground quarry and Middletown open pit of M. J. Grove Lime Co. also yielded a substantial quantity of raw material for the company burnt-lime plant at Stephens City. Lime output was sold for building, agricultural, and chemical uses. Virginia Glass Sand Corp., the only producer of glass sand in Virginia, continued to operate its open pit at Gore in 1953. Ground silica was produced by Shenandoah Silica Co., Inc., at a plant near Gore from sand purchased from the Virginia Glass Sand Co. Shenandoah Brick & Tile Co. produced clay for the manufacture of brick at its pit near Winchester. Old Dominion Manganese Co. produced manganese ore.

GILES

Giles County ranked first in 1953 among the lime-producing areas of Virginia. Plants active during the year included National Gypsum Co. and Standard Lime & Stone Co., both at Kimballton, and Ripplemead Lime Co., Inc., Ripplemead. The output was utilized for building, agricultural, and chemical purposes. In addition to this commodity, the first two companies, as well as Pembroke Limestone Corp., Pembroke, and Virginian Limestone Corp., Klotz, produced crushed limestone for concrete aggregate, road material, stone sand, and various miscellaneous uses.

GOOCHLAND

Boscobel Granite Co. worked its granite quarry near Manakin and produced crushed material for concrete aggregate and road material.

GREENSVILLE

A substantial tonnage of concrete aggregate, road material, railroad ballast, and stone sand was produced by Trago Stone Corp. from a granite quarry near Skippers.

HENRICO

Limestone was quarried in Henrico County by Augusta Stone Corp. Building and paving sand and gravel was recovered from pits near Richmond by Commonwealth Sand & Gravel Corp. Redford Brick Co. and Southside Brick Works operated pits for the production of common clay near Richmond.

ISLE OF WIGHT

Battery Park Fish & Oyster Co., Smithfield, produced a substantial quantity of agricultural lime from limestone and oystershells.

KING WILLIAM

Paving sand and gravel were produced in King William County in 1953 by Fox Co., Aylett.

LEE

The major mineral commodity produced in Lee County in 1953 was bituminous coal. Output came from the northwestern part of the county near Keekee, Johnsons Mill, St. Charles, and Pennington Gap. A substantial quantity of high-gravity paraffin-base petroleum was obtained from the Rose Hill field. Kentucky-Virginia Stone Co., Gibson Station, operated a limestone quarry for the production of riprap, concrete aggregate, road material, railroad ballast, agricultural stone, and rock dust.

LOUDOUN

Arlington Stone Co. operated a basalt quarry and crusher near Leesburg for the production of concrete aggregate and road material.

MECKLENBURG

Granite for use as concrete aggregate, road material, riprap, railroad ballast, and stone sand was produced by Lambert Bros., Inc., and Mills & Gorman Co., South Hill.

MONTGOMERY

Limestone, semianthracite, and burnt lime were produced in Montgomery County. The last commodity was produced by Montgomery Lime Co., Christiansburg, operators of an agricultural lime plant near Ellett. Although the output of coal was small, the area was distinguished by the fact that it was the only county in the Commonwealth to produce semianthracite. The coal mines of the county yielded over 70,000 tons of coal having an average value of \$6.33 per ton. Limestone for use as concrete aggregate and road material was quarried by Albert Bros. Contractors, Inc., Salem; Montgomery Lime Co., Christiansburg; Radford Limestone Co., Inc., Radford; and Dry Valley Lime Co., also of Radford.

NANSEMOND

Roanoke-Webster Brick Co., Inc., operated a pit near Suffolk in Nansemond County. A small quantity of sand was produced by Virginian Railway Co., Nansemond.

NELSON

American Cyanamid Co. operated an ilmenite mine on the Warrick farm near Piney River in 1953. Aplite was mined by Dominion Minerals, Inc., Piney River.

NORFOLK

Lone Star Cement Corp. utilized marl as raw material to produce portland cement at its South Norfolk plant.⁴ Reliance Fertilizer &

⁴ Although South Norfolk is an independent city, for the purposes of this chapter, it will be included in Norfolk County.

Lime Co., South Norfolk, produced agricultural lime from oystershells. Building sand was produced by J. C. Jones Sand Co., Inc., and Interstate Sand & Gravel Co., both with offices in Norfolk. A dredge for the production of sand was operated by Little Creek Sand & Gravel Co. Interstate Sand & Gravel Co. merged with the Commonwealth Sand & Gravel Co. on November 30, 1953. In addition to building sand, there was a small output of filter and fertilizer sand.

NOTTOWAY

Granite for use as concrete aggregate and road material was quarried near Burkeville by Burkeville Stone Co., Inc.

ORANGE

An output of concrete aggregate and road material from an epidote quarry at Madison Run was reported by Royal Stone Corp.

PITTSYLVANIA

The Danville Brick Co., Danville, which had mined clay for use in brick manufacture, was closed in 1953. Kendall Sand Works, Danville, produced paving sand.

POWHATAN

Powhatan County in 1953 was the only area in Virginia in which mica was mined. Mica was produced by Clinton Dolphin and W. D. Baltzley. Clinton Dolphin operated the Dolphin open quarry 3 miles east of Pine Creek Mills. W. D. Baltzley operated the Baltzley No. 1 underground mine and No. 2 surface operation near Powhatan.

PRINCE EDWARD

Kyanite was mined on Baker Mountain near Farmville by Kyanite Mining Corp. Production was utilized predominantly for refractories.

PRINCE GEORGE

Virginia Perlite Corp., Hopewell, only processor of expanded perlite in Virginia, sold this commodity for use as a plaster and concrete aggregate. Raw material for operating the plant was imported from southwestern United States. Arthur Hitch Co., Hopewell, and Friend Sand & Gravel Co., Inc., Petersburg, produced building and paving sand and gravel.

PRINCE WILLIAM

A substantial quantity of shale for use in manufacturing brick and heavy clay products was produced in Prince William County by Woodbridge Clay Products Co. from its pit near Woodbridge.

PRINCESS ANNE

J. C. Jones Sand Co., Inc., operated a pit near Cape Henry for the production of molding, building, and paving sands. Miscellaneous clays were mined from a pit near Oceana by Eureka Brick Co., Inc.

PULASKI

American Pigment Corp. produced natural yellows, sienna, ochre, and umbers from a mine near Pulaski. Lump iron ore was produced.

ROANOKE

Limestone for use as concrete aggregate, road material, and agricultural stone was produced by Rockydale Quarries Corp., Roanoke. Norfolk & Western Railways Co. produced sand. Salem Brick Co., Inc., Salem, was the only producer of clays.

ROCKBRIDGE

Mathews-Curtis Co., Inc., produced quartzite at its Greenlee quarry. The output was utilized in preparing ferrosilicon, as well as for concrete aggregate, railroad ballast, and road material. Limestone for these same uses was quarried by Charles W. Barger & Son, Lexington; Wiley N. Jackson Co., Timber Ridge; and Lone Jack Limestone Co., Inc., Glasgow. Miscellaneous clays were produced by Locher Brick Co., Glasgow, for use in making building brick.

ROCKINGHAM

Mineral production in Rockingham County in 1953 was limited to limestone quarried and crushed by Fred K. Betts, R. Y. Frazer, and C. S. Mundy, all of Harrisonburg. Output was utilized for concrete aggregate, road material, and agricultural stone. The Southern Lime & Stone Works, Linville, remained closed in 1953.

RUSSELL

The one mineral commodity produced in Russell County was bituminous coal. The mines of the county produced nearly 1 million tons in that year. Output was centered in the Clinchfield, Dante, Wilder, and St. Paul areas.

SCOTT

The major mineral commodity produced in Scott County in 1953 was natural gas from the Early Grove field, a major source of this commodity in Virginia in 1953. There was also a small output of bituminous coal.

SHENANDOAH

Concrete aggregate, road material, and flux were produced by Strasburg Lime Co., Inc., Strasburg; Shenandoah Valley Lime & Stone Corp., Strasburg; and Toms Brook Lime & Stone Co., Toms Brook. The only two producers of lime in Shenandoah County in 1953 were Strasburg Lime Co. and Dominion Limestone, Inc., both near Strasburg. The output was used for chemical lime and fluxing material.

SMYTH

Union Manganese Co. and Glade Mountain Manganese Co. mined manganese ore in Smyth County in 1953. Almost all of this production was sold to the GSA for the National Stockpile. Mathieson Chemical Corp. produced artificial brines from rock salt near Saltville. The brines were utilized for manufacturing chlorine, caustic soda, liquid carbon dioxide, and dry ice. The Mathieson Corp. also produced a large tonnage of limestone for chemical use by alkali plants,

as well as for concrete aggregate and road material. Limestone for the last two uses was also produced by E. P. Ellis, Marion. A substantial quantity of building sand was produced in Smyth County in 1953 by Clay S. Sayers and C. R. Snyder & Sons, both of Marion.

SPOTSYLVANIA

Massaponax Sand & Gravel Corp. recovered a substantial quantity of building and paving sand and gravel during the year from its pit near Fredericksburg.

SURRY

The only mineral commodity produced in Surry County in 1953 was calcareous marl mined from the Paul Miller pit at Spring Grove for agricultural purposes.

TAZEWELL

Tazewell County ranked fourth among the coal-producing counties of Virginia in 1953. Approximately 2½ million tons, with an average value of \$6.11 per ton, was mined during the year. Production was derived mainly from the Pocahontas, Boissevain, Sayresville, Jewell Ridge, and Red Ash seams. Crushed limestone for concrete aggregate, road material, railroad ballast, and coal-mine rock dust was produced by Pounding Mill Quarry Corp., Pounding Mill. Burnt lime for agricultural and building purposes, as well as for chemical usage, was prepared by Blue Grass Lime Co., Maxwell, and Perry Lime Co., North Tazewell. General Shale Products Corp. mined a substantial tonnage of miscellaneous clays for use in manufacturing building brick at its pit near Richlands.

WARREN

Natural cement was produced by Riverton Lime & Stone Co., Inc., Riverton. This company also quarried a substantial tonnage of limestone for use as concrete aggregate, road material, railroad ballast, and agricultural stone.

WASHINGTON

Washington County was the only gypsum-producing area in Virginia in 1953. Output came from the United States Gypsum Co. mine near Plasterco.

WISE

Wise County ranked as the second largest producer of bituminous coal in Virginia in 1953. Its output was about 5 million tons, with an average value of \$5.00 per ton. Production was obtained predominantly from the Wise, Harrold, Guest, Norrian, Pardee, Glamorgan, and Stonega areas. There was also a small output in natural gas from a few scattered wells.

WYTHE

The Austinville mine of the Bertha Mineral Division of the New Jersey Zinc Co. continued to produce lead and zinc in 1953. Zinc concentrate produced in the Austinville mill was sent to smelters at Palmerton, Pa., and Depue, Ill. Lead concentrate was shipped to Alton, Ill. This company also produced a substantial quantity of limestone for fertilizer filler and agricultural stone. Building sand was produced by Silica Products Co., Wytheville.

The Mineral Industry of Washington

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior, and the State of Washington Division of Mines and Geology.

By Kenneth D. Baber,¹ Frank B. Fulkerson,¹ Albert J. Kauffman, Jr.,²
and Paul F. Yopes¹



THE TONNAGE OUTPUT of all the principal nonmetallic minerals produced in Washington decreased in 1953. These commodities were cement, sand and gravel, stone, coal, magnesite, lime, quartz, diatomite, clays, and peat. Although the annual production value of all the products listed (except stone and magnesite) declined, a drop of approximately \$1 million in both coal and cement production largely was responsible for a 4-percent decrease in the value of nonmetallic-mineral output. The nonmetallics supplied over two-thirds of the total value of the State mineral output. Washington continued to lead the Nation in magnesite production.

Zinc, lead, copper, and gold were the chief products of metal mines. The increased value of zinc output resulting from a record yield from mines in northeastern Washington brought about a 2-percent gain in the value of metal-mine production, more than offsetting a sharp drop in the value of lead output.

A moderate 3-percent decline occurred in the combined value of the metals and nonmetals produced in the State. Commodities whose annual production was valued in excess of \$1 million were cement, sand and gravel, stone, coal, and magnesite and zinc, lead, copper, and gold.

The production of primary aluminum by the 5 reduction plants in Washington increased nearly 50 percent to 398,781 short tons in 1953, with a value of \$158,507,000. The new Alcoa plant at Wenatchee completed its first year of operation, and expanded production was reported at the four older plants.

Production of ferrochrome was begun at a plant leased from the Government at Mead, Spokane County.

The State's first major oil refinery was under construction near Bellingham by General Petroleum Corp. Initial construction on a second large refinery also was begun at Anacortes. Each refinery was to be supplied with crude oil from Alberta by an extension from Vancouver, B. C., of the Trans Mountain pipeline. An oil-products pipeline was completed to Spokane from Salt Lake City. The Federal Power Commission held hearings on applications to construct natural-gas pipelines to the Pacific Northwest.

Total wages and salaries paid to workers in mining occupations increased by 4 percent over 1952.³ In mining and quarrying plants

¹ Commodity-industry analyst, Region II, Bureau of Mines, Albany, Oreg.

² Chief, Mineral Industry Division, Region II, Bureau of Mines, Albany, Oreg.

³ Survey of Current Business, vol. 34, No. 8, August 1954, p. 13.

included under the unemployment insurance law, a monthly average of 2,859 workers was employed in 1953, with annual wages and salaries totaling \$13,021,310 ⁴ (stone quarries and sand and gravel pits operated by railroads and county highway departments were the principal operations classed as mining that were not covered by Washington's unemployment-insurance program). About 72 percent of the employment in mining was provided by operations east of the Cascades, principally by coal production in Kittitas County, lead-zinc mining and stone and magnesite quarrying in Pend Oreille and Stevens Counties, and copper mining in Chelan County. King County, where coal and other nonmetallic commodities were produced, led in employment in western Washington and supplied 16 percent of the State total.

Under provisions of the Federal Coal Mine Safety Act of 1952, the State of Washington and the Bureau of Mines entered into a cooperative plan providing for joint examination of coal mines by State and Federal inspectors.

Publications pertaining to Washington's mining laws and its geology and resources were issued by the Division of Mines and Geology, Department of Conservation and Development, State of Washington. ⁵

TABLE 1.—Mineral production in Washington, 1952-53 ¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Abrasive stone:				
Pebbles (grinding).....	20	\$240	(?)	(?)
Pulpstones.....	12	908		
Antimony ore and concentrate..... gross weight.....	100	(?)		
Clays.....	4 291, 134	4 352, 576	259, 421	\$312, 141
Coal.....	844, 197	5, 986, 129	689, 831	5, 047, 928
Copper (recoverable content of ores, etc).....	4, 357	2, 108, 788	3, 740	2, 146, 760
Epsomite.....	(?)	(?)	200	8, 000
Gold (recoverable content of ores, etc.)..... fine ounces.....	54, 776	1, 917, 160	62, 560	2, 189, 600
Gypsum (crude).....	7, 900	29, 625	3, 800	14, 250
Lead (recoverable content of ores, etc.).....	11, 744	3, 781, 568	11, 064	2, 898, 768
Manganese ore (35 percent or more Mn) gross weight.....	436	(?)	(?)	(?)
Manganiferous ore (5 to 35 percent Mn) ² do.....	142	(?)		
Peat.....	42, 580	111, 386	32, 107	104, 274
Pumice and pumicite.....	3, 604	8, 089	(?)	(?)
Sand and gravel.....	13, 322, 279	9, 422, 117	11, 182, 835	9, 317, 793
Silver (recoverable content of ores, etc.)..... fine ounces.....	315, 645	285, 675	321, 202	290, 704
Stone (except limestone for cement and lime).....	4, 523, 234	5, 491, 525	4, 438, 259	5, 890, 849
Talc.....	(?)	(?)	5, 351	28, 833
Tungsten concentrate..... 60-percent WO ₃ basis.....	4	14, 008	5	19, 710
Zinc (recoverable content of ores, etc.).....	20, 102	6, 673, 864	32, 786	7, 540, 830
Undistributed: Barite (1953), carbon dioxide, cement, diatomite, gem-stones, lime, magnesite, olivine, quartz, ground sand and sandstone, strontium, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2).....		\$19, 955, 089		18, 766, 830
Total Washington.....		\$46, 139, 000		54, 577, 000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers). Some minerals that originated in Washington cannot be credited owing to lack of information (see par. 1, on p. 3).

² Value included with "Undistributed."

³ Production of manganiferous ore mined and shipped to Government stockpiling depots not included in State totals until removed from stockpile for commercial use.

⁴ Revised figure.

⁵ Employment Security Department, State of Washington, Employment and Payrolls in Washington State by County and by Industry, July 2, 1954.

⁶ Van Nuys, M. H., Outline of Mining Laws of the State of Washington: Bull. 41, 1953, 142 pp.; Campbell, Charles D., Introduction to Washington Geology and Resources: Inf., Circ. 22, 1953, 153 pp.

In addition to the mineral values credited to Washington in table 1, some are omitted owing to lack of information. Many ores contain valuable minor constituents, such as arsenic, bismuth, cadmium, cobalt, nickel, platinum-group metals, selenium, tellurium, gallium, and germanium. These quantities sometimes are unknown and sometimes, though known by analyses, are not accounted for metallurgically in early processing stages or credited to mine or origin. These minor constituents are recovered at plants that frequently treat mixtures of materials from many sources, including residues from refining such metals as copper, lead, and others. It is not possible in many such cases to distribute the mineral products by States of origin, and in some instances it is even difficult to obtain an accurate separation as to domestic and foreign sources. Another mineral product of value, the production of which usually cannot be separated as to source, is byproduct sulfuric acid.

During 1953 the program of the Defense Minerals Exploration Administration (DMEA) continued to encourage systematic investigation of strategic and critical mineral occurrences. Financial assistance extended under the Government contracts was repayable from royalties on ore discovered and subsequently mined. The projects listed in table 2 were active under the program during part or all of 1953.

TABLE 2.—Defense Minerals Exploration Administration contracts active during 1953

County	Name of operator	Name of property	Mineral	Total contract	Government participation (percent)	Contract No.
Chelan.....	Black Warrior Mining Co.	Black Warrior...	Lead, zinc, copper.	\$34, 147	50	E49
	Howe Sound Co.	Holden.....	Copper.....	219, 410	50	E644
Ferry.....	Phantom Creek Copper, Inc.	Pickwick.....	do.....	7, 600	50	E172
	Attwood Copper Mines, Ltd.	Lone Star.....	do.....	109, 196	50	E599
King.....	Spokane Mining Syndicate, Inc.	Talisman.....	Copper, zinc.....	44, 000	50	E137
	Western States Copper Corp.	Rainey.....	Copper.....	22, 300	50	E436
Pend Oreille.	American Zinc, Lead & Smelting Co.	Bluebird.....	Lead, zinc.....	116, 500	50	E301
Pierce.....	Jim Creek Mines.....	Jim Creek.....	do.....	47, 500	50	E318
	Mount Rainier Mining Co.	Mount Rainier..	Copper, molybdenum.	3, 000	50	E383
Skagit.....	William Soren	Johnsburg.....	Lead.....	42, 750	50	E242
	Curtiss and Rogers..	Mint.....	Copper.....	17, 600	50	E417
Snohomish..	Index Mining Co.	Sunset.....	do.....	115, 000	50	E489
	Addy Mining Co.	Ady.....	Tungsten.....	21, 290	75	E200
Stevens.....	Big Q Tungsten Mine, Inc.	Blue Grouse Mtn.	do.....	10, 200	75	E582
	Farmer Mine Enterprises.	Farmer.....	Lead, zinc.....	10, 000	50	E208
Grandview Mines.....	do	Hartbauer.....	do.....	21, 000	50	E587
	do	Maki.....	do.....	36, 400	50	E605
Laurence Hammond Mines Management, Inc.	do	Merikay.....	Beryl.....	12, 100	90	E344
	do	Advantage.....	Lead, zinc.....	59, 150	50	E308
Pacific Northwest Mining Co.	do	Lucle.....	do.....	37, 284	50	E228
	do	Pioneer.....	do.....	23, 651	50	E330
Pioneer Mining Co.	do	Scandia.....	Zinc.....	29, 260	50	E60
	Scandia Mining Group.	Germania.....	Tungsten.....	34, 650	75	E214
Tungsten Mining & Milling Co.	do	Glacier.....	Copper.....	7, 415	50	E362
	do	do	do	do	do	do

REVIEW BY MINERAL COMMODITIES

METALS

Aluminum.—Production of primary aluminum from the 5 reduction plants in the State was 126,400 short tons more than in 1952, an increase of nearly 50 percent. The gain was attributed to favorable hydropower conditions in the region, the availability of new hydroelectric generation facilities, and the first full year of operation of the new Aluminum Co. of America plant at Wenatchee.

Efforts to diminish the effects of low-water periods such as occurred in the latter part of 1952 led to signing of an agreement between the producing companies in the Pacific Northwest (Aluminum Co. of America, Kaiser Aluminum & Chemical Corp., and Reynolds Metals Co.) and the Bonneville Power Administration which provided for the release of up to 200,000 acre-feet of water capable of generating 150 million kilowatt-hours of energy from Hungry Horse Dam in Montana. The location of this dam makes release of stored water possible at a time when the power-generating capability of other reservoirs in the region is nearly depleted. The companies assumed the risk of power deficits arising from premature release of water stored by Hungry Horse Dam and were to supply energy from steam or other non-Federal sources should such a deficit arise.

A report issued by the Bonneville Power Administration during the year gave extensive information on the development of the aluminum industry in the Pacific Northwest and included data on the distribution of power to consumers in the area.⁶ According to the report, the Bonneville Power Administration's sales of firm electrical energy to the aluminum-reduction industry declined from nearly 63 percent of the total generation in 1944 to a little less than 30 percent in 1952. The report also pointed out the existence of some 300 manufacturers in Washington and Oregon engaged in fabricating aluminum into products such as transportation equipment, building products, furnishings and industrial equipment, and foundry castings. Employment by the 3 primary aluminum-producing companies (2 of which also operate fabrication facilities) in the Pacific Northwest during 1953 totaled 8,900 workers with a payroll of \$39 million.⁷

Developments completed or underway at aluminum plants in the State included construction of a \$7 million fluorine fume-control system at the Kaiser Aluminum & Chemical Corp. Mead plant, installation of new extrusion presses at a cost of nearly \$3 million at the Aluminum Co. of America Vancouver plant, and addition of cryolite-recovery facilities at the Reynolds Metals Co. Longview plant. Operation of the fourth and last potline of the new Aluminum Co. of America Wenatchee plant was begun in March.

Beryllium.—No beryl was reported produced in the State during the year. A DMEA beryl project was active at the Laurence Hammond Merikay mine in Stevens County.

Copper.—Decreased output of the Howe Sound Co. from the Holden mine, Chelan County, the only major producer of copper in Washing-

⁶ Bonneville Power Administration, Columbia River Power and the Aluminum Industry: A Research Report, July 1953, 21 pp.

⁷ The Ore.-Bin, Oregon State Department of Geology and Mineral Industries, vol. 16, No. 2, February 19 4, p. 10.

ton, brought about a 14-percent reduction in the State production of the metal. In its annual report to stockholders the company indicated that unstable rock conditions encountered in recent years had made mining of an established grade of ore progressively more difficult. The firm's engineering staff continued to look for means to solve the problem. Considerable work on development, which had been behind schedule, was made possible by the availability of an adequate supply of labor for the first time in several years at the isolated mine, deep in the Cascade Mountains near the head of Lake Chelan. In December the General Services Administration announced terms of a contract between the Government and Howe Sound Co. under which the agency agreed to purchase for the National Strategic Stockpile up to 9,350 tons of refined copper produced from the Holden mine in the next 2 years at a price of 31½ cents per pound. The contract will terminate December 31, 1955, or earlier if the full quantity has been supplied. Under a previous contract the Government obtained copper from the Holden mine at 29.80 cents and later at 32.54 cents per pound; this agreement automatically terminated when price controls ended in February 1953. The company reported that it planned to apply any surplus resulting from the Government purchases to accelerated development at the Holden mine. Negotiations also were concluded by Howe Sound Co. with DMEA for a loan to facilitate extensive exploratory work into areas of the property not previously prospected.

Several thousand tons of copper-zinc ore was mined during 1953 at the Alder group, Okanogan County, by the Alder Gold-Copper Co. This class of ore also was produced from the Talisman mine, Ferry County, by Spokane Mining Syndicate. Kromona Mines Corp., which continued development at a copper-tungsten property in Snohomish County, completed construction of a 100-ton flotation mill and made several mill test runs late in the year. A small tonnage of copper ore was shipped from the Rainey mine, King County.

TABLE 3.—Mine production of gold, silver, copper, lead, and zinc in 1953, by months, in terms of recoverable metals¹

Month	Gold (fine ounces)	Silver (fine ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
January.....	2,917	19,029	178	860	2,173
February.....	4,365	25,917	254	1,294	2,525
March.....	4,233	28,615	266	1,012	2,926
April.....	4,318	24,508	280	1,081	3,271
May.....	5,289	25,777	284	1,035	3,144
June.....	6,092	23,804	398	1,113	3,189
July.....	6,185	24,159	355	883	3,030
August.....	6,235	28,555	365	916	3,384
September.....	6,495	40,293	329	822	3,006
October.....	6,774	37,725	350	627	2,351
November.....	4,774	19,982	329	730	1,906
December.....	4,883	22,838	352	691	1,881
Total.....	62,560	321,202	3,740	11,064	32,786

¹ Mine production comprises ore, gravel, or other mineral material sold or treated and metal recovered as natural gold or as bullion from cyanidation or amalgamation and the estimated recoverable metal contained in concentrates, ore, tailings and other mineral materials shipped directly to smelters or sold to ore buyers within the year.

TABLE 4.—Mine production of gold, silver, copper, lead, and zinc, 1944-48 (average), 1949-53, and total, 1860-1953, in terms of recoverable metal¹

Year	Mines producing		Material sold or treated ² (short tons)	Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer		Fine ounces	Value	Fine ounces	Value
1944-48 (average)	23	4	931,473	52,269	\$1,829,415	307,414	\$249,698
1949	29	3	1,012,198	71,994	2,519,790	357,853	323,875
1950	27	6	1,279,595	92,117	3,224,095	363,656	329,127
1951	29	1	1,304,495	67,405	2,359,175	334,948	303,145
1952	28	1	1,402,472	54,776	1,917,160	* 315,645	285,675
1953	33	2	1,706,410	62,560	2,189,600	321,202	290,704
1860-1953			(³)	2,632,562	70,894,993	15,192,744	11,248,016

Year	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1944-48 (average)	4,884	\$1,620,692	5,024	\$1,267,826	12,273	\$2,973,817	\$7,941,448
1949	5,275	2,078,350	6,417	2,027,772	10,740	2,663,520	9,613,307
1950	5,057	2,103,712	10,334	2,790,180	14,807	4,205,188	12,652,302
1951	4,089	1,979,076	8,002	2,768,692	18,189	6,620,796	14,030,884
1952	4,357	2,108,788	11,744	3,781,568	20,102	6,673,864	14,767,055
1953	3,740	2,146,760	11,064	2,898,768	32,786	7,540,780	15,066,612
1860-1953	109,349	34,516,605	135,830	28,516,022	260,877	56,784,104	201,959,740

¹ Includes recoverable metal content of gravel washed (placer operations), ore milled, and ore shipped to smelters during calendar year indicated.

² Does not include gravel washed.

³ No silver produced from placer mines.

⁴ 1860-1903: Figure not available; 1904-53, 20,881,025 tons produced.

TABLE 5.—Gold produced at placer mines, 1944-48 (average), 1949-53, by methods of recovery

Class and method	Mines producing	Material treated (cubic yards)	Gold recovered	
			Fine ounces	Value
Nonfloating washing plants:¹				
1944-48 (average)	1	5,620	26	\$924
1949				
1950	1	8,000	31	1,085
1951	1	5,100	13	455
1952				
1953	2	535	28	980
Small-scale hand methods:				
1944-48 (average)	2	173	6	210
1949	3	400	10	350
1950	5	1,033	8	280
1951				
1952				
1953	(²) 1	(²) 60	3	105
Grand total placers:				
1944-48 (average)	3	5,793	32	1,134
1949	3	400	10	350
1950	6	9,033	39	1,365
1951	1	5,100	13	455
1952	1	60	3	105
1953	2	535	29	1,015

¹ Includes all placer operations using power excavator and washing plant, both on dry land; an outfit with movable washing plant is termed a "dry-land dredge."

² From property not classed as a mine.

³ Figure not available.

TABLE 6.—Mine production of gold, silver, copper, lead, and zinc in 1953, by counties, in terms of recoverable metals

County	Mines producing		Gold (lode and placer)		Silver (lode and placer)	
	Lode	Placer	Fine ounces	Value	Fine ounces	Value
Benton.....		2	28	\$980	3	\$3
Chelan and Ferry 1.....	5		61,469	2,151,415	251,205	227,353
King, Kittitas, and Snohomish 1.....	3		29	1,015	222	201
Okanogan and Pend Oreille 1.....	6		916	32,060	39,567	35,810
Skagit.....	1		1	35	398	360
Stevens.....	17		77	2,695	29,702	26,882
Whatcom.....	1		40	1,400	105	95
Total.....	33	2	62,560	2,189,600	321,202	290,704

County	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
Benton.....							\$983
Chelan and Ferry 1.....	3,614	\$2,074,436	2	\$524	431	\$99,130	4,552,858
King, Kittitas, and Snohomish 1.....	7	4,018					5,234
Okanogan and Pend Oreille 1.....	94	53,956	8,708	2,281,496	17,355	3,991,650	6,394,972
Skagit.....			5	1,310			1,705
Stevens.....	25	14,350	2,349	615,438	15,000	3,450,000	4,109,365
Whatcom.....							1,495
Total.....	3,740	2,146,760	11,064	2,898,768	32,786	7,540,780	15,066,612

1 Combined to avoid disclosure of individual output.

TABLE 7.—Mine production of gold, silver, copper, lead, and zinc in 1953, by classes of ore or other source materials, in terms of recoverable metals

Source	Number of mines	Material sold or treated (short tons)	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode ore:							
Dry gold.....	6	115,312	46,146	190,101	3,000		
Copper.....	3	1,186	21	545	49,000		
Copper-zinc.....	3	443,824	16,241	66,202	7,349,000	32,000	1,202,000
Lead.....	10	3,989	1	4,716	404	428,683	52,560
Lead-zinc and zinc 1.....	11	1,142,099	122	59,635	78,596	21,669,317	64,317,440
Total.....	27	1,591,098	16,385	131,098	7,477,000	22,128,000	65,572,000
Total "lode material".....	33	1,706,410	62,531	321,199	7,480,000	22,128,000	65,572,000
Gravel (placer operations).....	2		29	3			
Total, all sources.....	35	1,706,410	62,560	321,202	7,480,000	22,128,000	65,572,000

1 Combined to avoid disclosure of individual output.

TABLE 8.—Mine production of gold, silver, copper, lead, and zinc in 1953, by methods of recovery and types of material processed, in terms of recoverable metals

Type of material processed and method of recovery	Gold (fine ounces)	Silver (fine ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode:					
Amalgamation.....	17	2			
Cyanidation.....	3,841	42,739			
Concentration and smelting of concentrates.....	34,658	242,585	7,476,000	22,020,969	65,563,559
Direct smelting.....	24,015	35,873	4,000	107,031	8,441
Total lode.....	62,531	321,199	7,480,000	22,128,000	65,572,000
Placer.....	29	3			
Grand total.....	62,560	321,202	7,480,000	22,128,000	65,572,000

Ferroalloys.—The Government contract with Pacific Northwest Alloys, Inc., for producing magnesium in the Government-owned plant at Mead, Spokane County, was canceled in June, and the company made immediate plans for leasing a major portion of the plant. Following completion of leasing arrangements and a reported \$1.5 million renovation, production of ferrochrome was begun in August. Output of ferrosilicon, previously produced in the plant for use in the magnesium process, continued. The company 10-year lease provided for payment of a minimum annual rent of \$158,000 plus a percentage on gross sales. The plant also may be reconverted to magnesium production on short notice.

Production of ferroalloys from the Keokuk Electro-Metals Co. Wenatchee plant, Chelan County, and the Ohio Ferro-Alloys Co. Tacoma plant, Pierce County, continued throughout the year.

Gold.—Production gained 14 percent compared with 1952. The increase resulted from substantial advances in gold-ore output from the Knob Hill mine of Knob Hill Mines, Inc., Ferry County, and the Gold King mine, Lovitt Mining Co., Chelan County. The gains more than offset a decrease in production of byproduct gold from the Holden mine of Howe Sound Co., Chelan County, which supplied copper-zinc ore. The 3 properties contributed 98 percent of the State gold output. The main source of the remaining 2 percent was copper-zinc ore mined and milled by the Alder Gold-Copper Co. in Okanogan County. The Polepick mine in Chelan County, the Ace of Diamonds claim in Kittitas County, and the Golden Arrow property in Whatcom County yielded some gold ore, and gold was contained in some of the ores mined in the lead- and zinc-producing districts of Pend Oreille and Stevens Counties. Of the 29 ounces produced from placer mines, 28 ounces was recovered on Blalock Island on the Columbia River 23 miles south of Prosser.

Lead.—Mine production of lead, which reached record proportions in 1952, decreased 6 percent in quantity and 23 percent in value. Production was maintained at a high rate through June, but activity was curtailed the remainder of the year, particularly in the last quarter. On October 31, Goldfield Consolidated Mines Co. entirely discontinued production from the Deep Creek mine, Stevens County, and conducted only limited development the rest of the year before a

complete shutdown. In Pend Oreille County underground work was reduced in mid-September from 6 days to 5 and placed on a 1-shift basis at both the Pend Oreille mine, Pend Oreille Mines & Metals Co., and the Grandview mine, operated by American Zinc, Lead & Smelting Co. Milling, previously carried out continuously 7 days per week at the 2 mines, also was restricted. Operations continued below the normal rate for the balance of the year.

Increased mechanization lowered mining costs substantially at the Pend Oreille and Grandview properties, permitting a higher production of ore than otherwise would have been possible under prevailing prices for lead and zinc. Also contributing to keeping the annual yield for the State at a comparatively high level was an increased quantity of lead produced from the Van Stone mine, Stevens County, which completed its first full year of operation in 1953. The Pend Oreille, Grandview, Deep Creek, and Van Stone properties supplied 97 percent of the State output. Several small mines in Pend Oreille and Stevens Counties, northeastern Washington, also produced lead in 1953.

Magnesium.—Following cancellation of the Government contract with Pacific Northwest Alloys, Inc., for producing magnesium at the Government-owned plant at Mead, Spokane County, the company prepared to lease the plant and to begin production of ferroalloys. All 200 of the plant's magnesium furnaces were shut down shortly after the contract was terminated in June. Magnesium for the National Strategic Stockpile had been produced at the electrometallurgical facility since 1951 and during World War II. (See also Ferroalloys.)

Manganese.—All shipments of manganese ores during the year were from Clallam County on the Olympic Peninsula. Ore was shipped from the Crescent mine by Milburn Lewis to the Government high- and low-grade stockpiles and from the Bear Creek mine by Victor Oberg to the low-grade stockpile. Shipments of ore to low-grade stockpiles are not included in State production totals until the ore is removed from the stockpile for commercial use.

Work on an atlas of manganese occurrences and on direct smelting of the low-grade Olympic Peninsula manganese ores was carried on by the Federal Bureau of Mines.

Silver.—The Knob Hill mine continued to be the principal source of silver. Increased production from the Knob Hill and Gold King mines advanced the State output 2 percent. Production of silver from the Holden mine, also an important producer of the metal, was less than in 1952. The 3 mines supplied 78 percent of the total production. Of the State total, 59 percent came from gold ore, 21 percent from copper-zinc ore, and nearly all the rest from lead-zinc and zinc ores.

Tungsten.—Output of tungsten ore and concentrate remained substantially the same as in 1952 with production reported from four mines. High-grade concentrate containing a total of 200 units of tungsten trioxide was shipped from the Big Q and Kelly Camp mines by Big Q Tungsten Mines, Inc., and Kelly Camp Tungsten Co., respectively. Production from the Big Q mine, Stevens County, was purchased for the National Stockpile by the General Services Admin-

istration, while concentrate from the Kelly Camp mine in Ferry County was sold to National Hardware & Supply Co., Calif.

Low-grade concentrate from the Germania Consolidated mine in Stevens County was shipped by Germania Consolidated Mines, Inc., to the Big It mill, operated by Schmittroth and Etherton, near Pinehurst, Idaho, for upgrading. A. C. Neiman shipped low-grade concentrate from the Red Top mine, Stevens County, to the Big It mill and to United States Vanadium Corp., Calif.

In addition to production from the foregoing properties, considerable other activity was noted in the State during the year. Henry Ewing of Colfax, Wash., operated the mill at the Germania mine in Stevens County during the summer. Some concentrate was produced, but no shipments were reported. In the latter part of the year Pentiction Tungsten Mines, Ltd., of British Columbia leased, with option to buy, the Germania mine from Tungsten Mining & Milling Co. At the Border Lord mine in Okanogan County, efforts were directed toward constructing an access road and camp facilities. A 25-ton-per-day spiral concentrator was added to the mill equipment. Part interest in a lease on 80 acres of State-owned land in Stevens County 30 miles north of Spokane was acquired by Sunshine Mining Co. Exploration work at the mine on the property, the Little King Tungsten mine, was conducted by the company.

Zinc.—Zinc production advanced to a new record total for the fourth consecutive year. The large 63-percent increase in 1953 was due in part to the fact that the new Van Stone zinc mine, which was brought into production by American Smelting & Refining Co. late in 1952, was operated during the full year. Production of zinc from the Pend Oreille and Deep Creek mines was greater than in 1952, and output from the Grandview mine compared favorably with that of the previous year despite depressed market prices. During the last quarter, however, the unfavorable price situation led to closing of the Deep Creek mine and reduced production from the Pend Oreille and Grandview mines. Starting in November, Pend Oreille Mines & Metals Co. did not ship zinc concentrate from the Pend Oreille property but stockpiled it at the mill. The Pend Oreille, Van Stone, Grandview, and Deep Creek properties produced 98 percent of the zinc mined in Washington. Most of the remainder came from the Holden mine.

Based on the average market price of refined metal in the United States, the value of Washington's zinc production increased only 13 percent compared with the 63 percent increase in quantity. In 1953 the Government obtained part of the State output at a figure above the market price, as the General Services Administration continued to purchase slab zinc produced from Van Stone concentrates under a contract providing for production of 18,436 tons of the metal for the National Stockpile at a floor price of 15½ cents per pound during the first 3 years of operation at the Van Stone mine.

NONMETALS

Abrasive Materials.—The Mineral Products Co. reported output of grinding pebbles from the Chewelah pit in Stevens County. Sand for sand blasting also was recovered at this operation. In adjoining

Spokane County the Pacific Silica Co. sold part of its output of crushed and ground quartz for use as an abrasive. For the first time in many years there was no production of pulpstones at the Walker Cut Stone Co., Inc., plant near Wilkeson, Pierce County.

At Vancouver, Clark County, the Carborundum Co. manufactured crude silicon carbide for use in abrasive and refractory products. The silica used was obtained principally from Oregon.

Barite.—Mining of barite was reported at the Madsen pit near Addy, Stevens County, by the Manufacturers Mineral Co., Seattle. The material was ground and shipped to Canada to be used in well drilling. Less than 100 tons was sold; however, this represented the first commercial production of barite from the State in a number of years.

Cement.—Production and shipment totals in 1953 from the six cement-manufacturing plants in Washington were substantially lower in quantity and value than in either 1951 or 1952. Stocks on hand increased slightly. There were conflicting trends in the industry statewide; some producers reported increasing demand and others a decline in the market. Increases in shipments over 1952 figures were made from two plants despite the overall drop in the State total.

Once again cement was the leading mineral commodity produced in the State from locally mined materials. Over half of the cement manufactured in the Pacific Northwest was produced in Washington.

Superior Portland Cement, Inc., was the State's largest producer. The company quarried limestone at Concrete, Skagit County, and manufactured cement at 2 plants, 1 near the quarry and the other in Seattle. Northwestern Portland Cement Co. operated a plant and the Maloney limestone quarry at Grotto, King County. A limerock deposit adjacent to the present quarry was purchased to assure an ample supply of limestone for many years. The Olympic Portland Cement Co., Ltd., produced cement at a plant in Bellingham, Whatcom County, using limestone and clay obtained from nearby company-operated quarries. Installation of equipment to increase finishing-mill capacity was completed during the year.

There were two cement plants in eastern Washington—Spokane Portland Cement Co. at Irvin near Spokane and Lehigh Portland Cement Co., Metaline Falls, Pend Oreille County. The plant at Irvin used limestone shipped from the Limerock quarry in Stevens County, and the Metaline Falls plant used locally mined limestone and quartzite.

Clays.—Decreased output of both fire clay and common clay for structural clay products was reported in 1953. Total value of clay production was about 12 percent less than in 1952.

King County was the leading producing area and also the center of the ceramic industry in the State. Gladding, McBean & Co. manufactured refractory and structural clay products at a plant in Renton. Clay was obtained by the company from a number of pits in the county and also from the underground Johnson mine, formerly a coal producer. In Seattle Abrahamson Brick Co., Builders Brick Co., and Seattle Brick & Tile Co. manufactured structural clay products from local glacial clay sand some clays mined in Pierce County. Auburn Pottery Co., Inc., Auburn, and Washington Pottery Co., Seattle, manufactured flowerpots.

The Spokane-Stevens County area has important clay deposits and ceramic industries. Washington Brick & Lime Co. manufactured structural clay products in plants at Clayton, Stevens County. Refractory products also were made at Dishman. Clays were procured from nearby deposits. An increased output of clay products was reported in 1953 owing to commencement of production by the company of "SCR brick." This is a new-type masonry unit developed by the Structural Clay Products Research Foundation, and introduced nationally in 1952. A brick weighs 8 pounds and is longer, thinner, and deeper than regular building brick used heretofore. It is entirely modular. The weight has been held down and handling facilitated by carefully planned coring (each brick has 10 core holes $1\frac{1}{2}$ inches in diameter). The design permits easy installation of windows and doorways. The unit was designed to provide a regular brick shape that would meet the needs of modern architectural design and improve the competitive position of solid-masonry construction. Refractories and structural clay products were manufactured by Gladding, McBean & Co. at the Mica plant, Spokane County.

Elsewhere in the State structural clay products were manufactured from locally mined clays by the following companies: Wenatchee Brick & Tile Co., Chelan County; Hidden Brick Co., and Muffet Brick & Tile Co., Clark County; Chehalis Brick & Tile Co., Lewis County; Lowell Brick & Tile Co., Snohomish County (purchased clays from Stadium Brick & Tile Co.); and Granger Clay Products Co., Yakima County.

Diatomite.—Although a new company became active during the year, the output of diatomite from deposits in south-central Washington declined somewhat from 1952.

Kenite Corp. (formerly Quincy Corp.) was the largest producer. Diatomite was mined south of Quincy, Grant County, by open-pit methods from a bed 10 to 14 feet thick. The crude material was hauled by truck to a plant at Quincy, where it was crushed, dried, classified, and otherwise treated. Refined diatomite was sacked automatically in 50-pound bags for shipment. The material was sold for use principally as a filter aid. A new drying system was installed at the plant during the year.

Western Ventures, Inc., Spokane, reported a small output from the Squaw Creek deposits near Ellensburg, Kittitas County. The operation was acquired from the Kittitas Diatomite Co. The diatomite was open-pit-mined, passed through a hammer mill into a flash drier, milled, classified, and sacked.

Gem Stones.—Agate, jasper, and silicified or petrified wood, found at many localities in the State, provided material for gem collectors and mineral dealers. No large commercial operations produced gem stones. Polished petrified-wood specimens were sold at Ginkgo Petrified Forest State Park near Vantage, Kittitas County.

Gypsum and Epsomite.—The only production of gypsite in Washington was from the Poison Lake deposit, Okanogan County. A processing plant was at Ellisford. The output (3,800 tons) was only half that of 1952. The entire output was used for agricultural purposes; the gypsite contained impurities of epsomite and trace minerals that are reported to enhance its value as a soil conditioner. Epsom salt

also was produced for agricultural use. A new company, Agro Minerals, Inc., was formed in 1953 to operate the venture.

Columbia Gypsum Products, Inc., reported it was constructing a plant at Spokane to manufacture wallboard, lath, and allied products. During 1953 agricultural gypsum was produced from raw gypsum imported from the Lake Windemere quarry in British Columbia.⁸

At Seattle the Kaiser Gypsum Co. announced plans to construct a gypsum-board plant and plaster mill, utilizing ore shipped in from the company quarries on San Marcos Island in the Gulf of California.⁹

Lime.—The output of lime in Washington was reduced drastically as a result of closing of the United States Gypsum Co. lime-burning plant at Evans, Stevens County. The operation was closed by a strike in April, and in September the company announced that the plant would be shut down permanently and dismantled. According to the company, the plant had been operating without adequate return in recent years, and industrial customers were demanding a high-quality product costly to produce. The Roche Harbor Lime & Cement Co., San Juan County, thereby became the one commercial producer of lime in Washington. Quicklime manufactured at this plant was used principally as building lime and at paper mills. This company also sold crushed and ground limestone.

Magnesium Compounds.—Due to production by the Northwest Magnesite Co., Chewelah, Stevens County, Washington was again the leading domestic supplier of natural magnesite. Gross output was slightly less than in 1952, and the plant was closed for about 6 weeks in March and April because of slackened demand for basic refractories.

Magnesite at the company quarries occurs as massive replacement deposits in dolomite. Quarried rock was crushed, screened, and beneficiated by heavy-medium separation and flotation at plants near the quarries. Concentrates were transported about 5 miles by aerial tramway to a calcining plant at Chewelah. Here they were dead-burned and crushed in rod mills before shipment to refractory centers in the East.

The quoted market price for dead-burned-grain magnesite in bulk at Chewelah increased from \$36.30 to \$39.56 per ton in February and subsequently declined in September to \$38.00, holding that level for the remainder of the year.

An illustrated article describing drilling practices at the quarry was published late in 1953.¹⁰

Olivine was mined by the H. P. Scheel Co. near Sedro Wooley, Skagit County, for use as foundry sand and in refractories. An increase in output over 1952 was reported, and further expansion of production was planned.

Pumice.—As a result of increased output by Arne Sorlie from a deposit near Twenty-five Mile Creek, Chelan County, the State production of pumice was greater than in 1952, but still well below the high level held in the period 1945-48. The pumice was used almost entirely for lightweight-concrete aggregate.

⁸ Cummings, J. M., The Windemere Gypsum Deposit: *Western Miner & Oil Rev.*, vol. 26, No. 11, November 1953.

⁹ *Engineering and Mining Journal*, vol. 154, No. 9, September 1953, p. 164.

¹⁰ Fisk, R. L., Changes in Primary Drilling at Northwest Magnesite: *Min. Cong. Jour.*, vol. 39, No. 11, November 1953, pp. 34-36.

TABLE 9.—Sand and gravel sold or used by producers, 1952-53, by classes of operations and uses

	1952			1953			Percent of change in—	
	Short tons	Value		Short tons	Value		Ton-nage	Aver-age value
		Total	Aver-age		Total	Aver-age		
COMMERCIAL OPERATIONS								
Sand:								
Building.....	1,252,613	\$999,003	\$0.80	1,337,385	\$1,183,895	\$0.89	+7	+11
Road material.....	508,626	350,071	.69	440,420	230,155	.52	-13	-25
Other.....	67,702	107,180	1.58	57,745	118,830	2.06	-15	+30
Total sand.....	1,828,941	1,456,254	.80	1,835,550	1,532,880	.84	-----	+5
Gravel:								
Building.....	1,907,556	1,482,233	.78	2,157,435	1,793,445	.83	+13	+6
Road material.....	2,040,157	1,522,469	.75	1,169,295	1,093,783	.94	-43	+25
Railroad ballast.....	366,283	216,247	.59	337,320	177,090	.52	-8	-12
Other.....	752,348	423,592	.56	454,130	241,070	.53	-40	-5
Total gravel.....	5,066,344	3,644,541	.72	4,118,180	3,305,388	.80	-19	+11
Total sand and gravel.....	6,895,285	5,100,795	.74	5,953,730	4,838,268	.81	-14	+9
GOVERNMENT-AND-CONTRACTOR OPERATIONS								
Sand:								
Building.....	212,350	188,500	.89	11,035	17,170	1.56	-95	+75
Road material.....	2,106,808	988,537	.47	446,310	417,790	.94	-80	+100
Total sand.....	2,319,158	1,177,037	.51	457,345	434,960	.95	-80	+86
Gravel:								
Building.....	808,958	741,933	.92	927,105	649,120	.70	+15	-24
Road material.....	3,298,878	2,402,352	.73	3,844,655	3,393,445	.88	+17	+21
Total gravel.....	4,107,836	3,144,285	.77	4,771,760	4,044,565	.85	+16	+10
Total sand and gravel.....	6,426,994	4,321,322	.67	5,229,105	4,479,525	.86	-19	+28
TOTAL ALL OPERATIONS								
Sand:								
Molding.....	2,917	14,704	5.04	3,425	17,175	5.01	+17	-----
Building.....	1,404,963	1,187,503	.81	1,348,420	1,201,065	.89	-8	+10
Road material.....	2,615,434	1,338,608	.51	886,790	647,945	.73	-66	+43
Other.....	64,785	92,476	1.43	54,320	101,655	1.87	-16	+31
Total sand.....	4,148,099	2,633,291	.64	2,292,895	1,967,840	.86	-45	+34
Gravel:								
Building.....	2,716,514	2,224,166	.82	3,084,540	2,442,565	.79	+14	-4
Road material.....	5,339,035	3,924,821	.74	5,013,950	4,489,228	.90	-6	+22
Railroad ballast.....	366,283	216,247	.59	337,320	177,090	.52	-8	-12
Other.....	752,348	423,592	.56	454,130	241,070	.53	-40	-5
Total gravel.....	9,174,180	6,788,826	.74	8,889,940	7,349,953	.83	-3	+12
Total all sand and gravel.....	13,322,279	9,422,117	.71	11,182,835	9,317,793	.83	-16	+17

Negotiations were underway between William M. Ellwood, principal owner, and a prospective operator to reopen the Mount St. Helens pumice pit 50 miles east of Castle Rock, Cowlitz County.

Sand and Gravel.—The 16-percent decrease in the quantity of sand and gravel produced in Washington in 1953 was due largely to a smaller volume used at the United States Army Corps of Engineers Chief Joseph dam project. However, as a result of an increase in average value from \$0.71 to \$0.83 per ton, the gross value of output declined only 1 percent. Based on value, 55 percent of the output was used

for building and maintaining public and private (principally logging) roads, and 39 percent was utilized in other construction work. Some gravel railroad ballast was produced. Small quantities of glass, molding, engine, and blast sands also were prepared. Production was reported from 34 of the 39 counties in the State, however, 42 percent of the output, having 36 percent of the total value, was derived from 5 counties (Pierce, King, Snohomish, Skagit, and Whatcom) in the heavily populated industrial area bordering Puget Sound.

Silica.—About 96 percent of the crushed quartz produced in 1953 was used at ferrosilicon plants; the remainder was used for foundry sand, abrasives, traction sand, or building purposes. Ground sand was sold for use as a filter aid, foundry sand, and blast sand.

Crushed quartz was produced at three operations. In Spokane County the Pacific Silica Co., controlled by Hemphill Bros., Inc., mined the Latshaw deposit north of Spokane. Hemphill Bros. also operated the Stoner quarry in Skagit County and reported that mining was discontinued during the year because the deposit had been depleted. The third active operation was that of Mineral Products Corp. at Chewelah, Stevens County, where a small tonnage of quartzite was mined.

The only active operation producing ground sand was that of Mineral Products Corp. in Stevens County.

Stone.—The gross output of stone quarried for all purposes except making cement or lime declined 2 percent in quantity in 1953 but had a 7-percent greater value. About 63 percent by value was marketed through commercial channels, and 37 percent was noncommercial, that is, reported by Government agencies as being produced by themselves or by contractors for their consumption. Ton-nagewise, 33 percent was produced for State highway projects.

Broken and crushed stone and screenings used as road material and as concrete aggregate comprised two-thirds of the output by value. Basalt was the principal stone quarried for these purposes. Some rock that was excavated for the Bureau of Reclamation during canal construction on the Columbia Basin project was crushed for road material.

Production of limestone was reported from nine quarries. Forty percent of the quantity mined was ground for agricultural limestone, and the remainder was used principally at paper mills, with smaller quantities used as flux, in the manufacture of glass and mineral wool, for stucco, and as coal-mine rock dust.

Variouly colored marble was obtained at four quarries in Stevens County and used in manufacturing terrazzo chips.

Granite was quarried at 5 operations, with production totaling 24,000 tons valued at \$86,000. The largest tonnage was used as rubble in railroad construction. "Blue Ridge gray" monumental granite was produced at the Morris quarry in Spokane County and andesite flagstone at Mt. Adams Sheet Rock quarry in Yakima County. At the Index quarry in Snohomish County granite was quarried for poultry grit and roofing granules. Poultry grit also was prepared at Seattle from granite mined at the Baring quarry in the northern part of King County.

The Wilkeson sandstone quarry in Pierce County was the principal source of dimension building stone in the State. A total of 71,000

cubic feet of shaped stone valued at \$390,000 was prepared for architectural blocks and for veneering homes. Some structures in which the stone was used were the Cathedral of St. John, Spokane; Holy Name Family Church, Seattle; and College of Puget Sound buildings, Tacoma. In Chelan County sandstone was quarried at the Wenatchee quarry and shaped into architectural blocks and 4-inch veneer. Production was 4,400 cubic feet valued at \$12,000.

TABLE 10.—Stone sold or used, 1952–53, by uses

Use	1952		1953	
	Short tons	Value	Short tons	Value
Agriculture (limestone).....	78, 000	\$325, 051	68, 155	\$309, 795
Building (dimension stone).....	6, 284	293, 678	6, 357	413, 265
Concrete, road metal, and screenings.....	3, 527, 163	3, 638, 379	3, 363, 002	3, 866, 598
Riprap.....	195, 143	236, 183	404, 700	373, 596
Railroad ballast.....	509, 006	518, 385	380, 450	409, 050
Terrazzo chips.....	2, 226	35, 143	2, 485	11, 785
Other.....	205, 412	444, 701	213, 110	506, 760
Total.....	4, 523, 234	5, 491, 525	4, 438, 259	5, 890, 849

¹ Used for metallurgical plant flux, coal-mine rock dust, stucco, chicken grit; in the manufacture of paper, glass, and mineral wool and for other unspecified purposes.

Strontium.—One of the few commercial strontium-mineral deposits in the United States is on Fidalgo Island, Skagit County, near La Conner. The deposit contains celestite and strontianite in about equal proportions. No ore was mined in 1953, but about 20 tons of stockpiled rock was processed by the operating company, Manufacturers Minerals Co. The material was ground to buyers' specifications at a plant in Seattle.

Talc (Soapstone).—Production of soapstone was reported from eight properties, all in Skagit County. The principal producing area was near Marblemount, and a less important area was east of Clear Lake. Marketable production of 5,351 tons was reported—a substantial decrease from 1952. Over half of the quantity was mined by Skagit Talc Products and at the Dad's Girl mine of Wilson Talc Co. Crude material was prepared at several plants in Washington and Oregon and used almost entirely in preparing insecticides. Small quantities were used as fertilizer mix and in paint.

MINERAL FUELS

Carbon Dioxide.—Gas-Ice Corp. converted natural carbon dioxide to "dry ice" at a plant in Klickitat County. Plant capacity was doubled, enabling the company to meet increasing demand. The carbon dioxide gas occurs in mineral waters drawn from drilled wells. The company also has a plant at a similar occurrence near Ashland, Oreg.

Coal.—The quantity of coal mined in Washington declined for the fifth consecutive year. Production was less than 700,000 tons, the lowest annual output since 1886. The number of active mines decreased from 25 to 18.

Nearly 60 percent of the coal output was derived from Kittitas County. The Northwest Improvement Co., the principal producer

in the county, reported output from the No. 3 and No. 9 underground mines and the Roslyn strip. The strip was operated by Russell-Gillett Co., contractors, Cle Elum. The Roslyn Cascade Coal Co. No. 4 mine near Ronald was also a large producer.

In King County 9 mines were active and produced 22 percent of the State total output. The Palmer Coking Coal Co. operated three mines and supplied over half of the county production. The McKay strip, operated by J. A. Terteling & Sons, Inc., and the Newcastle mine of B. & R. Coal Co. were other large producers.

Output by the Bellingham Coal Mines Co., Whatcom County, at the No. 1 mine was increased as a result of the first full year of operation of mechanized mining equipment installed in 1952. The mine furnished about 13 percent of the total State production.

Three mines were active in the Centralia area in Lewis and Thurston Counties. Their combined output was 31,000 tons, less than 5 percent of the State total.

Only 1 of the 3 small mines that had been active in Pierce County in recent years produced coal in 1953, and output was less than 2,000 tons.

Peat.—Washington continued to be the leading peat-producing State, in terms of quantity, with an output of 32,100 tons valued at \$104,000. Production declined one quarter, however, from the high levels established in 1951 and 1952, when 45,300 and 42,600 short tons, respectively, were produced. Average value of output has climbed sharply from \$2.18 per ton in 1951 to \$2.62 in 1952 and \$3.25 in 1953.

Output was reported by 11 producers in King County and 1 each in Okanogan, Snohomish, and Thurston Counties.

Peat was used principally for soil improvement and for horticultural work, litter in poultry yards, and other purposes.

Petroleum and Natural Gas.—There were important developments in 1953 in the construction and planning of pipelines to bring oil and gas and petroleum products into Washington from other areas. The Trans Mountain pipeline to carry crude oil from Alberta to Vancouver, B. C., was completed, and plans were made to extend a branch line into the Puget Sound area. Construction of two refineries to utilize oil from this source was underway. At Ferndale near Bellingham, Whatcom County, the General Petroleum Corp. was constructing a 35,000-barrel-per-day-capacity plant scheduled to go on stream in 1954. The Shell Oil Co. began constructing a 50,000-barrel-capacity plant at Anacortes, Skagit County.

An oil-products line extending from Salt Lake City to Spokane was completed in 1953, and a products line from Billings, Mont., was being laid.

Applications to provide natural gas through pipelines from producing areas in the Southwest and in Canada were pending before the Federal Power Commission. A supply of gas from one of these sources within a very few years appeared to be assured. Availability of natural gas will be of great value to many of the mineral industries in the State.

Several wildcat wells were drilled in search of oil in Washington, but no discoveries of commercial importance were reported. There

has been increased interest in the search for oil in the State in recent years, and large acreage leases have been made.

REVIEW BY COUNTIES AND DISTRICTS

ADAMS

Mineral production consisted solely of sand and gravel, most of which was used on county roads; some was used in making concrete.

ASOTIN

The only mineral production reported was 83,300 tons of sand and gravel valued at \$79,900. Lewiston Pre-Mix Concrete Co., Lewiston, Idaho, produced sand and gravel for concrete at a plant near Clarkston from gravel mined near Silcott. County road crews mined gravel and operated a washing plant; all output was used as road material.

BENTON

Production of sand and gravel valued at more than \$300,000 was reported. The bulk of the output was mined by county crews and road contractors for road material. Smaller quantities were used for commercial building material and at the Yakima Project of the Bureau of Reclamation.

Columbia River District.—In November Louis Tyacke began placer mining on Blalock Island 23 miles south of Prosser. A bulldozer with hydraulic scoop delivered gravel and old tailings to a homemade washing plant with a capacity of 12 yards per hour. The material then was run through a sluice box 20 feet long and 1 foot wide. A total of 335 cubic yards of gravel was washed. The operator reported that he planned to install a more efficient plant.

CHELAN

At Wenatchee the new Aluminum Co. of America aluminum-reduction plant completed its first full year of operation. Output from the plant, which began operating in June 1952, contributed substantially to the nearly 50-percent increase in total primary aluminum production in the State. Ferroalloys were produced at the Keokuk Electro-Metals Co. plant at Wenatchee.

Basalt and gravel mined and prepared for use by the Great Northern Railway Co. as railroad ballast and rubble composed a large proportion of the value of nonmetallic mineral products of the county. Sand and gravel were produced also for road and building materials. Sandstone was quarried at the Wenatchee quarry on Dry Gulch and shaped to 4-inch veneer. The stone was used in constructing the First Methodist Church, Wenatchee; Latter Day Saints Church, Ephrata; and other buildings. Arne Sorlie, Lakeside, and Bunny & Komp, Entiat, produced pumice, largely for lightweight aggregate. Building brick was manufactured from local clays by the Wenatchee Brick & Tile Co.

Chelan Lake District.—Howe Sound Co.'s production from the Holden mine was at a reduced rate compared with 1952. In 1953 the company mined and milled 433,700 tons of copper-zinc ore having gross metal content of 7,779,000 pounds of copper, 2,117,000 pounds

TABLE 11.—Value of mineral production in Washington, by counties, 1952-53

County	1952	1953	Minerals produced in 1953, in order of value
Adams.....	\$171,325	\$68,770	Sand and gravel.
Asotin.....	97,495	79,930	Do.
Benton.....	531,747	309,941	Sand and gravel, gold, silver.
Chelan.....	3,750,068	3,893,003	Copper, gold, stone, sand and gravel, zinc, silver, pumice, clays, lead.
Clallam.....	74,640	34,750	Manganese, sand and gravel.
Clark.....	232,665	349,885	Stone, sand and gravel, clays.
Cowlitz.....	571,603	514,325	Stone, sand and gravel.
Douglas.....	97,965	653,090	Sand and gravel, stone.
Ferry.....	(¹)	(¹)	Gold, silver, tungsten, sand and gravel, copper, zinc.
Franklin.....	65,793	144,815	Stone, sand and gravel.
Garfield.....	27,500	31,805	Stone.
Grant.....	619,302	814,525	Sand and gravel, diatomite, stone.
Grays Harbor.....	224,210	131,060	Sand and gravel.
Island.....	64,962	7,300	Do.
Jefferson.....	250,500	292,000	Stone, sand and gravel.
King.....	7,940,908	7,321,365	Cement, coal, sand and gravel, stones, clay, copper, gold, silver.
Kitsap.....	54,638	149,120	Sand and gravel.
Kittitas.....	4,229,566	2,997,605	Coal, diatomite, sand and gravel, gold.
Klickitat.....	123,078	43,240	Carbon dioxide, sand and gravel.
Lewis.....	616,991	534,051	Sand and gravel, coal, stone, clays.
Lincoln.....	242,064	98,325	Sand and gravel, stone.
Mason.....	48,597	3,470	Sand and gravel.
Okanogan.....	* 181,982	178,895	Sand and gravel, zinc, copper, gold, gypsum, silver, lead, magnesium sulphate, stone.
Pacific.....	333,918	276,410	Stone, sand and gravel.
Pend Oreille.....	11,190,689	8,867,605	Zinc, lead, cement, sand and gravel, silver, copper, gold.
Pierce.....	1,644,830	1,787,403	Sand and gravel, stone, clays, coal.
San Juan.....	(¹)	(¹)	Lime, limestone.
Skagit.....	* 3,991,172	(¹)	Cement, sand and gravel, stone, talc, olivine, lead, strontium, silver, gold.
Skamania.....	30,871	30,670	Stone, sand and gravel.
Snohomish.....	735,946	863,958	Sand and gravel, stone, copper, clays, gold, silver.
Spokane.....	3,655,844	3,311,912	Cement, sand and gravel, stone, silica, clay.
Stevens.....	5,979,763	7,157,609	Zinc, magnesite, lead, lime, stone, silver, silica, clays, copper, tungsten, gold, barite, grinding pebbles.
Thurston.....	250,594	55,000	Coal.
Walla Walla.....	85,172	350,065	Sand and gravel, stone.
Whatcom.....	2,710,523	2,650,778	Cement, coal, sand and gravel, stone, gold, silver.
Whitman.....	295,826	436,270	Sand and gravel, stone.
Yakima.....	291,579	264,744	Sand and gravel, stone, clays.
Undistributed ²	* 4,624,221	9,868,026	
Total.....	56,139,000	54,877,000	

¹ Included with "Undistributed" to avoid disclosure of individual output.

² Value of production from counties combined to avoid disclosure of confidential data, and sand and gravel, stone, peat, and gem-stone production that cannot be assigned to specific counties.

* Revised figure.

of zinc, and considerable quantities of gold and silver. The 2,000-ton flotation plant recovered 15,800 tons of copper concentrate containing 7,417,000 pounds of copper and 902 tons of zinc concentrate containing 876,600 pounds of zinc. During most of 1953, the zinc circuit in the mill was shut down because of the low price for the metal. Mine development consisted of 12,160 feet of drifts and raises, 1,436 cubic yards of volume work, and 12,009 feet of diamond drilling.

Peshastin Creek (Blewett) District.—The Calton Mining Co. did some work at the Polepick group and recovered a small quantity of gold and silver by milling developmental ore in a 30-ton gravity-concentration mill.

Wenatchee River District.—The Gold King mine 3 miles south of Wenatchee at Squillchuck was operated throughout 1953 by Lovitt Mining Co., and production of gold ore was increased greatly over 1952. The ore was shipped to the Tacoma copper smelter, where it was used for fluxing because of its high silica content. Development comprised drifts, 537 feet; crosscuts, 872 feet; raises, 574 feet; and test long-hole drilling, 14,072 feet.

CLALLAM

Manganese ore from the Crescent and the Bear Creek mines was shipped to the Government by Milburn Lewis and Victor Oberg, respectively.

Sand and gravel was mined by county crews and by the National Park Service for road material.

CLARK

Operations at the Aluminum Co. of America aluminum-reduction plant at Vancouver continued throughout the year, as favorable water conditions in the Pacific Northwest made enough electrical energy available to permit a high level of activity. Work was begun on a \$2,700,000 installation of extrusion presses in buildings being built on land adjoining the reduction plant.

Silicon carbide for abrasives and refractories was manufactured by Carborundum Co. at Vancouver. Some 187,000 tons of sand and gravel valued at \$171,000 and 161,000 tons of crushed and broken stone worth \$176,000 were produced by county road crews and several companies. The bulk of the output of these materials was used for road construction. Substantial quantities also were used for concrete aggregate. Some stone was employed in jetty construction, and one company produced molding sand. The Hidden Brick Co., Vancouver, and Muffet Brick & Tile Co., north of Vancouver, produced common brick, and the latter company also made drain tile. Clays were obtained locally.

COWLITZ

The Longview aluminum-reduction plant of Reynolds Metals Co. operated at a high level throughout the year following a 60-percent increase in production capacity in 1952. Facilities to recover cryolite from plant fumes and from the carbon linings of the reduction pots were placed in operation.

Mineral production originating in the county consisted of 361,000 tons of broken and crushed stone valued at \$429,000 and 132,000 tons of sand and gravel valued at \$85,000. Almost the entire output of stone was for road material, about half of which was used for logging roads. County-operated quarries, gravel pits, and crushers contributed substantially to the value of output.

DOUGLAS

Washed sand and gravel valued at more than \$500,000 were produced in the county by contractors for the Chief Joseph Dam project near Bridgeport, under construction by the United States Army Corps of Engineers. The dam and million-kilowatt power plant are scheduled for completion in 1955. Sand and gravel were also produced by contractors on State and county highway construction jobs and by two companies for general building. The Great Northern Railway Co. mined bank gravel and quarried a small quantity of basalt for rubble.

FERRY

Kelly Camp Tungsten Co. produced tungsten concentrate from scheelite ore averaging 0.65 percent WO_3 at the Kelly Camp mine.

The operation was one of two in the State reporting output of high-grade concentrate (approximately 60 percent WO_3).

Sand and gravel was mined for county road construction.

Orient District.—Spokane Mining Syndicate, Inc., continued work on an exploration project begun in 1952 at the Talisman mine. Several hundred tons of ore produced in 1953 was milled in the 75-ton flotation mill, which was operated intermittently for 52 shifts. One car each of copper and zinc concentrate was shipped.

Republic District.—The Knob Hill gold mine, 1½ miles north of Republic, yielded a greater tonnage of ore than in 1952. Mine development consisted of shaftwork, 165 feet; drifts and raises, 3,622 feet; and diamond drilling, 1,025 feet. Sand-fill technique developed at the Knob Hill mine was described in an article.¹¹ The Knob Hill 400-ton mill was operated 2 shifts per day, 6 days, per week. Mill products were high-grade gold-silver flotation concentrates and a precipitate recovered by cyaniding flotation-cell tailings. Changes in metallurgical practice were made by Knob Hill Mines, Inc., involving elimination of the shaking table from the mill circuit.

FRANKLIN

Crushed stone and sand and gravel were produced by county crews for road construction. The Northern Pacific Railway Co. worked the Cactus quarry, producing crushed basalt for ballast and riprap.

GARFIELD

Basalt was quarried and crushed by county crews for road surfacing.

GRANT

Kenite Corp. (formerly Quincy Corp.) mined the Quincy-Burke diatomite deposit 18 miles southeast of Quincy. The diatomite was hauled by truck to Quincy where it was prepared for marketing. Nearly 500,000 tons of sand and gravel, largely for road material, was produced in the county. Spoil material from Bureau of Reclamation irrigation canals was crushed and prepared by contractors for use on county roads.

GRAYS HARBOR

Production of sand and gravel was reported by three commercial operations, the county road department, and the Olympic National Park.

ISLAND

Sand and gravel and stone for road construction were mined.

JEFFERSON

Two hundred thousand tons of broken and crushed basalt was produced at the Mats quarry near Fort Ludlow. Output was used on roads and for breakwaters. Bank gravel was mined by county crews for road material.

¹¹ Engineering and Mining Journal, Knob Hill Sand-Fill System Combats Heavy, Blocky Ground Vol. 154, No. 11, November 1953, pp. 96-99.

KING

Including the value of finished cement manufactured at 2 plants, the nonmetallic industrial and construction materials produced in King County were valued at 7.3 million, representing 13 percent of the State mineral production. King County ranked third in the State in terms of value of output. Northwestern Portland Cement Co. operated quarries and manufactured cement at Grotto on the Stevens Pass Highway. Superior Portland Cement, Inc., shipped limestone from the company quarry at Concrete, Skagit County, to its Diamond cement-manufacturing plant in Seattle. Clay used at the plant was dug locally. One of the two Gladding, McBean & Co. clay-products plants in Washington was at Renton. A complete line of clay-refractory shapes, vitrified clay pipe, and face brick was manufactured. Raw clays and shale were obtained principally from deposits in King County, supplemented by shipments of special clays from other localities. Abrahamson Brick Co., Builders Brick Co., and Seattle Brick & Tile Co., Inc., operated clay pits and manufactured heavy clay products. Auburn Pottery Co., Inc., Auburn, and Washington Pottery Co., Seattle, manufactured flowerpots. Northwestern Glass Co., Seattle, manufactured glass containers. About half the silica used was obtained locally from the Hammer Bluff deposit east of Auburn, where it was quarried by Smith Bros. Silica Sand Co. Mutual Materials Co., Seattle, manufactured sand-lime bricks.

A total of 456,000 short tons of stone was quarried, excluding limestone used in manufacturing cement. Output was used largely for riprap, building and road material, and railroad ballast. Granite quarried at the Baring quarry near the Snohomish County line was crushed for poultry grit. Basalt quarries worked were the Veazey quarry, operated by Northern Pacific Railway Co.; Stillwater quarry, operated by the county; and the Riverton, Black River, and Stoneway quarries, worked by private companies.

Sand and gravel output of 897,000 short tons valued at more than \$1 million was reported by 10 commercial operations and by King County and the city of Seattle. Production was used largely for road and building material. M. B. Cavanaugh, Kenneydale, produced molding sand.

Coal production of 153,000 tons was reported from 9 mines compared with 190,000 tons from 10 mines in 1952. The Palmer Coking Coal Co., supplied nearly 60 percent of the tonnage mined. A fire of spontaneous origin occurred at the Landsburg mine of Palmer Coking Coal Co. on March 16. Production was interrupted briefly but not seriously, as mining was done on the retreat system and the fire was sealed off in the working area. The Bureau of Mines assisted in extinguishing the fire, using a dry-ice machine and 7,000 pounds of dry ice. A large part of the peat production in the State was obtained from bogs in King County. Output was reported from 12 operations—8 near Seattle, 3 near Auburn, and 1 near Redmond.

Many mineral-industry processing and fabrication plants are in King County. Bethlehem Pacific Coast Steel Corp., Isaacson Iron Works, Northwest Steel Rolling Mills, Inc., Pacific Car & Foundry Co., and Seidelhuber Steel Rolling Mill Corp., operated steel-producing

or fabricating plants. Many foundries were active. Northwest Lead Co. operated rolling, drawing, and extrusion facilities in its plant at Seattle. The company received ingot from Kellogg, Idaho, and manufactured a complete line of lead products. Newly mined gold from Alaska and the Pacific Northwest and scrap gold were purchased at the United States Assay Office, a branch of the mint.

Manufacturers Mineral Co. operated a crushing and grinding plant in Seattle, processing talc (soapstone), strontium minerals, granite, and marble (for terrazzo chips). Crushed and ground limestone was prepared by J. A. Jack & Sons, also in Seattle.

Taylor River District.—A small shipment of copper ore from the Rainey property was reported.

KITSAP

Over 300,000 tons of building and road sand and gravel was produced by commercial operators and county road crews.

KITTITAS

Coal mines of Northwest Improvement Co. and Roslyn-Cascade Coal Co. produced 60 percent of the coal mined in Washington. Output was valued at \$2.9 million, the lowest level since 1946, and \$1.2 million less than in 1952. A small quantity of sand and gravel was mined for railway ballast; contractors mined sand and gravel and produced crushed stone for State highway projects. Mining and processing of diatomite at the Squaw Creek deposit were resumed when Western Ventures, Inc., took over operation of the property from Kittitas Diatomite Co. on June 1, 1953. Petrified wood used to prepare polished specimens was found in Gingko Petrified Forest State Park and the adjoining area in the eastern part of the county. Polished stones were displayed and sold at the Park headquarters.

Swauk District.—Ore from the Ace of Diamonds mine was treated by amalgamation and yielded a small quantity of gold.

KLICKITAT

The Gas-Ice Corp., Seattle, produced dry ice from carbon dioxide recovered from drilled mineral water wells near Klickitat. Crushed stone and sand and gravel road materials were prepared by county crews and contractors. Basalt was quarried near Bingen Station for railroad riprap.

LEWIS

Black Prince Coal Co. No. 3 mine, Monarch Coal Processing Co. Monarch mine, and Stoker Coal Co. Martin mine had a gross output of 23,000 tons of coal. The Monarch Co. also cleaned coal mined at a strip operation in Thurston County. At Chehalis the Chehalis Brick & Tile Co. operated one of the State's largest clay-products plants, manufacturing hollow ware and building brick from locally mined clay using coal for fuel. County crews operated the Bunker quarry, preparing crushed-basalt road material, and also mined and prepared large quantities of sand and gravel, used principally for road construction. Sand and gravel and stone were produced by Pacific Sand & Gravel Co. at Blakeslee Junction.

LINCOLN

Road and building sand and gravel were produced by county crews and contractors. Basalt was quarried and crushed at a State-owned quarry 10 miles north of Davenport, and a small quantity of basalt for railroad rubble was quarried near Odessa Station.

MASON

A small output of building and road sand and gravel was reported.

OKANOGAN

Activity at the Border Lord Mining Co. Border Lord tungsten mine in the northern part of the county was seasonal. Eleven miles of access road were built, making a total of 21 miles completed. Other work included addition of camp facilities and installation of a 25-ton-per-day spiral concentrator.

Laucks Chemical Co., Tacoma, formed a subsidiary company, Agro Minerals, Inc., to work the Poison Lake gypsite deposit near Ellisford. Output of 3,800 tons of land plaster and fertilizer filler was reported. Sand and gravel road material was prepared by county crews and contractors. Building sand and gravel were prepared by W. S. Pryor, Grand Coulee Dam. A small quantity of basalt for railroad rubble was quarried and 25,000 tons of pit-run gravel was mined by Great Northern Railway Co. The Mountain Lake Peat Moss Co. produced peat moss near Okanogan.

Methow District.—The Alder Gold-Copper Co. mined and milled a relatively small tonnage of copper-zinc ore at its property near Twisp.

Meyers Creek & Mary Ann Creek District.—Exploration and development were carried out at the Chesaw gold mine by C. N. Bagwell and H. B. Splawn of Yakima.

PACIFIC

A combined output of 148,000 tons of broken and crushed stone was reported by 4 companies and county road crews. Most of it was used for road material, much of it on logging roads. At the Bear River quarry near Chinook 17,100 tons of limestone was quarried and crushed for agricultural stone. A small quantity of road gravel was produced.

PEND OREILLE

The Lehigh Portland Cement Co., Allentown, Pa., manufactured portland and masonry cement at Metaline Falls. Limestone and quartzite were quarried nearby. Employment and output were reduced substantially; shipments declined below 1 million barrels for the first year since 1950.

Sand and gravel totaling 190,000 tons valued at \$285,000 was produced by Curtis Gravel Co., Spokane, for concrete work at the Box Canyon Dam, which was under construction near Ione.

Metaline District.—Pend Oreille Mines & Metals Co. recorded a 40-percent increase in production of lead-zinc ore compared with 1952, despite curtailment of operations at the Pend Oreille mine during the last quarter because of depressed metal prices. Increased mechanization of mining methods was credited with lowering production costs

per unit and making possible the increased tonnage.¹² At the end of 1953 over 75 percent of the ore produced was extracted by trackless mining methods compared with 16 percent in January. The program of enlarging facilities for ore handling and milling was largely completed by the end of the year. With completion of this expansion program the firm had the capacity to mill 900,000 to 1,000,000 tons yearly; and it was expected that, when operations were carried out at the capacity rate, production costs per ton could be reduced still further. The main incline shaft was deepened 710 feet, making the total length 3,400 feet. This shaft is equipped with a conveyor-belt system to raise ore to the surface plant. Other mine development consisted of 1,772 feet of drifts and raises, 41,674 cubic feet of station work, and 8,291 feet of diamond drilling. A third 800-ton flotation unit was being installed at the east mill at the end of 1953. Ore storage and crushing facilities also were expanded, a blacksmith and steel sharpening shop and a garage building erected, and additional housing units completed.

The other major producer in the Metaline district, the American Zinc, Lead & Smelting Co., operated the Grandview property at capacity until September, when operations were cut back to a 1-shift, 40-hour-week basis. A major mine-development project, including sinking of an incline shaft, was begun late in 1953 to permit additional production from the 500 level when necessary. Total development work during the year comprised 2,181 feet of drifts and 8,604 feet of diamond drilling. During recent years American Zinc, Lead & Smelting Co. has devised mechanical methods of mining at the Grandview property involving use of diesel-powered, self-loading transport units to move broken rock to dump stations or use as drilling jumbos when mounted with drills; beginning in March, ore production became 100-percent-mechanized by this method. According to the company, this type of mining has enabled the Grandview mine to remain a profitable operation during the last 18 months of low lead and zinc prices. A trade-journal article discussed mechanical mining at the Grandview property.¹³ The company postponed further exploration and development of property adjoining the Grandview mine on the east where promising results were obtained in 1952 by diamond drilling from surface stations under a DMEA contract. It was planned to develop this property from the lower levels of the Grandview mine. Further development at the company Lead Hill mine in the Slate Creek area was postponed also.

Early in 1953 Sullivan Mining Co. suspended the extensive development program which it had been carrying out for the last 3 years at the Metaline Contact property. Low "base-metal" prices led to the shutdown. The program had been aimed at bringing into production areas explored by diamond drilling during World War II by the Bureau of Mines.

Arthur Betchart and Edwin Dressel obtained a lease on the Oriole property near Metaline Falls and installed a small mill.

¹² Kinney, L. M., Trackless Mining at Pend Oreille: Min. Cong. Jour., vol. 39, No. 11, November 1953, pp. 28, 29, and 105.

¹³ Engineering and Mining Journal, Gismo Multiplies Miners' Output: Vol. 154, No. 2, February 1953, pp. 148-152.

PIERCE

Raw mineral products of the county were stone, sand and gravel, coal, and clays. Architectural sandstone valued at \$390,000 was produced at the Wilkeson quarry. The quarry and cutting and shaping works employed over 40 men. Sand and gravel were mined by 5 companies, with a gross production of 2.7 million short tons valued at nearly \$1.5 million reported. At Clay City near Eatonville the Builders Brick Co. mined residual clay for use in making structural clay products at its Seattle plant. Coal output decreased from 3,470 tons in 1952 to 1,790 as the Gale Creek and Skookum slope mines closed, leaving the Carbonado Coal Co. No. 1 mine the only producer. Exploration and development had been underway at the Skookum slope mine on the Wilkeson-Wingate property.

The Tacoma area is the site of many chemical and metallurgical plants processing or utilizing mineral raw materials. The largest plant, employing over 1,200 people, was the custom copper smelter and electrolytic refinery of American Smelting and Refining Co. at Ruston. Ores, concentrates, and scrap material from many foreign and domestic sources were treated. Smelter byproducts included gold, silver, arsenic, nickel sulfate, selenium compounds, and sulfuric acid. Flue dust containing lead and other metals was recovered and shipped elsewhere for recovery of the metals. The Tacoma aluminum-reduction plant of Kaiser Aluminum & Chemical Corp., 1 of the 5 such plants in the State, produced primary aluminum throughout the year from alumina obtained from bauxite-processing plants in the Gulf Coast area. Also at Tacoma, ferroalloys were produced at the Ohio Ferro-Alloys Co. plant.

Important chemical plants in or near Tacoma were those of Hooker Electrochemical Co., Pennsylvania Salt Manufacturing Co., Stauffer Chemical Co., and E. I. du Pont de Nemours Co. The Philadelphia Quartz Co. produced sodium silicate. Mineral wool was manufactured by Feltrock Manufacturing Co. The Stauffer Chemical Co. manufactured superphosphate fertilizer and was constructing a plant to produce an ammonium-phosphate-sulfate fertilizer.

SAN JUAN

Limestone was quarried on San Juan and Orcas Islands. The Roche Harbor Lime & Cement Co., Roche Harbor, San Juan Island, produced broken and crushed limestone and quicklime. On Orcas Island the Everett Lime Co. worked the McGraw-Kittinger deposit; the entire output was used at paper mills.

SKAGIT

Superior Portland Cement, Inc., quarried limestone and manufactured cement at Concrete, 30 miles east of Sedro Woolley. Limestone also was produced for a company-operated cement plant in King County. Output of talc (soapstone) from five properties was reported and represented the State's entire production. A small quantity of olivine was mined by H. P. Scheel. Hemphill Bros., Inc., quarried 33,000 tons of vein quartz at the Stoner quarry near Marblemount. The La Conner strontium mine on Fidalgo Island was idle,

as the operating company, Manufacturers Mineral Co., of Seattle, had accumulated a stockpile in 1952 sufficient to supply the market through 1953. Sand and gravel and stone were mined by county crews for road material. The Great Northern Railway Co. and Mt. Vernon Building Material Co. also reported production of sand and gravel. At Anacortes a 50,000-barrel-capacity oil refinery was being constructed by Shell Oil Co. Crude oil was to be supplied by tanker from overseas and from Alberta via the recently completed 718-mile Trans Mountain oil pipeline.

Cascade District.—Ten tons of lead ore was shipped from the Johnsburg mine by William Soren.

SKAMANIA

Sand and gravel and crushed stone for road material were produced.

SNOHOMISH

Stone production valued at \$259,000 and sand and gravel output valued at \$591,000 together furnished 98 percent of the county mineral production. Limestone deposits were worked by three companies, granite crushed for chicken grit was quarried at the Index quarry, and crushed-stone railroad ballast and road material were produced. About 55 percent by value of the sand and gravel was used as road material, 3 percent on railroads, and 42 percent for other uses, principally building. The Lowell Brick & Tile Co. manufactured building brick, using clay purchased from Stadium Brick & Tile Co. The Pacific Grinding Wheel Co., Everett, manufactured grinding wheels using alumina and silicon carbide grain shipped in from the East.

Index District.—The Bureau of Mines published the results of a diamond-drilling investigation of the Sunset copper deposits.¹⁴ The Index Copper Co. began a DMEA project at the Sunset property in 1953. A geophysical survey of the vicinity was the first activity carried out under the project.

Sultan District.—Kromona Mines Corp. placed its new 100-ton flotation mill in operation late in 1953 at its copper-tungsten property on the South Fork of the Sultan River.

SPOKANE

The Kaiser Aluminum & Chemical Corp. aluminum-reduction plant at Mead was active throughout the year. A \$7 million fluorine fume-control system was being installed at the plant. Addition of a \$300,000 mill, for producing aluminum tubing, to the company Trentwood fabrication plant was planned. Conversion of the Government Mead magnesium plant to the production of ferrochrome by Pacific Northwest Alloys, Inc., was accomplished in August after cancellation of the company magnesium-production contract by the Government in June. The conversion involved minor alterations to kilns and installation of additional vacuum equipment.

Spokane County's mineral production consisted entirely of non-metallic commodities. Including the value of cement manufactured

¹⁴ Toepfer, Peter H., Investigation of the Sunset Copper Mine, Snohomish County, Wash.: Bureau of Mines Rept. of Investigations 4989, 1953, 9 pp.

from raw materials, largely brought in from Stevens County, production was valued at \$3 million, and the county ranked fifth in the State in terms of value of output.

The Spokane Portland Cement Co. manufactured portland and masonry cements at Irvin. A steadily increased demand was reported by the company. Gladding, McBean & Co. manufactured refractories and heavy clay products from locally mined clays in its Mica plant. Refractories, heavy clay products, and sandlime bricks were made by Washington Brick & Lime Co., using raw materials mined in Spokane and Stevens Counties. Pirello Bros. mined clay at the Tiono pit east of Chester. "Blue Ridge gray" monumental granite was quarried and cut at Morris quarry near Medical Lake. Demand was poor, and output declined 23 percent in value from 1952. Pacific Silica Co. quarried quartz and operated a crushing and sizing plant at the Latshaw deposit north of Spokane. Some 280,000 tons of broken and crushed stone and a million tons of sand and gravel were produced. Stone was quarried principally by contractors for State road projects and for use by railroads. Two companies reported production of crushed stone (not gravel) for concrete aggregate. Sixty-four percent of the tonnage of sand and gravel produced was mined and prepared by 5 commercial operators and 1 railroad company. The remaining 36 percent was produced by county crews and contractors for county and Federal projects.

STEVENS

Laurence Hammond conducted a beryl-exploration project under the auspices of the DMEA at the Merikay mine (Railway Dike prospect) near Chewelah. The project, involving both trenching and underground exploration, was completed in November. High-grade tungsten concentrates were produced at the Big Q Tungsten Mines, Inc., Big Q mine, and low-grade concentrate was shipped from the Germania Consolidated mine and the Red Top mine by Germania Consolidated Mines, Inc., and A. C. Neiman, respectively. DMEA tungsten projects were active during the year at the Addy Mining Co. Addy mine, the Tungsten Mining & Milling Co. Germania mine, and the Big Q mine.

Northwest Magnesite Co., the principal domestic natural-magnesite producer, operated magnesite quarries and processing plants near Chewelah. Limestone was quarried by two companies for use in manufacturing cement, as flux and agricultural stone, in paper manufacturing, and for other purposes. The United States Gypsum Co. limestone quarry and lime-burning plant at Evans operated until April, when it was closed by a strike. Subsequently the company announced that the operation would be abandoned and the plant dismantled. Manufacturers Mineral Co. produced variously colored marble at four quarries for use in making terrazzo chips. Grinding pebbles and crushed and ground silica sand products were prepared by Mineral Products Corp., Seattle. Refractory- and structural-grade clays were mined by Washington Brick & Lime Co. near Clayton for use in manufacturing building brick. Some fire clay was sold by the company. Mrs. M. A. Fitzgerald mined clay at the Hendrix cut near Evans for sale to smelters. Crushed stone and sand and gravel were produced for company use by the Great Northern Railway Co.

Bossburg (Clugstone Creek) District.—The Anaconda Copper Mining Co. relinquished its purchase option on the Bonanza lead mine early in 1953 and returned the property to the owner, Bonanza Lead Co. The Anaconda firm had operated the mine since 1951, but exploratory work by the company failed to disclose enough ore to warrant a large-scale operation. The mine and 100-ton mill were shut down in November 1952. The Young America lead mine and mill were operated by Bonanza Lead Co.

Colville District.—The Old Dominion lead-zinc mine reportedly was operated for a brief period by Bonanza Lead Co.

Kettle Falls District.—The Koyotte property (copper ore) and the Santiago mine (lead ore) were worked during part of 1953.

Northport District.—Two sizable mines and several small mines were active in the Northport district. The Goldfield Consolidated Mines Co. operated its Deep Creek lead-zinc mine and 300-ton mill until mid-October, when the mill was closed and mine work confined to development because of depressed market prices. The company did not work the Anderson open pit during 1953; operations at the property were suspended in June 1952. Zinc-ore production from American Smelting & Refining Co. new Van Stone mine, an open-pit operation, reached the rate of 30,000 tons per month in March, and this rate was maintained the remainder of the year. The 1,000-ton Van Stone mill was operated at capacity 24 hours per day, 7 days per week. Two articles published in mining journals in 1953 described the Van Stone operation.¹⁵ Pacific Northwest Mining & Milling Co. milled several hundred tons of lead-zinc ore at the Red Top property. Lead ore was shipped to a smelter from the Gladstone mine by Gladstone Mountain Mining Co. Harris & Bumgarner, Northport contracting firm, continued exploration and rehabilitation work begun late in 1952 at the Electric Point lead mine. A 1-ton-per-hour test mill was set up about 3 miles from the mine. The operators reported that test runs on old stope fillings in the gravity mill were satisfactory and indicated the possibility of commercial operation. The partnership of Godfrey, Godfrey & Yocum developed the Lead King property during the last 6 months of 1953 and shipped a small tonnage of lead ore. Other small mines reported active included King Tut, Lead Trust, Leo Ray, and United Treasure.

Old Dominion District.—Pioneer Mining Co. milled ore from its Longshot property in a 60-ton flotation mill completed late in 1952.

THURSTON

The Strain Coal Co. and Monarch Coal Processing Co. strip mined 11,000 tons of coal. Operations of the Strain company were closed in June. Production of humus peat was reported by J. Arnold Sharp, Olympia.

WALLA WALLA

County crews mined sand and gravel and stone for road material; crushed basalt for State highway construction was produced by a

¹⁵ Huttli, John B., A. S. & R's Van Stone Mine: Eng. & Min. Jour., vol. 154, No. 4, April 1953, pp. 72-76.

Mining World, Van Stone, American Smelting's Newest Zinc Operation: Vol. 15 No. 4, April 1953, pp. 26-31.

contractor. Sand and gravel for building and road material were produced by Jones-Scott Co., Walla Walla.

WHATCOM

The Olympic Portland Cement Co., Ltd., Bellingham, was the principal mineral-industry operation in the county; the company quarried limestone and clays and manufactured portland cement. Because of poor marketing conditions, the plant was closed 3 months during the year. Limestone was quarried also by Mitchell Bay Lime Co., Seattle, near Maple Falls. The entire output was used in paper manufacturing. Bellingham Coal Mines Co. increased its output from 24,000 tons to 92,000. Bank-gravel road material was mined by county crews and the city of Bellingham. Commercial sand and gravel production was reported by one company. A 35,000-barrel-per-day oil refinery was under construction at Ferndale by the General Petroleum Corp.

Slate Creek District.—Walter Gourlie shipped gold ore to a smelter from the Golden Arrow mine.

WHITMAN

Sand and gravel and stone comprised the entire mineral production from Whitman County. Over 200,000 tons of stone was quarried and crushed by contractors for the county road department. Smaller quantities of stone for concrete aggregate and for railway riprap were produced. County crews, road contractors, 1 commercial operator, and the Chicago, Milwaukee, St. Paul & Pacific Railroad Co. produced a total of 292,000 tons of sand and gravel for roads, building, and railroad ballast.

YAKIMA

Five commercial producers and contractors for road projects reported a combined output of 223,000 tons of sand and gravel. Broken and crushed stone totaling 255,000 tons was produced for road construction by county crews and by 4 contractors on county road projects. Gray andesite flagging was prepared at the Mt. Adams Sheet Rock quarry. The Granger Clay Products Co., Granger, manufactured a complete line of structural clay products, using clay from two nearby pits.

The Mineral Industry of West Virginia

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By Alvin Kaufman ¹



A DECLINE in the production of bituminous coal in 1953 resulted in a reduced overall value of West Virginia mineral output of 4 percent compared with 1952. Mine output of coal, which composed 88 percent of the total value of minerals produced in 1953, fell 5 percent from that in 1952. Lower production in 1953 reflected the continued instability of marketing conditions and competition from oil and natural gas. The importance of coal to the State's mineral economy was illustrated by the fact that the four major coal-producing counties—McDowell, Logan, Raleigh, and Marion—were also the largest mineral-producing counties. Sand and gravel was the only other major commodity having a substantial decline in the value of output.

TABLE 1.—Mineral production in West Virginia, 1952–53 ¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays.....	982,030	\$2,421,669	968,838	\$2,488,938
Coal.....	141,713,059	741,421,131	134,105,310	693,593,645
Natural gas..... million cubic feet.....	180,995	35,475,000	186,477	44,009,000
Natural-gas liquids:				
Natural gasoline..... thousand gallons.....	43,302	3,069,000	44,352	3,245,000
L.P. gases..... do.....	199,794	6,187,000	153,090	6,743,000
Petroleum (crude)..... thousand 42-gallon barrels.....	2,602	9,780,000	² 3,038	² 11,570,000
Sand and gravel.....	392,519	1,438,490	419,907	1,490,592
Stone (except limestone for cement and lime).....	4,120,105	7,275,370	3,162,776	6,070,847
Undistributed: Abrasive stones, bromine, calcium-magnesium chloride, cement, lime, calcareous marl, ground sand and sandstone, stone (dimension limestone) and recovered elemental sulfur. Excludes value of clays used for cement.....	³ 4,869,442	³ 6,826,113	³ 5,501,148	³ 8,924,411
		411,838,988		11,974,948
Total West Virginia.....		\$825,733,000		790,110,000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

² Final figure. Supersedes preliminary figure given in commodity chapter.

³ Excludes certain stone, value for which is included with "Undistributed."

⁴ Revised figure.

¹ Commodity-industry analyst, Region VIII, Bureau of Mines, Pittsburgh, Pa.

Inasmuch as total fuel production contributed 96 percent to the mineral value in 1953, the aggregate output of other nonmetallics was relatively minor. Nevertheless, in 1953 West Virginia maintained its position among the top four States in the production of grindstones, calcium-magnesium chloride, and ground sand and sandstone.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal.—As of January 1, 1953, total West Virginia reserves (assuming 50-percent recovery) exceeded 52 billion tons. The output of coal in West Virginia in 1953 dropped 5 percent compared with 1952. Nevertheless, the State remained, for the 22d consecutive year, the leading producer of bituminous coal in the United States and ranked second only to Pennsylvania in total output from the earliest record to 1953. Coal was produced in 36 counties in West Virginia during the year; the most important were McDowell, Logan, Marion, Raleigh, and Kanawha. Strip mining was reported from 28 coal-producing counties; however, because of the rugged terrain, the percentage of coal mined by stripping methods (7 percent) was relatively minor compared with the national average (23 percent). In all, 1,021 coal mines were active in 1953, including 184 strip mines. The average production from West Virginia coal mines was 131,347 tons compared with the national average of 6,549 tons. This difference between national and State mine output results from a comparatively large number of operations (32.8 percent of West Virginia mines) producing over 100,000 tons per year and to a high degree of underground mechanization. West Virginia producers in 1953 cut 97 percent of their coal by machines and loaded 86 percent mechanically. Some type of mechanical loading mechanism was used by 386 mines. In addition, over 1 percent of production was mined and loaded by continuous miners. Leading coal mines in the State in 1953 included Eastern Gas & Fuel Associates, Federal No. 1 mine, Marion County; Bethlehem Mines Corp., Ida Mae No. 44 mine, Marion County; Eastern Gas & Fuel Associates, Kopperston No. 1 and No. 2 mines; and Pocahontas Fuel Co., Inc., Itmann. All of these mines ranked among the 50 largest producers in the United States in 1953.

In March 1953 Consolidation Coal Co. (West Virginia), Division of the Pittsburgh Consolidation Coal Co., announced the completion of a modernization program at its Williams mine, 2 miles northwest of Shinnston. At that time a new windowless cleaning plant, capable of cleaning 5 by 3/8-inch material by a sand-flotation process and preparing 3/8 by 0 fractions on wet-type cleaning tables, was put into operation. Three centrifugal driers lowered the moisture content of fine-size coal to 8 percent. Thermal driers were used for final removal of moisture.

Petroleum and Natural Gas.—In terms of value, the production of natural gas and petroleum in 1953 ranked second and third, respectively, among the mineral industries of the State. Compared with 1952, natural gas rose 3 percent in output and 24 percent in value; petroleum increased 17 percent in production and 18 percent in value. The Committee on Reserves of the American Petroleum Institute and

TABLE 2.—Coal production in 1952-53, by counties, in short tons

County	1952 total production	1953				
		Total production	Average value per ton	Average tons per man per day	Number of strip pits	Strip-mine production
Barbour	3,081,983	3,264,678	\$4.23	12.65	12	1,226,294
Boone	5,921,694	5,620,808	5.07	8.16	2	184,922
Braxton	77,925	74,474	4.79	5.91		
Brooke	1,507,237	1,355,077	4.30	8.52	5	373,502
Clay	784,050	787,945	5.47	5.80		
Fayette	10,647,536	8,364,858	5.59	5.70	17	637,850
Gilmer	145,129	55,777	3.14	10.87	1	29,765
Grant	59,520	48,991	4.74	3.00	1	2,265
Greenbrier	1,867,628	1,536,532	4.90	7.08	6	407,395
Hancock	130,691	147,771	3.88	13.27	3	132,328
Harrison	8,732,645	8,561,706	4.00	14.55	38	2,599,649
Kanawha	9,318,408	9,137,497	5.35	8.38	5	341,225
Lewis	295,309	240,098	3.40	17.13	6	228,298
Logan	18,897,617	17,190,006	4.81	8.76	3	128,927
Marion	10,073,286	10,843,691	5.10	9.86	2	10,110
Marshall	447,817	436,344	4.56	7.04		
Mason	691,082	413,674	5.12	7.46		
McDowell	18,506,678	18,362,423	6.17	6.19	10	598,918
Mercer	2,286,004	2,392,274	5.88	6.37	14	658,408
Mineral	87,831	47,681	4.12	7.77	2	25,471
Mingo	6,376,623	7,130,841	4.77	8.32	1	23,610
Monongalia	9,558,055	8,250,409	4.45	11.42	4	148,503
Nicholas	3,889,573	3,871,581	4.99	7.59	3	330,779
Ohio	1,326,250	1,101,432	4.37	8.44		
Pocahontas	231,698	394,763	6.69	6.42	1	71,344
Preston	1,983,721	2,008,499	3.90	6.03	12	474,878
Putnam	46,426	25,156	4.78	5.51		
Raleigh	11,216,232	9,548,445	5.88	6.09	9	464,891
Randolph	1,445,652	1,428,732	5.89	5.70	9	229,131
Summers	12,053					
Taylor	382,009	351,613	3.46	12.20	4	212,657
Tucker	247,441	184,240	5.49	7.09	1	72,008
Upshur	964,354	950,112	3.97	9.10	5	135,528
Wayne	200,349	187,162	4.16	6.66		
Webster	1,428,167	1,027,498	5.96	6.54	2	43,100
Wyoming	8,844,386	8,762,522	5.57	6.98	6	144,373
Total	141,713,059	134,105,310	5.17	7.78	184	9,936,129

the American Gas Association, respectively, reported that, as of December 31, 1953, approximately 36 million barrels of petroleum and 1,653,942 million cubic feet of natural gas were in reserve in West Virginia. The latter figure included 166,014 million cubic feet in underground storage and 21,850 million cubic feet discovered in new fields or pools. In 1953, 13,460 oil wells and 13,800 gas wells were producing compared with 13,900 and 13,500 respectively, the previous year. Natural gas production was reported in 39 counties, principally from the Mississippian strata that underlie the coal-bearing rocks. In recent years, however, the Devonian of the southern and western portions of the State have become important. There was little petroleum activity aside from secondary recovery. Repressuring by both air-gas or water flooding was undertaken in many counties. A byproduct of natural-gas production was natural-gas liquids. Compared with the previous year, the output of natural gasoline increased 2 percent, and the production of LP-gases decreased 23 percent.

NONMETALS

Cement.—Cement was produced in West Virginia by Standard Lime & Stone Co., Martinsburg, Berkeley County, and Alpha Portland

Cement Co., Manheim, Preston County. Both companies utilized local limestones and shales as raw material.

TABLE 3.—Clays sold or used by producers, 1944–48 (average), and 1949–53

Year	Fire clay		Miscellaneous		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1944–48 (average)-----	285, 747	\$849, 349	191, 278	\$139, 568	477, 025	\$988, 917
1949-----	239, 373	586, 237	315, 151	230, 594	554, 524	816, 831
1950-----	309, 100	735, 285	366, 001	269, 135	675, 101	1, 004, 420
1951-----	732, 492	1, 023, 872	371, 154	371, 154	1, 103, 646	2, 295, 026
1952-----	621, 996	2, 072, 688	360, 034	348, 981	982, 030	2, 421, 669
1953-----	677, 005	2, 213, 376	291, 833	275, 562	968, 838	2, 488, 938

Clays.—Despite West Virginia's prominent position in the china-ware and clay-products industry, the State had a relatively minor output of raw material for these items. Production of fire clay, which composed 70 percent of the tonnage and 89 percent of the value of clays produced in 1953, was concentrated in Marion, Hancock, and Kanawha Counties. Major producers were Hammond Brick Co., Fairmont, Marion County; and Globe Brick Co., Newell, Hancock County. Miscellaneous clays, predominantly shale, were produced, mainly in Berkeley and Cabell Counties. Major producers of this commodity were United Clay Products Co., North Mountain, and Continental Clay Products Co., Martinsburg, both in Berkeley County.

Lime.—Burnt lime was produced in 1953 by Jones & Laughlin Steel Corp. and Standard Lime & Stone Co. in Berkeley and Jefferson Counties. These companies operated five plants for the production of quick and hydrated lime to be used for chemical, refractory (dead-burned dolomite), agricultural, and building purposes. Calcareous marl was produced from a pit near Charles Town, Jefferson County, by West Virginia Lime Co. for use as agricultural material.

Magnesium Compounds.—Standard Lime & Stone Co. produced a small quantity of refractory magnesia from raw dolomite at its Millville plant, Jefferson County.

Salt.—Salt and brine were produced in West Virginia in 1953 by Columbia Southern Chemical Corp., Natrium, Marshall County; Liverpool Salt Co., Hartford, Mason County; and Westvaco Chemical Division, Food Machinery & Chemical Corp., South Charleston, Kanawha County. Westvaco Chemical Division also reported output of natural salines, such as calcium-magnesium chloride, bromine, and bromides as byproducts of brine production.

Sand and Gravel.—Production of sand and gravel in 1953 declined 23 percent as compared with the previous year. Building and paving sand and gravel, mainly from terraces and flood plains along major rivers (particularly the Ohio), comprised 46 percent of total output compared with 63 percent the previous year. Most of this decline resulted from decreased road construction, with a consequent lower use of paving sand and gravel. Glass sand was obtained from the Oriskany and Pottsville formations in Morgan, Fayette, and Monongalia Counties. Of the 15 sand-and-gravel-producing counties, the largest was Morgan County. In all, 20 commercial pits were worked during the year. Of these, the largest were operated by Pennsylvania

TABLE 4.—Sand and gravel sold or used by producers, 1952-53, by uses

	1952		1953	
	Short tons	Value	Short tons	Value
Sand:				
Glass.....	1,060,369	\$3,102,404	1,152,776	\$3,357,367
Building.....	418,239	620,943	447,163	632,302
Paving.....	780,314	882,584	326,012	329,677
Fire or furance.....	60,201	87,670	(¹)	(¹)
Engine.....	198,637	334,349	152,887	288,179
Grinding and polishing.....	13,331	54,718	(¹)	(¹)
Gravel:				
Building.....	441,292	585,536	410,808	528,674
Paving.....	949,083	1,117,476	351,502	352,274
Undistributed ²	198,639	489,690	321,628	582,374
Total.....	4,120,105	7,275,370	3,162,776	6,070,847

¹ Figure withheld to avoid disclosure of individual company operations, included with "Undistributed."

² Includes molding sand, blast sand, sand and gravel for miscellaneous uses, railroad ballast, and sand and gravel indicated by footnote 1.

Glass Sand Corp., Morgan County; Dravo Corp., Hancock County; Ohio River Sand & Gravel Co., Wood County; and Ohio Valley Sand Co., Wetzel County.

Sand and Sandstone (Ground).—Pennsylvania Glass Sand Corp. produced substantial quantities of ground sandstone from the Oriskany formation near Berkeley Springs, Morgan County. The output was utilized for cleansing and scouring compounds, foundry and glass sand, and pottery, porcelain, and tile manufacture.

Stone.—West Virginia stone output increased 13 percent in 1953 compared with the previous year. Limestone was the principal stone produced, but sandstone also was quarried. Limestone was crushed in 13 plants in 6 counties in West Virginia. Its major use was as blast-furnace flux; concrete aggregate and road stone occupied second place. The major limestone-producing areas were Jefferson and Berkeley. The largest companies operating in the State in 1953 were Jones & Laughlin Steel Corp., Blair Division, Berkeley and Jefferson Counties; Michigan Limestone Division, United States Steel Corp., Jefferson County; Acme Limestone Co., Fort Spring, Greenbrier County; and Standard Lime & Stone Co., Berkeley County. Sandstone was quarried by Brown & Wright Co., Raleigh County, and Paul E.

TABLE 5.—Crushed and broken stone sold or used by producers, 1952-53, by uses

	1952		1953	
	Short tons	Value	Short tons	Value
Flux (limestone).....	2,968,872	\$3,683,777	3,689,511	\$5,960,661
Concrete and road metal.....	1,027,709	1,655,694	1,136,539	1,843,686
Railroad ballast.....	509,276	517,482	420,781	542,187
Agricultural (limestone).....	62,345	122,026	49,410	95,910
Other.....	205,645	640,280	204,907	481,967
Undistributed ²	95,595	206,854		
Total.....	4,869,442	6,826,113	5,501,148	8,924,411

¹ Sandstone data included with "Undistributed" to avoid disclosure of individual company output.

² Includes figures for certain stone, and stone indicated by footnote 1.

³ Incomplete total; excludes dimension limestone.

Garbart, Kingwood, Preston County; the output was utilized for concrete aggregate and road material. Constitution Stone Co. produced a small quantity of grinding stones in Jackson County.

REVIEW BY COUNTIES ²

BARBOUR

The only mineral commodity produced in Barbour County in 1953 was bituminous coal. The leading producers were Compass Coal Co. Compass Nos. 1, 2, and 3 mines near Philippi, and Simpson Coal & Chemical Corp. Galloway No. 3 mine, Galloway.

BERKELEY

In 1953 Berkeley County was the major producing area for flux stone in West Virginia and also the source of substantial tonnages of crushed limestone for use as concrete aggregate, road material, and railroad ballast. The largest active companies in 1953 were J. E. Baker, Co., Inwood; W. S. Frye, Berkeley Station; Blair Limestone Division, Jones & Laughlin Steel Corp.; and Standard Lime & Stone Co. (which also produced portland cement), both in Martinsburg. Jones & Laughlin Steel Corp. and Standard Lime & Stone Co. also reported the output of burnt lime for chemical, agricultural, and building purposes. Clays were mined in Berkeley County by Continental Clay Products Co. and United Clay Products Co. from

TABLE 6.—Value of mineral production in West Virginia, 1952-53, by counties, and principal minerals produced in 1953

County	1952	1953			
		Value	Percent of total	Rank	Principal minerals in order of value
Barbour.....	\$12,851,869	\$13,809,588	1.76	14	Coal.
Berkeley.....	8,131,777	8,975,345	1.13	17	Stone, cement, lime, clays.
Boone.....	29,786,121	28,497,497	3.61	11	Coal.
Braxton.....	323,064	356,730	.04	36	Do.
Clay.....	4,210,349	4,310,059	.54	24	Do.
Gilmer.....	473,121	175,140	.02	38	Do.
Hancock.....	2,463,698	2,294,211	.29	27	Clays, coal, sand and gravel, stone.
Jefferson.....	5,005,643	6,172,038	.78	19	Stone, lime, marl.
Kanawha.....	48,205,071	50,876,814	6.42	5	Coal, clays, sand and gravel, salt.
Logan.....	93,354,228	82,683,929	10.48	2	Coal.
McDowell.....	114,371,270	113,296,150	14.35	1	Do.
Mercer.....	14,488,092	14,069,371	1.78	13	Coal, stone, clays, sand and gravel.
Mineral.....	451,451	196,446	.02	38	Coal.
Mingo.....	31,950,921	34,018,152	4.31	10	Coal, sand and gravel.
Morgan.....	4,395,739	4,571,731	.57	23	Ground sandstone, sand and gravel, stone.
Pocahontas.....	1,536,158	2,640,964	.33	26	Coal.
Preston.....	10,440,217	9,812,389	1.24	15	Coal, cement, stone.
Putnam.....	224,238	120,246	.01	39	Coal.
Tucker.....	1,338,656	1,011,478	.12	31	Do.
Webster.....	8,326,214	6,123,888	.77	20	Do.
Wyoming.....	54,039,198	48,807,243	6.19	6	Do.
Undistributed ¹	379,360,521	357,290,586	45.24	-----	-----
Total.....	825,733,000	790,110,000	100.00	-----	Coal, natural gas, petroleum, stone.

¹ Includes petroleum, natural gas, and natural-gas liquids, data for which are not available on a county basis, and Brooke, Cabell, Fayette, Grant, Greenbrier, Harrison, Jackson, Lewis, Lincoln, Marion, Marshall, Mason, Monongalia, Nicholas, Ohio, Raleigh, Randolph, Summers, Taylor, Upshur, Wayne, Wetzel, and Wood Counties, production from which must be concealed to avoid disclosure of individual company totals.

² Excludes petroleum, natural gas, and natural-gas liquids. County data for these commodities are not available.

pits near Martinsburg and North Mountain, respectively. The output was utilized in manufacturing building brick and structural clay tile.

BOONE

The only mineral commodity produced in Boone County in 1953 was bituminous coal. Most of the output came from underground mines, the largest of which were Eastern Gas & Fuel Associates Portland Nos. 1 and 2 mines near Wharton and Barrett, respectively, and the Youghiogheny & Ohio Coal Co. Van mine near Van.

BRAXTON

A small quantity of bituminous coal was produced in Braxton County in 1953. Irish Ridge Coal Co., Exchange Coal Co., and Floyd Coal Co. were the only active producers in that year.

BROOKE

The major mineral commodity produced in Brooke County was bituminous coal. Approximately one-third of the total output was derived from the county's seven strip operations. The leading producer was Windsor Power House Coal Co. Beech Bottom underground mine.

CABELL

Ohio River Dredging Co. and Union Sand & Gravel Co. operated dredges on the Ohio River near Huntington to produce building, paving, and road sand and gravel. Ohio River Dredging Co. also worked various fixed and portable plants. Shale for use in manufacturing face brick was mined by West Virginia Paving & Pressed Brick Co., Huntington.

CLAY

Six underground mines produced bituminous coal in Clay County in 1953. The Rich Run mine of Elk River Coal & Lumber Co. near Widen was the largest producer by far.

FAYETTE

Fayette County ranked as one of the largest coal-producing counties in West Virginia in 1953. There were 92 mines active, including 17 strip pits. Major producers of bituminous coal were Semet-Solvay Division, Allied Chemical & Dye Corp., operator of mines in the Kingston-Lonacre area, and New River Co., operator of mines in the Mount Hope-Summerlee-Whipple area. Sun Sand Co. produced glass sand from a pit and plant near Thayer.

GILMER

Gilmer County mines reported a small output of bituminous coal in 1953.

GRANT

Oscar Keplinger, Maysville, produced limestone in Grant County in 1953. The output was utilized for concrete aggregate, and road material. Several coal mines were also active during the year.

GREENBRIER

Bituminous coal was the major mineral commodity produced in Greenbrier County in 1953. The major producer was Leckie Smokeless Coal Co., operator of Leckie Nos. 5 and 8 mines near Anjean and the Burnrite mine near Bellburn. The limestone quarries of Acme Limestone Co. and H. Frazier Co., Inc., both of Fort Spring, yielded substantial quantities of concrete aggregate, road material, railroad ballast, and agricultural stone.

HANCOCK

Clays, sand and gravel, and bituminous coal were produced in Hancock County in 1953. The county ranked as second largest producer of fire clay in West Virginia. The output was from the underground operations of Globe Brick Co., Newell, and Crescent Brick Co., New Cumberland, and from the surface mine of West Virginia Fire Clay Manufacturing Co., also near New Cumberland. Production was utilized principally in manufacturing ladle and other refractory brick. The Keystone Division of Dravo Corp., Chester, operated a sand and gravel dredge on the Ohio River in Hancock County in 1953. Production was utilized mainly for building and paving sand and gravel.

HARRISON

The only mineral commodity produced in the mines of Harrison County in 1953 was bituminous coal. Approximately 2 million tons of this commodity was obtained by strip mining and nearly 5½ million tons from underground operations. The largest producing mines during the year were Consolidation Coal Co. No. 32 and Williams mines near Owings and Worthington, respectively. Other major producers were Barnes-Dawson Coal Co. Dawson mine and Pursglove Coal Service Co. Chiefton No. 2 mine, both near Clarksburg.

JACKSON

Constitution Stone Co., Constitution, produced grindstones in Jackson County in 1953. The company reported that the quarry was closed several weeks in 1953.

JEFFERSON

Jefferson County was the largest limestone producing area in West Virginia in 1953. This was also the only section of the State from which dimension stone for rough building material was quarried. A very small output of this commodity was quarried by the Jones & Laughlin Steel Corp. Blair Limestone Division at Millville. This organization, as well as Michigan Limestone Division, United States Steel Corp., and Standard Lime & Stone Co., also produced a substantial quantity of crushed limestone for blast furnace flux, concrete aggregate, road material, railroad ballast, and various miscellaneous uses. Standard Lime & Stone Co. and Jones & Laughlin Steel Corp. both produced quicklime and hydrated lime near Bakerton and Millville, respectively. A substantial portion of the lime output was dead-burned dolomite for refractory purposes. Standard Lime & Stone Co. also produced, at its Millville plant, a small quantity of

refractory magnesia from dolomite. West Virginia Lime Co. mined calcareous marl for agricultural purposes from a pit near Charles Town. Wet weather during the 1953 mining season again curtailed production.

KANAWHA

Mineral products of Kanawha County in 1953 included bituminous coal, salt, natural salines, clays, and engine sand. Most of the coal production was obtained from underground mines, the largest of which included Carbon Fuel Co. No. 9 and 9X mines, and Truax-Traer Coal Co. Shamrock No. 1 mine.

The sole producer of salt and natural salines in 1953 was Westvaco Chemical Division, Food Machinery & Chemical Corp., operators of an evaporation plant near South Charleston. Virtually all output was utilized for chlorine, bleaches, and chlorides. Chemical byproducts of the operation included calcium chloride, calcium-magnesium chloride, elemental bromine, ethylene dibromide, and various other bromine compounds.

Charleston Clay Products Co., Barlow, and West Virginia Brick Co., Charleston, produced clays for use in manufacturing heavy clay products.

Engine sand was produced from dredges by the Zenith Sand Co., Inc., on the Kanawha River near Finley and by the St. Albans Sand Co. near Calvert.

LEWIS

Lewis was one of the few coal-mining areas in West Virginia to have an almost 100-percent output from strip mines; 6 strip pits and 1 underground mine were active in 1953. Underground production was obtained from the Weston State Hospital No. 2 mine near Weston. Major producers, however, were the Bittner Fuel Co. and Yochym Bros. Coal Co., Clarksburg. Clays for use in manufacturing various types of brick and tile were mined by Weston Brick & Coal Co., Weston, and Jane Lew Brick & Tile Co., Jane Lew.

LINCOLN

Engine and building sands, the only mineral commodities produced in Lincoln County in 1953, were dredged by the Guyan River Co., Midkiff; Robert Davis, Ferrellsburg; and Dean Coal & Sand Co., Hamlin.

LOGAN

Logan County dropped from first place to second among the coal-producing counties of the State; 62 underground mines, 3 strip pits, and 2 auger mines were in operation in 1953. The largest mines in the county were operated by Guyan Eagle Coal Co., Powellton Coal Co., and Island Creek Coal Co. The auger-mine projects were operated by Auger Mining Co., Logan, and George O. Carter, Sharples.

MARION

Marion County was the third largest bituminous-coal-producing area in West Virginia in 1953. Virtually all of the county output was obtained from underground mines. Leading producers were Eastern Gas & Fuel Associates, Bethlehem Mines Corp., and Roches-

ter & Pittsburgh Coal Co. Plastic, flint, and miscellaneous clays were mined by the Hammond Brick Co. near Fairmont for use in manufacturing firebrick.

MARSHALL

Columbia Southern Chemical Corp. produced substantial quantities of brine from its wells near Natrium, Marshall County, in 1953. The output was utilized for chlorine, bleaches, and chlorides. Four underground coal mines were active during most of the year; the largest was The Valley Camp Coal Co. Alexander mine. Columbia Southern Chemical Corp. Columbia mine was second.

MASON

Liverpool Salt Co. produced evaporated salt by the open-pan method at its Hartford plant. Output was utilized for textile processing, tanning, meat packing, and livestock feeding, as well as table salt. A small quantity of bituminous coal was also produced in the county in 1953.

McDOWELL

McDowell County was the largest producer of bituminous coal in West Virginia, with 130 underground mines, 8 strip operations, and 4 auger mines. The major producers were United States Steel Corp., Pocahontas Fuel Co., Inc., and Pond Creek Pocahontas Co.

MERCER

Bituminous coal and clays were mined in Mercer County in 1953. The only clay producer was Virginian Brick & Tile Co., Princeton. The largest coal producers were Cliff Coal Co. Hiawatha and Smokeless mines; and Pocahontas Fuel Co., Inc., Sagamore No. 11 mine.

MINERAL

The only mineral commodity produced in Mineral County was bituminous coal. The major producer was Pine Swamp Mining Co., Piedmont.

MINGO

A substantial quantity of bituminous coal, most of which came from underground mines, was produced in Mingo County in 1953. Island Creek Coal Co. was by far the largest producer in the county.

MONONGALIA

Bituminous coal, limestone, and sand were mined in Monongalia County in 1953. The county, with an output of bituminous coal exceeding 7 million tons, was one of the major sources of this commodity in West Virginia. The leading producers remained the Purs-glove No. 15, Arkwright No. 1, and Osage No. 3 mines of Christopher Coal Co. Greer Limestone Co. produced crushed limestone for use as concrete aggregate, road material, coal-mine rock dust, and agricultural stone. Glass, engine, grinding, and polishing sands were mined by Deckers Creek Sand Co., Greer.

MORGAN

Morgan County remained the major sand-producing area in West Virginia in 1953. At its quarry and plant north of Berkeley Springs, Pennsylvania Glass Sand Corp. mined, crushed, and sized the Oriskany sandstone for sale as glass, molding, and engine sands and for miscellaneous purposes. In addition, the company reported an output of substantial quantities of ground sand and sandstone for cleansing and scouring compounds.

NICHOLAS

Soft coal and building sand were the principal commodities obtained from Nicholas County mines and quarries in 1953. The Cornelia No. 6 and No. 7 mines of Peters Creek Coal Co. at Summersville and the Quinwood No. 2 mine of Imperial Smokeless Coal Co., Quinwood, were the principal producers of bituminous coal. Nettie Sand Co. recovered building sand from its pit near Nettie.

OHIO

Coal and sand and gravel were the only mineral commodities produced in Ohio County in 1953. Virtually all coal production was from the mines of the Valley Camp Coal Co. at Elm Grove. A substantial quantity of building sand and gravel was dredged from the Ohio River near Wheeling by H. L. Sebright Co.

POCAHONTAS

Maust Coal & Coke Co. worked its No. 1 mine near Cowen throughout 1953.

PRESTON

Alpha Portland Cement Co. continued in 1953 to produce portland cement at its plant near Manheim. Raw material was quarried from the Greenbrier limestone on the Cheat River. Sandstone was quarried and crushed near Kingwood by Paul E. Garbart for use as concrete aggregate and road material. Bituminous coal was yielded by 51 underground operations, most of which were comparatively small. The Preston County Coke Co. No. 4 mine near Cascade was the only mine to produce over 100,000 tons annually.

PUTNAM

There was a small output of bituminous coal from Putnam County mines in 1953. In all, 28 operations were active, and only 4 were commercial. These were Hughes Coal Co., Eagle Hole mine; Nitro Nos. 1 and 2 mines of Thomas & Thomas Coal Co., Lanham; H. S. B. Thomas No. 1 mine, Lanham; and Zitzelbarger No. 2 mine near Poca.

RALEIGH

Raleigh County ranked fourth among the coal-producing counties in West Virginia in 1953. Leading producers were Armco Steel Co., Montcoal; Salb Fork Coal Co.; C. H. Mead Coal Co., Division of the

North American Coal & Dock Co.; and New River Co., Cranberry Sandstone, which was crushed for use as concrete aggregate and road material, was quarried by Brown & Wright Co.

RANDOLPH

Bethlehem Mines Corp. was the largest producer of bituminous coal in Randolph County in 1953. This company operated the Golden Ridge No. 92 mine near Monterville. Elkins Limestone Co., Elkins, produced limestone for concrete aggregate and road material.

SUMMERS

Springdale Coal Co. operated its Hump Mountain mine approximately 17 days in 1953 and produced a small quantity of soft coal.

TAYLOR

Bituminous coal and clay were mined in Taylor County in 1953. The principal coal producers were Insel Coal Co., operators of a strip pit near Grafton; Francis Coal Co. No. 1 mine, Simpson; and Pool Coal Co. Pool Nos. 3 and 4 mines, Simpson. Hammond Brick Co., Grafton, worked its open-pit mine near Grafton in 1953 and produced miscellaneous clays for brick manufacture.

TUCKER

The leading coal producers in Tucker County in 1953 were Thomas Engineering Co., Elkins, and Compass Coal Co. No. 36 mine near Thomas.

UPSHUR

Pecks Run Coal Co., Kano mine, and Packers Creek Coal Co., Packers Creek No. 1 mine, both near Buckhannon, were the major producers of soft coal in Upshur County in 1953. Buckhannon Brick Co. reported production of miscellaneous clays for use in manufacturing building brick.

WAYNE

Laval Sand Co., Inc., operated a sand dredge near Fort Gay. The output was sold for engine sand. Ten underground coal mines in the vicinity of East Lynn and Sidney produced substantial quantities of bituminous coal during 1953. The major producers were Trace Fork Coal Co. and Northland Coal Co.

WEBSTER

Bituminous coal, over half from the mines of Pardee & Curtin Lumber Co. near Bergoo, was the sole mineral product of Webster County in 1953. Nine operations were active in the county in that year.

WETZEL

Sand and gravel were dredged near New Martinsville by Ohio River Sand & Gravel Corp. and Ohio Valley Sand Co., Inc. This out-

put was utilized for building and paving material as well as railroad ballast.

WOOD

Ohio River Sand & Gravel Corp., Parkersburg, produced gravel for railroad ballast and miscellaneous purposes.

WYOMING

Bituminous coal was the only mineral commodity produced in Wyoming County in 1953. The major producing mines, which together supplied over 50 percent of the total output, were Pocahontas Fuel Co., Inc., Itmann mine; Eastern Gas & Fuel Associates Kopperston Nos. 1 and 2 mines; Raleigh-Wyoming Mining Co. No. 2 mine; and Allied Chemical & Dye Corp., Semet-Solvay Division, Tralee mine.

The Mineral Industry of Wisconsin

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the Bureau of Mines, United States Department of the Interior and the Geological Survey of Wisconsin.

By Samuel A. Gustavson¹



MINERAL production of Wisconsin in 1953 was valued at \$55,271,000, a 1-percent decline from 1952. Decreases in the production and value of sand and gravel, stone, and zinc more than offset increases in the production and value of cement, lime, and iron ore. The value of these 6 minerals represented about 99 percent of the total worth of the State mineral output in 1953. Other mineral commodities produced included: Abrasive stone, clays, lead, marl, quartz, and peat.

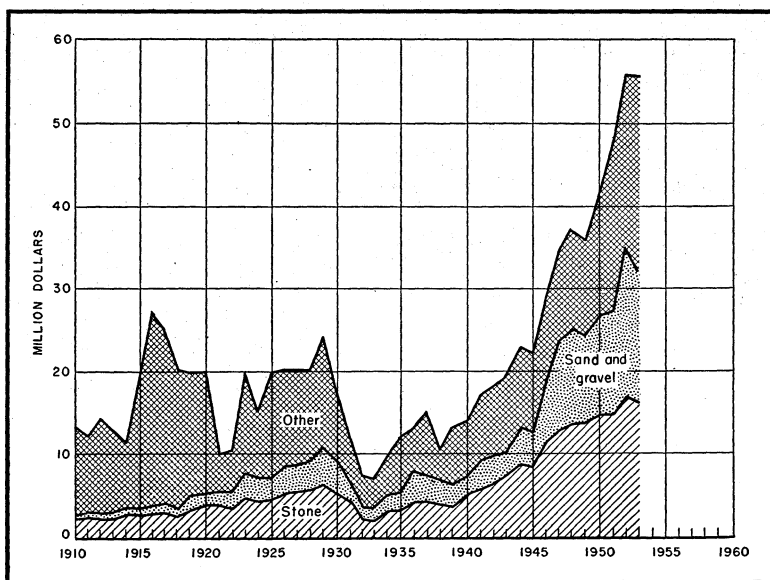


FIGURE 1.—Value of stone and sand and gravel and total value of all minerals produced in Wisconsin, 1910–53.

Table 1 lists production and value of minerals produced in Wisconsin, 1952–53. Many ores contain valuable minor constituents recovered at plants that treat mixtures of materials from many sources. It is impossible in many such instances to distribute these mineral products by place of origin. In Wisconsin these nondistributable

¹ Chief, Mineral Industry Division, Region V, Bureau of Mines, Minneapolis, Minn.

minerals probably include byproduct sulfuric acid and very small quantities of silver, cadmium, and germanium, all contained in zinc, zinc-lead, or lead ores.

TABLE 1.—Mineral production in Wisconsin, 1952-53¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Abrasive stone: Pebbles (grinding).....	723	\$17,352	(²)	(²)
Clays.....	134,453	134,493	175,311	\$175,276
Iron ore (usable)..... long tons, gross weight..	1,485,845	(²)	1,655,331	(²)
Lead (recoverable content of ores, etc.).....	2,000	644,000	2,094	548,628
Lime (open-market).....	107,813	1,368,556	123,997	1,566,085
Marl, calcareous (except for cement).....	17,000	8,833	15,871	7,327
Peat.....	(²)	(²)	366	(²)
Sand and gravel.....	24,895,947	16,938,228	23,656,086	16,173,302
Stone (except limestone for cement and lime).....	8,578,882	16,754,675	7,450,396	16,039,183
Zinc (recoverable content of ores, etc.).....	20,588	6,835,216	16,830	3,870,900
Undistributed: Abrasive stone (tube-mill liners), cement, quartz, ground sand and sandstone, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2). Excludes value of clays used for cement.....		\$13,008,759		16,890,752
Total Wisconsin.....		55,710,000		55,271,000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

² Value included with "Undistributed."

³ Revised figure.

DEFENSE MINERALS EXPLORATION ADMINISTRATION

Six contracts for lead-zinc exploration in the Upper Mississippi Valley field, all holdovers from the previous year, were in effect in Wisconsin during 1953 between mine operators and the Defense Minerals Exploration Administration (DMEA). At a total cost to the Government of \$166,711.17, work was completed on 3 contracts, which resulted in DMEA certifications of discovery. The Government approved the assignment of E. P. Scallon's contract to the Piquette Mining & Milling Co., Platteville, a joint venture of the Piquette Mining Co., Platteville, and the American Zinc, Lead & Smelting Co., St. Louis, Mo. Still in effect at the year end were contracts with the Piquette Mining & Milling Co., Vinegar Hill Zinc Co., and Eagle-Picher Co.

The Homestead Mining Co. operated a new zinc-lead concentrating mill near Platteville, in Grant County, spasmodically for several months during 1953 until operations were suspended on May 30. The mill was completed in December 1952 under a \$240,000 loan from the Reconstruction Finance Corporation, which also called for unwatering and rehabilitating the Homestead and Acme mines and developing and equipping the Rasque ore body. The Acme mine produced about 9,700 tons of 3.5-percent zinc ore and the Rasque mine about 3,200 tons of 9.2-percent zinc ore during the brief period of operation.

TABLE 2.—DMEA contracts in effect during 1953

Company or operator	Mineral	County	Contract date	Work begun	Work ended	Proposed total cost	Actual cost to Government	Government share in actual cost (percent)	DMEA certifications of discovery reported
Piquette Mining & Milling Co., Platteville, Wis. ¹	Zinc.....	Grant.....	June 20, 1951	Oct. 28, 1951	(²)	\$19,100.00	(²)	50	
Calumet & Hecla, Inc., Calumet, Mich.....	Zinc-lead....	Lafayette and Jo Daviess (Ill.).	July 13, 1951	July 18, 1951	June 5, 1953	310,430.00	\$155,068.28	50	Yes.
Cuba Mining Co., Platteville, Wis. ³	Lead-zinc....	Iowa.....	Jan. 25, 1952	Mar. 24, 1952	Apr. 20, 1953	429,154.00	10,292.65	50	Yes.
Vinegar Hill Zinc Co., Platteville, Wis.....	do.....	Lafayette.....	Feb. 6, 1952	Feb. 6, 1952	(²)	68,440.38	(²)	50	
Eagle-Picher Co., Miami, Okla.....	do.....	do.....	June 11, 1952	June 11, 1952	(²)	191,230.78	(²)	50	
Mayer & Thiede Mining Co., Chicago, Ill. ⁴	do.....	do.....	June 13, 1952	June 1, 1953	July 23, 1953	10,000.00	1,350.24	50	Yes.

¹ E. P. Scallon, St. Paul, Minn., assigned property leases to Piquette Mining & Milling Co. on Oct. 19, 1953. Assignment of contract to new company approved by Government on Nov. 12, 1953.

² Work under contract not completed as of Dec. 31, 1953.

³ Assignment of contract from D. H. & S. Mining Co., Dodgeville, Wis., to the Cuba Mining Co. approved by Government, effective Nov. 1, 1952.

⁴ Proposed total cost as amended Nov. 1, 1952.

⁵ Contract ended before completion of work by an agreement dated Oct. 20, 1953.

REVIEW BY MINERAL COMMODITIES

METALS

Iron Ore.—Shipments of usable iron ore from mines in Wisconsin totaled 1,655,300 long tons in 1953, an 11-percent increase over 1952. Shipments in 1953 have been exceeded only in 1950 and 1951. Production in 1953 was from the Montreal mine operated by Oglebay, Norton & Co., the Cary mine operated by Pickands, Mather & Co., and the Davidson mine operated by Zontelli Bros., Inc. The Montreal and Cary mines are on the Gogebic range in Iron County, and the Davidson mine is on the Menominee range in Florence County.

The Montreal and Cary mines were underground operations. The Davidson mine was an open-pit operation. All ore was of direct-shipment grade. In gross tons, stocks of ore at Wisconsin mines January 1 totaled 146,300 tons. Production was 1,756,200 tons. Shipments were 1,655,300, and year-end stocks totaled 247,100 tons. The iron content of the ore produced was 931,500 tons.

In the Lake Superior district (Minnesota, Michigan, and Wisconsin) decontrol of prices for iron ore by the Office of Price Stabilization became effective February 12, 1953, and new base prices effective from that date were Mesabi non-Bessemer and High-Phosphorus \$9.70 per long ton, Mesabi Bessemer \$9.85, Old Range non-Bessemer \$9.95, Old Range Bessemer \$10.10, and Lake Superior open-hearth lump ore \$10.95. These prices held until July 1, when a further increase became effective. At the end of 1953 Lake Erie base prices were: Mesabi non-Bessemer and High-Phosphorus \$9.90 per ton, Mesabi Bessemer \$10.05, Old Range non-Bessemer \$10.15, Old Range Bessemer \$10.30, and open-hearth lump ore \$11.15. These prices were for ore delivered at lower Lake ports, carrying 51.5 percent natural iron content with 0.045 percent (max.) phosphorus (dry) for Bessemer grades; ores exceeding 0.18 percent phosphorus (dry) are classified as High-Phosphorus. Premiums and penalties are applied for variations in analyses and physical structure.

TABLE 3.—Iron-ore (hematite) production and shipments, 1949–53

Year	Number of mines	Production (gross tons)	Shipments (gross tons)	Iron content shipments, natural (percent)
1949.....	2	1,433,557	1,405,775	52.88
1950.....	2	1,701,638	1,701,619	52.89
1951.....	2	1,757,234	1,745,120	52.41
1952.....	2	1,495,109	1,485,845	52.56
1953.....	3	1,756,150	1,655,331	52.48

Lead and Zinc.—Wisconsin's lead- and zinc-mining district is in the southwestern part of the State in Grant, Iowa, and Lafayette Counties. The district extends into two adjacent States—Iowa and Illinois.

Output from Wisconsin mines in 1953, in terms of recoverable metals, totaled 2,100 short tons of lead and 16,800 short tons of zinc, representing a 5-percent increase in lead production over 1952 but an 18-percent decrease in zinc production. The Vinegar Hill Zinc

Co. and Calumet & Hecla, Inc., operated continuously throughout the year. They were virtually the only producing operators of zinc or zinc-lead mines in the State during the last 3 months of 1953. The mines of both these companies were in Lafayette County. Other producers stopped or curtailed operations, chiefly because of the low price for zinc.

Calumet & Hecla, Inc., was again the State's largest producer of both lead and zinc. The company Calumet mine and concentration mill are just south of Shullsburg, Lafayette County. Vinegar Hill Zinc Co. was the second largest producer of lead and zinc in the State in 1953. The company mines and custom concentrating mill are also in Lafayette County. Eagle-Picher Co., Mining and Smelting Division, operated the Birkett, Andrews, and Bastian mines from August 1952 through March 31, 1953, when a fire destroyed the powerplant at the company Graham central mill. The damage was repaired; but, because of the low price of zinc, operations were not resumed. The Mifflin Mining Co. ceased production January 30 because of the low price of zinc, then started again in March and operated through July, except for a short period in May. This production was from the Coker and Bickford mines near Mifflin, Iowa County. Both mines are operated through one inclined adit.

Other producers during the year included Whitechurch & Farr, George M. Baker Milling Co., Murray & Richards Mining Co., and Homestead Mining Co. The Dodgeville Mining Co. ceased operations at Dodgeville in June 1952; however, the company made a test shipment of ore from a prospect during 1953. With a \$240,000 (RFC) loan, the Homestead Mining Co. opened the Acme and Rasque mines and operated a new mill at Platteville spasmodically until May 30, 1953, when operations ceased. About 810 tons of zinc concentrate were produced and sold. Davis Mining Enterprises received a \$220,000 (RFC) loan in January 1953 to develop zinc-ore property near Linden, Iowa County.

In 1953 the average weighted yearly prices used for calculating values of lead and zinc produced were 13.1 cents per pound for lead and 11.5 cents per pound for zinc. Average prices for 1952 were lead 16.1 cents per pound and zinc 16.6 cents per pound. For zinc metal the market prices, East St. Louis, per pound opened 1953 at 12.5 cents, advanced to 13 cents January 2, dropped to 11 cents by March 5, and reached a low of 10 cents September 11, where they remained through the end of the year.

TABLE 4.—Mine production of lead and zinc, 1949-53, in terms of recoverable metals

Year	Mines producing		Material treated		Lead		Zinc		Total value
	Lode	Tailings	Ore (short tons)	Tailings ¹ (short tons)	Short tons	Value	Short tons	Value	
1949.....	45	1	165,962	8,000	857	\$270,812	5,295	\$1,313,160	\$1,583,972
1950.....	11	1	186,083	19,600	532	143,640	5,722	1,625,048	1,768,688
1951.....	22	3	499,971	14,750	1,391	481,286	15,754	5,734,456	6,215,742
1952.....	24	10	670,332	82,146	2,000	644,000	20,588	6,835,216	7,479,216
1953.....	29	3	534,882	19,133	2,094	548,628	16,830	3,870,900	4,419,528

¹ Partly estimated.

TABLE 5.—Mine production of lead and zinc in 1953, by months, in terms of recoverable metals, in short tons

Month	Lead	Zinc	Month	Lead	Zinc
January.....	199	1,745	August.....	149	1,066
February.....	163	1,785	September.....	124	1,029
March.....	231	1,970	October.....	197	1,315
April.....	203	1,815	November.....	183	1,075
May.....	135	1,360	December.....	126	1,198
June.....	177	1,235			
July.....	197	1,237	Total.....	2,094	16,830

NONMETALS

Cement.—Portland cement was produced by Manitowoc Portland Cement Co. at Manitowoc. Output was about 46 percent greater than in 1952. The company is a subsidiary of Medusa Portland Cement Co. (home office in Cleveland, Ohio). Hydraulic lime cement was produced by The Western Lime & Cement Co. at its High Cliff plant, Calumet County.

Clays.—Clays produced in the State were chiefly for use in manufacturing heavy clay products and cement. The greater part of the output for heavy clay products was from pits in Brown, Dunn, Fond du Lac, LaCrosse, Marathon, Racine, and Waupaca Counties. The larger producers of either common brick or other heavy clay products include: Hockers Bros. Brick & Tile Co., in Brown County; Menomonie Brick Co., in Dunn County; Oakfield Shale Brick & Tile Co., in Fond du Lac County; Marshfield Brick & Tile Co., in Marathon County; Union Grove Drain Tile Co., in Racine County; and Hockers Brick Co. and Waupaca Brick Co., both in Waupaca County.

Production and value of raw clay used in cement manufacture are included in the tables and discussion on clays in this chapter.

Lime.—Producers of lime in Wisconsin included: Western Lime & Cement Co., with plants in Brown, Calumet, and Fond du Lac Counties; Cutler-LaLiberte-McDougall Corp., with a plant in Douglas County; Rockwell Lime Co., with a plant in Manitowoc County; and Valders Lime & Stone Co., Inc., with a plant in Manitowoc County. Cutler-LaLiberte-McDougall Corp. and Valders Lime & Stone Co., Inc., produce only quicklime in Wisconsin plants. However, Cutler-LaLiberte-McDougall Corp. does make hydrated lime at its Duluth, Minn., plant. Cutler-LaLiberte-McDougall Corp. obtains all its limestone from Michigan. The total production of hydrated and quicklime was 15 percent greater than in 1952.

Production of open-market quicklime and hydrated lime in 1953 was 124,000 tons (includes 471 tons used by producer) valued at \$1,566,000 compared with 107,800 tons valued at \$1,369,000 in 1952. The average reported selling price of hydrated and quicklime in 1953 in Wisconsin was \$12.63 per ton.

Marl.—Production of marl was reported by 10 firms in 1953. The output was about 7 percent less than in 1952. The producing pits were situated in Portage, Washburn, Waupaca, and Waushara Counties. All output was for agricultural use.

Perlite.—Plants in Milwaukee and Appleton, using crude rock from deposits in Western States, produced expanded perlite for use chiefly as a lightweight aggregate in plaster and concrete.

Sand and Gravel.—Sand and gravel production in 1953 was reported by 123 commercial operators. Also, 50 Government agencies (cities, counties, etc.) reported production or were contracting for production of sand and gravel. In all, output was reported from sources in 55 of the State's 71 counties. The 10 leading commercial producers in 1953 were: Courtney & Plummer, Neenah; Friedrich & Loots, Oshkosh; Janesville Sand & Gravel Co., Janesville; Jaeger Sand & Gravel Co., Milwaukee; Koepke Sand & Gravel Co., Appleton; Ed Lutz Sand & Gravel Co., Inc., Milwaukee; Portage Manley Sand Co., Rockton, Ill.; A. J. Reiske Sons Co., Milwaukee; Schultz Sand & Gravel, Inc., Appleton; and Schuster Construction Co., Denmark.

TABLE 6.—Sand and gravel sold or used by producers, 1952–53, by classes of operations and uses

Class of operation and use	1952			1953		
	Short tons	Value		Short tons	Value	
		Total	Average per ton		Total	Average per ton
COMMERCIAL OPERATIONS						
Sand:						
Building.....	2,276,143	\$1,759,848	\$0.77	1,984,787	\$1,486,557	\$0.75
Paving.....	756,671	558,186	.74	1,164,428	948,319	.81
Fire or furnace.....	7,350	52,000	7.07	—	—	—
Railroad ballast.....	(1)	(1)	(1)	56,873	32,282	.57
Other.....	376,617	157,830	.42	262,459	109,405	.42
Undistributed ²	638,533	1,133,912	1.78	621,958	1,151,624	1.85
Total commercial sand.....	4,055,314	3,661,776	.90	4,090,505	3,728,187	.91
Gravel:						
Building.....	1,992,987	1,695,615	.85	1,995,251	1,588,501	.80
Paving.....	5,017,094	3,485,166	.69	4,661,254	3,359,064	.72
Railroad ballast.....	990,919	375,774	.38	1,249,717	531,152	.43
Other.....	194,457	56,658	.29	142,697	65,929	.46
Total commercial gravel.....	8,195,457	5,613,213	.68	8,048,919	5,544,646	.69
Total commercial sand and gravel.....	12,250,771	9,274,989	.76	12,139,424	9,272,833	.76
GOVERNMENT-AND-CONTRACTOR OPERATIONS						
Sand:						
Building.....	78,518	48,409	.62	—	—	—
Paving.....	1,723,080	741,045	.43	2,504,979	1,405,743	.56
Total Government-and-contractor sand.....	1,801,598	789,454	.44	2,504,979	1,405,743	.56
Gravel:						
Building.....	412,300	432,933	1.05	—	—	—
Paving.....	10,431,278	6,440,852	.62	9,011,683	5,494,726	.61
Total Government-and-contractor gravel.....	10,843,578	6,873,785	.63	9,011,683	5,494,726	.61
Total Government-and-contractor sand and gravel.....	12,645,176	7,663,239	.61	11,516,662	6,900,469	.60
ALL OPERATIONS						
Sand.....	5,856,912	4,451,230	.76	6,595,484	5,133,930	.78
Gravel.....	19,039,035	12,486,998	.66	17,060,602	11,039,372	.65
Grand total.....	24,895,947	16,938,228	.68	23,656,086	16,173,302	.68

¹ Included with "Undistributed" to avoid disclosure of individual company operations.

² Includes molding, blast (1953 only), engine, grinding, and polishing (1952 only) sand.

Stone.—Wisconsin supplied dimension granite in shades of gray, black, and red. Output came from five counties and was used in buildings and for monuments. Dimension limestone and sandstone were produced primarily for building purposes, the chief market being as a veneer for private dwellings. Table 7 shows the production and value of rough and dressed dimension stone in 1952 and 1953.

Crushed granite, limestone, sandstone, and basalt were produced from many localities in the State. The principal uses of crushed granite, limestone, and sandstone were for road material, concrete aggregate, riprap, and railroad ballast. In Marinette County basalt was used in manufacturing roofing granules. Limestone, in addition to dimension and construction use, was also widely used for agricultural purposes. In Wisconsin agricultural limestone must meet rigid specifications as to size and must have a neutralizing value of at least 85 percent on a dry basis.

Quartzite from quarries in Marathon County was used in manufacturing roofing granules and abrasive products. Quartzite produced in Sauk County was used as grinding pebbles and tube-mill liners and also as a concrete aggregate.

Sandstone and ground sand from Sauk County was used as a refractory material (ganister) and as a foundry sand. Table 8 shows the production and value of crushed stone in 1952 and 1953.

TABLE 7.—Dimension stone sold or used by producers, 1952-53, by kinds and uses

Kind and use	1952			1953		
	Quantity	Value	Average value	Quantity	Value	Average value
Granite:						
Rough: Architectural and monumental..... cubic feet..	30,761	\$103,557	\$3.37	54,208	\$333,893	\$6.16
Dressed: Monumental..... do....	85,560	1,364,329	15.95	78,181	1,151,845	14.73
Total granite equivalent short tons ¹ ..	9,596	1,467,886	152.97	10,922	1,485,738	136.03
Limestone:						
Building stone: Rough construction:						
Commercial..... short tons..	2,005	9,597	4.79	18,081	48,969	2.71
Noncommercial..... do....	175	88	.50	480	72	.15
Rubble:						
Commercial..... do....	13,545	39,522	2.92	10,084	29,244	2.90
Noncommercial..... do....	450	225	.50	715	107	.15
Rough architectural..... cubic feet..	100,125	199,093	1.99	96,504	183,736	1.90
Dressed:						
Sawed..... do....	43,900	117,788	2.68	25,350	85,027	3.35
Cut..... do....	213,028	554,996	2.61	237,118	601,480	2.54
Curbing and flagging..... do....	71,664	65,447	.91	73,932	67,743	.92
Total limestone equivalent short tons ¹ ..	50,474	986,756	19.55	63,992	1,016,378	15.88
Sandstone, all uses..... short tons..	2,729	62,869	23.04	3,118	71,814	23.03
Total dimension stone equivalent short tons ¹ ..	62,799	2,517,511	40.09	78,032	2,573,930	32.99

¹ Following average weights per cubic foot used in converting to short tons: Granite, 165 pounds; limestone, 160 pounds; sandstone, 160 pounds.

TABLE 8.—Crushed and broken stone sold or used by producers, 1952-53, by kinds and uses

Kind and use	1952			1953		
	Short tons	Value	Average value	Short tons	Value	Average value
Basalt and granite: All uses, commercial and noncommercial.....	328,360	\$970,089	\$2.96	402,532	\$1,138,048	\$2.83
Limestone (exclusive of limestone used in cement and lime):						
Riprap:						
Commercial.....	116,073	173,769	1.50	34,255	39,674	1.16
Noncommercial.....	4,750	1,900	.40	700	980	1.40
Flux.....	105,357	108,258	1.03	18,674	21,469	1.15
Concrete and road:						
Commercial.....	4,164,682	4,820,305	1.16	4,520,707	4,837,537	1.07
Noncommercial.....	1,419,121	1,336,018	.94	428,925	396,650	.92
Railroad ballast.....	195,637	231,165	1.18	157,639	198,075	1.26
Agricultural:						
Commercial.....	1,072,511	1,552,292	1.45	786,276	1,166,685	1.48
Noncommercial.....	219,700	349,108	1.59	167,835	234,737	1.40
Other: Commercial.....	85,680	179,941	2.10	144,252	207,258	1.44
Total commercial.....	5,739,940	7,065,730	1.23	5,661,803	6,470,698	1.14
Total noncommercial.....	1,643,571	1,687,026	1.03	597,460	632,367	1.06
Total limestone.....	7,383,511	8,752,756	1.19	6,259,263	7,103,065	1.13
Sandstone: All uses, commercial and non-commercial.....	697,823	4,436,835	6.36	699,954	5,209,498	7.44
Miscellaneous stone: All uses, commercial and noncommercial.....	106,389	77,484	.73	10,615	14,642	1.38
Total commercial.....	6,552,409	12,310,918	1.88	6,570,060	12,659,523	1.93
Total noncommercial.....	1,963,674	1,926,246	.98	802,304	805,730	1.00
Grand total.....	8,516,083	14,237,164	1.67	7,372,364	13,465,253	1.83

MINERAL FUELS

Fuel Briquets and Packaged Fuel.—Several companies produced coal or coke briquets, and three companies produced packaged fuel. In 1953 the total output of packaged fuel was 13,701 short tons valued at \$245,397. The Milwaukee Solvay Coke Co. was the State's only coke producer.

Peat.—Tardif Domestic Peat Sales Co. produced moss peat from its property in Waukesha County near Delafield. Output was for agricultural purposes.

REVIEW BY COUNTIES

ASHLAND

Cold Spring Granite Co. produced rough building and monumental stone from the Mellen quarry. The granite, described as "veined ebony black," was finished at the company's plant, Cold Spring, Minn.

BARRON

The Barron County Agricultural Department, Barron, produced limestone for agricultural purposes.

Building sand and gravel was produced by Clyde Lilly of Poskin and sand and gravel for road construction was produced by and for the county highway department.

TABLE 9.—Value of mineral production in Wisconsin, 1952-53, by counties

County	1952	1953	Minerals produced in 1953 in order of value
Barron.....	\$261,926	\$212,060	Stone, sand and gravel.
Brown.....	974,674	907,440	Sand and gravel, stone, lime, clays.
Buffalo.....	340,233	187,834	Stone.
Burnett.....	52,451	28,388	Sand and gravel.
Calumet.....	129,025	156,810	Lime, sand and gravel, stone, hydraulic lime cement.
Clark.....	104,536	133,550	Sand and gravel, stone.
Columbia.....	410,439	1,216,552	Do.
Crawford.....	21,741	34,024	Stone, sand and gravel.
Dane.....	6,691,448	1,296,381	Sand and gravel, stone.
Dodge.....	651,550	600,768	Sand and gravel, lime, stone.
Door.....	187,092	178,571	Stone, sand and gravel.
Douglas.....	783,777	764,273	Lime, sand and gravel.
Dunn.....	75,118	30,142	Stone, clays.
Eau Claire.....	-----	14,139	Sand and gravel.
Fond du Lac.....	1,007,498	750,212	Stone, sand and gravel, lime, clays.
Forest.....	76,199	80,902	Sand and gravel.
Grant.....	690,554	456,889	Stone, zinc, lead, sand and gravel.
Green.....	368,616	366,411	Stone, sand and gravel, ground sand and sandstone.
Green Lake.....	185,108	(1)	Sand and gravel.
Iowa.....	998,355	237,802	Stone, zinc, lead.
Jefferson.....	129,483	140,583	Sand and gravel, stone.
Juneau.....	(1)	223,497	Do.
Kenosha.....	192,355	190,954	Sand and gravel.
La Crosse.....	105,034	69,673	Sand and gravel, stone, clays.
Lafayette.....	6,774,611	4,188,486	Zinc, lead.
Lincoln.....	(1)	101,114	Sand and gravel.
Manitowoc.....	3,889,809	5,650,331	Cement, stone, sand and gravel, lime.
Marathon.....	4,746,211	5,213,270	Stone, sand and gravel, quartzite, clays.
Marquette.....	853,245	812,183	Stone, sand and gravel.
Marquette.....	(1)	289,012	Do.
Milwaukee.....	1,304,697	832,676	Do.
Monroe.....	(1)	136,856	Stone.
Oconto.....	196,224	245,252	Sand and gravel, stone.
Oneida.....	(1)	176,504	Do.
Outagamie.....	(1)	194,500	Sand and gravel.
Ozaukee.....	95,514	(1)	Do.
Pierce.....	296,304	118,472	Sand and gravel, stone.
Polk.....	266,746	347,987	Stone, sand and gravel.
Portage.....	346,234	267,669	Sand and gravel, stone, marl.
Price.....	22,897	10,282	Sand and gravel.
Racine.....	851,138	824,788	Stone, sand and gravel, clays.
Richland.....	84,465	254,477	Stone.
Rock.....	1,280,329	1,372,226	Sand and gravel, stone.
St. Croix.....	650,336	537,258	Do.
Sauk.....	1,728,143	1,746,209	Stone, sand and gravel, grinding pebbles, and tube-mill liners.
Sawyer.....	42,030	55,281	Sand and gravel.
Shawano.....	208,066	181,455	Sand and gravel, stone.
Sheboygan.....	334,588	341,620	Do.
Taylor.....	13,048	65,000	Sand and gravel.
Vernon.....	135,271	461,134	Stone, sand and gravel.
Vilas.....	(1)	132,259	Sand and gravel.
Walworth.....	293,754	195,656	Sand and gravel, stone.
Washburn.....	(1)	1,090	Marl.
Washington.....	385,580	397,708	Sand and gravel, stone.
Waukesha.....	3,354,218	2,956,864	Stone, sand and gravel, peat.
Waupaca.....	58,269	8,539	Clays, marl.
Wausara.....	29,943	7,223	Sand and gravel, marl.
Winnebago.....	1,427,012	1,187,595	Stone, sand and gravel.
Wood.....	(1)	226,527	Stone.
Undistributed ²	11,634,218	17,455,195	
Total.....	55,710,000	55,271,000	

¹ Included with "Undistributed."

² Includes value of mineral production and principal minerals produced as indicated in footnote 1 and in the following counties: Ashland (stone); Bayfield (sand and gravel, 1952 only); Chippewa (sand and gravel); Florence (iron ore); Iron (iron ore, sand and gravel); Kewaunee (sand and gravel); Langlade (sand and gravel); Rusk (sand and gravel); Trempealeau (stone).

BROWN

Duck Creek Brick Co. and Hockers Bros. Brick & Tile Co., both of Green Bay, produced miscellaneous clays for the manufacture of building brick and heavy clay products. The Western Lime &

Cement Co., Milwaukee, produced quicklime and hydrated lime at its Green Bay plant for chemical and industrial use. Dimension limestone used for rough building stone, cut stone, and flagging was produced by Nels Scray and Victor De Cleene, both of De Pere. Crushed stone for road-building and agricultural purposes was produced by Daanen & Janssen and Nels Scray, both of De Pere, and Edward Kraemer & Sons, of Plain. Companies producing sand and gravel in Brown County include Schuster Construction Co., Denmark; Daanen & Janssen and Ed Kocken, De Pere; Flor Evraets and Frank Van Nelson, Green Bay; and the W. B. Sheedy Construction Co., Pulaski. Production was chiefly for building and road purposes.

BUFFALO

Crushed limestone for road construction and agricultural purposes was produced by H. E. Kochenderfer, Cochrane; Neuheisel Lime Works (Eau Claire), Mondovi; Otto Sanders, Inc., Mount Horeb; and H. O. Tiffany, Jr., Nelson.

BURNETT

The Minneapolis, St. Paul & Sault Ste. Marie Railroad Co. produced engine sand, and the Burnett County Highway Department produced sand and gravel for road construction.

CALUMET

The Western Lime & Cement Co. of Milwaukee produced quicklime and hydrated lime for building, agricultural, chemical, and industrial uses at its High Cliff plant. The company also produced a hydraulic lime cement and crushed limestone for road construction. The Calumet County Highway Department produced crushed limestone for road construction. Quality Sand & Gravel Co., Wrightstown, produced building and paving gravel, and the Calumet County Highway Commission produced gravel for highway purposes.

CHIPPEWA

Chippewa Gravel Co., Chippewa Falls, produced building sand and gravel.

CLARK

Ellis Stone Construction Co., Stevens Point, produced dimension sandstone for architectural use. Charles Marek, Merillan, produced sand and gravel for road construction; and Plautz Bros. Sand & Gravel Co., Willard, produced building sand and building and paving gravel. Sand and gravel for highway work was produced by and for the county highway commission.

COLUMBIA

Crushed limestone for agricultural use was produced by Dann & Wendt, Rio, and Kuhnau & Hosig Bros., Spring Green. Marvin H. Ladwig, Columbus, produced gravel for building and paving; Francis James and John F. Kirley, both of Doylestown, produced molding

and building sand, and Portage Manley Sand Co., Rockton, Ill., produced molding sand from its Columbia County pit. Road gravel was produced by the county highway commission.

CRAWFORD

Crushed limestone for road construction was produced by Edward Kraemer & Sons, Plain, and Loren J. Slaght, Prairie du Chien. Velda Ward and Velmer Monroe, Eastman, produced limestone for fluxing purposes. Frank Mezera, Eastman, produced sand for miscellaneous uses.

DANE

Crushed limestone for road construction and agricultural purposes was produced by Alva Brumm, Carl Raemisch, Stewart Watson, and Wingra Stone Co., all of Madison; Boehnen Estate, Cross Plains; Elden Quam and Rein & Dahl, Stoughton; Einar Evenson and Norman Carpenter, Cambridge; Lawrence Schneider, Oregon; and the Dane County Highway Department. Sand and gravel producers in Dane County include: Capital Sand & Gravel Co., Madison Sand & Gravel Co., and Speedway Sand & Gravel Co., Madison; Rein & Dahl and Sundby Sand & Gravel Co., Stoughton; Hartland Verona Gravel Corp., Verona; Charles Langer & Son, Waterloo; and Maier & Ketelbodter and Frank Raemisch, Waunakee. Production was chiefly for building and road purposes. Sand and gravel for highway purposes was produced by and for the county highway department.

DODGE

Lime was produced by the Western Lime & Cement Co., Milwaukee, at its Knowles plant for building, agricultural, chemical, and industrial uses. Limestone for rubble, flux, road construction, and agriculture was produced by the Mayville White Lime Works, Mayville, and the Western Lime & Cement Co., Knowles. Melvin Voigt (Ashippun), C. C. Linck, Inc. (Beaver Dam), and Edward Brunt & Eugene Frings (Watertown) produced sand and gravel for road construction. Sand and gravel for highway purposes was produced by and for the county highway department.

DOOR

Dimension limestone was produced by Adamski & Emil Fisher, Sturgeon Bay. Crushed limestone for road construction was produced by Elmer L. Albert, Sturgeon Bay, and by the Door County Highway Department. The county highway department produced gravel for highway purposes.

DOUGLAS

Lime was produced by the Cutler-LaLiberte-McDougall Corp., at Superior, for building, chemical, and industrial uses. Limestone used was produced in Michigan. Paving and road sand and gravel was produced by the city of Superior and by and for the county highway department.

DUNN

The Menomonie Brick Co., Menomonie, produced clays for manufacturing building brick and heavy clay products. The Downsville Cut Stone Co., Downsville, produced rough and dressed sandstone for building purposes. Agricultural limestone was produced by Otto Sanders, Inc., Mount Horeb, and the Dunn County Highway Commission produced crushed limestone for road construction.

EAU CLAIRE

Paving sand and gravel was produced by and for the city of Eau Claire.

FLORENCE

Zontelli Bros., Inc., Ironton, Minn., operated the Davidson iron mine, an open-pit operation, near Florence, on the Menominee range. Production in 1953 from this mine was 45,127 gross tons; shipments were 40,134 gross tons.

FOND du LAC

The Oakfield Shale Brick & Tile Co., Oakfield, produced clays for manufacturing building brick and heavy clay products. Western Lime & Cement Co., Milwaukee, produced lime at its Eden Plant for building, agricultural, chemical, and industrial uses. Rough and finished limestone for architectural use and crushed limestone for road construction and agricultural use were produced by the Fond du Lac Stone Co. and Nellis Limestone, Inc., both of Fond du Lac, and Western Lime & Cement Co., Eden. Building and paving sand and gravel was produced by Braun Construction Co., Lake View Sand & Gravel Co., and the county highway department, all of Fond du Lac.

FOREST

Railroad ballast was produced by the Minneapolis, St. Paul & Sault Ste. Marie Railroad Co. and gravel for highway purposes by the county highway department.

GRANT

The Homestead Mining Co., Platteville, operated the Acme and Rasque zinc mines and a new mill at Platteville after having received a \$240,000 RFC loan in 1952. About 810 tons of zinc concentrates were produced and sold before operations ceased in May 1953. Eagle-Picher Co., Mining and Smelting Division, of Miami, Okla., operated the Bastian zinc mine until March 31, 1953, when it was closed after a fire destroyed the powerplant of the company Graham central mill in Illinois. The mine remained closed after the fire damage was repaired because of the low price of zinc. A small production of lead and zinc was also reported by other producers. The Piquette Mining & Milling Co., Platteville, has undertaken development of a lead-zinc ore body at Tennyson under a DMEA contract.

Crushed limestone for use as riprap, railroad ballast, road construction, and agriculture was produced by Becker & Tuckwood, Lancaster; Joe C. Hartnett, Platteville; Dell Needham, Fennimore;

E. C. Schroeder Co., Inc., McGregor, Iowa; and Zenz & Sturmer, Bloomington. Sand for highway purposes was produced by the county highway department.

GREEN

Crushed limestone for road construction and agricultural use was produced by P. W. Ryan Sons, Janesville, and Waelti Lime & Gravel Co., Juda. Ground sandstone was produced by the Lyle T. Manley Silica Co., Rockton, Ill. The plant was formerly operated as the Browntown Silica Co. A new storage silo was added to the three already in use. Vacuum separators were installed for separating and grading the silica. A building to house the plant equipment was built. Paving and road sand and gravel was produced by Henry Altmann and Green County Sand & Gravel Co., Inc., and by and for the county highway commission, all of Monroe.

GREEN LAKE

Molding sand and paving gravel were produced by Leonard & Theodore Chier, Berlin and building sand and gravel was produced by Kopplin & Kinan Co., Inc., Green Lake.

IOWA

The Mifflin Mining Co., Mifflin, operated the Coker No. 1 and the Bickford mines and company mill near Mifflin, producing both zinc and lead; both mines are operated through one inclined adit. The company ceased production January 30, started again in March, and operated through July, except for a short period in May. The Dodgeville Mining Co., Dodgeville, made a test shipment of zinc ore from a prospect in 1953. Davis Mining Enterprises received a \$220,000 RFC loan in January 1953 to develop its zinc-ore property near Linden and construct a jig and flotation mill with a capacity of 250 tons of ore per day. Production was expected to begin in 1954. Wonn & Bailey, Cobb, produced crushed limestone for road construction and agricultural use.

IRON

Production of iron ore from the Montreal mine, operated by Oglebay, Norton & Co., Cleveland, Ohio, and from the Cary mine, operated by Pickands, Mather & Co., also of Cleveland, totaled 1,711,023 gross tons in 1953; shipments were 1,615,197 gross tons. Both mines were opened in 1886. Since that date the Montreal has shipped every year except 1921; the Cary, every year except 1932. Both were underground operations on an extension of the Gogebic range. The county highway department and Ironwood City produced paving and road gravel.

JEFFERSON

Donald Diekow, Jefferson, produced crushed limestone for agricultural use. Building and paving sand and gravel was produced by Einar Evenson, Cambridge; Hausz Bros., Fort Atkinson; and the county highway commission.

JUNEAU

Crushed limestone for road construction was produced by Edward Kraemer & Sons, Plain, and Arthur Overgaard, Elroy. Paving sand and gravel was produced by and for the county highway department, and road gravel was produced by Arthur Overgaard.

KENOSHA

Bloss Sand & Gravel, Salem, the City of Kenosha, and the county highway department produced paving and road sand and gravel.

KEWAUNEE

Paving and road sand and gravel for railroad ballast was produced by Casco Sand & Gravel Corp., Casco.

LA CROSSE

The Meir Brick Co., La Crosse, produced clays for manufacturing building brick and heavy clay products. Herbert Hass, La Crosse, produced limestone flagging and Edward Kraemer & Sons, Plain, crushed limestone for road construction. Kammel-Smith Sand & Gravel Co., La Crosse, and Carl N. Hauge, Medary Sand & Gravel Co., and Josephine Waldenberger, all of Onalaska, produced building sand and gravel. The county highway department produced sand for highway purposes.

LAFAYETTE

Approximately 99 percent of the lead output and 94 percent of the zinc output in the State in 1953 were produced from 24 operations in Lafayette County. Chief producers during the year were: Calumet & Hecla, Inc., Vinegar Hill Zinc Co., and Eagle-Picher Co. Mining and Smelting Division. Calumet & Hecla, Inc., operated its Central shaft and 1,200-ton-daily-capacity flotation mill just south of Shullsburg throughout the entire year. The company was the largest producer of both lead and zinc in Wisconsin. Development work included 150 feet of drift and 30,000 feet of churn drilling. The company completed work under a DMEA contract (work partly in northern Illinois) in June 1953, with a certification of discovery October 2, 1953. Vinegar Hill Zinc Co., the second largest producer of lead and zinc in the State, operated the Blackstone, Hancock, and Mulcahy mines and its 900-ton-per-day gravity and flotation mill throughout the entire year. Custom ores were accepted at the mill. The company also did development under a DMEA contract. Eagle-Picher Co., Mining and Smelting Division, operated the Birkett and Andrews mines until March 31, 1953, when a fire destroyed the powerplant of the company Graham central mill in Illinois. The mines remained closed after the fire damage was repaired because of the low price of zinc. Eagle-Picher Co. also did development under a DMEA contract. Other producers of lead and/or zinc in the county in 1953 included Murray & Richards Mining Co., George M. Baker Milling Co., New Diggings Mining Co., Whitechurch & Farr, Glendenning & Herron, and Big Dick Mining Co.

LANGLADE

Duffeck Sand & Gravel Co., Antigo, produced building and paving sand and gravel. The county highway department produced gravel for highway purposes.

LINCOLN

Merrill Gravel & Construction Co., Merrill, and Thayer Sand & Gravel, Tomahawk, produced building and paving sand and gravel. The county highway department produced gravel for highway purposes.

MANITOWOC

The Manitowoc Portland Cement Co., Manitowoc, operated the entire year. Raw materials, except for clays, were purchased. The Rockwell Lime Co., Chicago, Ill., produced lime for building, chemical, and industrial uses at its Francis Creek plant. An expansion program was completed that included a feeder, elevators, conveyors, and three storage tanks. Valders Lime & Stone Co., Inc., Valders, produced lime for building and agricultural uses. The company also produced dimension limestone for building and architectural uses and crushed limestone for road construction. The City of Manitowoc produced crushed limestone. Building and paving sand and gravel was produced by Fred Radant Sons, Manitowoc, and Walter L. Zander, Two Rivers. The City of Manitowoc and the county highway commission produced sand and gravel for highway purposes.

MARATHON

The Marshfield Brick & Tile Co., Marshfield, produced clays for the manufacture of building brick and other clay products. Minnesota Mining & Manufacturing Co., St. Paul, Minn., produced crushed quartzite at Wausau for the manufacture of abrasive materials. The company also produced a hard argillite at another quarry at Wausau for manufacturing roofing granules. Rough and dressed granite for building and monuments was produced by Anderson Bros. & Johnson Co., Lake Wausau Granite Co., DeVoe Granite Co., and Rib Mountain Granite Co., all of Wausau. The granites are gray or red. Mrs. John Gesicki, Sr., and Mike Wisnewski (Edgar), and Heiser Ready-Mix Co., Lotz Sand & Gravel Co., and Riverside Gravel Co. (Wausau), produced sand and gravel, mostly for building and road purposes.

MARINETTE

Crushed basalt was produced by the Staso Milling Co., Chicago, Ill., for the manufacture of roofing granules. E. A. Mundt Granite Co., with a quarry near Amberg, produced rough and dressed granite for buildings and monuments. Walsh Sand & Gravel Co., Menominee, Mich., produced building sand and gravel.

MARQUETTE

The Montello Granite Co., Montello, produced polished monumental granite. The stone is extremely hard, is red, and is marketed under the trade name "Montello granite." Edward Kraemer & Sons

produced crushed limestone for road construction. The county highway department produced gravel for road purposes.

MILWAUKEE

Crushed limestone for road construction was produced by Franklin Stone Products, Inc., Manegold Stone Co., and Milwaukee Limestone Products Co., all of Milwaukee. The Badger Perlite Products Co., Milwaukee, produced expanded perlite from crude material produced in Colorado. A. J. Reiske Sons Co., Milwaukee, and Fink Bros., South Milwaukee, produced sand and gravel for road purposes.

MONROE

Crushed limestone for road construction and agricultural use was produced by Ray Frings, Tomah; Otto Meyer, Sparta; and Schendel Bros., Norwalk.

OCONTO

The Oconto County agricultural agent produced crushed limestone for agricultural use. Henry F. Thompson (Coleman), Belongia Construction Co. (Oconto), and John Jaworski (Sobieski), produced gravel for road purposes. The county highway department produced paving and road sand and gravel.

ONEIDA

Musson Bros., Rhinelander, produced crushed stone for refractory use and road construction. The company also produced building and paving sand and gravel, and the county highway commission produced sand and gravel for road purposes.

OUTAGAMIE

Expanded perlite was produced by the Midwest Perlite Co. at Appleton for use as a lightweight aggregate in plaster and concrete. Raw material came from Colorado and Nevada. Landwehr & Hackle, Seymour, produced building and paving sand and gravel.

OZAUKEE

Otto Ladwig & Sons, Inc., Milwaukee, produced building sand and gravel from a pit at Thiensville. The county highway department produced sand and gravel for road purposes.

PIERCE

Edward Kraemer & Sons, Plain, produced crushed limestone for road construction. Sand and gravel producers include: Bay City Sand Co. and Funk Bros., Bay City; Rush River Sand & Gravel Co., Ellsworth; Maiden Rock Silica Sand Co., Maiden Rock; and River Falls Sand & Gravel, Inc., River Falls. Molding and blast sand and building sand and gravel were the principal types produced.

POLK

Dresser Trap Rock Co., Dresser, produced crushed basalt for use as riprap, concrete aggregate, and railroad ballast. The Polk County agricultural agent produced crushed limestone for agricultural use. Gravel for railroad ballast was produced by the Minneapolis, St. Paul Sault Ste. Marie Railroad Co., and the county highway department produced sand and gravel for road purposes.

PORTAGE

Ellis Stone Construction Co., Stevens Point, produced dressed sandstone. Bert Somers produced calcareous marl for agricultural use. Gilford Wimpe (Stevens Point), F. F. Mengel Co. (Wisconsin Rapids), Minneapolis, St. Paul & Sault Ste. Marie Railroad Co., and the county highway department produced sand and gravel, chiefly for building and road purposes and railroad ballast.

PRICE

Minneapolis, St. Paul & Sault Ste. Marie Railroad Co. produced gravel for railroad ballast.

RACINE

The Union Grove Drain Tile Co., Union Grove, produced clays for the manufacture of heavy clay products. Consumers Co. of Illinois, Chicago, Ill., produced crushed limestone for riprap, blast-furnace flux, refractories, road construction, railroad ballast, and agricultural and industrial uses at its Racine quarry. J. W. Peters & Sons, Inc. (Burlington), Bloss Sand & Gravel Co. (Salem), and the county highway commission produced building and paving sand and gravel.

RICHLAND

Edward Kraemer & Sons, Plain, and the Richland County Highway Commission produced crushed limestone for road use.

ROCK

Dimension limestone for building was produced by Clinton Limestone Co., Clinton, as well as crushed limestone for road construction and agricultural use. Other producers of crushed limestone for riprap, road construction, and agstone were Peter J. Roth, Janesville; Frank Bros., Milton Junction; and the Rock County Highway Department. Sand and gravel producers include: Atlas Sand & Gravel Co. and Janesville Sand & Gravel Co., Janesville; Edgerton Sand & Gravel Co., Edgerton; Luety Bros., Beloit; Dean B. Ekstrom, Superior; Consumers Co. of Ill., Chicago, Ill.; Chicago, Milwaukee, St. Paul & Pacific Railway Co.; and the county highway department. Production was chiefly for building and road purposes and railroad ballast.

RUSK

Koepke Sand & Gravel Co., Appleton, and the county highway department produced sand and gravel for road purposes.

ST. CROIX

Crushed limestone for riprap, road construction, and agriculture was produced by the Ed. J. Leary Estate, River Falls; Wilson Rock & Limestone Co., Wilson; and the St. Croix County Highway Department. The Ed. J. Leary Estate, River Falls, and Dean B. Ekstrom, Superior, produced building and paving gravel. The county highway department produced sand and gravel for road purposes.

SAUK

The Baraboo Quartzite Co., Baraboo, produced grinding pebbles and tube-mill liners as well as crushed quartzite for refractory uses. Other producers of refractory material were John D. Geoghegan, Baraboo; General Refractories Co., Philadelphia, Pa.; and Harbison-Walker Refractories Co., Pittsburgh, Pa. Edward Kraemer & Sons (Plain) and Matashek Bros. (Prairie du Sac) produced crushed limestone for road construction and agriculture. Paving and road sand and gravel was produced by Deppe Lumber Co. and Deane Dubois, both of Baraboo. The Sauk County Highway Department and the City of Baraboo also produced or contracted for production of sand and gravel.

SAWYER

Sand and gravel for road purposes was produced by the county highway department.

SHAWANO

Shawano County Agricultural Committee produced crushed limestone for road construction and agricultural use. Ed. J. Murphy Sand & Gravel Co. (Bonduel), Edward Weichoff (Seymour), M. J. Zimmerman (Shawano), Herman Dey (Tigerton), and the county highway department produced sand and gravel for building and road purposes. A small quantity of blast sand was also produced.

SHEBOYGAN

The Sheboygan County agricultural agent produced crushed limestone for road construction and agricultural use. Building and paving sand and gravel was produced by Crystal Lake Crushed Stone Co., Sheboygan; Elkhart Moraine Sand & Gravel Co., Elkhart Lake; the county highway commission; and for the City of Sheboygan.

TAYLOR

Gravel for road purposes was produced by the county highway department.

TREMPEALEAU

Neuheisel Lime Works produced crushed limestone for road construction and agricultural use at Arcadia.

VERNON

Edward Kraemer & Sons (Plain) and Ellefson Bros. (Viroqua), produced crushed limestone for road construction and agricultural

use. The Vernon County Highway Department produced rough dimension limestone for building purposes. Paving and road sand and gravel was produced by the county highway department.

VILAS

Deane B. Ekstrom, Wissota Sand & Gravel Co., Chicago & North Western Railway Co., and the county highway department produced gravel for road purposes and railroad ballast.

WALWORTH

H. E. Wheeler, Elkhorn, produced crushed limestone for road construction and agriculture. Sand and gravel producers include: George Booth, Delavan Sand & Gravel Co., and J. F. Thorpe, Delavan; Bernard R. Amon and Mann Bros., Elkhorn; Lake Geneva Sand & Gravel Co., Fontana; and R. W. Miller, Lake Geneva. Production was chiefly for building and road purposes.

WASHBURN

Martin Spexet, Spooner, and the Washburn County agricultural agent produced calcareous marl for agricultural purposes.

WASHINGTON

The Northern Sand & Gravel Co. and the Washington County Highway Commission produced crushed limestone for road construction. Producers of sand and gravel include: Laubenstein & Portz, Inc., Hartford; Ozaukee Sand & Gravel Co., Milwaukee; O. & W. Gravel Co., Port Washington; John B. Jacklin, Richfield; Palmer Crushing Co., Slinger; Northern Sand & Gravel Co. and Fred C. Schultz & Son, West Bend; and the county highway commission. Production was chiefly for building and road purposes and railroad ballast.

WAUKESHA

Dimension limestone for construction and architectural use was produced by the Cawley quarry, Fonda Lannon Stone Co., and White Rock Lannon Stone Co., all of Lannon; Halquist Lannon Stone Co. and Quality Limestone Products, Inc., Sussex; and W. G. Perren, Waukesha. Crushed limestone for riprap, railroad ballast, road construction, and agricultural and industrial uses was produced by Halquist Lannon Stone Co. and Quality Limestone Products, Inc., Sussex; and the Waukesha Lime & Stone Co., Inc., Waukesha. Producers of sand and gravel include: Northwest Sand & Gravel Co., Brookfield; Hartland Washed Sand & Gravel Co., Hartland; Wm. Buege, Jaeger Sand & Gravel Co., Inc., Edward Lutz Sand & Gravel Co., Inc., and State Washed Sand & Gravel Co., all of Milwaukee; A. W. Nowatske, Mukwonago; Vogt, Inc., Okauchee; Kohler Bros. Sand & Gravel Co., Valley Sand & Gravel Co., and Waukesha County Highway Department, Waukesha; and the Chicago & North Western Railway Co. Production was chiefly for building and road purposes and railroad ballast.

WAUPACA

Hockers Brick Co. (New London) and Waupaca Brick Co. (Waupaca) produced clays for the manufacture of building brick and other clay products. Clifford Coldwell, Waupaca, produced calcareous marl for agricultural use.

WAUSHARA

Calcareous marl for agricultural use was produced by Elmer Bruck and Kenneth Walker, Hancock; Leo Hendrickson, Redgranite; William Edwards and Gaylord Dehling, Wautona; and Theodore Anderson, Wild Rose. The Lohrville Stone Co., Lohrville, produced rough and dressed dimension granite for buildings and monuments. They also produced broken granite for riprap. Paving gravel was produced by C. H. Peters, Fremont.

WINNEBAGO

Crushed limestone for riprap, road construction, and agricultural and industrial uses was produced by Badger Highways Co., Inc., Menasha; Courtney & Plummer, Inc., Neenah; and the Lutz Co. and Oshkosh Stone Co., both of Oshkosh. Badger Highways Co., Inc., produced some rough construction stone. Sand and gravel producers include: Schultz Sand & Gravel, Inc., Appleton; F. B. Dubberstein & Sons, Ltd., Berlin; Courtney & Plummer, Inc., Neenah; Cook & Brown Lime Co., Oshkosh; and the county highway department. Production was chiefly for building and road purposes, molding sand, and gravel for railroad ballast.

WOOD

Dimension sandstone was produced by Ellis Stone Construction Co. and Felix Klesmith, both of Stevens Point, and Tony Schmick, Wisconsin Rapids. The Wood County Highway Department produced crushed granite for road construction.



The Mineral Industry of Wyoming

By A. J. Martin¹ and F. J. Kelly²



THE MINERAL industry of Wyoming in 1953 was characterized by substantial increases in the output of crude petroleum, sand and gravel, trona, phosphate rock, iron ore, and sulfur. Feldspar and manganese production was recorded for the first time in several years. The year also marked another sharp decline in the output of coal, which has been trending downward since 1944. Small decreases were recorded in the production of bentonite, stone, pumice, and gypsum.

The increased production and value of petroleum, coupled with the gain in most nonmetallic minerals, raised the total value of State mineral output, exclusive of uranium, to \$255,906,000 in 1953 from \$206,828,000 in 1952, an increase of \$49,078,000 or 24 percent. Petroleum, with a gain of \$47,400,000, contributed 97 percent of the increase and trona, elemental sulfur, natural gas, and iron ore most of the remainder. There were no major decreases in the output of any principal minerals.

Of the total value in 1953, petroleum contributed 77, coal 9, bentonite 4, natural gas 2, natural-gas liquids 2, sand and gravel 1, and other minerals 5 percent. The mineral fuels—coal, natural gas and natural-gas liquids, and petroleum, with an aggregate value of \$230,940,000—represented 90 percent of the total value.

In 1953 Wyoming ranked first in the United States in the production of bentonite and of byproduct elemental sulfur extracted from natural gas; second in trona (hydrous sodium carbonate); fifth in phosphate rock; sixth in petroleum; and tenth in natural gas. The State also produced significant quantities of cement, sand and gravel, and stone.

Great activity in uranium prospecting and exploration prevailed throughout the year, and a substantial quantity of uranium ore was shipped. Figures on production of uranium are not available under regulations of the Atomic Energy Commission, and therefore the value of the uranium output is not included in the total value of the State mineral production in this report.

¹ Assistant chief for mineral statistics, Region IV, Bureau of Mines, Denver, Colo.

² Commodity-industry analyst, Region IV, Bureau of Mines, Denver, Colo.

TABLE 1.—Mineral production in Wyoming, 1952-53¹

Mineral	1952		1953	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Clays.....	706,748	\$9,176,507	852,651	\$10,036,727
Coal.....	6,088,421	26,451,530	5,244,572	23,743,996
Copper (recoverable content of ores, etc.).....			1	574
Gold (recoverable content of ores, etc.).....			1	
..... troy ounces.....	1	35	1	35
Gypsum (crude).....	(²)	(²)	5,493	21,972
Iron ore (usable)..... long tons, gross weight.....	484,945	(²)	654,285	(²)
Natural gas..... million cubic feet.....	75,313	5,874,000	76,262	6,025,000
Natural-gas liquids:				
Natural gasoline..... thousand gallons.....	51,492	4,016,000	(²)	(²)
LP-gases..... do.....	38,976	1,881,000	(²)	(²)
Petroleum (crude)..... thousand 42-gallon barrels.....	68,074	148,400,000	³ 82,618	³ 195,800,000
Phosphate rock ⁴ long tons.....	186,715	1,247,256	(²)	(²)
Pumice.....	2,851	10,918	648	1,898
Sand and gravel.....	2,426,999	1,738,548	3,149,376	2,001,197
Silver (recoverable content of ores, etc.).....				
..... troy ounces.....			11	10
Stone (except limestone for cement).....	1,466,567	1,688,800	1,431,372	1,839,922
Vermiculite.....	(²)	(²)	403	2,418
Undistributed: Cement, feldspar (1953), gem stones, manganese ores, sodium carbonate and sulfate, sulfur ore, recovered elemental sulfur and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2). Excludes value of clays used for cement in 1953.		⁵ 6,343,624		16,432,721
Total Wyoming.....		⁵ 206,828,000		255,906,000

¹ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

² Value included with "Undistributed."

³ Final figure. Supersedes preliminary figure given in commodity chapter.

⁴ Basis for reporting phosphate rock has been changed from shipments to marketable production, because the latter more nearly reflects output at the mine on a calendar-year basis.

⁵ Revised figure.

TABLE 2.—Average prices of certain mineral commodities in Wyoming, 1952-53¹

Mineral	1952	1953
Bentonite..... short ton.....	\$13.233	\$14.702
Common clay or shale..... do.....	.561	.964
Coal..... do.....	4.344	4.530
Natural gas..... M cubic feet.....	.078	.079
Petroleum (crude)..... 42-gallon barrel.....	2.169	2.370
Phosphate rock..... long ton.....	6.682	6.370
Pumice..... short ton.....	3.830	2.929
Sand and gravel..... do.....	.716	.636
Stone..... do.....	1.152	1.285
Sulfur (elemental)..... long ton.....	20.713	20.803

¹ Prices are based on average f. o. b. mines or wells reported by the producers.

DEFENSE MINERALS EXPLORATION PROJECTS

The Government, through the Defense Minerals Exploration Administration (DMEA), continued to aid in financing exploration in search of strategic and critical minerals. From the beginning of the program in 1951 through 1953 2 projects for sulfur and 1 for iron ore were undertaken in Wyoming for a total expenditure of \$226,660, of which the Government contributed 50 percent and private capital 50 percent.

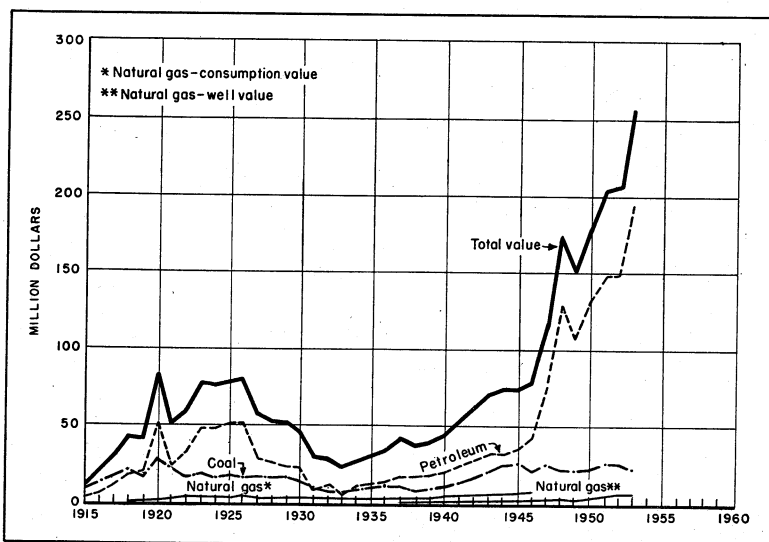


FIGURE 1.—Value of coal, petroleum, and natural gas and total value of all minerals produced in Wyoming, 1915–53.

In 1953 one contract covering exploration for iron (financed on a 50–50 basis), involving a total of \$48,100, was undertaken at the Good Fortune and Nightingale group in Platte County.

REVIEW BY MINERAL COMMODITIES

METALS

Alumina (Experimental Plant).—The Government experimental alumina plant at Laramie, reactivated by the Bureau of Mines in June 1952, operated throughout 1953. The plant (built during World War II by the Defense Plant Corporation) was used by the Bureau to make runs to test the feasibility of the soda-lime-sinter process for producing alumina suitable for the production of aluminum metal from anorthosite and other aluminum silicate rocks.

In this process anorthosite containing 27–30 percent alumina is ground and mixed with recycled soda solution and ground limestone. The resulting slurry is dried and then sintered in oil-fired rotary kilns. The sinter is ground and leached in a soda solution to dissolve the soda and alumina in much the same way as alumina is extracted from bauxitic ores. Passing carbon dioxide into the solution causes precipitation of the alumina, which is filtered, dried, and calcined. This product is then suitable for use in the production of aluminum.

Beryl.—A small quantity of beryl was shipped to the Beryl Ores Co., Arvada, Colo., by W. L. Marion of Lander, Wyo., from a prospect in Fremont County.

Copper.—In 1953 1 ton of copper was recovered from ore mined from the Joyce property near Bolser, Albany County, and operated by E. A. Baumgartner.

TABLE 3.—Mine production of gold, silver, copper, and lead, 1944-48 (average), 1949-53, and total, 1867-1953, in terms of recoverable metals ¹

Year	Material sold or treated ² (short tons)	Gold (lode and placer)		Silver (lode and placer)		Copper		Lead		Total value
		Fine ounces	Value	Fine ounces	Value	Short tons	Value	Short tons	Value	
1944-48 (average).....	1,409	346	\$12,096	33	\$28	(³)	\$65	1	\$103	\$12,292
1949.....	4 1,800	389	13,615	21	19					13,634
1950.....										
1951.....	10	9	315	2	2					317
1952.....		1	35							35
1953.....	2	1	35	11	10	1	574			619
1867-1953.....	(⁴)	80,042	1,909,798	74,832	51,924	16,327	5,684,946	14	1,486	7,648,154

¹ Includes recoverable metal content of gravel washed (placer operations), ore milled, and ore shipped directly to smelters during the calendar year indicated.

² Does not include gravel washed.

³ Less than ½ ton.

⁴ Ore milled; recovery was 86 ounces of gold and 3 ounces of silver in amalgamation and cyanidation bullion and 300 ounces of gold and 18 ounces of silver in 35 tons of concentrates smelted.

⁵ Figure not available.

Gold.—The only output of gold reported from Wyoming in 1953 was 1 ounce recovered from the Hermit Creek placer in the Atlantic City district, Fremont County.

Iron Ore.—Shipments of iron ore in Wyoming during 1953 totaled 654,285 long tons, an increase of 35 percent from 1952. The Sunrise mine of the Colorado Fuel & Iron Corp. in the Hartville district north of Guernsey, Platte County, continued to be the leading producer in the State and has been one of the prominent iron-ore mines of the United States since 1900. The mine, originally located in 1898, was an open-pit operation until 1942, when underground mining was begun. The main shaft is 750 feet deep and was completed in 1945. In 1953, 273 men were employed in surface and underground operations for 257 days. The ore was shipped to the company-owned steel works at Pueblo, Colo., for processing.

The Good Fortune mine of the E. C. Schroeder Co., Inc., also in the Hartville district near Sunrise, was a consistent producer from April through September, when operations were suspended for the winter months. Ore was shipped to the Granite City Steel Co. at Granite City, Ill., and other eastern steel manufacturers. A report showing the results of preliminary examination and exploration of the Good Fortune mine has been published.³

Silver.—Eleven ounces of silver was recovered from the copper-silver ore produced from the Joycie mine near Laramie, Albany County.

TABLE 4.—Shipments of iron ore, total 1900-48, and by years 1949-53, in long tons

Year	Quantity	Year	Quantity
1900-48.....	23,023,196	1951.....	616,949
1949.....	539,554	1952.....	484,945
1950.....	491,906	1953.....	654,285

³ Frey, Eugene, Good Fortune Iron Mine, Platte County, Wyo.: Bureau of Mines Rept. of Investigations 4089, 1947, 7 pp.

Titanium.—The Union Pacific Railroad for several years has been carrying on an extensive exploration program on titaniferous magnetite deposits in the Iron Mountain area in the Laramie Range northwest of Laramie, Albany County. In the fall of 1953 a permanent camp was established to facilitate the program. The work included magnetometer surveys, geologic mapping, and geophysical surveying. According to published information,⁴ over 16,000 feet of diamond drilling was completed during the year. Exploratory work on the Laramie Range up to 1953 by the Bureau of Mines and the Union Pacific Railroad indicate that the reserves of all classes of ore total 178 million tons containing approximately 45 million tons of iron, 10 million tons of titanium, and 300,000 tons of vanadium metal. Research by the Bureau of Mines and the Battelle Memorial Institute indicates that considerable additional work, eventually on a large scale, will be required to establish the economics of treating the massive magnetite-ilmenite and silicate deposits.

The Shanton titaniferous magnetite deposits on the Shanton ranch homestead near the Iron Mountain deposits were diamond-drilled by the Bureau of Mines in 1948, and the results obtained from drilling 1,042 feet in 8 holes were published in 1953.⁵

Uranium.—Mines and prospects in the Black Hills area in the northeastern corner of Wyoming produced (considerable) uranium ore in 1953, and the search for additional deposits of commercial size and grade continued in this and other areas in the State. A market for ore was provided by the Atomic Energy Commission at the ore-buying depot established in Edgemont, S. Dak., in December 1952. According to information made public,⁶ one mine near Carlile, Crook County, was in operation in 1953, and other ore deposits were known. There were 2 producing deposits along the Wyoming-South Dakota border near Aladdin, and 1 of the larger ore bodies of the Black Hills had been found at Hulett Creek. In Wyoming and South Dakota uranium ore was shipped from more than 50 locations by more than 2 dozen individuals or groups.

Besides the uranium occurrences in the Cretaceous Lakota and Fall River formations of the Black Hills, other Wyoming occurrences have been discovered⁷ in the Eocene Wasatch formation of the Powder River Basin and the Red Desert area; in the Eocene Wind River formation on the western slopes of the Gas Hill anticline, between Casper and Lander; in the Miocene Brown's Park formation of Carbon County; and in the pre-Cambrian rocks near Lusk.

The Atomic Energy Commission and the Geological Survey each prepared publications showing the results of geological studies and other work done in the search for uranium deposits. Volume I of *Minerals Yearbook, 1953*, chapter on Uranium, Radium, and Thorium,

⁴ Pinnell, D. B., Marsh, J. A., Union Pacific Railroad Co., Summary Geologic Report on the Titaniferous Iron Deposits of the Laramie Range: Address at ann. meeting, Colorado Mining Association, Denver, Colo., Jan. 30, 1954, p. 7.

⁵ Held, J. H., Diamond Drilling on the Shanton Geologic Magnetite-Ilmenite Deposits, Albany County, Wyo.: Bureau of Mines Rept. of Investigations 5012, 1953, 7 pp.

⁶ King, John W. (Chief, Hot Springs, S. Dak., Suboffice, DEB Atomic Energy Commission) Exploration Phases of the Uranium Program in South Dakota: Remarks before Colorado Section, AIME, Denver, Colo., May 20, 1954.

⁷ Merritt, Phillip L. (Assistant Director, Division of Raw Materials, Atomic Energy Commission), Review of Recent Developments in Uranium Exploration: Address at meeting of Colorado Mining Association, Denver, Colo., Jan. 29, 1954.

contains a general review of the uranium industry, with references to literature published.

NONMETALS

Bentonite.—Shipments of bentonite in Wyoming decreased 3 percent from the record high set in 1952, but the value increased from \$9,168,708 in 1952 to \$9,861,321 in 1953, owing to a higher average price. The temporary leveling off of present productive capacity, coupled with the continued demand for bentonite as a conditioning agent for oil-well drilling mud, are among the major factors contributing to the rise in price. The demand for bentonite for oil-well drilling mud and foundry-molding sands remained stable, consuming approximately 70 and 30 percent, respectively, of the total supply.

TABLE 5.—Shipments of bentonite, 1944-48 (average) and 1949-53

Year	Short tons	Value	Year	Short tons	Value
1944-48 (average).....	250,172	\$2,330,602	1951.....	465,254	\$5,981,655
1949.....	350,644	3,556,480	1952.....	692,853	9,168,708
1950.....	394,939	4,091,571	1953.....	670,756	9,861,321

Wyoming maintained its rank as producer of the largest amount of bentonite in the United States, with South Dakota second. The bentonite deposits in Crook and Weston Counties are in the Black Hills region, which extends from South Dakota into Wyoming. Other producing counties during 1953 were: Big Horn, Johnson, and Natrona. The 8 producing companies in 1953, in order of output, were: Baroid Sales Division, National Lead Co., operating in Crook and Weston Counties; Magnet Cove Barium Corp., Big Horn County; Wyodak Chemical Division, Federal Foundry Supply Co., Weston County; Eastern Clay Products Department, International Minerals & Chemical Corp., Crook County; the American Colloid Co., Weston County; Black Hills Bentonite, Inc., Crook County; Wyo-Ben Products Co., Big Horn County; and the Benton Clay Co., with mines in Johnson and Natrona Counties and a processing plant at Casper.

The price of bentonite is determined by quality, viscosity, and other factors and therefore varies within fixed limits for certain producers. The average price per ton for Wyoming bentonite reported to the Bureau of Mines by the producers increased from \$13.23 in 1952 to \$14.70 in 1953.

Cement.—The entire output of cement in Wyoming came from the Monolith Portland Midwest Co. plant at Laramie. The plant was in continuous operation during 1953.

Clays (Except Bentonite).—A total of 15,895 tons of shale, valued at \$9,406, was produced by the Lovell Clay Products Co. in Big Horn County and the Sheridan Pressed Brick & Tile Co. in Sheridan County, for use by these companies in making building brick and other heavy clay products.

Gem Stones.—Sales of gem stones consisted mainly of jade, agate, petrified wood, and obsidian.

Gypsum.—Substantial tonnages of gypsum continued to be mined by the Wyoming Construction Co. in Albany County for shipment to the Monolith Portland Midwest Co. cement plant at Laramie.

Phosphate Rock.—The output of phosphate rock in 1953 came from the Leefe mine $2\frac{1}{2}$ miles northwest of Sage, Lincoln County, which was operated by the San Francisco Chemical Co. Total shipments of phosphate rock in the State during 1953 were increased by the marketing of stocks by the Phosphate Mines, Inc., whose mines in Lincoln County near Kemmerer were idle during 1953.

Pumice.—The Superior Pumice Co., Inc., continued to be the only producer of pumice in Wyoming, and during 1953 production from the company deposit near Superior, Sweetwater County, was less than 25 percent of the 1952 output.

Sand and Gravel.—The total output of reported sand and gravel increased 30 percent in 1953 over 1952. Washed, screened, or otherwise prepared materials comprised 92 percent of the total production in 1953. Of the 3,149,376 tons produced, 587,930 tons came from commercial enterprises, and 2,561,446 tons was produced by Government maintenance crews and project contractors. The largest individual commercial producer was the Gilpatrick Construction Co. in Fremont County. Other important producers included W. E. Barling, Inc., Park County; Casper Concrete Co. and Mize Sand & Gravel Co., Natrona County; and the Union Pacific Railroad, Albany County. The leading counties in commercial production, in order of importance, were Fremont, Albany, Natrona, and Park; in noncommercial output, they were Laramie, Sweetwater, Park, and Crook.

Sodium Carbonate and Sulfate.—The production of natural sodium carbonate (trona) in 1953 was three times that in 1952. The entire output for the State came from a plant owned and operated by the Intermountain Chemical Co. near Green River, Sweetwater County. Although the new processing plant can handle 600,000 tons of crude trona yielding 300,000 tons of soda ash a year, utilization of full capacity was not achieved in 1953.

The output of sodium sulfate showed a 60-percent increase in 1953 over 1952; it was used in the production of salt cake and natural glauber's salt. The operators in 1952 and 1953 were the Iowa Soda Products Co., operating the Bull Lake saline deposit in Carbon County, and William E. Pratt, producing from a deposit near Casper in Natrona County.

Stone.—The total reported production of stone in Wyoming in 1953 (excluding limestone used for cement) was 1,431,372 tons, a 2-percent decrease from 1952. No production of dimension stone was reported; crushed limestone, granite, and miscellaneous crushed rock were the only types of stone produced. The major uses, in order of magnitude, were railroad ballast, roads, construction, and sugar refining. Riprap, flux, and mineral food were among the miscellaneous uses.

The 5 leading producers, which together produced 97 percent of the State total stone, were the Guernsey Stone Co. in Platte County (limestone quarry); the Union Pacific Railroad Co. granite quarry (operated by Morrison-Knudsen Co., Inc.) in Laramie County; the Great Western Sugar Co. (limestone quarry) also in Laramie County; the Chicago, Burlington & Quincy Railroad Co. quarry in Sheridan County; and Boatright & Smith, Carbon County.

The Horse Creek mine, the largest underground limestone mine in the Rocky Mountain region, is owned and operated by the Great Western Sugar Co. and is near Iron Mountain, about 35 miles northwest of Cheyenne. This mine was one of the first industrial developments on the eastern slope of Wyoming. From 1907, the year it first opened, until 1922, it was operated as an open-pit quarry. Further exploration located deeper limestone beds in a prominent hogback ridge rising 600 feet above the original quarry, which led to underground operations.

According to an article in the Denver Post of March 11, 1954, the mine produces annually 80,000 to 125,000 tons of carefully graded limestone averaging 97 to 98 percent pure lime. This material is shipped to the Great Western Sugar factories in Colorado, Wyoming, and Nebraska. Stone too small for use in processing sugar is used as concrete aggregate, fluxing rock, and road-surfacing material. In all, 75 men were employed in various phases of the operation.

Sulfur.—The production of elemental sulfur as a byproduct in the liquid purification of gas increased 11 percent in 1953, owing mainly to the output of the new Silvertip plant in Park County, owned and operated by the Seaboard Oil Co. of Delaware, which began operations during the year. The plants of the Stanolind Oil & Gas Co., also in Park County, and the Texas Gulf Sulphur Co. in Washakie County were in continuous operation during 1953. The average price per ton of sulfur increased slightly, from \$20.81 in 1952 to \$20.89 in 1953. The Wyoming Gulf Sulphur Corp. discontinued mining in 1953, and the property reverted to the owners, the Cody Sulphur Co. of Cody, Wyo.

Vermiculite.—The entire output of vermiculite in Wyoming in 1953 was shipped from the Fluor and Platt leases near Encampment, Carbon County.

MINERAL FUELS

The production and value of the mineral fuels in 1952 and 1953 are shown in table 1.

The output of coal in 1953 was 5,245,000 tons, a 14-percent decrease from 1952 and 45 percent less than the wartime high of 9,540,000 tons in 1944. Production was reported in 10 counties, with an aggregate value of \$23,758,000. Five counties (Sweetwater, Carbon, Lincoln, Sheridan, and Campbell) furnished 99.5 percent of the total production. Table 6 shows the production of coal by counties in 1952 and 1953.

Petroleum was by far the most important of the mineral fuels; its value in 1953 was \$195,800,000, an increase of 32 percent over 1952. Crude petroleum was produced from fields in 19 of the State's 23 counties, and 11 fields in 10 counties supplied 61 percent of the total production. These fields were: Elk Basin, Frannie, and Oregon Basin, Park County; Grass Creek and Hamilton Dome, Hot Springs County; Glenrock, Converse County; Salt Creek, Natrona County; Steamboat Butte, Fremont County; Sussex-Meadow Creek, Johnson County; Lost Soldier, Wertz, etc., Sweetwater and Carbon Counties; and Byron-Garland with parts in Big Horn and Park Counties. There were 17 petroleum refineries, 8 of which had cracking facilities, in operation as of January 1953 with a daily operating crude-oil capacity

TABLE 6.—Production of coal, 1952–53, by counties ¹

County	1952			1953		
	Production (net tons)	Average value per ton	Total value	Production (net tons)	Average value per ton	Total value
Campbell.....	320,945	\$1.38	\$442,900	320,654	\$1.36	\$436,089
Carbon.....	1,022,928	5.23	5,346,000	736,478	5.57	4,105,648
Converse.....	8,707	3.62	31,500	6,908	3.13	21,622
Fremont.....	4,043	5.60	22,600	3,042	6.48	19,712
Hot Springs.....	17,104	7.43	127,100	12,542	7.71	96,699
Johnson.....	1,659	5.39	8,900	1,453	4.00	5,812
Lincoln.....	819,677	2.63	2,152,500	617,874	2.97	1,835,086
Sheridan.....	611,074	4.42	2,700,000	535,446	3.21	1,718,782
Sublette.....	1,016	4.90	5,000	1,000	6.21	6,210
Sweetwater.....	3,281,268	4.76	15,615,030	3,009,175	5.15	15,498,336
Total.....	6,088,421	4.34	26,451,530	5,244,572	4.53	23,743,996

¹ Figures are based on final complete returns from all operators known to have produced 1,000 tons and over per year.

of 103,800 barrels. There were 3 plants in Natrona County, 2 each in Niobrara, Park, and Weston Counties, and 1 each in Big Horn, Carbon, Converse, Crook, Fremont, Goshen, Hot Springs, Laramie, and Platte Counties. Table 7 gives the production of crude petroleum by fields, in Wyoming for 1952 and 1953.

Production of natural gas in 1953 amounted to 76,262 million cubic feet valued at \$6,025,000, a 6-percent gain in quantity over 1952. Natural-gas liquids were processed at 6 plants during the year. The combined output of natural gasoline and liquid-petroleum gases dropped to 2,066,000 barrels in 1953 compared with 2,154,000 barrels in 1952.

Additional data and a summarized review covering coal, natural gas, natural-gas liquids, and petroleum production and well drilling may be found in volume II of this yearbook.

TABLE 7.—Production of crude petroleum, 1952–53, by fields, in thousand barrels

Field	1952	1953	Field	1952	1953
Big Sand Draw.....	2,387	2,400	Little Buffalo.....	951	1,142
Big Muddy.....	1,197	1,373	Lost Soldier, Wertz, etc.....	5,299	5,900
Bonanza.....	1,620	2,935	Mush Creek.....	773	878
Byron-Garland.....	4,343	5,603	Oregon Basin.....	2,688	3,508
Cole Creek.....	1,820	2,271	Salt Creek.....	4,159	4,375
Elk Basin.....	8,041	8,488	Steamboat Butte.....	2,056	3,611
Fiddler Creek.....	1,321	865	Sussex-Meadow Creek.....	2,960	4,022
Frannie.....	3,709	3,731	Winkleman.....	811	1,255
Glenrock.....	2,414	4,197	Worland.....	1,421	1,105
Grass Creek.....	2,395	3,583	Other fields.....	12,739	16,156
Hamilton Dome.....	3,075	3,558			
Lance Creek.....	1,895	1,662	Total.....	68,074	82,618

¹ Includes crude oil consumed on leases and net change in stocks held on leases for entire State.

REVIEW BY COUNTIES ⁸

ALBANY

Cement produced by the Monolith Portland Midwest Co. at Laramie composed the major portion of the value of mineral output

⁸ This review is confined to a discussion of the production of all minerals except crude petroleum, natural gas, and natural-gas liquids.

of Albany County in 1953. Except for coal, the county is self-sufficient in those raw materials required in manufacturing cement. Shale and limestone were quarried by Monolith for its own consumption. Significant quantities of gypsum were mined by the Wyoming Construction Co. for use in making cement.

The production of sand and gravel and crushed stone increased slightly over the 1953 total; the major portion was used for road paving and railroad ballast.

The metal mines of the Douglas Creek district produced 1 ton of copper and 11 ounces of silver during 1953—the first production from this area in several years. A small quantity of manganese ore was shipped to the Columbia steel plant at Geneva, Utah, from a mine in Albany County. At the Government experimental alumina plant at Laramie the Bureau of Mines continued work on a project begun in 1952 to test the feasibility of producing alumina from anorthosite occurring in the vicinity.

TABLE 8.—Value of mineral production in Wyoming in 1952–53, by counties,¹ and principal minerals¹ produced in 1953, excluding uranium

County	1952	1953	Principal minerals in order of value ¹
Big Horn.....	\$1, 274, 776	\$2, 040, 907	Bentonite, sand and gravel, clays, stone.
Campbell.....	442, 904	493, 725	Coal, sand and gravel.
Carbon.....	(2)	4, 249, 811	Coal, sand and gravel, stone, sodium sulfate.
Converse.....	31, 500	104, 895	Sand and gravel, coal.
Crook.....	3, 834, 453	4, 447, 308	Bentonite, sand and gravel.
Fremont.....	205, 071	270, 638	Sand and gravel, coal.
Goshen.....	(2)	53, 238	Sand and gravel.
Hot Springs.....	139, 154	175, 102	Coal, sand and gravel, stone.
Johnson.....	³ 8, 900	³ 83, 020	Sand and gravel, coal, bentonite.
Laramie.....	1, 930, 423	1, 141, 842	Stone, sand and gravel, feldspar.
Lincoln.....	3, 399, 756	3, 208, 411	Coal, phosphate rock, sand and gravel.
Natrona.....	300, 184	322, 183	Bentonite, ³ sand and gravel, sodium sulfate.
Niobrara.....	(4)	62, 323	Sand and gravel, stone.
Park.....	(2)	631, 281	Sulfur, sand and gravel.
Sheridan.....	2, 786, 099	1, 922, 749	Coal, sand and gravel, stone, clays.
Sublette.....	5, 000	64, 995	Sand and gravel, stone, coal.
Sweetwater.....	16, 540, 836	18, 648, 316	Coal, sodium carbonate, sand and gravel, stone pumice.
Teton.....	222, 622	50, 990	Sand and gravel, stone.
Uinta.....	500	68, 103	Sand and gravel.
Weston.....	3, 785, 859	3, 410, 914	Bentonite, sand and gravel, stone manganese.
Undistributed ⁵	11, 748, 913	7, 259, 249	
	46, 657, 000	48, 710, 000	
Petroleum, natural gas, and natural-gas liquids..	160, 171, 000	207, 196, 000	
Total.....	206, 828, 000	255, 906, 000	

¹ Excluding petroleum, natural gas, and natural-gas liquids.

² Value included with "Undistributed" to avoid disclosing value of individual company production.

³ Value of bentonite in Johnson County included in value for Natrona County.

⁴ Data not available.

⁵ Includes value of mineral production and principal minerals produced in the following counties: Albany (cement, sand and gravel, gypsum, stone); Platte (iron ore, stone, sand and gravel); Washakie (sulfur, sand and gravel); and counties indicated by footnote 2 and in 1952 some undistributed stone and sand and gravel.

BIG HORN

The production of bentonite was the largest single factor affecting the increased value of the total mineral production of Big Horn County. The Magnet Cove Barium Corp., mining from a large

deposit northeast of Greybull, expanded its output in 1953 by two-thirds of its 1952 production. The Wyo-Ben Products Co., the only other producer of bentonite in the county, operated continuously in 1953.

A small quantity of sand and gravel for road paving and crushed granite used as riprap were also produced during 1953.

CAMPBELL

Coal and sand and gravel were the only minerals produced in Campbell County during 1953.

CARBON

Coal continued to rank first in total value among the minerals mined in Carbon County. Sand and gravel produced by the State highway department for road construction took second place in value, and crushed limestone quarried by Boatright & Smith Construction Co. and used for concrete and road metal ranked third. Sodium sulfate was obtained from the Bull Lake region north of Rawlins by the Iowa Soda Products Co. The salt beds range from 2.5 to 26 feet in thickness and are almost pure mirabilite.⁹ Vermiculite was mined from the Fluor and Platt leases in the Encampment area.

CONVERSE

Sand and gravel and coal were the only mineral commodities produced in Converse County during 1953.

CROOK

Crook ranked first among Wyoming counties in production of bentonite in 1953, even though output dropped 2 percent from 1952. On the other hand, the total value for the county increased owing to a rise in the average price of Wyoming ground bentonite from \$13.23 to \$14.70 a ton. The major producers, in order of importance, were the Baroid Sales Division, National Lead Co., with mines in both Crook and Weston Counties; the Eastern Clay Products Department, International Minerals & Chemical Corp.; and the Black Hills Bentonite, Inc., at Moorcroft.

Uranium mining and prospecting were sustained throughout 1953. The Carlisle deposit north of Moorcroft, discovered by the Homestake Mining Co. in 1952, was in production by early 1953. Other deposits along the Wyoming-South Dakota border near Aladdin were reported to have produced ore. The Atomic Energy Commission did exploratory drilling in the Aladdin area, and private companies and individuals were active in exploration at many places in the county. A market for ore is provided at the ore-buying station of the AEC at Edgemont, S. Dak.

A small quantity of sand and gravel was produced by the State highway department for road construction and maintenance.

⁹ Osterwald, Frank W., and Doris B., Wyoming Mineral Resources: Wyoming Geol. Survey Bull. 45, 1952, p. 131.

FREMONT

Outside of the mineral fuels coal and petroleum, the mineral production of Fremont County continued to consist mainly of sand and gravel used for road construction, and the county ranked first in value of output of this commodity. The only production of gold reported for the State in 1953 came from the Atlantic City district, which produced 1 ounce, valued at \$35. A small quantity of beryl was produced from a prospect operated by W. L. Marion of Lander.

GOSHEN

The county and State highway departments reported a small amount of sand and gravel as being produced by their maintenance crews for road use.

HOT SPRINGS

Coal, sand and gravel, and crushed miscellaneous stone comprised the mineral output of Hot Springs County during 1953. The construction materials were used solely for road building and maintenance.

JOHNSON

The Benton Clay Co. reported some bentonite production from Johnson County in 1953. Some sand and gravel were mined by the State highway department for use on county roads.

LARAMIE

Crushed limestone from the Horse Creek quarry of the Great Western Sugar Co. northwest of Cheyenne was the mineral of chief value produced in Laramie County in 1953. The major use of this limestone was in refining sugar; however, significant quantities were also consumed in road construction, railroad ballast, as a flux and for mineral food. Sand and gravel were the second-ranking minerals in terms of value; the entire output was mined and used by the State highway department. A small quantity of feldspar was produced in Laramie County during 1953 and shipped to the Denver plant of the Consolidated Feldspar Dept., International Minerals & Chemical Corp.

LINCOLN

The San Francisco Chemical Co., operating the Leefe open-pit mine, was the only Wyoming producer of crude phosphate rock in 1953. The output for the county and State increased 14 percent over 1952. The company has spent a large amount in development work and equipment and is mining 2 different types of ore, only 1 of which requires beneficiation. A mill has been constructed for two-stage dry separation to remove clay and silt. The mill process involves dry grinding by attrition, followed by two stages of air classification in series, comprising a rougher and cleaner circuit.

The San Francisco Chemical Co. produces high-grade phosphate rock for acidulation and direct application fertilizer; about half of it goes into the production of fertilizer.

NATRONA

The Benton Clay Co. mill at Casper continued to receive and process crude bentonite from its mines in the vicinity of Kaycee, Johnson County, and Casper, Natrona County. The output of the mill increased 27 percent in 1953.

Glauber's salt, one of the sodium sulfate minerals, was produced by William E. Pratt from an open-pit saline deposit in the region around Casper. Considerable tonnages of sand and gravel for road construction were produced by two private companies and by the State and county highway departments during 1953.

NIOBRARA

Noncommercial sand and gravel and crushed granite were the only commodities produced in Niobrara County during 1953.

PARK

The entrance of the Seaboard Oil Co. of Delaware into the brimstone or byproduct-sulfur industry boosted the output of elemental sulfur in Park County considerably in 1953. This company constructed a new plant, which was completed and placed in operation by May 1, 1953. The sulfur-recovery unit is at Silvertip, 22 miles northeast of Powell. The Standolind Oil & Gas Co. of Casper maintained its output of elemental sulfur at the same level reported in 1952. Other production in the county was commercial and noncommercial sand and gravel.

PLATTE

The output of iron ore (hematite) from the Hartville district, Platte County, increased 35 percent in 1953 over 1952, owing mainly to the increased production from the Sunrise underground mine of the Colorado Fuel & Iron Corp. at Sunrise. Output from the Good Fortune open-pit mine in Whalen Canyon, a few miles from the Sunrise mine, accounted for some of the increase. The ore mined from Sunrise was shipped to the Colorado Fuel & Iron Corp. steel plant at Pueblo and that from the Good Fortune was sold to Granite City Steel Co. at Granite City, Ill., and other eastern steel manufacturers. The E. C. Schroeder Co., Inc., shut down the Good Fortune mine in September, 1953, for the winter months, and construction was begun on a beneficiation plant. The company planned to reopen the mine in April 1954.

The output of crushed limestone for railroad ballast, concrete road metal, and riprap from the Guernsey quarry of the Guernsey Stone Co. increased considerably. The Wyoming State Highway Department produced some sand and gravel for road construction in Platte County during 1953.

SHERIDAN

Coal was by far the most important mineral, value-wise, in Sheridan County in 1953, accounting for 92 percent of the total county value. Sand and gravel was produced by the State highway department for road use, and a small tonnage of commercial structural sand was also

produced by two private companies. A considerable tonnage of crushed miscellaneous stone was produced by the Chicago, Burlington & Quincy Railroad from a quarry near Kleenburn for use as railroad ballast.

The Sheridan Press Brick & Tile Co. produced a small quantity of shale in 1953, which was consumed in manufacturing heavy clay products.

SUBLETTE

A little noncommercial sand and gravel, commercial crushed granite, and coal were produced in Sublette County in 1953.

SWEETWATER

Trona mined by the Intermountain Chemical Co. showed the largest net gain in tons produced and value of output among the minerals in Sweetwater County during 1953. The Westvaco underground mine and processing plant are 15 miles west and north of Green River. Mine and plant expansion continued in 1953, with completion of the No. 2 shaft headframe and hoisting facilities and the underground crusher station and shop.

The trona was mined from a bed 10 to 20 feet thick and approximately 1,500 feet below the surface. The broken ore was loaded into shuttle cars and transported by belt conveyors to the underground crusher. After being crushed, it was hoisted to the surface and delivered to the processing plant for conversion to soda ash. According to the State inspector of coal mines, 272,530 tons of trona was mined in 1953.

The county was the largest producer of coal in the State in 1953, with 65 percent of the total production. Other output included sand and gravel and crushed granite for use in road building, and pumice for lightweight aggregate.

TETON

Sand and gravel and crushed limestone were produced in Teton County in 1953.

UINTA

The State highway department reported some sand and gravel production from Uinta County in 1953.

WASHAKIE

Sulfur was recovered in 1953 as a byproduct from hydrogen sulfide gas produced by the Pure Oil Co. in the Worland oil field. The sulfide gas is piped to the sulfur-processing plant of the Texas Gulf Sulphur Co. north of Worland, where the hydrogen sulfide is reduced to elemental sulfur. The gas is then transmitted back to the Pure Oil Co. for further refining. According to a published report,¹⁰ this plant has a capacity of 300 tons of elemental sulfur per day.

¹⁰ Osterwald, Frank W., and Doris B., Wyoming Mineral Resources: Wyoming Geol. Survey Bull. 45, 1952, p. 157.

The State highway department and the Bureau of Public Roads, United States Department of Commerce, reported sand and gravel production in the county.

WESTON

The output of bentonite in Weston County decreased 23 percent and the value 13 percent in 1953 from 1952. The three producing companies were the Wyodak Chemical Division, Federal Foundry Supply Co., with a mill at Upton; the Baroid Sales Division, National Lead Co., with mines near Osage and a mill at Clay Spur; and the American Colloid Co., with a mine and mill near Upton. The latter company also operated bentonite properties in the Black Hills of South Dakota.

Sand and gravel, stone, and a small tonnage of manganese ore were also produced.

YELLOWSTONE PARK

The Bureau of Public Roads, United States Department of Commerce, reported some sand and gravel production for road construction in 1953.

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