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THE UNIVERSITY OF WISCONSIN
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY
SOIL SURVEY DIVISION

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SOIL SURVEY IN COOPERATION WITH THE SOILS
DEPARTMENT OF THE COLLEGE OF AGRICULTURE

Bulletin No. 80 **Soil Series No. 55**

SOIL SURVEY

OF

GRANT COUNTY

WISCONSIN

AN INTRODUCTORY REPORT

by

FRANCIS D. HOLE
Soil Survey Division
Wisconsin Geological and Natural History Survey
in cooperation with
The Soils Department, College of Agriculture

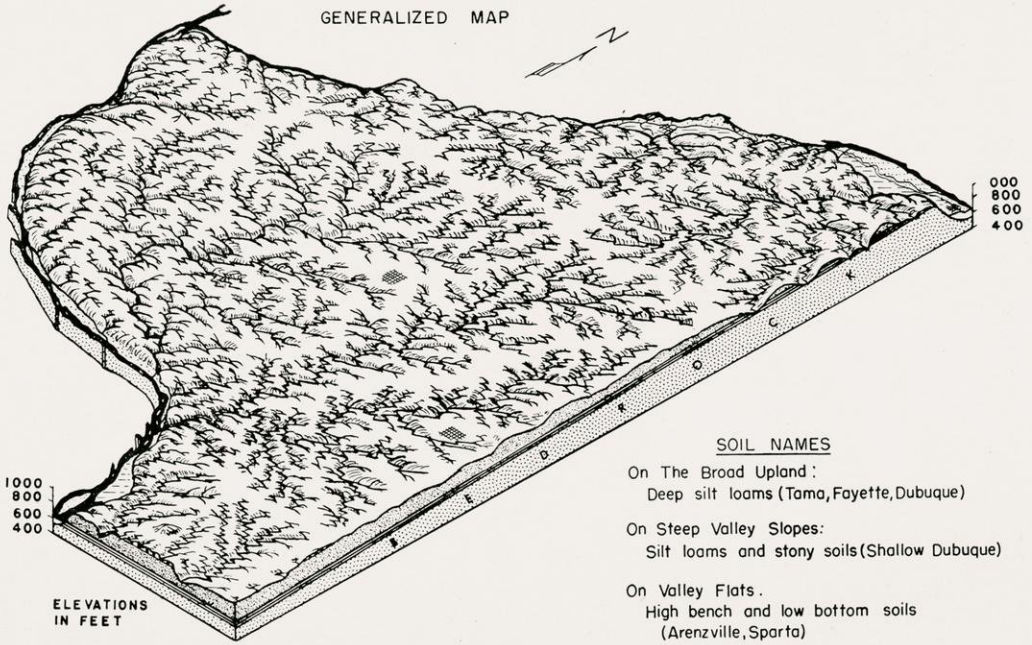
and

The Soil Conservation Service, U.S.D.A.
G. H. Robinson, Soil Survey Party Chief
Grant County Soil Survey

Madison, Wisconsin
Published by the State
1956

SOILS OF GRANT COUNTY, WISCONSIN

GENERALIZED MAP



SOIL NAMES

On The Broad Upland:
Deep silt loams (Tama, Fayette, Dubuque)

On Steep Valley Slopes:
Silt loams and stony soils (Shallow Dubuque)

On Valley Flats.
High bench and low bottom soils
(Arenzville, Sparta)

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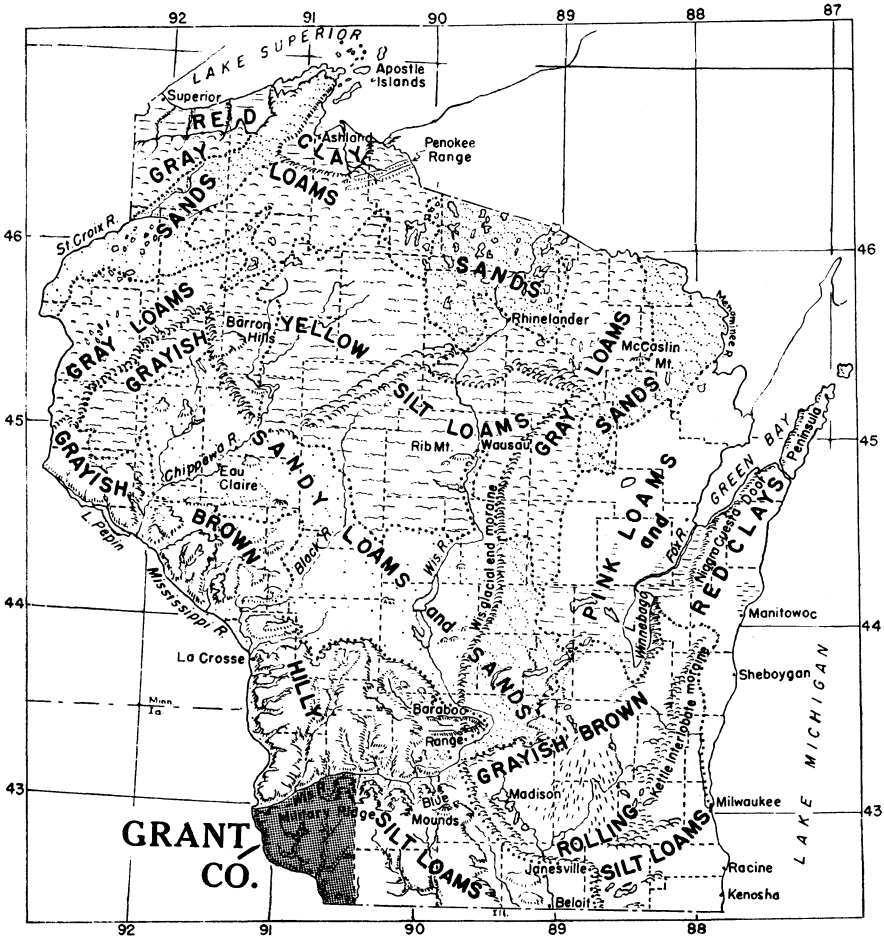

Figure 1. Index map showing location of Grant County, Wisconsin

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GENERALIZED SOIL KEY FOR USE IN THE GRAYISH BROWN HILLY SILT LOAMS REGION (FAYETTE-DUBUQUE SOIL ASSOCIATION), S.W. WISCONSIN

(Note: A soil key for your farm will be simpler. Your agricultural leader can help you prepare a small soil key for your landscape.)

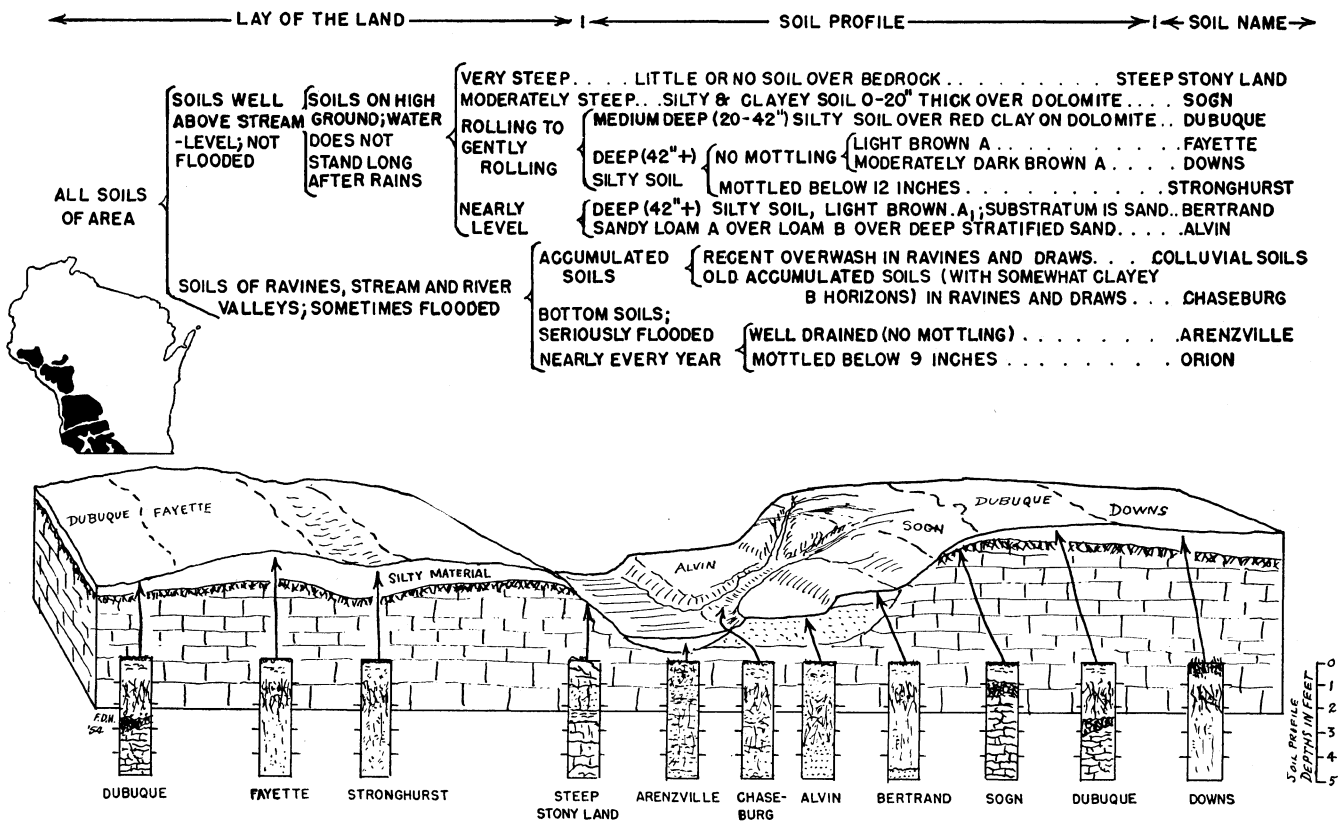

Figure 2.

SOIL SURVEY OF GRANT COUNTY, WISCONSIN

AN INTRODUCTORY REPORT

By FRANCIS D. HOLE
Soil Survey Division
Wisconsin Geological and Natural History Survey

THE SOIL MAP

The soil survey of Grant County was completed in 1950[1]. The field surveyors drew the soil boundaries on aerial photographs at a scale of 4 inches equal 1 mile. In 1952, the Soil Survey Division at the University issued a generalized colored soil map based on the detailed field sheets. A copy of this map is in the back pocket of this report. On the back of the map are 14 pages of text and illustrations explaining how to use the map, and giving general information about Grant County. There is a frost date map of the state. Individual town soil maps for 13[2] of the 31 towns in the county were issued by the Soil Survey Division and are available at the office of the County Agricultural Agent or at the University.

THIS REPORT

To provide further information about the soils and soil materials of the area, this introductory report has been prepared to accompany the map. There are four parts to the report: a generalized key to the soils of the county; a soil productivity rating table, in which the soils are listed in order of their estimated productivity of crops; a brief discussion on how the soils formed, illustrated by maps; and a set of soil profile descriptions.

SOILS OF GRANT COUNTY: GENERALIZED KEY

Introduction to the Soil Key

Grant County has an area of 1,168[3] square miles, or 747,520[3] acres of land, and is bounded on the north by the Wisconsin River and on the West by the Mississippi River, as indicated in Figure 1.

[1] The soil survey was made by soil surveyors of the U. S. Soil Conservation Service, the former U. S. Bureau of Plant Industry, Soils, and Agricultural Engineering, and the Soil Survey Division of the Wisconsin Geological and Natural History Survey at the University, cooperating with the College of Agriculture. Dr. G. H. Robinson was Field Party Chief.

[2] Folder town maps were issued for the following towns of Grant County: Bloomington, Boscobel, Ellenboro, Harrison, Hazel Green, Jamestown, Lima, Paris, Platteville, Potosi, Smelser, South Lancaster, Wyalusing (6).

[3] Data based on Bull. 325, Wis. Crop and Livestock Reporting Service (2). Other figures have been given in various publications, ranging from 1,137 square miles up to 1,169 square miles (9). The Wisconsin River covers about 4 square miles and the Mississippi River about 20 square miles in addition.

Forty different soils and three miscellaneous land types are listed in the legend of the introductory colored soil map. On the map they are grouped into 25 units, of which five cover 88 per cent of the area of the county (see page 4 on the back of the colored soil map). A complete list of the 43 soil separations is given on page 25.

Two types of soil keys, graphic keys and tabular keys, are represented in this report. Figure 2 on page 5 is an example of a graphic key (4) which shows the landscape positions of 12 soils in Grant County. The key can be taken to the field by an observer, who stands on a soil body and reads across the upper half of the key from left to right to find the soil-name. Choices are based on his observations made with the help of a spade or auger (5). The letter "A" refers to the topsoil and "B" stands for the somewhat clayey subsoil. The diagram in Figure 2 shows uplands (occupied by the soils named Dubuque, Fayette, Sogn, Downs, and Steep Stony Land), terraces (occupied by Alvin and Bertrand), and valley bottom (occupied by Chaseburg and Arenzville). Similar keys can be constructed with the help of the County Agricultural Agent for other soils of Grant County.

The soil key, pages 9 and 10, is in table form, and is divided into three parts for I) upland soils, II) natural terrace or bench soils in valleys, and III) valley bottom soils (see Figures 3 and 7). At the left side of each table are listed parent materials from which the soils formed. The probable original vegetation is indicated. This is of some importance to agriculture because forest soils, when cultivated, have a lower organic

Figure 3. View of bottomland (left), terrace soils (right, on which the men are standing), and upland soils (in the distance). Proper use and management requirements vary with different soil conditions illustrated.

Table 1

PART I, SOIL KEY, GRANT COUNTY, WISCONSIN: UPLAND SOILS

Parent Materials from which Soils Formed			Probable Original Vegetation	Shallow or Droughty Soils	Well Drained Soils	Fairly Well Drained Soils	Somewhat Poorly Drained Soils	Wet Marsh-Border Soils	Peats and Mucks
Silty layer (weathered silt, called loess)	42″ + thick		Forest		7. Seaton silt loam (coarse) 7. Fayette silt loam 15. Fayette silt loam, valley phase		7. Strong-hurst silt loam		
			Forest-Prairie Transition		3. Downs silt loam		18. Cashton silt loam	19. Garwin silty clay loam	
			Prairie		3. Tama silt loam 9, 16. Lindstrom silt loam	3. Muscatine silt loam			
	12–42″ thick	Over cherty clay on dolomite	Forest	23. Dubuque stony silt loam	8. Dubuque silt loam deep (24–42″) 14. Dubuque silt loam, shallow (9–24″)				
			Prairie	23. Sogn stony silt loam	8. Dodgeville silt loam, deep 14. Dodgeville silt loam, shallow				
		Over sand-stone			14. Gale silt loam				
Sandy material, wind-blown			Forest	24. Lamont loamy sand					
Sandstone	Coarse		Forest	24. Boone sand					
	Fine grained	Yellowish	Forest		17. Hixton loam				
			Prairie		17. Hesch loam				
		Greenish	Forest		-- Norden loam				
Sandstone and limestone			Forest	25. Stony land, steep					

Note: The numbers in the key refer to legend numbers on the Introductory Soil Map of Grant County, Wisconsin. A few soils are listed in the key which do not appear in the map legend. These soils are more extensive in counties adjacent to Grant County.

Table 1. PART II, SOIL KEY, GRANT COUNTY, WISCONSIN: TERRACE SOILS
(Natural Valley flats or benches well above flood levels)

Parent Materials from which Soils Formed			Probable Original Vegetation	Shallow or Droughty Soils	Well Drained Soils	Moderately Well Drained Soils	Somewhat Poorly Drained Soils	Wet Marsh-Broder Soils	Peats and Mucks
Silty layer (weathered loess-like)	42″ + of silty material		Forest		2. Bertrand silt loam	2. Jackson silt loam	11. Curran silt loam		
			Forest-Prairie transition		Downs silt loam, terrace phase				
			Prairie		1. Richwood silt loam	1. Toddville silt loam			
	12–30″ of silty material	over red clay	Forest		12. Medary silt loam				
		over sand	Forest		Tell silt loam				
Loam and sandy loam over sand			Forest		5. Alvin loam				
			Prairie		6. Dakota loam 13. Dakota sandy loam				
Deep sand			Forest	Plainfield sand					
			Forest-Prairie transition	Gotham loamy sand					
			Prairie	20. Sparta loamy sand 22. Sparts loamy sand, dune phase 24. Chelsea sand (wind-blown)					

PART III, SOIL KEY, GRANT COUNTY WISCONSIN, VALLEY BOTTOM SOILS
(Subject to floods or much wash)

Recent alluvium, often flooded	From timbered upland soils	Forest		4. Arenzville silt loam (deep, brown) 4. Ray silt loam (brown on black)	4. Orion silt loam			21. Marsh
	From timbered and prairie upland soils				10. Alluvial soils, undifferentiated			
	From prairie upland soils			4. Lawson silt loam				
Local alluvium subject to wash	From timbered upland soils	Forest		9. Chaseburg silt loam				
	From prairie upland soils	Prairie		9. Judson silt loam				

matter content in the plow layer, and are lighter in color than prairie soils (13, 18). The remaining columns, from left to right, arrange the soils in order from the most droughty to the wettest. In this table, natural drainage conditions are assumed, which means that the soils are classified by their natural condition before tiling and ditching or irrigation have altered normal water relationships. The numbers in the key correspond to numbers on the colored soil map.

Most of the soils of Grant County are well drained and show no mottling of rusty brown and light gray spots. Moderately well-drained soils show these mottlings in the subsoil or B horizon. Somewhat poorly drained soils show mottling in the entire soil profile. Marsh border soils have thick (8"–16") dark A horizons overlying gray subsoils. Soils with impeded drainage are most extensive along river bottoms and occur to a limited extent on the uplands in southeastern Grant County (see Figure 14). A comparison between Figure 5 and Figure 14 shows that areas of imperfectly drained soils on the upland appear to coincide with areas underlain by Maquoketa shale.

SOIL PRODUCTIVITY RATING ESTIMATES FOR GRANT COUNTY SOILS: GENERALIZED TABLE

Introduction to the Soil Productivity Rating Table

Soils differ in their ability to produce crops[4] (17). The best soils may be regarded as "blue-ribbon" soils, which, like stock-show animals, excell in productivity. Like a superior animal, a superior soil has a fine heritage (see Figure 4) and has received good care from its owner. A poor corn soil, like the Chelsea sand, cannot be eliminated from a farm, as can a poor stock animal, except as it is excavated and hauled off by sand and gravel trucks. But such a soil may be put to another use better suited to it and to the economy of the farm. In this sense no soil on the farm is a poor soil. The Chelsea sand is probably better suited to woodland than to any other use. Some soils which are not naturally suited to agricultural crops respond amazingly well to improved or intensive management. Sparta loamy sand, of low natural productivity, can with irrigation and fertilization be improved from an eighth rate to a fourth rate soil, according to estimates. This shows a greater response than in the case of the Richwood silt loam, a highly productive soil, which can be improved from a second rate to a first rate soil for corn.

Soil tests of samples from the plow layer of Grant County soils indicate that many fields are acid and low in phosphorus. With changes in fertilizer applications and management practices, the fertility levels of the soils will change. Therefore, the productivity ratings in the table, pages 12 and 13, are estimated on the basis of "1" for the least produc-

[4] See page 8 on the back of the colored soil map accompanying this report.

Table 2

SOIL PRODUCTIVITY RATING TABLE, GRANT COUNTY, WISCONSIN

(Preliminary edition)

Map Symbol	Soil types, listed in order[1] as given in the legend of the Introductory Soil Map	Approximate % of county by area	General Productivity Rating[2]	Crop Productivity Index[3] for							
				Corn (grain)	Corn (silage or fodder)	Oats	Clover, timothy	Alfalfa	Vegetables and small fruits	Tree fruits	Permanent pasture
1	Richwood silt loam	0.06	2	2(1)	2(1)	2(1)	2(1)	3(1)	2(1)	2--	2(1)
1	Toddville silt loam	0.05	2	2(1)	2(1)	2(1)	2(1)	3(2)	2(1)	2--	2(1)
2	Bertrand silot loam	0.30	3	3(2)	3(2)	3(1)	3(1)	3(2)	4(2)	3(2)	3(1)
2	Jackson silt loam	0.10	3	3(2)	3(2)	3(1)	3(1)	3(2)	2(1)	2--	2(1)
3	Tama silt loam	7.00	2	3(2)	3(2)	2(1)	2(1)	3(1)	2(1)	2(1)	2(1)
3	Downs silt loam	4.00	2	3(2)	3(2)	2(1)	2(1)	3(1)	2(1)	2(1)	2(1)
3	Muscatine silt loam	1.00	2	2(1)	2(1)	3(2)	2(1)	3(2)	2(1)	3(2)	2(1)
4	Arenzville silt loam	2.00	4(2)	5(2)	3(1)	5(3)	3(1)	--(4)	5(2)	---	3(2)
4	Ray silt loam	2.00	4(2)	5(2)	3(1)	5(3)	3(1)	--(4)	5(2)	---	3(2)
4	Orion silt loam	0.20	5(3)	6(3)	5(2)	6(3)	4(2)	---	6(3)	---	4(2)
4	Lawson silt loam	0.08	3(2)	4(1)	2(1)	4(2)	2(1)	3(1)	4(1)	---	2(1)
5	Alvin loam	0.40	5	5(3)	5(3)	5(3)	5(3)	7(3)	4(3)	4(3)	5(3)
6	Dakota loam	0.10	4	5(2)	5(2)	5(2)	5(2)	7(3)	4(2)	4(2)	5(3)
7	Fayette silt loam	24.00	3	4(2)	4(2)	3(2)	3(2)	3(1)	4(2)	3(1)	3(1)
7	Stronghurst silt loam	0.05	5(4)	5(2)	4(2)	4(2)	4(2)	--(3)	5(2)	5(3)	5(2)
7	Seaton silt loam	2.00	4	4(3)	4(3)	3(2)	3(2)	3(2)	4(2)	3(1)	4(2)
8	Dubuque silt loam, deep phase	10.00	4	5(3)	5(3)	4(2)	4(2)	4(2)	4(2)	3(1)	4(2)
8	Dodgeville silt loam, deep phase	8.00	3	4(2)	4(2)	3(2)	3(2)	3(2)	3(2)	3(1)	3(2)
9	Chaseburg silt loam	0.04	4(3)	5(3)	5(3)	4(2)	4(2)	4(2)	4(2)	3(2)	4(2)
9	Judson silt loam	0.04	4(2)	4(2)	4(2)	3(2)	3(2)	3(2)	3(2)	3(2)	3(2)
9	Lindstrom silt loam	0.03	4	4(2)	4(2)	3(2)	3(2)	3(1)	4(2)	3(1)	3(1)

Table 2 (Continued)

10	Alluvial soils, undifferentiated	2.00	10(3)	--(4)	--(3)	--(4)	--(4)	---	--(4)	---	--(3)
11	Curran silt loam	0.10	5(4)	5(2)	4(2)	6(3)	5(2)	--(3)	5(2)	6(4)	5(2)
12	Medary silt loam	0.20	4(3)	4(3)	4(3)	3(2)	3(2)	5(3)	5(3)	5(4)	4(2)
13	Dakota sandy loam	0.10	5	5(4)	5(4)	5(4)	5(4)	4(3)	5(2)	5(4)	5(4)
14	Dubuque silt loam, shallow phase	10.00	6	6(5)	6(5)	6(5)	6(5)	5(4)	6(3)	5(3)	5(4)
14	Dodgeville silt loam, shallow phase	8.00	5	5(4)	5(4)	5(4)	5(4)	4(3)	5(3)	5(3)	5(4)
14	Gale silt loam	0.30	6	6(4)	6(4)	6(4)	6(4)	6(4)	6(2)	6(4)	6(4)
15	Fayette silt loam, valley phase	0.40	5	5(4)	5(4)	5(3)	4(3)	5(3)	5(3)	4(2)	5(2)
16	Lindstrom silt loam, stp. ph.	0.10	5	5(4)	5(4)	5(4)	5(3)	4(3)	5(3)	4(2)	4(2)
17	Hesch loam	0.30	6	6(4)	6(4)	6(4)	6(4)	5(3)	6(3)	6(3)	6(3)
17	Hixton loam	0.60	7	7(5)	7(5)	7(5)	7(5)	6(4)	7(4)	7(4)	7(4)
18	Cashton silt loam	0.10	5(4)	5(2)	4(2)	5(3)	4(2)	--(3)	4(2)	6(4)	5(2)
19	Garwin silty clay loam	0.10	7(3)	7(2)	6(1)	7(4)	6(4)	---	7(3)	---	6(2)
20	Sparta loamy sand	1.00	8(4)	8(4)	8(4)	8(4)	9(4)	9(5)	7(3)	8(6)	9(5)
21	Marsh	0.30	9(6)	9(6)	9(6)	---	9(6)	---	9(5)	---	9(6)
22	Sparta sand, dune phase	0.40	10	---	---	---	---	---	---	---	10(8)
23	Sogn stony silt loam	0.50	9	9(6)	9(6)	9(6)	9(6)	9(5)	---	7(5)	9(6)
23	Dubuque stony silt loam	0.50	8	8(6)	8(6)	8(6)	8(6)	8(5)	8(6)	6(4)	7(5)
24	Boone sand	0.10	10	---	---	---	---	---	---	---	10(7)
24	Chelsea sand	0.20	10	---	---	---	---	---	---	---	10(7)
24	Lamont loamy sand	0.05	8	8(6)	8(6)	8(7)	8(6)	9(6)	9(5)	9(4)	9(5)
25	Steep stony land	13.20	10	---	---	---	---	---	---	---	10(8)

[1]The order of listing of soils in the Introductory Soil Map legend is determined in part by the association of the soils in the landscapes. For example, the Lamont loamy sand is associated with the more extensive and less productive Chelsea sand, and is therefore placed in the same class with the Chelsea.

[2]Soils have the highest general agricultural productivity in the agricultural region in which they occur are rated grade "1" for that region. When two productivity ratings are given in column three, the first rating refers to the grade number, and the figure in parentheses refers to the grade number when the soil is improved, as by artificial drainage or irrigation, or by protection from floods. The difference between the two figures is an estimate of the ability of the soil to respond to management.

[3]Soils most productive for a specific crop in the United States are rated as grade "1". Figures in parentheses indicate the productivity of the soil on which production is increased by the use of soil amendments, such as lime, fertilizer, manure, and by supplemental irrigation and by drainage, as needed. Where dashes (---) substitute for figures, the crop is usually not grown on the soil in question, or improvement is not likely because of some unfavorable condition, such as frost hazard.

tive soil, and "10" for the soil most productive of agricultural crops common to the region. The reader will need to consult the County Agricultural Agent and the Soils Department of the University to determine corresponding crop yields in terms of bushels or tons per acre under a given management. Soils differ as to reserves of moisture and plant nutrients which they carry in the subsoils. These differences are taken into account in the table.

General Management Recommendations

The job of increasing the productivity of a soil from the lower figure assigned to it in the table (pages 12, 13) to the higher figure, involves management practices such as those outlined on page 9 on the back of the colored map: application of fertilizers and barnyard manure, conservation of green manure, renovation of permanent pastures, fencing out stock from woodlands, use of soil conservation practices to reduce erosion. Farm operators can obtain latest information from the County Agricultural Agent, Soils Department of the University, and the Soil Conservation Service to assist them in developing the management system best suited to each soil and field, and to the farm enterprise.

HOW THE SOILS OF GRANT COUNTY WERE FORMED

Introduction

Why is one soil different from another? A tractor will pull two plows in one soil, and three in another; some soils have dark and others light

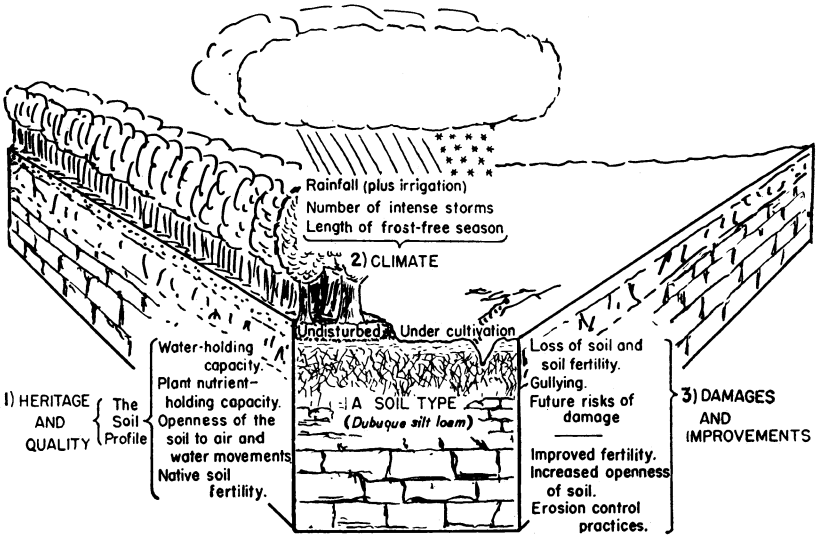

Figure 4. Important factors affecting the productivity of a soil.

surface colors; some are sandy and others clayey; some wet, some droughty; some deep and some shallow. Most soil differences in Grant County are related to the kinds of materials from which the soils formed, the types of vegetation, and the drainage conditions prevailing during soil formation.

The maps in this section of the report help explain the formation of Grant County soils. The oldest rocks exposed in the county are said by geologists to be over 400 million years old, while the most recent deposits on alluvial soils are less than a year old.

Bedrock Formations

Figure 5 sketches and tabulates the principal geologic formations (3) whose geographic pattern is shown in the map. These are all sedimentary rocks: sandstones and dolomitic limestones, originally laid down as sediments in ancient seas. Soft recent sedimentary deposits fill the deeply excavated Wisconsin River valley. Over a residual mantle of cherty clay which caps the upland lies a covering of loess (wind-laid silt), weathered to a depth of about six feet. A variety of land forms occur in Grant County, as illustrated in Figure 7. Figure 6 shows the principal mining areas in Grant County and adjacent counties. Lead, zinc and some copper ores have been taken from the Middle Ordovician rocks (Platteville, Decorah, Galena).

Surficial Deposits

RESIDUAL CHERTY CLAY

A brown or reddish-brown cherty clay overlies the major portion of the surfaces of the dolomitic limestones under the Dubuque, Dodgeville, and most of the Tama, Downs and Fayette soil bodies. The chert occurs as scattered fragments in the clay or, in many places, as concentrated bands or shattered masses, lying in and on the clay. On some slopes, just outside the boundaries of the dolomites, residual or colluvial cherty clay overlies sandstone instead of dolomite.

WIND-LAID DEPOSITS: SILTS AND SANDS

Most of the county is blanketed by a yellowish-brown silty or flourlike material, called loess, or its weathered residue. This material is believed to be a wind-blown deposit, most of which was laid down 8,000 to 20,000 years ago, according to Robinson (7). Near the Mississippi River, the deposit is thicker and coarser textured than farther north-east (see Figure 8). This suggests that south-west winds picked up dust from the ancient Mississippi River flood plains and carried it into and across the county. Without this fertile silty deposit, agriculture

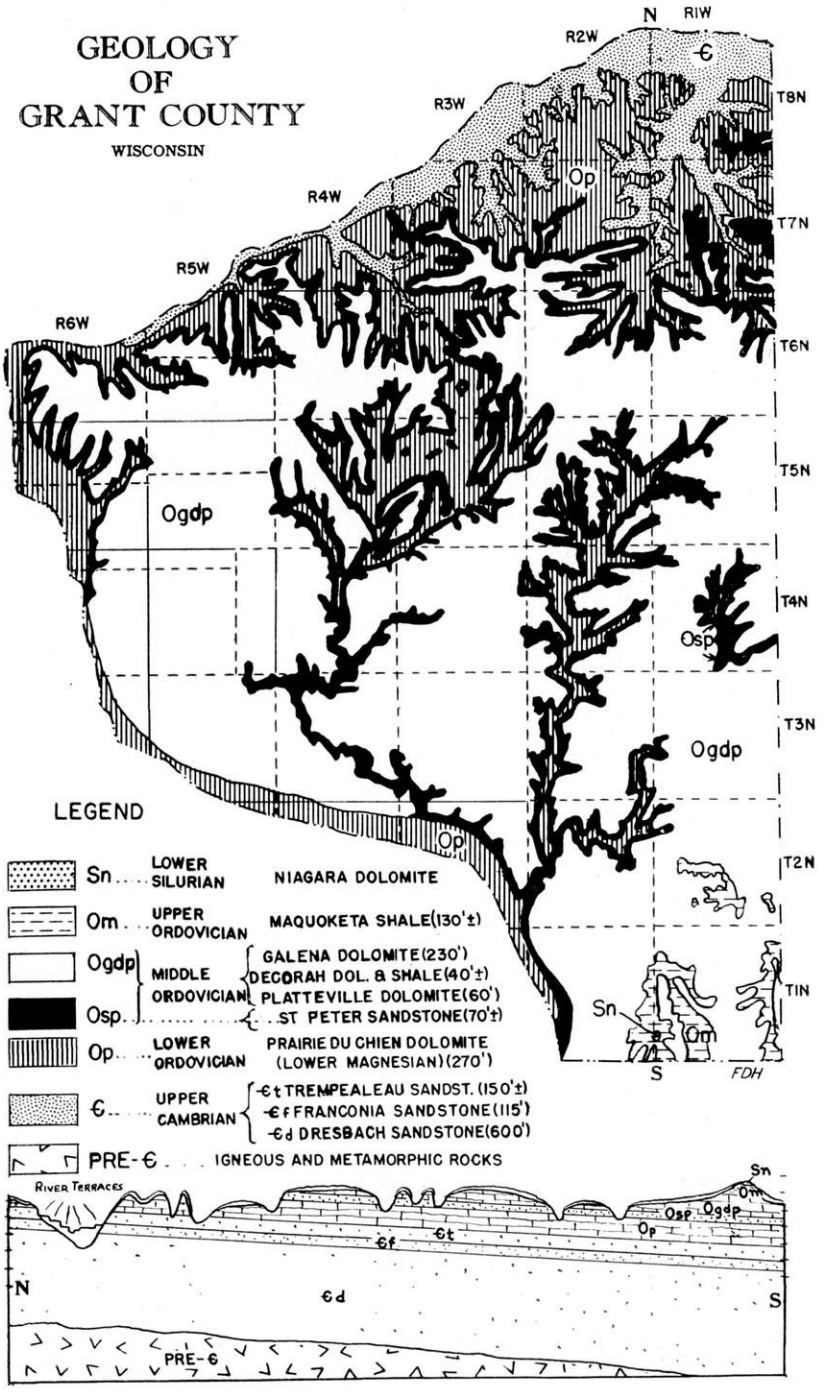
GEOLOGY
OF
GRANT COUNTY
WISCONSIN
N
R1W
R2W
R3W
R4W
R5W
R6W
T8N
T7N
T6N
T5N
T4N
T3N
T2N
T1N
Op
Ogdp
Osp
Sn
Om
LEGEND
Sn LOWER SILURIAN NIAGARA DOLOMITE
Om UPPER ORDOVICIAN MAQUOKETA SHALE(130'±)
Ogdp MIDDLE ORDOVICIAN GALENA DOLOMITE(230')
DECORAH DOL. & SHALE(40'±)
PLATTEVILLE DOLOMITE(60')
Osp ST PETER SANDSTONE(70'±)
Op LOWER ORDOVICIAN PRAIRIE DU CHIEN DOLOMITE (LOWER MAGNESIAN)(270')
€ UPPER CAMBRIAN €t TREMPEALEAU SANDST. (150'±)
€f FRANCONIA SANDSTONE(115')
€d DRESBACH SANDSTONE(600')
PRE-€ IGNEOUS AND METAMORPHIC ROCKS
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Figure 5.

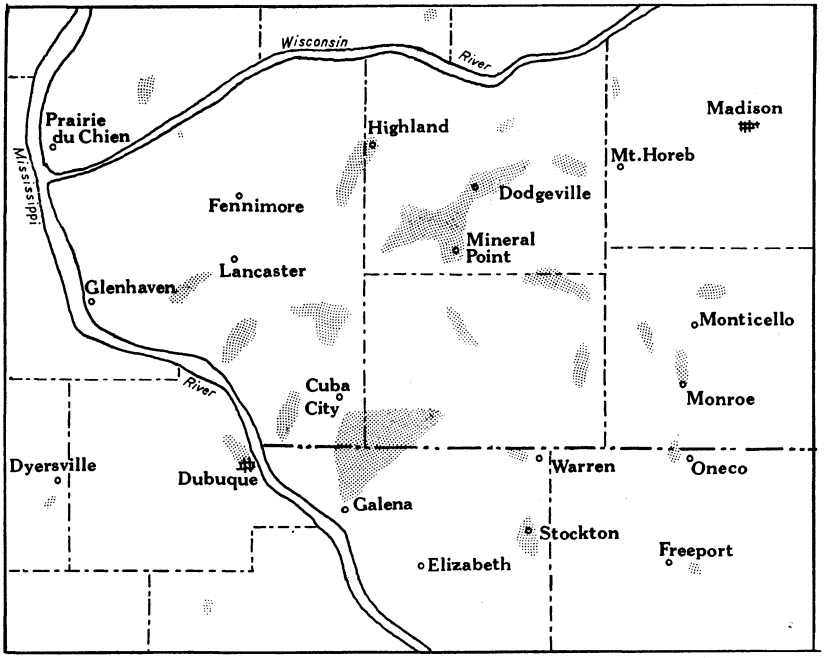

Figure 6. Mining areas in the upper Mississippi valley zinc-lead district (3).

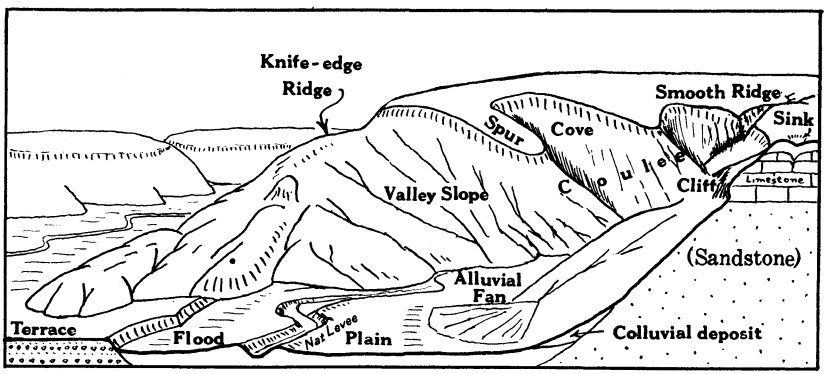

Figure 7. Some land forms found in unglaciated portions of south-western Wisconsin. Representative soil series for the various land forms are as follows—Terrace: Alvin, Sparta, Medary; Flood plain: Lawson, Arenzville; Alluvial fan and colluvial deposits: Chaseburg, Judson; Knife-edge ridge and cove: Hixton, Boone, Gale; Valley slope; Lindstrom, Hesch, Fayette (valley phase); Spur: Dubuque, Sogn; Smooth ridge: Tama, Muscatine, Downs.

would today depend on the less productive stony clay, and the limestone and sandstone bedrocks which now lie buried for the most part.

A few surficial sandy deposits are found on the upland. One-eighth of a mile north of the junction of U. S. Highway 151 and Wisconsin Highway 11 in Section 21 in the Town of Jamestown is an area of Lamont loamy sand, showing some old dune topography, high on the upland. Winds transporting the sand probably came from the west and south-west. At the foot of the bluffs southeast of Boscobel, T.8N., R.3W. are sand deposits with steep slopes, called Chelsea sand, which appear to have been blown out of the Wisconsin River floodplains by winds from the northwest, probably thousands of years ago. Some of the Chelsea deposits extend up ravines to the cultivated fields on the upland, some 300 feet above the river.

Legend for Figure 8, Generalized Map of Surficial Wind- and Water-Laid Deposits of Grant County, Wisconsin

Map Symbols	Original Deposits	Present Soils on Ridge Crests	Present Soils on Valley Slopes	Present Soils on Terraces
1	Coarse loess, about 16 ft. deep on uplands	Seaton silt loam (Black areas on map)	Seaton silt loam	----------
2	Wind- and water-laid sands about 25 ft. thick	Lamont loamy sand	Chelsea sand (Vertically striped areas on map)	----------
3	Wind- and water-laid sands and loams on river terraces	----------	----------	Sparta and Plainfield sands; Dakota and Alvin sandy loams and loams
4	Wind- and water-laid silts and clays on river terraces	----------	----------	Downs, Richwood, Bertrand, Tell and Medary silt loams
5	Loess, about 8 to 16 ft. deep, on uplands	Tama, Downs, Fayette silt loams	Tama, Downs, Fayette silt loams	----------
6	Loess about 4 to 8 ft. deep, on uplands	Tama, Downs, Fayette silt loams	Deep Dubuque and Dodgeville silt loams; steep stony land	----------
7	Loess, about 3 to 7 ft. deep, on uplands	Tama, Downs, Fayette, Deep Dubuque silt loams	Shallow Dubuque and Dodgeville silt loams; steep stony land	----------
8	Loess, about 2 to 6 ft. deep, on uplands	Deep Dubuque and Dodgeville silt loam	Shallow Dubuque and Dodgeville silt loams; valley phase Fayette silt loam; steep stony land	----------
9	Loess, about 1 to 4 ft. deep, on uplands	Shallow Dubuque silt loam	Hixton and Norden sandy loams; some valley phase Fayette silt loam	----------
10	Alluvium, recent, in flood plains	----------	----------	----------

Topography

Figures 9 and 10 show the well-integrated drainage system of Grant County. The valleys of permanent streams are steep sided. Elevations range from slightly over 1225 feet above sea level, four miles north of Fennimore, to 595 feet, the level of the Mississippi River at Dubuque, giving a total relief of more than 600 feet. Intense rain storms give rise

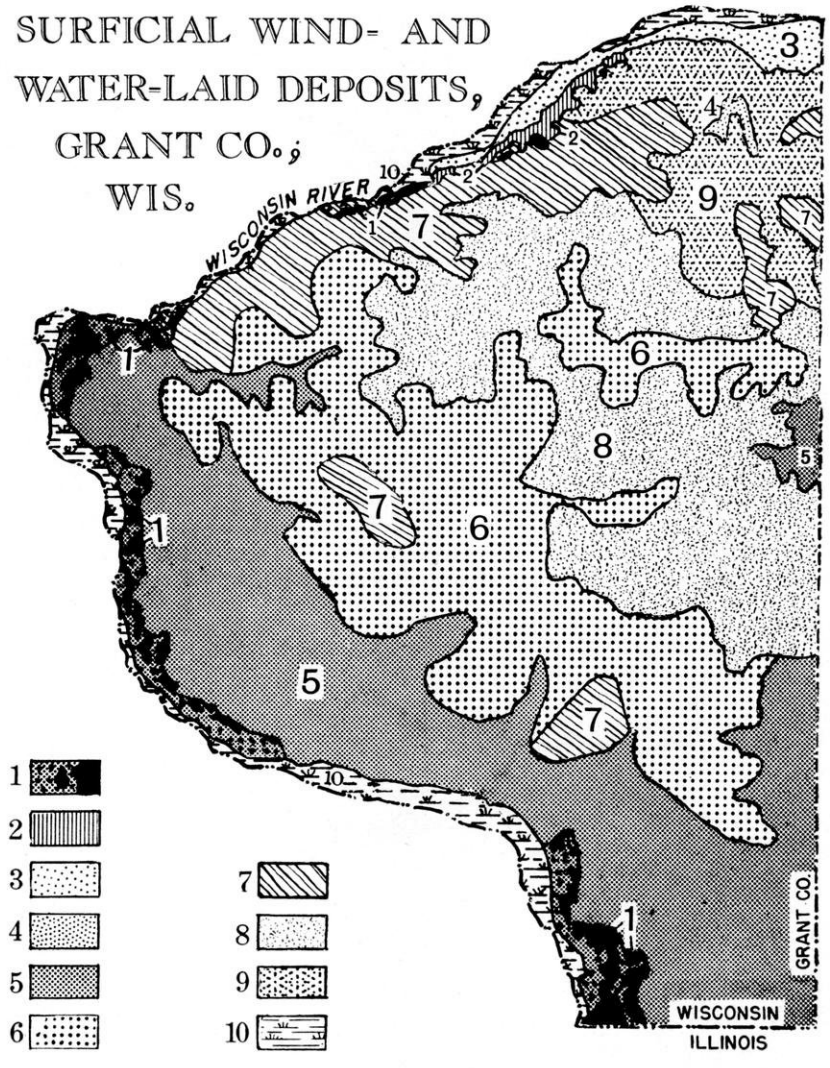

Figure 8.

to flash floods in the valleys of Grant County. The Ray soil (see page 47), consisting of one to four feet of light colored alluvium over a buried dark soil, was more extensive 25 years ago than it is today. Because of continued deposits by flood waters over the years, the light colored alluvium is now six or more feet thick in many places, and this deeper soil is called the Arenzville silt loam. In portions of the upper

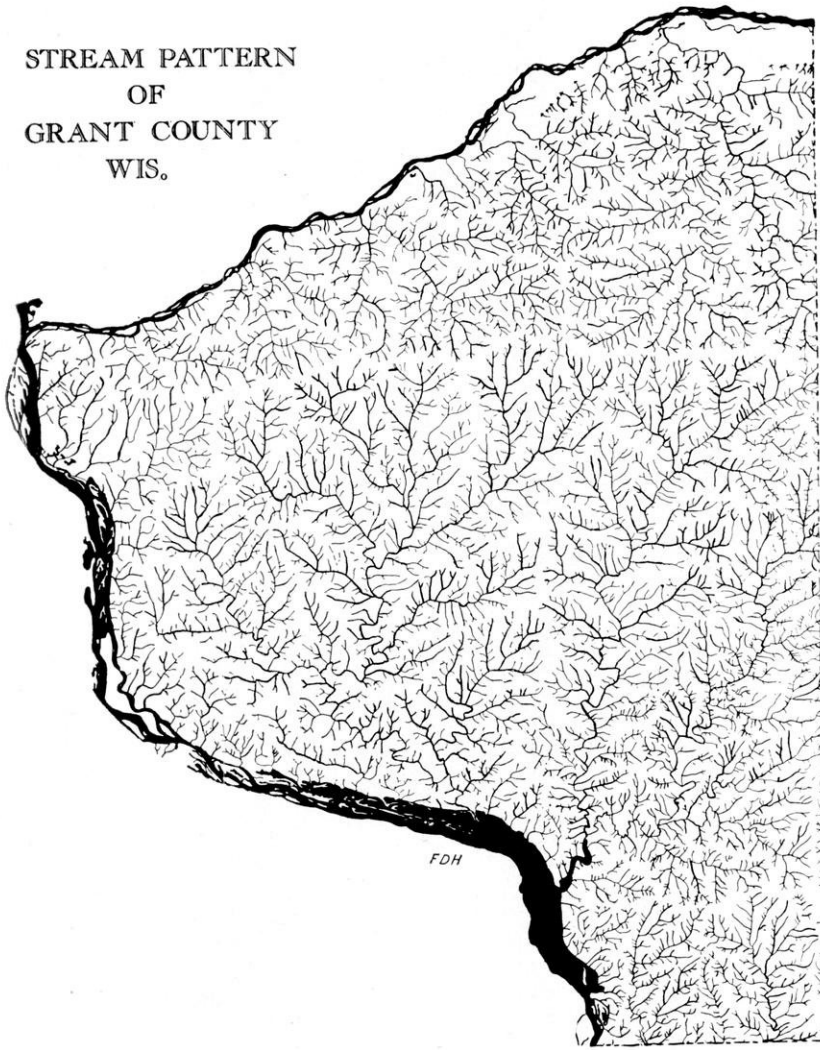

Figure 9.

valleys and their tributaries, the Chaseburg silt loam has been buried or replaced by stony, cherty deposits. The program of soil and water conservation which has been in operation in Grant County has curtailed damage to soil remarkably, but the force of running water during intense storms can still defy precautions taken.

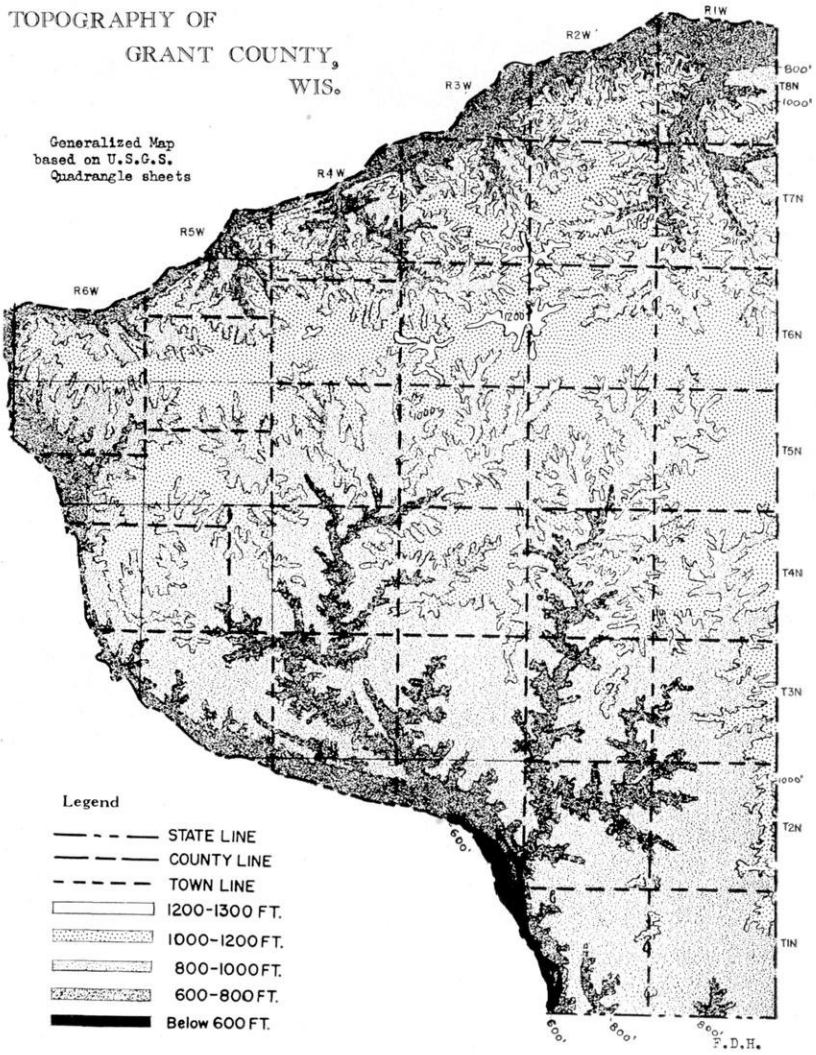

Figure 10.

Climate

The climate of Wisconsin is characterized by long, severe winters, and humid summers with alternating warm and cool periods. According to some climatologists (16), a boundary runs through Grant County roughly parallel to the Mississippi River, separating the humid climatic zone on the east from the subhumid climatic zone on the west.

Table 3

TEMPERATURE AND PRECIPITATION: MONTHLY, SEASONAL, AND ANNUAL AVERAGES FOR LANCASTER, GRANT COUNTY, WISCONSIN (1)

Month	Average Temperature		Average Precipitation Inches	
December	22		1.3	
January	16		1.1	
February	19		1.1	
WINTER		19		3.5
March	32		2.0	
April	47		2.8	
May	58		4.1	
SPRING		46		8.9
June	67		4.0	
July	69		3.9	
August	70		3.6	
SUMMER		68		11.5
September	62		4.2	
October	50		2.3	
November	35		1.9	
AUTUMN		49		8.4
YEAR		46		32.3

Snow covers the landscape approximately 90 days out of the year, and the average annual snow fall is almost three feet. The frost-free season ranges from 150 to 165 days. Average frost penetration in the soil is between five and 40 inches. The last average date of killing frost in the Spring at Lancaster is usually on April 26 (4, p. 44), although ten times out of a hundred it is as late as May 19. The average date for the first fall frost is October 3 but 10 per cent of the time it may come as early as September 25. According to "Climate and Man" (16), temperatures as high as 108° and as low as —30° have been recorded in the county. There are nearly 40 days each year with thunderstorms, some of which have rainfall intensities as high as 2.5 inches per hour. There are about three days with hail, annually, and ten or 15 days with dense fog. On a winter day, there are on an average 4½ hours of sunshine, or 45 per cent of the possible sunshine. In summer, there are about ten hours of sunshine daily, or nearly 70 per cent of the possible sunshine.

The distribution of dark colored and light colored agricultural soils, shown in Figure 11, is characteristic of areas lying between the drier prairie country to the southwest and the once forested country to the northeast. In Grant County, prairie vegetation, oak woods, and maple forest have probably shifted positions for centuries. Sometimes fires extended the prairie areas at the expense of the woodlands.

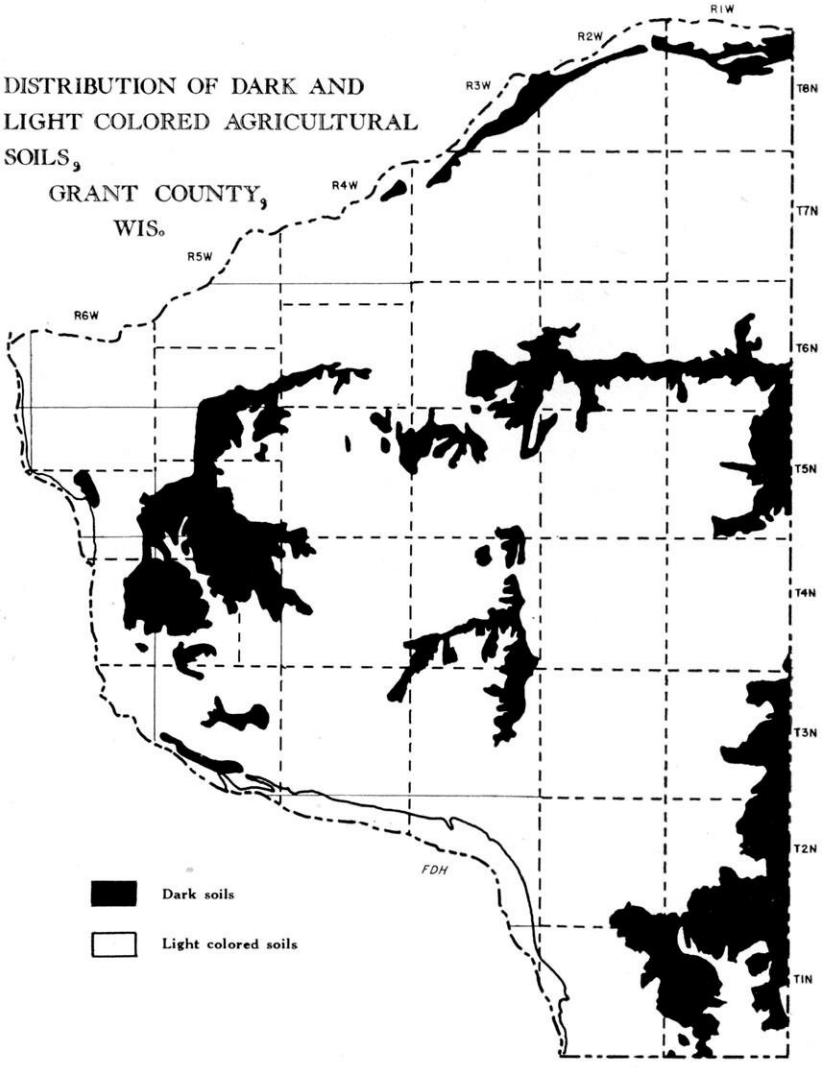

Figure 11.

SOIL PROFILE DESCRIPTIONS

Introduction

Table 4 lists the 43 soil separations shown on the colored soil map. Each soil is defined by its cross-section to a depth of about four feet, as shown in Figure 12. This cross-section is called the soil profile (4, 14), and shows the various soil layers in which plant roots develop and feed (see Figure 12 on page 26 for sketches of soil profiles). A soil body of which the four-foot profile is a narrow, representative vertical cross-section, is a large sheet, irregular in shape, measuring 300 to 3,000 or more feet across. Soil bodies of each kind of soil have a characteristic range in profile characteristics, slope, susceptibility to erosion under various conditions, native fertility, and response to amendments. It may be said that soil management is simpler on fields which consist of one soil. In such a case, the same treatments can be applied to the entire field with uniform results. However, many soil bodies are irregular ribbons in shape and even a strip in a stripcropped field may be traversed by two or more bodies of different soils. Where two soils in a field have extremely different management requirements, the operator may handle each portion of the field differently, or may treat the whole field in accordance with the requirements of the least productive part.

Individual soil profile descriptions are arranged in alphabetical order in the following pages. In some cases, exact locations are given for the sites at which detailed descriptions were made in the field. For most of the soils, however, descriptions have been based on observations made at several sites.

A soil profile description provides important information, because our scientific classification of soils (8, 11), as well as our agriculture are based on these kinds of soils. Great Soil Groups (8), such as "Gray-Brown Podzolic" and "Brunizem," are technical terms used by soil scientists in classifying soils throughout the world. As more research is done on the soils both in the laboratory and in the field, more complete descriptions and data will become available. Present data have been compiled by workers of the Soil Survey Division, the Soil Conservation Service, and of Agricultural Colleges of the region.

The reader is referred to the Soil Survey Manual (14) for detailed explanations of the technical terms used in the soil descriptions. Each description consists of two parts, an introductory paragraph and a description of soil horizons. The introductory paragraph gives information about the parent material from which the soil formed; the thickness and approximate clay content of the subsoil or B horizon, and the overlying horizons; the common types and phases mapped; and names of associated soils. The description of soil horizons gives colors with corresponding

scientific "Munsell notations," such as 10 YR 4/2 for moist soil, taken from the color chart books (10) used by soil surveyors, the texture (sandy loam, silt loam, clay, and so on), structure (granular, blocky, platy, prismatic), reaction or pH (degree of acidity or alkalinity by Truog quick test), and sometimes organic matter content. The type location and the place and date of establishment of the series are known for most of the soils. The loess from which the silty upland soils formed is called Peorian loess (12, 7).

Table 4

LIST OF SOILS AND OTHER UNITS SHOWN ON THE COLORED INTRODUCTORY SOIL MAP OF GRANT COUNTY, WISCONSIN IN ORDER OF PROPORTIONATE EXTENT

Map Symbol	Name of Unit	Percent of County	Map Symbol	Name of Unit	Percent of County
7	Fayette silt loam	24.0	14	Gale silt loam	0.3
25	Steep stony land	13.2	17	Hesch loam	0.3
8	Dubuque silt loam, deep	10.0	21	Marsh	0.3
14	Dubuque silt loam, shallow	10.0	4	Orion silt loam	0.2
8	Dodgeville silt loam, deep	8.0	12	Medary silt loam	0.2
14	Dodgeville silt loam, shallow	8.0	24	Chelsea sand	0.2
3	Tama silt loam	7.0	2	Jackson silt loam	0.1
3	Downs silt loam	4.0	6	Dakota loam	0.1
7	Seaton silt loam	2.0	11	Curran silt loam	0.1
4	Arenzville silt loam	2.0	13	Dakota sandy loam	0.1
4	Ray silt loam	2.0	16	Lindstrom silt loam, steep	0.1
10	Alluvial soils, undifferentiated	2.0	18	Cashton silt loam	0.1
20	Sparta loamy sand	1.0	19	Garwin silty clay loam	0.1
3	Muscatine silt loam	1.0	24	Boone sand	0.1
17	Hixton loam	0.6	4	Lawson silt loam	0.08
23	Sogn stony silt loam	0.5	1	Richwood silt loam	0.06
23	Dubuque stony silt loam	0.5	1	Toddville silt loam	0.05
15	Fayette silt loam, valley phase	0.4	7	Stronghurst silt loam	0.05
5	Alvin loam	0.4	24	Lamont loamy sand	0.05
22	Sparta sand, dune phase	0.4	9	Chaseburg silt loam	0.04
2	Bertrand silt loam	0.3	9	Judson silt loam	0.04
			9	Lindstrom silt loam	0.03
					100.00

Individual Soil Profile Descriptions

ALLUVIAL SOILS, UNDIFFERENTIATED (No. 10 on the colored soil map)

Alluvial soils, undifferentiated, is a miscellaneous land unit, which includes many kinds of alluvial soils on the bottomlands. The term, "undifferentiated" means that the surveyors did not map out the individual soil series and types, chiefly because floods change the surface textures and pattern of deposits from year to year. These soils are not considered productive enough to warrent expenditure of time and money to map them in detail. This unit includes silty clay loams, silt loams, loams, sandy loams, and sands, well to poorly drained. In some places flood waters have washed stones and cherty gravels down over bottomland. Some peat areas may be included in this miscellaneous land unit. This is a multitype and multiphase unit, whose components have not been separated on current soil maps.

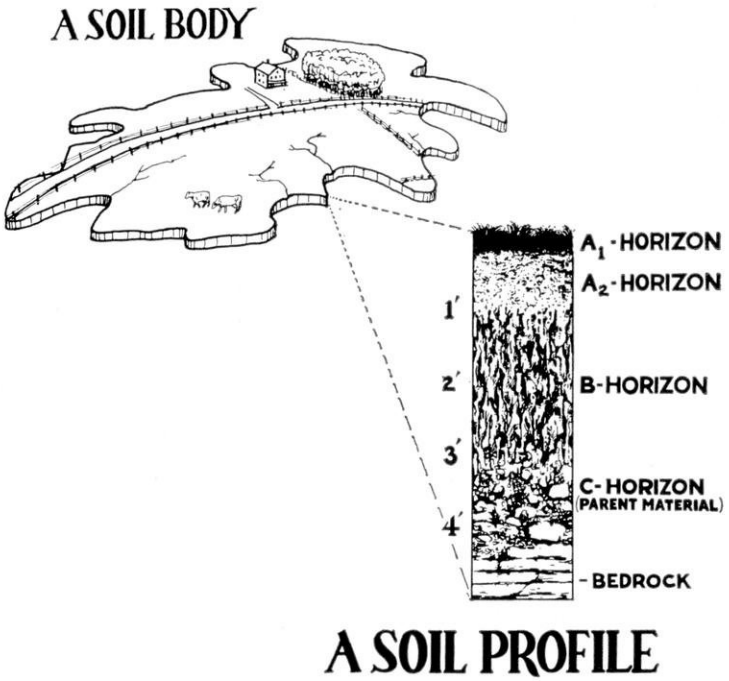

Figure 12. A soil body is a natural unit in the landscape, characterized by position, slope, size, profile, and other features.

ALVIN SERIES (No. 5 on the colored soil map)

The Alvin series (formerly called the Meridian series) includes soils on terraces or benches made of old sandy river deposits, with or without surficial wind sorting locally. Natural soil drainage conditions have been good during soil formation, and the original vegetation was oak-hickory forest. The subsoil (B horizon) begins at a depth of about 15 inches and continues downward another 15 or 20 inches, with a maximum clay content of about 12%. Above and below the B horizon are sandier layers, the upper of which (A horizon) contains about 6% clay and the lower (C horizon) about 3% clay. Slopes are usually less than 4% on the river bench surfaces, and reach 20% to 30% on the breaks or escarpments. The presence of a distinct textural B horizon differentiates this series from the Plainfield series, and the light colors of the upper horizons separate it from the Dakota series. The Alvin series includes several types: fine sandy loam, sandy loam, and loamy sand. There are slope and erosion phases.

SOIL PROFILE DESCRIPTION

Alvin fine sandy loam

0–8″	A_p	Dark grayish-brown (10YR 4/2, moist) fine sandy loam; very weak fine granular to single grain; pH 6.5; about 1% organic matter.
8–14″	A_2	Brown (10YR 5/3, moist) sandy loam, weak medium platy structure to single grain; pH 6.0; about 0.2% organic matter.
14–20″	B_2	Yellowish-brown (10YR 5/4, moist) sandy loam; weak fine blocky structure, subangular; pH 5.6; about 12% clay.
20–32″	B_3	Yellowish-brown (10YR 5/4–5/6, moist) sandy loam to loamy sand; very weak fine blocky structure to single grain; pH 5.4; about 0.1% organic matter; about 6% clay.
32–42″	C_1	Light yellowish-brown to very pale brown (10YR 6/4–7/4) fine sand; single grain; pH 5.1; about 0.1% organic matter.

Type location: Iroquois County, Illinois. Series established: Vermillion County, Illinois, 1931. Source of name: Town in Vermillion County, Illinois.

ARENZVILLE SERIES (No. 4 on the colored soil map)

The Arenzville series includes well to moderately well drained soils on valley bottoms which are subject to flooding. These soils have been formed for the most part since settlement by Europeans. At a depth of five to 15 feet lies a dark buried soil, the original bottomland soil which was at the surface many years ago. Arenzville soils differ from the Ray soils in the greater depth (more than 42 inches) of light colored alluvium overlying the dark soil. Arenzville soils can be considered to be young ones, whose development is interrupted annually by fresh deposits washed from the upland soils of the Peorian loess-derived prairie and associated Gray-Brown Podzolic areas. These soils are classified as Azonal, Alluvial soils. This is a monotype and monophase series, as mapped in Grant County.

SOIL PROFILE DESCRIPTION

Arenzville silt loam

0–6″	A_1	Dark grayish-brown (10YR 4/2, moist) silt loam; weak fine granular to weak medium platy structure; pH 7.0
6–80″	A_b	Grayish-brown (10YR 5/2, moist) silt loam; weakly stratified to massive; pH 7.0.
80″–90″+	DA_b	Very dark grayish-brown (10YR 3/2, moist) silt loam; massive to weak fine blocky; pH 6.5.

Type location: Cass County, Illinois. Series established: Cass County, Illinois, 1939. Name from a town in Cass County, Illinois.

BERTRAND SERIES (No. 2 on the colored soil map)

The Bertrand series includes soils developed from deep silt (42″+) over high terraces or valley benches of outwash gravels, sands or rock. Natural soil drain-

age conditions have been good and the original vegetation was forest, probably oak-hickory. In some places, in Richland and Crawford Counties, reddish-brown silts and clays have been encountered at ten to 15 feet beneath the Bertrand soil profile. The subsoil (B horizon) begins at a depth of about one foot and continues downward 20 to 30 inches, with a maximum clay content of about 34%. Both above and below the B horizon are silt loam layers, the upper of which (A horizon) contains about 15% clay and the lower (C horizon) 25% clay. Slopes are usually less than 8%. Associated soils are the moderately well-drained Jackson and the somewhat poorly drained Curran. This is a monotype series with several slope and erosion phases.

SOIL PROFILE DESCRIPTION

Bertrand silt loam

0–4″	A_{1p}	Dark grayish-brown (10YR, 4/2 moist) silt loam; fine granular structure; friable; pH 6.5; about 3% organic matter.
4–8″	A_2	Brown (10YR 5/3, moist) silt loam; weak fine platy; friable; pH 6.0; about 0.5% organic matter.
8–14″	B_1	Brown (10YR 4/3, moist) heavy silt loam; well developed fine subangular blocky structure; aggregates coated with dark grayish-brown (10YR 4/2, moist); pH 5.5; about 0.3% organic matter.
14–23″	B_{21}	Brown (10YR 4/3, moist) heavy silt loam; well developed medium subangular blocky; pH 5.8; about 0.1% organic matter; coatings of aggregates as in the B_1.
23–35″	B_{22}	Yellowish-brown (10YR 5/4, moist) silty clay loam, coated with dark grayish-brown (10YR 4/2, moist); pH 5.8; about 0.2% organic matter.
35–40″	C_1	Yellowish-brown (10YR 5/4, moist) silty clay loam, coated with some dark yellowish-brown (10YR 4/4, moist); pH 6.0; about 0.1% organic matter.

Type location: Vernon County, Wisconsin. Series established: Mississippi County, Missouri, 1921.

BOONE SERIES (No. 24 on colored soil map)

The Boone series includes upland soils formed from fine and medium sands weathered from upper Cambrian and St. Peter (Ordovician) sandstones in the unglaciated region of southwestern Wisconsin and adjacent states. Drainage has been rapid and vegetative cover was forest of oak-hickory, scrub oak, and jack pine. The B horizon is evident only as a yellowish-brown layer. The clay content of about 5% is no higher in the B than in the A horizons above it and in many places also than in the horizon below it. Slopes are usually less than 30%. The series includes several types: loamy fine sand, fine sand, medium sand. There are several slope and erosion phases.

SOIL PROFILE DESCRIPTION

Boone loamy fine sand

2–1½″	A_{00}	Fresh leaf litter.
1½–0″	A_0	Very dark gray (7.5YR 3/0, moist) decomposed organic layer with a moderately developed medium granular structure. Lower

boundary is smooth, abrupt. "Salt and pepper" appearance produced by the presence of quartz grains.

0–4″	A_1	Dark grayish-brown loamy fine sand (10YR 4/2, moist); very friable; with a weak crumb to single-grain structure; lower boundary is wavy, clear.
4–8″	A_2	Dark yellowish-brown (10YR 4/4, moist) loamy fine sand; somewhat compact in place, but friable when disturbed; single grain structure; lower boundary wavy, clear.
8–24″	B	Yellowish-brown (10YR 5/6, moist) loamy fine sand, slightly compact in place; friable when disturbed; weak fine granular structure; lower boundary wavy, gradual.
24–30″	C_1	Very pale brown (10YR, 7/4, moist); loose sand; single grain; sandstone fragments occupy 30% of the volume of the horizon.
30–36″	D_r	Bedrock sandstone.

Type location: Eau Claire Connty, Wisconsin. Series established: Bates County, Missouri, 1907.

CASHTON SERIES (No. 18 on colored soil map)

The Cashton series includes upland soils formed from deep (42″+) silt under prairie and oak-hickory vegetative covers, and under moderate to somewhat poor natural soil drainage conditions. Probably these soils were prairie soils a century or more ago, but invasion of the prairie by trees has favored the formation of an A_2 or light colored subsurface horizon. These soils are classified as moderately well drained inter-grades between Gray-Brown Podzolic and Brunizem great soil groups; or as intrazonal planosolic associates of them. The subsoil (B horizon) begins at a depth of about 14 inches and continues downward for about two feet, with a maximum clay content of about 38%. Both above and below the B horizon are silt loam layers, the upper of which (A horizon) contains about 20% clay, and the lower (C horizon) about 26% clay. Slopes are usually less than 7%. This appears to be a monotype series, with various phases based on differences in slope and degree of artificial drainage.

SOIL PROFILE DESCRIPTION

Cashton silt loam

(SW¼ SE¼ Sec. 1, T 1 N, R 1 W, Grant County, Wis.)

0–10″	A_1	Black (10 YR 2/1, moist) silt loam; friable; coarse to medium granular structure; pH 7.0.
10–13″	A_{2g}	Dark gray to dark grayish-brown (10YR 4/1–4/2, moist) silt loam; friable; fine platy; vesicular; pH 6.5.
13–19″	B_{1g}	Dark gray mottled with grayish-brown (10YR 4/1, 5/2, moist) silt loam; friable; medium platy to fine blocky structure; pH 5.8.
19–25″	B_{21g}	Dark grayish-brown mottled with brown (10YR 4/2, 5/3, moist) heavy silt loam; medium blocky structure; pH 6.5.

25–36″	B_{22g}	Light brownish-gray (2.5Y 6/2, moist) mottled with brown (10YR 5/3, moist) and dark reddish-brown (5YR 2/2, moist) silty clay loam; medium blocky structure; pH 7.0.
36–60″	C_g	Light brownish-gray (2.5Y 6/2, moist) mottled yellowish-brown (10YR 5/6, moist) silt loam; pH 7.5; calcareous at 60 inches.

Type location: Fillmore County, Minn. Series established: Coon Creek Project in Vernon, Monroe and La Crosse Counties, Wisconsin, 1939. Source of name: town in Monroe County, Wisconsin.

CHASEBURG SERIES (No. 9L on the colored soil map)

The Chaseburg series includes soils formed from light colored colluvial deposits (local alluvium) in ravines draining uplands on which Fayette and Dubuque soils predominate. Drainage conditions have been good, and the original cover was hardwood forest (oak-hickory). This series includes young, Azonal local alluvial soils, and some young Gray-Brown Podzolic soils. Some of the Chaseburg soils have no textural B horizon, though they may have layers of slightly finer texture with depth, which represent the earliest colluvial deposits. Some Chaseburg soils appear to have slightly developed textural B horizons, with a maximum clay content of about 25%. Some stones and sandy streaks are usually found throughout the profile. Slopes are usually less than 10%. Chaseburg soils have been mapped in ravines, or small alluvial fans, and on colluvial foot slopes below Fayette valley phase bodies and above alluvial flats. This series includes several types: silt loam, very fine sandy loam, loam. Several slope and stony phases are mapped.

SOIL PROFILE DESCRIPTION

Chaseburg silt loam

0–4″	A_1	Dark grayish-brown (10YR 4/2, moist) silt loam; friable; weak fine granular structure; pH 6.0.
4–20″	A_3	Pale brown to light yellowish-brown (10YR 6/3–6/4, moist) silt loam; friable; weak fine blocky structure to massive; pH 5.8.
20–40″	A_3–B_1	Light yellowish-brown (10YR 6/4, moist) heavy silt loam; friable; massive; pH 5.8.
40–45″+	C	Light yellowish-brown (10YR 6/4, moist) silt loam, with light gray and yellowish-brown (10YR 7/2 and 5/4, moist) mottlings; friable; weak coarse blocky structure; pH 5.5.

Type location: Vernon County, Wisconsin. Series established: Vernon County, Wisconsin, 1938. Source of name: town in Vernon County, Wisconsin.

CHELSEA SERIES (No. 24 on the colored soil map)

The Chelsea series includes soils formed from deep sandy deposits which occupy a position between high river terraces and valley slopes. The deposits show cross-bedding, and occasional seams of fine textured material. It appears that wind was the principal agent of deposition of the sand at the bases of the bluffs and in ravines which dissect the uplands south of the lower course of the Wisconsin River. Vegetation was oak-hickory and prairie. These soils are classified as Azonal Regosols. Slopes range up to 30%.

Chelsea soils are most extensive in Grant County between Blue River and Boscobel. Because the deposits from which the soils formed are in a foot-slope position where colluvium is usually found, and yet appear to have been blown into place by winds from the north, the term "duneuvium" is proposed. Some of these deposits extend from the base of the bluffs in the Wisconsin River valley up deep ravines, even as far as the uplands at the heads of the ravines. Dune topography occurs locally. Evidence from a study of soils on terraces in Richland County indicates that prevailing winds which deposited aeolian material on those benches were from the southwest. The Chelsea soils of Grant County are so placed that northerly winds are indicated. This is a monotype series in Grant County, with several slope and erosion phases.

SOIL PROFILE DESCRIPTION

Chelsea fine sand

(NW corner, Sec. 3, T 7 N, R 3 W, Grant Co., Wis.)

0–9″	A_1	Very dark grayish-brown (10YR 3/2, moist) loamy fine sand; loose; weak fine granular structure to single grain; lower boundary wavy, clear; pH 6.0 above to 5.7 below.
9–16″	A_3	Dark brown (10YR 3/3, moist) fine sand; loose; single grain; lower boundary wavy and clear; pH 5.7.
16–26″	C_1	Brown to strong brown (7.5YR 5/4–5/6, moist) fine sand; loose; single grain; lower boundary wavy, gradual; pH 5.8.
26–40″	C_2	Yellow to brownish-yellow (10YR 6/6–7/6, moist) fine sand; loose; single grain; stratified below; pH 5.9.

Type location: Tama County, Iowa. Series established: Tama County, Iowa, 1938. Source of name: small town in Tama County, Iowa.

CURRAN SERIES (No. 11 on the colored soil map)

The Curran series includes soils formed from deep silt (42″+) on high terrace benches of outwash gravels, sands, or bedrock in valleys. Natural soil drainage conditions have been somewhat poor and the original vegetation was probably forest, chiefly oak, elm, maple and walnut. They are classified variously as planosolic or low Humic-Gley intrazonal soils associated with Gray-Brown Podzolic zonal soils. The subsoil (B horizon) begins at a depth of about a foot and continues downward 20 or 30 inches, with a maximum clay content of about 35%. Both above and below the B horizon are silt loam layers, the upper of which (A horizon) contains about 15% clay, and the lower (C horizon) about 25% clay. Slopes are usually less than 2%. Associated soils are the well drained Bertrand and the moderately well drained Jackson. This is a monotype, monophase series in Grant County.

SOIL PROFILE DESCRIPTION

Curran silt loam

0–4″	A_1	Very dark gray (10YR 3/1, moist) friable silt loam; fine granular structure; pH 6.3.
4–12″	A_2	Light gray (10YR 7/2, moist) with a few specks of brown (10YR 5/3, moist) friable silt loam; fine platy structure; pH 5.3.

12–15″	B_{21g}	Pale brown (10YR 6/3, moist) mottled with very pale brown and yellowish brown (10YR 7/3 and 5/4, moist) light silty clay loam; fine blocky structure; pH 5.3.
15–35″	B_{22g}	Grayish-brown, mottled with light yellowish-brown (10YR 5/2, 5/4, 5/6, moist) heavy silty clay loam; medium blocky structure; pH 5.0.
25–42″+	C_1	Grayish-brown mottled with brown (10YR 5/2; 7.5YR 5/4, moist); heavy silt loam; coarse blocky; pH 5.5.

Type location: Jackson County, Wisconsin; Series proposed: Jackson County, Wisconsin, 1940. Source of name: town in Jackson County, Wisconsin.

DAKOTA SERIES (Nos. 6 and 13 on the colored soils map)

The Dakota series includes terrace or bench soils formed from medium textured deposits over acid outwash sands and gravels under prairie vegetation and good drainage conditions. They are classified in the Brunizem (prairie) great soil group. They occur on benches in the Wisconsin and Mississippi River valleys. The subsoil (B horizon) begins at a depth of about ten inches and continues downward for about two feet, with a maximum clay content of about 20 to 30% Both above and below the B horizon are more sandy layers, the upper one of which (A horizon) contains 10 or 15% clay, and the lower (C or D horizon) 3 to 8% clay. Slopes are usually less than 4%.

The Dakota series includes loams, sandy loams, and fine sandy loams. Phases may be distinguished with regard to depth of solum, clay content of the B horizon, and degree of wind erosion.

SOILS PROFILE DESCRIPTIONS

Dakota sandy loam (No. 13 on the colored soil map)

0–9″	A_p	Very dark grayish-brown (10YR 3/2, moist) sandy loam; weak fine granular; pH 6.0.
9–13″	A_3	Dark grayish- to yellowish-brown (10YR 4/2–4/4, moist) sandy loam; weak fine granular to blocky; pH 5.5.
13–28″	B	Brown to yellowish-brown (7.5YR–10YR 5/4, moist) loam; moderately developed medium subangular blocky structure; pH 5.5.
28″+	D	Yellowish-brown to very pale brown (10YR 5/4, 7/4) loose fine sand; 5.3.

Type location: Dakota County, Minnesota; Series established: Dakota County, Minnesota, 1941. Source of name: Dakota County, Minnesota.

Dakota loam (No. 4 on the colored soil map)

0–8″	A_p	Very dark brown to very dark grayish brown (10YR 2/2–3/2, moist) loam; friable; fine granular structure; pH 6.5.
8–13″	A_3—B_1	Dark yellowish-brown (10YR 4/4, moist) silt loam; friable; weak medium blocky structure; pH 5.5.
13–18″	B_2	Yellowish-brown to dark yellowish-brown (10YR 4/4–5/4, moist) light silty clay loam; medium blocky structure; pH 5.5.

18–26″	B_3	Brown (7.5YR 4/4–5/4, moist) loam; friable; medium blocky structure; pH 5.5.
26–30″+	D	Yellowish-brown to very pale brown (10YR 5/4, 7/4) loose fine sand; pH 5.3.

Type location, etc., as for the Dakota sandy loam.

DODGEVILLE SERIES (Nos. 8D and 14D on the colored soil map)

The Dodgeville series, deep phase, includes upland soils formed from nine to 42 inches of silt overlying cherty clay (residual) on dolomitic bedrock. The cherty clay varies in thickness from a few inches to several feet, and in color from dark brown to reddish-brown. The original vegetation was prairie, in most areas. Natural soil drainage has been good. These soils are classified as Brunizem (prairie) soils. This is a monotype series, with several slope and erosion and depth phases. The deep phase formed from 24 to 42 inches of silt, and may be thought of as a shallow Tama, or prairie equivalent of a deep Dubuque. The shallow phase of Dodgeville is considered the normal phase, and so the phrase "shallow phase" is usually omitted. In this case, the depth of silt is nine to 24 inches to cherty red clay. The C horizon is therefore absent, because all of the loess has been leached and transformed into A and B horizons. The B, or even the A horizon, rests on the cherty clay. In the deep phase of the Dodgeville, the B horizon begins at a depth of about a foot and continues downward 20 to 24 inches with a maximum clay content of about 30%. Above the B horizon is the silt loam A, containing about 15% clay. Where the cherty red clay lies at a depth of three feet or more, a silt loam C horizon is present, with about 17% clay in it. Slopes are usually less than 10% for the deep phase, and under 16% for the normal or shallow Dodgeville. The reddish-brown cherty clay horizon contains 45 to 55% clay and 20 to 40% silt. Content of cherty gravel in the clay ranges from about 5% to 70%.

SOILS PROFILE DESCRIPTIONS

Dodgeville silt loam (shallow, or normal phase)

0–10″	A_1	Very dark brown (10YR 2/2, moist) above to very dark grayish-brown (10YR 3/2, moist) below; friable silt loam; fine to medium granular structure; pH 6.0; about 4.5% organic matter.
10–16″	B_1	Very dark grayish-brown (10YR 3/2, moist) friable heavy silt loam; fine granular to fine blocky structure; pH 5.8; about 2.5% organic matter.
16–21″	B_2	Brown (10YR 4/2, moist) silty clay loam; fine blocky structure; organic stains on surfaces of aggregates; pH 5.6; about 0.8% organic matter.
21–24″	B_3—D_1	Reddish-brown (5YR 4/4, moist) clay loam; medium blocky structure; pH 5.5; about 0.5% organic matter; chert fragments present.
24–34″	D_2	Reddish-brown (2.5YR 4/4, moist) clay; medium blocky; pH 5.3; about 0.3% organic matter; about 10% by volume of chert fragments.
34–36″+	D_3	Dolomitic limestone; light gray to pale brown (10YR 6/4; 2.5Y 5/4–5/2, moist).

Type location: Iowa County, Wisconsin. Series established: Iowa County, Wisconsin, about 1912.

Dodgeville silt loam, deep phase

0–12″	A_1	Very dark brown (10YR 2/2, moist) in upper part, grading to very dark grayish-brown (10YR 3/2, moist) in the lower part; friable silt loam; fine to medium granular; pH 6.2; about 4.5% organic matter.
12–16″	B_1	Dark brown (10YR 4/3, moist) with coatings of very dark grayish-brown (10YR 3/2, moist) friable heavy silt loam; fine granular to very fine blocky structure; pH 5.8; about 2.5% organic matter.
16–32″	B_2	Brown (10YR 4/3, moist) silty clay loam; fine to medium blocky structure; organic stains on surfaces of aggregates; pH 5.6; about 0.8% organic matter.
32–39″	C_1	Dark yellowish-brown (10YR 4/4, moist) heavy silt loam; coarse blocky structure; pH 5.8; about 0.4% organic matter.
39–42″	C_2—D_1	Brown (7.5YR 5/4, moist) silty clay loam; medium blocky structure; pH 5.5; about 0.3% organic matter; some chert fragments present.
42–48″	D_2	Reddish-brown (2.5YR 4/4, moist) to dark brown (7.5YR 3/2, moist) clay; coarse blocky; pH 5.2; about 0.3% organic matter; about 10% by volume of chert fragments.
48–50″+	D_3	Dolomitic limestone; light gray to very pale brown (2 5Y 5/4–5/2; 10YR 6/4, moist).

Type location, etc. as for the Dodgeville silt loam (shallow).

DOWNS SERIES (No. 3 on colored soil map)

The Downs series includes upland soils formed from deep (42″+) silt under prairie and oak-hickory vegetative covers (18), and under conditions of good natural soil drainage. Probably these soils were prairie soils a century or more ago, but invasion of the prairie by trees has favored the formation of a light colored subsurface horizon (A_2). Downs soils are classified as transitional between Brunizem (prairie) and Gray-Brown Podzolic great soil groups. The subsoil (B horizon) begins at about 15 inches and continues downward for about 15 to 20 inches, with an estimated maximum clay content of about 29%. Both above and below the B horizon are silt loam layers, the upper one of which (A horizon) contains about 20% clay, and the lower one (C horizon) about 26% clay. Slopes are usually less than 10%. The moderately well to imperfectly drained Cashton soil is associated with the Downs. It is difficult to find an undisturbed site. Downs soils are largely cultivated, and so the profile has been altered by man to some extent. For example, the pH of the Downs before European settlement was probably considerably lower in the A and B horizons than reported below.

This is a monotype series in Grant County, with several slope and erosion phases. A terrace phase of Downs is mapped on benches in large river valleys in Richland County, north of Grant County.

SOIL PROFILE DESCRIPTION

Downs silt loam

(SW¼ SW¼ NE¼ Sec. 10, T 2 N, R 1 W, Grant Co., Wis.)

0–6″	A_{1p}	Very dark grayish-brown (10YR 3/2, moist) silt loam; fine granular structure; friable; pH 7.5; about 4% organic matter.

6–12″	A_2	Dark grayish-brown (10YR 4/2–4/3, moist) silt loam; medium to fine platy structure; pH 7.0; about 3% organic matter.
12–22″	B_1	Brown (10YR 4/3, moist) heavy silt loam; medium platy to blocky structure; pH 6.4 in upper portion; about 1.2% organic matter.
22–34″	B_2	Yellowish-brown (10YR 5/4, moist) silty clay loam; weak medium blocky structure; aggregates are coated with light yellowish-brown (10YR 6/4, moist); pH 5.3; about 0.8% organic matter.
34–40″+	C	Yellowish-brown (10YR 5/4–5/3, moist) coarse silt loam; coarse blocky structure; aggregates coated with pale brown (10YR 6/3–6/4, moist); pH 5.8; about 0.6% organic matter.

Type location: Clayton County, Iowa. Series established: Stephenson County, Illinois, 1938.

DUBUQUE SERIES (Nos. 8L and 14L on the colored soil map)

The Dubuque series includes soils formed from nine to 42 inches of silt overlying cherty clay (residual) on dolomitic limestone bedrock. The cherty clay varies in thickness from a few inches to several feet, and in color from dark brown to reddish-brown. The original vegetation was oak-hickory forest, for the most part. Natural soil drainage has been good. These soils are classified in the Gray-Brown Podzolic great soil group. The moderately well-drained Norwalk is associated with the Dubuque but is not extensive. Dubuque soils occur in a predominantly well-drained landscape. This series includes two types, the silt loam and the stony silt loam. There are many slope, erosion and depth phases.

The typical or normal Dubuque is sometimes referred to as the shallow Dubuque. It is formed from nine to 24 inches of silt. The C horizon is absent because all the loess has been leached and transformed into A and B horizons. The cherty red clay beneath the silty layers contains 45 to 55% clay and 20 to 40% silt. Content of cherty gravel ranges from about 5 to 70%. In the vicinity of Stitzer, in the Town of Liberty, Grant County, an excavation for a basement in 1951 exposed a Dubuque profile which showed irregular interlayering of brown B_2 horizon and reddish-brown cherty clay between the depths of 24 and 48 inches. This mixing may possibly have been produced by frost action during the glacial period. It is not known that this kind of intermixing of loess-derived and limestone-derived materials is wide spread in Grant County. Slopes are usually less than 30%. These Dubuque soils occur locally over sandstone, where the cherty clay lies directly on sandstone bedrock.

The deep phase of Dubuque formed from 24 to 42 inches of silt. It may be thought of as a shallow Fayette. The subsoil (B horizon) begins at a depth of about one foot and continues downward for 20 to 24 inches, with a maximum clay content of about 30%. Above the B horizon is a silt loam horizon (A horizon) containing about 13% clay. Where the cherty reddish-brown clay lies at a depth of three feet or more, a silt loam horizon called the C horizon lies below the B horizon, and contains about 17% clay. Slopes are usually less than 20%.

SOIL PROFILE DESCRIPTIONS

Dubuque silt loam (normal, or shallow phase)

(No. 14L on the colored soil map)

½–0″	A_{00}	Leaf litter.

0–3″	A_1	Dark grayish-brown (10YR 4/2, moist) silt loam; fine to medium granular structure; friable; pH 6.8; about 4% organic matter.
3–9″	A_2	Pale brown (10YR 6/3–7/3, moist) silt loam; medium platy; friable; pH 5.9; about 1.5% organic matter.
9–18″	B_2	Yellowish-brown (10YR 5/4, moist) silty clay loam; fine to medium blocky structure; aggregates coated with yellowish-brown (10YR 4/4, moist); pH 4.7; about 0.5% organic matter; some chert fragments in the lower part of this horizon.
18–22″	B_3–D_1	Brown (7.5YR 5/4, moist) silty clay loam; medium blocky structure; pH 4.8; about 0.3% organic matter; chert fragments present.
22–37″	D_2	Reddish-brown (2.5YR 4/4, moist) to dark brown (7.5YR 3/2, moist) clay; coarse blocky structure; pH 5.3; about 0.3% organic matter; 5 to 20% by volume occupied by chert fragments.

Type location: Green County, Wisconsin. Series established: Dubuque County, Iowa, 1920.

Dubuque silt loam, deep phase (No. 8L on the colored soil map)

0–½″	A_{00}	Leaf litter.
0–3″	A_1	Dark grayish-brown (10YR 4/2, moist) silt loam; fine granular structure; friable; pH 6.6; about 4% organic matter.
3–10″	A_2	Pale brown (10YR 6/3, moist) silt loam medium platy structure; friable; pH 5.5; about 1.5% organic matter.
10–32″	B_2	Yellowish-brown (10YR 5/4, moist) to dark yellowish-brown (10YR 4/4, moist), silty clay loam; fine to medium blocky structure; pH 4.8; about 0.5% organic matter.
32–34″	C_1	Dark yellowish-brown (10YR 4/4, moist) heavy silt loam; coarse blocky structure; pH 4.8; about 0.2% organic matter.
34–39″	C_2–D_1	Brown (7.5YR 5/4, moist) silty clay loam; medium blocky structure; pH 4.8; about 0.3% organic matter; some chert fragments present.
39–45″	D_2	Reddish-brown (2.5YR 4/4, moist) to dark brown (7.5YR 3/2, moist) clay; coarse blocky structure; pH 5.5; about 0.3% organic matter; about 10% by volume of chert fragments.

Type location, etc., same as for the first Dubuque profile given above.

Dubuque stony silt loam (No. 23 on the colored soil map)

0–3″	A_1	Very dark grayish-brown (10YR 3/2, moist) stony silt loam; fine granular structure; pH 6.5; about 5% organic matter.
3–8″	A_2	Pale grown (10YR 6/3, moist) stony silt loam; medium platy structure; friable; pH 6.0; about 1.5% organic matter.
8–17″	B_2	Yellowish-brown to brown (10YR 5/4 to 7.5YR 5/4, moist) stony silty clay loam medium blocky structure; pH 5.0; about 0.5% organic matter.

17–22″	D_1	Reddish-brown (5YR–2.5YR 4/4, moist) cherty clay; coarse blocky structure; about 0.3% organic matter.
22″+	D_2	Bedrock dolomitic limestone, somewhat weathered.

Type location, etc., as for the other Dubuque profile.

FAYETTE SERIES (Nos. 7 and 15 on the colored soil map)

The Fayette series (15) includes upland soils formed from deep (42″+) silt under hardwood (oak-hickory) forest cover, with good soil drainage conditions. They are classified in the Gray-Brown Podzolic great soil group. The subsoil (B horizon) beings at a depth of about 16 inches and continues downward for about 20 to 30 inches, with a maximum clay content of about 30%. Both above and below the B horizon are silt loam layers, the upper one of which (A horizon) contains about 17% clay, and the lower one (C horizon) about 26% clay. Slopes are usually less than 30%. The A horizon erodes easily, where unprotected, exposing the less easily worked B horizon. The somewhat poorly drained Stronghurst is associated with the Fayette, but is not extensive. The Fayette soils occur in a predominantly well drained landscape.

On the ridge tops this is a monotype series, with several slope and erosion phases. There is a Fayette, valley phase, which is mapped with two textures, a silt loam and a very fine sandy loam. The valley phase has a higher sand and stone content and a somewhat weak textural B, as compared to the typical upland Fayette.

SOILS PROFILE DESCRIPTIONS

Fayette silt loam (No. 7 on the colored soil map)

(SE¼ SW¼ NE¼ Sec. 28, T 6 N, R 6 W, Grant Co., Wis.)

0–3″	A_1	Very dark gray above to dark grayish-brown below (10YR 3/1–4/2, moist) silt loam; fine granular above to coarse granular to medium platy structure below; pH 6.5; about 6% organic matter above and 4% below.
3–11″	A_2	Dark brown above to brown below (10YR 4/3–5/3, moist) silt loam; coarse platy structure; aggregates somewhat vesicular; pH 6.0 above to 5.0 below; organic matter content about 2.5% above to 1% below.
11–17″	A_3–B_1	Yellowish-brown (10YR 5/4, moist) silt loam weakly developed medium blocky structure to coarse platy and granular; aggregates vesicular; gray coatings present; pH 4.5; about 1% organic matter.
17–34″	B_2	Dark yellowish-brown (10YR 4/4, moist) silty clay loam; medium blocky structure; some dark organic stains on aggregates; slight mottling; pH 4.8; about 0.3% organic matter.
34–79″	C_1	Yellowish-brown to light yellowish-brown (10YR 5/6–6/4, moist) silt loam; coarse blocky structure; slight mottling; pH 5.0; about 0.2% organic matter.
79–81″+	C_2	Light yellowish-brown (10YR–2.5Y 6/3, moist) silt; dolomitic.

Type location: Jackson County, Iowa. Series established: Fayette County, Iowa, 1919.

Fayette silt loam, valley phase (No. 15 on the colored soil map)

0–3″	A_1	Very dark grayish-brown (10YR 3/2, moist) gritty silt loam; fine granular; friable; pH 6.5.
3–15″	A_2	Brown (10YR 5/3, moist) silt loam; medium platy structure; friable; pH 6.0.
15–19″	B_1	Yellowish-brown (10YR 5/4, moist) light silty clay loam; fine blocky structure; pH 5.8.
19–30″	B_2	Dark yellowish-brown (10YR 4/4, moist) silty clay loam; medium blocky structure; pH 5.8.
30–42″+	C_1	Yellowish-brown (10YR 5/4, moist) heavy silt loam; weak coarse blocky structure; pH 6.0.

Type location, etc., as for the first profile.

GALE SERIES (No. 14 on the colored soil map)

The Gale series includes upland soils formed from 24 to 40 inches of silt overlying weathered sandstone bedrock, originally with oak-hickory cover. Natural soil drainage has been good. These soils are classified in the Gray-Brown Podzolic great soil group. The subsoil (B horizon) begins at a depth of about ten inches and continues downward another 15 inches, with a maximum clay content of about 30%. Above the B horizon is a silt loam layer (the A horizon) with a clay content of about 12%. In profiles which are 28 to 40 inches deep, there is a silt loam to loam layer (the C horizon) below the B, with a clay content of about 15%. Slopes are usually less than 30%.

In some Gale profiles the B horizon rests directly on weathered sandstone bedrock and in other profiles a C horizon of silt loam intervenes between the B horizon and the bedrock (D horizon). Gale soils have a greater depth of silty material than do the Hixton soils. The Gale has been considered to be a monotype series in Grant County. There are several slope and erosion phases.

SOIL PROFILE DESCRIPTION

Gale silt loam

0–8″	A_p	Grayish-brown (10YR 5/2, moist) silt loam; weak fine granular structure above to weak medium platy below; pH 6.0.
8–13″	A_2	Light yellowish-brown (10YR 6/4, moist) silt loam; weak medium platy; pH 6.0.
13–25″	B_2	Dark brown to dark yellowish-brown (10YR 4/3–4/4, moist) silty clay loam; moderately developed fine to medium subangular blocky; pH 5.5.
25–33″	C_1	Yellowish-brown (10YR 5/4, moist) heavy silt loam; becoming a loam in the lower 3 inches; weak coarse blocky to massive; pH 5.5.
33–36″	D_1	Very pale brown (10YR 7/4, moist) stony fine sand, containing fragments of sandstone.
36–40″+	D_2	Somewhat weathered sandstone bedrock, reddish-yellow with dark brown coatings on surfaces (10YR 6/8, moist, with 4/4 coatings).

Type location: La Crosse County, Wisconsin. Series established: Trempealeau County, Wisconsin, 1940.

GARWIN SERIES (No. 19 on the colored soil map)

The Garwin series includes upland soils formed from deep (42"+) silt under prairie vegetation, and under poor drainage conditions. These soils are classified in the intrazonal Humic-Gley great soil group. The subsoil (B_g or G horizon) begins at a depth of about 18 inches and continues downward another 12 inches, with a maximum clay content of about 38%. The overlying horizon (A) may be a silt loam, containing about 20% clay, or a silty clay loam with about 32% clay. The C horizon, lying below the B, is a silt to silt loam, containing 10% to 20% clay. Slopes are usually less than 1%. There are two types in the series: Garwin silt loam and Garwin silty clay loam. Phases are based on degrees of artificial drainage.

SOIL PROFILE DESCRIPTION

Garwin silty clay loam

(NW¼ NE¼ NW¼ Sec. 28, T 1 N, R 1 W, Grant Co., Wis.)

0–8"	A_{11}	Black (10YR 2/1, moist) silty clay loam; medium to coarse granular structure; pH 7.5.
8–16"	A_{12}	Black to very dark gray (10YR 2/1–3/1, moist) silty clay loam; medium granular structure; pH 7.0.
16–20"	A_{13g}	Very dark gray to dark gray (10YR 3/1–4/1, moist) silty clay loam; medium granular to fine blocky structure; pH 7.3.
20–24"	G_1	Dark gray, mottled with dark grayish-brown and yellowish-brown (10YR 4/1, 4/2, 5/8, moist) silty clay loam; medium blocky and fine prismatic; pH 7.5.
24–36"	G_2	Light brownish-gray (10YR 6/2, moist) mottled light olive brown and dark gray (2.5Y 5/6, 3/1) and yellowish-brown (10YR 5/8, moist); medium blocky structure; pH 7.8.
36–55"+	C_g	Light brownish-gray (10YR 6/2, moist) mottled with yellowish-brown and dark gray (10YR 5/6, 4/1, moist) silt loam to silt; massive; pH 8.0.

Type location: Tame County, Iowa. Series established: Tama County, Iowa, 1938
Source of name: town in Tama County, Iowa.

HESCH SERIES (No. 17 on the colored soil map)

The Hesch series includes upland soils developed over Cambrian sandstone materials containing an appreciable amount of fines. These soils are found on valley slopes, and have been influenced by colluvial wash and weathered loess deposits. Natural soil drainage conditions have been good. The original vegetation was probably prairie. The soils are classified in the Brunizem great soil group. The subsoil (B horizon) begins at about a foot and continues downward for 20 inches, with a maximum clay content of 15 to 25%. Above and below the B horizon are less clayey horizons, the upper one of which (A horizon) contains about 15% clay, and the lower (C horizon) 3 to 15% clay. Slopes range up to 40%.

The Hesch soils may be thought of as Brunizem (prairie) equivalents of the Hixton and Norden soils. The underlying sandstone may be glauconitic, as in the Norden. The Hesch series is a multitype and multiphase series. Types include loams, fine sandy loams and sandy loams. Various slope and erosion phases occur.

SOIL PROFILE DESCRIPTION

Hesch fine sandy loam

0–9″	A_1	Very dark grayish-brown (10YR 3/2, moist) fine sandy loam; friable; fine crumb structure; pH 7.0.
9–12″	A_3	Dark grayish-brown (10YR 4/2, moist) fine sandy loam; friable; fine granular structure; pH 6.5.
12–22″	B_1	Brown (10YR 5/3, moist) fine sandy loam; weak fine blocky structure; pH 6.5.
22–32″	B_2	Dark brown (10YR 4/3, moist) sandy clay loam; moderately developed fine to medium blocky structure; sandstone fragments present; pH 6.5.
32–42″	C_1	Yellowish-brown (10YR 5/3, moist) fine sandy loam to loamy fine sand; fragments of sandstone present; massive; pH 6.0.
42–45″+	C_2	Light yellowish-brown (10YR 6/4, moist) sandstone, weathered and somewhat soft; pH 7.0.

Type location: Richland County, Wisconsin. Series proposed: Buffalo County, Wisconsin, 1943.

HIXTON SERIES (No. 17 on the colored soil map)

The Hixton series includes upland soils formed from those members of the Cambrian sandstone which are soft and relatively fine in texture, ranging from very fine sands to silts, yellowish-brown in color. Thin layers of clay (shale) occur. The original vegetation was oak-hickory forest for the most part. The soils are classified in the Gray-Brown Podzolic great soil group. The subsoil (B horizon) begins at a depth of about a foot, with a maximum clay content of 15 to 25%. Both above and below the B horizon are silt loam layers, the upper one of which (A horizon) contains 10 to 15% clay, and the lower one (C horizon) 2 to 10% clay. Slopes range up to 40%.

The Hixton series is a multi-type and multi-phase series. Surface textures range from silt loam to sandy loam. A textural B is present, and the content of 40% or more of sand in that horizon differentiates the Hixton silt loams from the Gale silt loams, which have less than 20% sand in the B horizon. Hixton soils differ from the Boone soils which are sand, and lack a textural B. The Norden soils are similar to the Hixton but contain green sand (glacuonite). Hixton soils with slopes up to 30% are usually in cultivation and have been disturbed by the plow. Steeper slopes have not been plowed, for the most part, but may have been disturbed by trampling of livestock, lumbering operations, or creep. The parent material of the Hixton is usually Cambrian sandstone, but some bodies developed from St. Peter sandstone have been classified as Hixton.

SOIL PROFILE DESCRIPTION

Hixton fine sandy loam

0–2″	A_1	Dark grayish-brown (10YR 3/2–4/2, moist) fine sandy loam; friable; fine granular structure; pH 5.5.
2–9″	A_2	Grayish-brown to brown (10YR 5/2–5/3, moist) fine sandy loam; friable; weak medium platy structure; pH 5.0.

9–15″	B_1	Yellowish-brown (10YR 5/4–4/4, moist) fine sandy loam; weak medium blocky structure; subangular; pH 5.0.
15–30″	B_2	Dark brown to olive brown (10YR–2.5Y 4/4, moist) loam; weak medium blocky structure; subangular aggregates; pH 5.0.
23–30″+	C_1	Yellowish-brown (10YR 5/8, moist) loose fine sand with fragments of partially decomposed sandstone; pH 5.0.

Type location: Jackson County, Wisconsin. Series proposed: Jackson County, Wisconsin, 1940. Source of name: small town in Jackson County, Wisconsin.

JACKSON SERIES (No. 2 on the colored soil map)

The Jackson series includes terrace or bench soils developed from deep silt (42″+) over high terrace benches of outwash gravels, sands or bedrock. Natural soil drainage conditions have been moderately good, and the original vegetation was forest, probably oak-hickory. In some places in Richland County and Crawford County, reddish-brown silts and clay have been encountered at ten to 15 feet beneath these soil profiles. The subsoil (B horizon) begins at about a foot and continues downward 20 to 30 inches, with a maximum clay content of about 35%. Both above and below the B horizon are silty layers, the upper one of which (A horizon) contains about 15% clay, and the lower (C horizon) about 25% clay. Slopes are usually less than 3%. Associated soils are the well-drained Bertrand and the somewhat poorly drained Curran. The Jackson series is a monotype series, with phases related to erosion, presence or absence of overwash deposits.

SOIL PROFILE DESCRIPTION

Jackson silt loam

0–5″	A_p	Dark grayish-brown (10YR 4/2, moist) silt loam; fine granular; friable; pH 6.2.
5–9″	A_2	Brown (10YR 5/3, moist) silt loam; medium platy structure; friable; pH 6.0.
9–15″	B_1	Dark brown (10YR 4/3 and 5/3, moist) light silty clay loam; well developed fine to medium subangular blocky structure; pH 5.0.
15–28″	B_{2g}	Mottled yellowish-brown and brown (10YR 5/4, 4/3, moist) silty clay loam; well developed medium subangular blocky structure; pH 5.3.
28–36″	B_{3g}	Mottled dark yellowish-brown and pale brown (10YR 4/4, 6/3, moist) silty clay loam; coarse blocky structure; pH 5.2.
36–50″	C_{1g}	Mottled yellowish, pale, and strong browns (10YR 6/3, 5/6, 5/4; 7.5YR 5/6, 5/8, moist) silt loam; coarse blocky structure; pH 5.2.
50″+	C_{2g}	Mottled dark and light yellowish-brown (10YR 4/4, 6/4, moist) silty clay loam; stratified; pH 5.7.

Type location: Trempealeau County, Wisconsin. Series established: Shelby County, Missouri, 1903.

JUDSON SERIES (No. 9 on the colored soil map)

The Judson series includes soils formed from dark colored colluvial deposits (local alluvium) in ravines draining uplands on which Tama and Dodgeville soils predominate. Drainage conditions have been good, and the original cover was prairie or open woodland. This series includes young, azonal local alluvial soils, and some young Brunizem (prairie) soils. Some of the Judson soils have no textural B horizon, though they may have layers of slightly finer texture at depth which represent the earliest colluvial deposits. Some Judson soils appear to have slightly developed textural B horizon, with a maximum clay content of about 25%. Some stones and sandy streaks are usually found throughout the profile. Slopes are usually less than 10%. Judson soils have been mapped in ravines, on small alluvial fans, and on colluvial foot slopes below Hesch and Lindstrom soils on the sides of valleys. This series comprises several types, including silt loam, very fine sandy loam, and there are several slope phases.

SOIL PROFILE DESCRIPTION

Judson silt loam

0–10″	A_{11}	Very dark gray (10YR 3/1, moist) silt loam; fine granular; pH 7.0.
10–18″	A_{12}	Dark gray (10YR 4/1, moist) silt loam; friable; fine granular to platy; pH 7.0.
18–40″	B_1	Very dark gray to dark brown (10YR 3/1–3/2, moist) silt loam; friable; weak fine blocky structure; pH 7.0.
40–42″	C	Very dark brown (10YR 2/2, moist) silt loam; friable; massive; pH 6.5.

Type location: Plymouth County, Iowa. Series established: Blue Earth County, Minn., 1906.

LAMONT SERIES (No. 24 on the colored soil map)

The Lamont series includes upland soils developed from deep (42″+) wind-worked sandy material, which is associated with weathered Peorian loess, under forest of oak-hickory, and under good natural drainage conditions. The subsoil (B horizon) begins at a depth of about a foot and continues downward for about 20 inches, with a maximum clay content of about 22%. Above and below the B horizon are sandy layers, the upper one of which (A horizon) contains about 5% clay, and the lower one (C horizon) about 2% clay. Slopes are usually less than 12%. In Grant County, these soils are found on old dune topography just above the bluffs of the Mississippi River valley, in the vicinity of Dubuque. East of them lie the finer textured Seaton soils. The Chelsea is coarser in texture than the Lamont and lacks the B horizon. This is a monotype series in Grant County, with several phases based on slope and erosion.

SOIL PROFILE DESCRIPTION

Lamont fine sandy loam

0–6″	A_1	Brownish-gray (10YR 5/2, moist) fine sandy loam; single grain; pH 5.5.
6–14″	A_2	Yellowish-brown (10YR 5/4, moist) fine sandy loam; single grain; pH 5.8.

14–30″	B	Yellowish-brown (10YR 5/4–6/4, moist) loam to light sandy clay loam; pH 5.8.
30–36″+	C	Light yellowish-brown (10YR 6/4, moist) sand containing a few small stones representing a variety of rocks; pH 6.0.

Type location: Linn County, Iowa. Series proposed: Delaware County, Iowa, 1942. Source of name: town in Buchanan County, Iowa.

LAWSON SERIES (No. 4 on the colored soil map)

The Lawson series includes soils forming from moderately well to well-drained dark colored alluvial silty deposits, on bottoms. This material has been removed by erosion from upland fields of Tama, Downs, and Fayette soils and deposited on river flats in valleys. The Lawson series may be regarded as the dark colored equivalent of the Arenzville series. Lawson soils can be considered to be young ones, whose development is interrupted annually by fresh deposits washed from the prairie soil uplands. These soils are classified as Azonal Alluvial soils. This is a monotype series in Grant County, and also monophase, as mapped.

SOIL PROFILE DESCRIPTION

Lawson silt loam

0–8″	A_{11}	Very dark gray (10YR 3/1, moist) silt loam; friable; medium granular structure; pH 7.5.
8–17″	A_{12b}	Black (10YR 2/1, moist) silt loam friable; medium granular structure; pH 7.2.

Figure 13. View of Lawson, Judson and other alluvial soils, with Hixton, Lindstrom and steep Stony Land in the background.

17–24″	A_{13b}	Very dark gray (10YR 3/1, moist) silt loam; friable; slightly mottled; weak medium blocky structure pH 7.7.
24–36″	A_{14bg}	Very dark gray (10YR 3/0–3/1, moist) silt loam; friable; slightly mottled; weak medium blocky structure; pH 7.5.
36–42″+	A_{15bg}	Very dark grayish-brown (10YR 2/2, moist) silt loam; mottled slightly with yellowish-brown and black (10YR 5/4, 2/1, moist); friable; massive; pH 7.5.

Series proposed: Richland County, Wisconsin, 1949.

LINDSTROM SERIES (Nos. 9D and 16 on the colored soil map)

The Lindstrom series includes upland soils formed from deep (42″+) silt (weathered Peorian loess and colluvium therefrom) under prairie or oak-hickory cover, with good soil drainage conditions. They are classified as Brunizems (prairie soils) or intergrades between the Brunizem and Gray-Brown Podzolic great soil groups. They are associated with the Tama and Downs soils of the upland ridges and with Fayette soils, valley phase. The subsoil (B horizon) begins at a depth of about 14 inches and continues downward 20 to 30 inches with an estimated maximum clay content of about 28%. Both above and below the B horizon are silt loam layers, the upper one of which (A horizon) contains about 20% clay and the lower one (C horizon), about 25% clay. Slopes are usually less than 30% and more than 10%. This is a monotype and monophase series in Grant County.

SOIL PROFILE DESCRIPTION

Lindstrom silt loam

0–15″	A_1	Very dark gray to very dark grayish-brown (10YR 3/1–3/2, moist) silt loam; fine granular structure; friable; pH 7.0.
15–19″	A_3–B_1	Dark gray to dark grayish- brown (10YR 4/1–4/2, moist) silt loam; weak fine granular to fine blocky structure; pH 6.2.
19–30″	B_2	Dark yellowish-brown (10YR 4/4, moist) silty clay loam; weak blocky structure; pH 6.0.
30–42″+	C_1	Brown (10YR 4/3, moist) silt loam; massive to weak coarse blocky structure; pH 7.0.

Type location: Washington County, Minnesota. Series established: Washington County, Minnesota, 1941.

MARSH (No. 21 on the colored soil map)

Marsh is a miscellaneous land unit of the bottomlands. It is nonagricultural land in its natural wet condition. It includes a variety of soils, ranging from sands to silty clay loams and peats. In the late summer and early fall the water table in some of the marsh areas may drop low enough to permit a detailed soil survey. However, during most of the year, marsh lands are too wet for satisfactory study of soil profiles and bodies. Undoubtedly several soil types and phases are included in this unit, but have not been separated on the map.

MEDARY SERIES (No. 12 on the colored soil map)

The Medary series includes acid soils on river terraces or benches, formed from reddish-brown stratified calcareous silts and clays with or without a silty wind-laid surface deposit. Natural soil drainage conditions have been moderately good, and the original vegetation was oak-hickory. The soils are classified in the Gray-Brown Podzolic great soil group. Robinson (7) estimated their age at 8,000 years on the basis of depth of leaching of carbonates. The subsoil (B horizon) begins at a depth of 6 inches if the silty covering is negligible, and at about 15 inches if the silty covering is distinct. The maximum clay content of the B horizon is about 50%. The surface or A horizon may have 15 to 35% clay. The acid C_1 horizon may or may not be less clayey than the B, depending on the character of the original strata. The calcareous C_2 usually has about 35% clay. These soils occur on river terrace remnants in the Wisconsin and Mississippi River valleys and valleys of their tributaries. The Zwingle series is the somewhat poorly drained associate. The Medary series includes silt loams and silty clay loams, and shallow silty phases and deep silty phases. Slopes range up to 4% on terrace benches and to 25% on terrace breaks or escarpments.

SOIL PROFILE DESCRIPTION

Medary silt loam

0–3″	A_1	Dark grayish-brown (10YR 4/2, moist) silt loam; medium granular structure; friable; lower boundary wavy, abrupt; pH 6.4.
3–9″	A_2	Pale brown to brown (10YR 5/3–6/3, moist) silt loam; moderately developed fine to very fine platy structure; friable; lower boundary wavy, abrupt; pH 6.0.
9–15″	B_1	Brown (7.5YR 5/4, moist) silty clay loam; well developed fine subangular blocky structure; sticky; lower boundary wavy, clear; pH 6.0.
15–25″	B_2	Reddish-brown (5YR–2.5YR 4/4, moist) silty clay; well developed fine subangular blocky structure; coatings of dark reddish brown (5YR 4/3–3/4, moist); plastic; lower boundary wavy, clear; pH 5.3.
25–36″	B_3	Reddish-brown (2.5YR–5YR 4/4, moist) silty clay to silty clay loam with layers of brown (10YR 5/3, moist), suggesting stratification; slightly plastic; moderately developed medium subangular blocky structure; lower boundary wavy, clear; pH 5.0.
36–40″	C_{1g}	Mottled brown, pale brown, yellowish-brown and reddish-brown (10YR 5/4, 6/3; 7.5YR 4/4; 5YR 4/4, moist) silty clay loam, silty clay or clay; slightly plastic to plastic; moderately developed medium subangular blocky; somewhat stratified; lower boundary wavy, clear; pH 5.5.
40″+	C_{2g}	Mottled pale brown and yellowish-brown (10YR 6/3, 5/4, moist) light silty clay loam strata; dolomitic.

Type location: La Crosse County, Wisconsin. Series proposed: Richland County, Wisconsin, 1948. Source of name: village in La Crosse County, Wisconsin.

MUSCATINE SERIES (No. 3 on the colored soil map)

The Muscatine series includes upland soils formed from deep (42"+) silt under prairie vegetation with moderately good to somewhat poor soil drainage conditions. They are classified in the Brunizem (prairie) great soil group. The subsoil (B horizon) begins at a depth of about 15 inches and continues downward 20 to 30 inches, with a maximum clay content of about 28%. Both above and below the B horizon are silt loam layers, of which the upper one (A horizon) contains about 23% clay, and the lower one (C horizon) about 26% clay. Slopes are usually less than 4%. The Tama is the well-drained associate, and the Garwin is the very poorly drained associate. This is a monotype series in Grant County, with several slope phases.

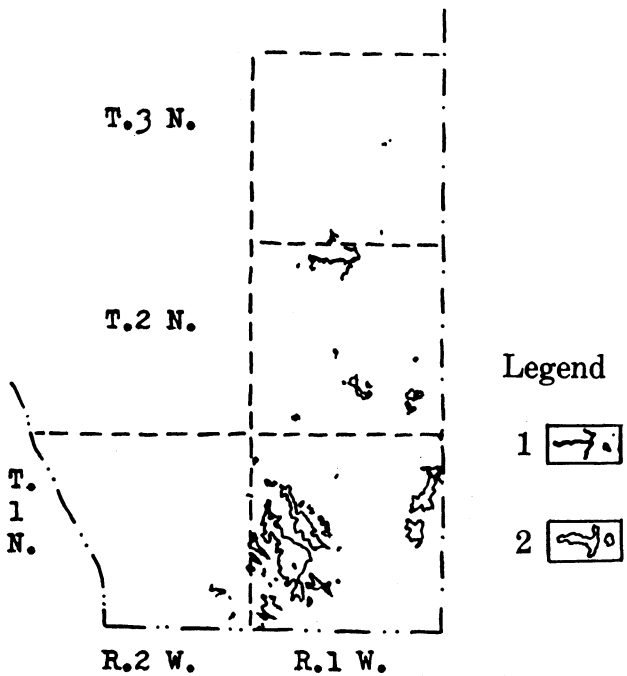

Figure 14. Location of somewhat poorly drained upland soils in Grant County, Wisconsin. Comparison with Figure 5 indicates a relationship between these soil bodies and the distribution of Maquoketa shale.

Map Legend: 1=Imperfectly and poorly drained soil bodies (Cashton, Stronghurst, Garwin)
2=Moderately well drained soil bodies (Muscatine)

SOIL PROFILE DESCRIPTION

Muscatine silt loam

(NW¼ NW¼ SE¼ Sec. 18, T 1 N, R 1 W, Grant Co., Wis.)

0–9″	A_{1p}	Very dark gray (10YR 2/1–3/1, moist) silt loam; fine granular structure; pH 6.0; about 5% organic matter.
9–15″	A_{12}	Very dark grayish-brown (10YR 3/1–3/2, moist) silt loam; fine granular steructure; pH 5.5; about 4% organic matter.
15–29″	B_{21}	Dark grayish-brown (10YR 4/2, moist) silty clay loam; medium subangular blocky structure; pH 5.6; about 2% organic matter.
29–37″	B_{22g}	Mottled brown and grayish-brown (10YR 5/3; 2.5Y 5/3, moist) silty clay loam; medium subangular blocky structure; pH 5.9; about 1% organic matter.
37–42″+	C_g	Mottled brown and grayish-brown (10YR 5/3; 2.5Y 5/3, moist) and yellowish-brown (10YR 5/8, moist) silt loam; weak medium blocky; pH 6.5; about 0.5% organic matter.

Type location: Tama County, Iowa. Series established: Muscatine County, Iowa, 1914.

ORION SERIES (No. 4 on the colored soil map)

The Orion series includes young soils developed from silty alluvial deposits under conditions of moderate to somewhat poor drainage on river valley bottoms. These soils are subject to flooding, even more than the associated, better drained Arenzville soils. At many sites, a dark buried soil lies at a depth of five to 15 feet. These soils are classified as Azonal, Alluvial soils. This is a monotype, monophase series in Grant County, Wisconsin.

SOIL PROFILE DESCRIPTION

Orion silt loam

0–8″	A_1	Very dark grayish-brown (10YR 3/2, moist) silt loam; weak granular structure; pH 7.0.
8–12″	A_{b1g}	Mottled dark grayish-brown, light gray and yellowish-brown (10YR 4/2, 6/1, 5/4, 5/6, moist) silt loam; weak fine platy structure; pH 7.0.
12–60″	A_{b2g}	Mottled dark gray, yellowish-brown and dark reddish-brown (10YR 4/1, 5/8; 5YR 3/2, moist) silt and very fine sand; stratified; pH 7.0.
60″+	DA_{b3g}	Mottled very dark gray and reddish-brown (10YR 3/1; 5YR 3/2, moist) silt loam to very fine sandy loam; pH 6.5.

Type location: Richland County, Wisconsin. Series proposed: Richland County, Wisconsin. Source of name: town in Richland County, Wisconsin.

RAY SERIES (No. 4 on the colored soil map)

Ray series includes light brown silty alluvial deposits 12 to 42 inches deep overlying a dark buried soil on valley bottom. They are well to moderately well drained, but subject to flooding nearly every year. These soils have been formed

since settlement by Europeans. Ray soils are differentiated from Arenzville soils by the shallow depth to a buried soil in the former. The development of Ray soils is interrupted each year by fresh deposits of alluvium washed from the upland Peorian-loess-derived soils of prairie and associated Gray-Brown Podzolic areas. The soils are classified as Azonal Alluvial soils. The area of Ray soils seems to be diminishing from year to year, as alluvial deposits become deeper than 42 inches. The area of Arenzville soils increases correspondingly. This is a monotype, monophase series, as mapped.

SOIL PROFILE DESCRIPTION

Ray silt loam

0–6″	A_1	Grayish-brown (10YR 5/2, moist) silt loam; weak fine granular to weak medium platy structure; pH 7.0.
6–40″	A_b	Grayish-brown to brown (10YR 5/2–5/3, moist) silt loam; weakly stratified to massive; pH 7.0.
40–50″+	DA_b	Very dark grayish-brown to very dark brown (10YR 3/2–2/2, moist) silt loam; massive to weak fine blocky structure; pH 6.5.

Type location: Ray County, Missouri. Series established: Ray County, Missouri, 1922.

RICHWOOD SERIES (No. 1 on the colored soil map)

The Richwood series includes terrace or bench soils developed from deep (42″+) silt over high terraces of outwash gravels, sands, or bedrock in large valleys. Natural soil drainage conditions have been good, and the original vegetation was prairie. These soils are classified in the Brunizem (prairie) great soil group. They are regarded as the prairie equivalent of the Bertrand soils. The subsoil (B horizon) begins at 18″ and continues downward about 20 inches with a maximum clay content of about 32%. Both above and below the B horizon are silt loam layers, the upper one of which (A horizon) contains about 15% clay, and the lower (C horizon) about 25% clay. Slopes are usually less than 5%. Associated soils are the moderately well drained Toddville and the somewhat poorly drained Rowley. This is mapped as a monotype series, with several slope phases, in Grant County.

SOIL PROFILE DESCRIPTION

Richwood silt loam

(SW¼ NW¼ SW¼ Sec. 25, T 12 N, R 1 W, Richland Co., Wis.)

0–12″	A_1	Very dark brown to very dark grayish-brown (10YR 2/2 to 3/2, moist) silt loam; friable; fine granular structure; pH 7.5.
12–18″	A_3	Very dark grayish-brown (10YR 3/2, moist) silt loam; friable; fine granular to platy structure; pH 6.3.
18–22″	B_1	Dark brown (10YR 4.3, moist) light silty clay loam; fine blocky structure; very dark grayish-brown coatings (10YR 3/2, moist); pH 5.8.
22–36″	B_2	Dark yellowish-brown (10YR 4/4–5/4, moist) with very dark gray (10YR 3/1, moist) coatings on medium blocky aggregates of silty clay loam; pH 5.8.

36–58″	C_1	Yellowish-brown (10YR 5/4, moist) heavy silt loam; weak fine blocky structure; pH 5.8.
58–60″+	C_2	Yellowish-brown (10YR 5/4, moist) silt loam; friable; massive; pH 6.0.

Type location: Richland County, Wisconsin. Series proposed: Richland County, Wisconsin, 1948. Source of name: town in Richland County, Wisconsin.

SEATON SERIES (No. 7 on the colored soil map)

The Seaton series (15) includes upland soils formed from deep (42″+) calcareous coarse silt under oak-hickory forest cover, with good soil drainage. They are classified in the Gray-Brown Podzolic great soil group. The subsoil (B horizon) begins at a depth of about a foot and continues downward for 20 to 30 inches, with a maximum clay content of about 27%. Both above and below this heavy silt loam B horizon are light silt loam layers, the upper one (A horizon) containing about 12% clay and the lower one (C horizon) about 18%. Slopes are usually less than 15%. Seaton soils occupy a similar landscape position to that of Fayette, but occur closer to the Mississippi River valley bluffs where the coarser loess was deposited. The C horizon may include very fine sandy loam layers. Layers containing carbonates occur at a depth of about seven feet. The Seaton series is mapped as a monotype series in Grant County with several slope and erosion phases.

SOIL PROFILE DESCRIPTION

Seaton silt loam

0–4″	A_1	Very dark gray (10YR 3/1–3/2, moist) silt loam; fine granular structure; friable; pH 5.7; about 4% organic matter.
4–12″	A_2	Dark brown (10YR 3/2–4/3, moist) silt loam; weak fine granular to weak medium platy structure; friable; pH 5.3; about 1.2% organic matter.
12–18″	B_1	Yellowish-brown to brown (10YR 5/4–7.5YR 5/4, moist) silt loam; weak fine to medium blocky structure; pH 5.2; about 0.8% organic matter.
18–34″	B_2	Brown to dark brown (7.5YR 5/4–4/4, moist) heavy silt loam; medium to coarse blocky structure; pH 5.0 to 5.4; about 0.3% organic matter.
34–42″+	C	Dark yellowish-brown to dark brown (10YR–7.5YR 4/4, moist) silt loam to very fine sandy loam; weak coarse blocky structure; pH 5.7 to 6.4; about 0.1% organic matter.

Type location: Henderson County, Illinois. Series established: Henderson County, Illinois, 1947. Source of name: Mercer County, Illinois.

SOGN SERIES (No. 23 on the colored soil map)

The Sogn series includes upland soils formed from shallow (less than 15″) silty material overlying cherty brown clay or dolomitic bedrock or both, in droughty situations on steep slopes. These soils seem to have formed under prairie vegetation and under oak-hickory forest. They are classified as Lithosols, but seem to have developed from two and possibly three distinct geologic materials: loess, dolomitic limestone and at some places, a thin layer of cherty red clay between the two. Slopes range up to 100%.

SOIL PROFILE DESCRIPTION

Sogn stony silt loam

0–10″	A_1	Very dark grayish-brown (10YR 3/2, moist) somewhat stony silt loam; fine granular structure; pH 6.5.
10–14″	A_3	Light grayish-brown (10YR 6/2–6/3, moist) stony silt loam; weak fine blocky structure; pH 6.0.
14–16″	D_1	Cherty dark brown (10YR 4/3, moist) clay; weak medium blocky structure; pH 6.0.
16″+	D_2	Dolomitic limestone bedrock, somewhat shattered.

Type location: Jefferson County, Nebraska. Series established: Goodhue County, Minnesota, 1913.

SPARTA SERIES (Nos. 20 and 22 on the colored soil map)

The Sparta series includes terrace or bench soils formed from deep acid outwash sands under prairie vegetation and somewhat droughty conditions. There is little or no textural B horizon, whereby this series may be differentiated from the Dakota series. These soils are classified in the Brunizem great soil group. Clay content ranges from 3 to 6%. Slopes are usually less than 2%, except in dune phases of the series where slopes range up to 15%. As indicated by the existence of a dune phase, the Sparta soils are subject to wind erosion. There are several types: loamy sand, loamy fine sand and fine sand.

SOILS PROFILE DESCRIPTIONS

Sparta loamy fine sand (No. 20 on the colored soil map)

(SE¼ NE¼ NE¼ Sec. 28, T 18 N, R 6 E, Adams County, Wis.)

0–7″	A_1	Very dark gray (10YR 3/1, moist) loamy fine sand with light colored (10YR 6/1, moist) quartz grains disseminated throughout; weak fine granular structure; loose; pH 5.0; about 1.2% organic matter; lower horizon boundary abrupt.
7–24″	A_3	Dark brown (10YR 4/3, moist) loamy fine sand; single grain; loose; pH 5.5; about 0.5% organic matter; lower horizon boundary is clear.
24–40″	C_1	Brownish-yellow (10YR 6/6, moist) fine sand; single grain; loose; pH 6.0; about 0.2% organic matter; lower boundary of horizon is clear.
40–52″	C_2	Light yellowish-brown (10YR 6/4–6/6, moist) fine sand and loamy fine sand; single grain; loose; pH 5.5; lower horizon boundary is abrupt.
52–60″+	C_3	Very pale brown (10YR 8/4, moist) medium sand; single grain; loose; pH 5.5; individual sand grains are white, reddish-brown and black.

Type location: Monroe County, Wisconsin. Series established: Monroe County, Wisconsin, 1923. Source of name: town in Monroe County, Wisconsin.

Sparta sand, dune phase (No. 22 on the colored soil map)

0–12″	A_1	Dark gray (10YR 4/1, moist) loose fine sand; pH 5.5; about 0.5% organic matter.
12–20″	A_3	Brownish-yellow (10YR 6/4, moist) loose loamy fine sand; pH 5.5; about 0.3% organic matter.

STONY LAND, STEEP (No. 25 on the colored soil map)

Stony land is a miscellaneous land unit of the upland. It is pasture and forest land for the most part, because slopes are usually greater than 30%, and because many of the soils are shallow to bedrock. Rock outcrops occur in places. If as detailed a soil survey were made on these steep slopes as on the better agricultural areas, the following soil series would probably be found extensive: Sogn, Fayette (valley phase), Lindstrom, stony Dubuque, Hixton. Large areas are in forest and some are in pasture. Unfortunately, considerable areas are in neither, being left in "woodland pasture." Gullies form easily where the soil is at least moderately deep and where the soil surface is bare. Cattle trails, especially those which lead steeply up and down slopes, are prone to erode. Where storm runoff waters discharge precipitously from ridge-tops above, ravines may deepen and become rocky and debris-choked in the steep stony land areas. Steep stony land constitutes a significant portion of Grant County, which is relatively neglected or even abused at present.

STRONGHURST SERIES (No. 7 on the colored soil map)

The Stronghurst series includes upland soils formed from deep (42″+) silt under hardwood (oak-hickory) forest cover, with somewhat poor natural soil drainage conditions. They are classified as planosolic or low Humic-Gley intrazonal soils, found in association with the Gray-Brown Podzolic Fayette soils. The subsoil (B horizon) begins at a depth of about 15 inches and extends downward for 20 or 30 inches, with a maximum clay content of about 30%. Both above and below the B horizon are silt loam layers, the upper one of which (A horizon) contains about 15% clay and the lower one (C horizon) about 25% clay. Slopes are usually less than 2%. This is a monotype series.

SOIL PROFILE DESCRIPTION

Stronghurst silt loam

(NW¼ NW¼ SW¼ Sec. 3, T 2 N, R 1 W, Grant Co., Wis.)

0–6″	A_p	Dark gray to dark grayish-brown (10YR 4/1–4/2, moist) silt loam; friable; weak fine granular structure; pH 7.6.
6–15″	A_2	Light gray (2.5Y 7/2, moist) mottled with yellowish-red (5YR 5/6) silt loam; friable; fine platy structure; pH 6.0.
15–22″	B_1	Light gray (2.5Y 7/2, moist) silt loam; weak medium blocky structure; aggregates coated with pale yellow (2.5Y 7/4, moist); pH 5.0.
22–37″	B_{2g}	Light brownish-gray (2.5Y 6/2, moist) silty clay loam, mottled with strong brown (7.5YR 5/6, moist); medium blocky, well developed; pH 5.5.
37–44″+	C_{1g}	Light gray (2.5Y–5Y 7/2, moist) heavy silt loam, mottled strong brown and dark brown (7.5YR 4/4, 5/8, moist); pH 5.3.

Type location: Henderson County, Illinois. Series established: Henderson County, Illinois, 1947.

TAMA SERIES (No. 3 on the colored soil map)

The Tama series includes upland soils formed from deep (42"+) silt under prairie vegetation, with good to moderately good soil drainage conditions. They are classified in the Brunizem (prairie) great soil group. They may be thought of as the prairie equivalent of the Fayette soils. The subsoil (B horizon) begins at about 14 inches, and continues downward 20 to 30 inches, with an estimated maximum clay content of about 28%. Both above and below the B horizon are silt loam layers, the upper one of which (A horizon) contains about 23% clay and the lower one (C horizon) about 25% clay. Slopes are usually less than 8%. The Muscatine is the moderately well to imperfectly drained associate and the Garwin is the very poorly drained associate. It is difficult to find an undisturbed site at which to study a Tama profile. Tama soils are so productive and have such favorable topography that they are either long since in cultivation or lie in prairie remnants along highways or railroad right-of-ways where limestone dust or earth movements have altered the profiles to some extent. This is a monotype series with several slope and erosion phases.

SOIL PROFILE DESCRIPTION

Tama silt loam

0–10"	A_{1p}	Very dark brown (10YR 2/2, moist) silt loam; fine crumb structure; friable; pH 6.0; about 5% organic matter.
10–13"	A_{12}	Dark brown (10YR 4/3, moist) silt loam; fine granular structure; friable; pH 5.7; about 4% organic matter.
13–18"	B_1	Dark yellowish-brown (10YR 4/4, moist) light silty clay loam; fine blocky structure; pH 5.8; about 3% organic matter.

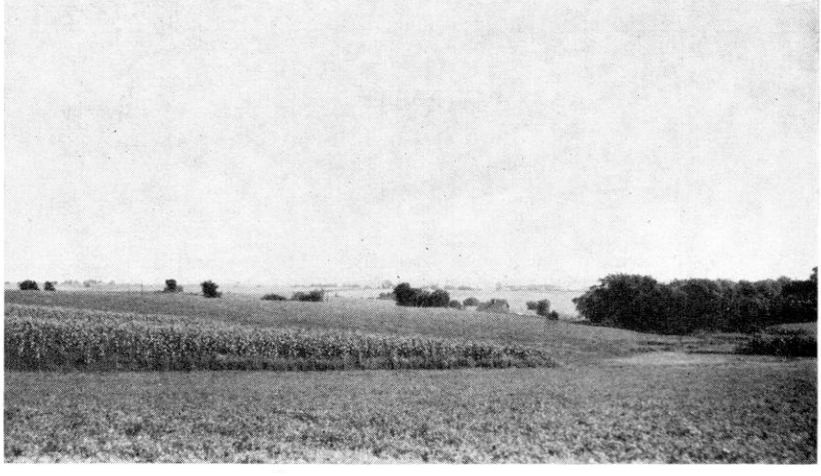

Figure 15. View of Muscatine and Tama soil landscape on the broad upland ridges of Grant County, Wisconsin. The woods to the right occupies a small ravine leading down to deep valleys.

18–28″	B_2	Dark yellowish-brown (10YR 4/4, moist) silty clay loam; medium subangular blocky structure; pH 5.8; about 1.5% organic matter.
28–36″	B_3	Dark yellowish-brown to yellowish-brown (10YR 4/4–5/6, moist) light silty clay loam; weak medium blocky structure; pH 5.5; about 1% organic matter.
36–40″	C	Yellowish-brown and light yellowish-brown, mottled (10YR 5/4–6/4, moist), heavy silt loam; weak medium to coarse blocky structure; pH 6.0; about 0.6% organic matter.

Type location: Tama County, Iowa. Series established: Blackhawk County, Iowa, 1917.

TODDVILLE SERIES (No. 1 on the colored soil map)

The Toddville series includes terrace or bench soils developed from deep (42″+) silt over outwash gravels, sands, or rock benches in valleys. Natural soil drainage conditions have been moderately good and the original vegetation was prairie. These soils are classified in the Brunizem (prairie) great soil group and are associated with the well drained Richwood soils. The subsoil (B horizon) begins at a depth of about 18 inches and continues downward 20 or 30 inches with a maximum clay content of about 32%. Both above and below the B horizon are silt loam layers, the upper one of which (A horizon) contains about 15% clay, and the lower (C horizon) about 25% clay. Slopes are usually less than 2%. This is a monotype series with several slope and erosion phases.

SOIL PROFILE DESCRIPTION

Toddville silt loam

0–10″	A_{11}	Very dark gray (10YR 3/1, moist) silt loam; friable; fine granular structure; pH 6.0.
10–15″	A_{12}	Very dark grayish brown (10YR 3/2, moist) silt loam; friable; fine granular structure; pH 5.5.
15–30″	B_{21}	Dark grayish-brown (10YR 4/2, moist) silty clay loam; medium subangular blocky structure; pH 5.6.
30–36″	B_{22g}	Mottled brown and grayish-brown (2.5Y 5/3, moist; 10YR 5/3, moist) silty clay loam; medium subangular blocky structure; pH 5.9.
36–48″	B_{3g}	Mottled brown and grayish-brown (10YR 5/3; 2.5Y 5/3, moist) and yellowish brown (10YR 5/3, moist) silt loam; weak medium blocky structure; pH 6.5.
48–55″	C_{1g}	Mottled silt loam; pH 6.5.

Type location: Shelby County, Iowa. Series proposed: Linn County, Iowa, 1941.

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SOILS OF Grant County WISCONSIN

F. D. Hole, G. H. Robinson, G. Dehnert, and F. C. Dahms

This folder presents an introductory soil map and report for Grant County, Wisconsin. A large detailed soil map in color and accompanying descriptive bulletin will be published later by the U. S. Department of Agriculture. Uncolored copies of this detailed map will be available meanwhile at the office of the County Agent and at the Soil Conservation District Office, Lancaster, Wisconsin, at the Soils Department, College of Agriculture, and at the office of the State Geologist, at Madison.

How to Use this Map and Report

To find the land area you are interested in, follow the lines on the map which show where the roads, rivers and section lines are. Notice what color is used for it on the map.

Green means first-class farm land.
Yellow means second-class farm land.
Red means third-class farm land.
Blue means fourth-class farm land.
Brown means fifth-class farm land.

The numbers and letters (soil symbols such as 8 or 8L) in the soil areas on the map are the same as the numbers and letters beside the blocks of color in the list (legend) at the bottom of the map. Find the color block which has the same number as the land area you are studying. In each color block in the legend are letters, such as FDsVG, which tell whether the soil is found on the upland or valley bottoms, whether it is dark or light in color, whether it is sandy or clayey, deep or shallow, well drained or poorly drained. To find out what these letters mean, look them up in the table entitled "How to Read the Soil Symbols in the Color Blocks of the Legend". This table is just above the legend, below the map.

The names of the soils are given under the color blocks in the legend. Each of the soils is described briefly on the back of this map (pages 4, 5, 6). Each soil has its own capacity for producing crops. The chapter on crop yields on page 8 tells what yields can be expected from the soils of Grant County. On page 9 are general recommendations for crop rotations and fertilizers to increase yields. The climate, the system of farming, and the history of the county are discussed on pages 10, 11, and 12.

The soil map shows the location of each section by township and range numbers. Streams, roads, villages, and cities are indicated on the map. The areas in color show not only the surface extent of the soils, but also tell what the soil is like to a depth of three or four feet.

SOIL SURVEY DIVISION
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY
AND THE
AGRICULTURAL EXPERIMENT STATION
UNIVERSITY OF WISCONSIN AT MADISON

1952

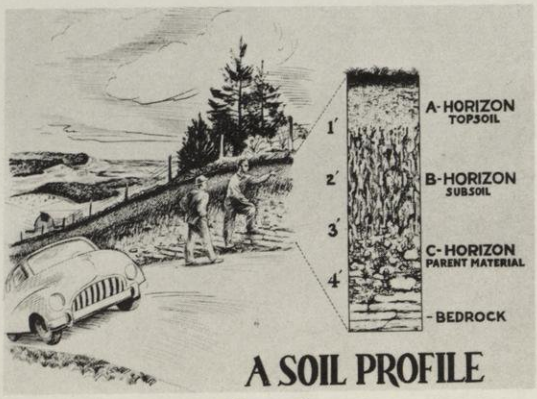


Figure 1.

A SOIL PROFILE. To find out what a soil is like, look at the side of a newly-dug pit or fresh road cut. Above is a sketch of one type of soil. A vertical cross-section of a soil, made up of layers of surface soil and subsoil, is called a soil profile. For example, the Dubuque soil has four layers or "horizons":

(1) Dark colored surface soil (A_1)
(2) Light colored subsurface soil (A_2)
(3) Brown subsoil (B)
(4) Red stony clay (C)

The respective horizons or layers differ from soil to soil, as can be seen by reading the soil descriptions (pages 4, 5, 6). Each soil or soil group has its own particular kinds of horizons and profile. The character of the lower horizons is very important, sometimes as much as the surface layer. Soils are classified according to the nature of their profiles, which usually extend to a depth of 4 or more feet.

SOILS CHANGE FROM PLACE TO PLACE. As you cross a field, look for differences in soil. These differences may be in one layer or in several layers of the soil profile. A buried gravel bed may merge into a buried clay bed. Or the surface soil may change from a flour-like silt loam to a gritty sandy loam. All such changes in soils from place to place can be discovered only by careful observation and use of a spade, soil auger, or post-hole digger for inspection of the soil below the surface. Soil surveyors have made thousands of inspections of both the surface and lower layers of the soils of Grant County. The surveyors drew lines—soil boundaries—on the map wherever one kind of soil changes to another kind of soil. Figures 2 and 3 give sketches of some of the kinds of soils found in various positions on the sides of the hills and valleys of Grant County.

WHAT MADE THE SOILS WHAT THEY ARE. The soils of the area now called Grant County were formed over a period of thousands of years. Wind-carried material was dropped as a blanket of dust called "loess" over the surface of soils and rocks as then exposed. From this fertile "loess" and underlying material, soils were formed through the action of water, growth of roots of trees and prairie grass, and myriads of soil organisms, such as molds and bacteria. Deeper soils were formed on level land than on steep slopes. And where the prairie grass grew the soils became darker than where trees prevailed. Soils formed from bedrock are found on some steep valley slopes.

What the Soil Map Shows

The soil map shows where the various kinds of soils in Grant County occur. Each soil has been labeled with numbers and letters (soil symbols) on the map, such as 8 or 8L. Corresponding letter symbols are given in the color blocks of the legend below the map, and these symbols are explained in the table just above the legend. The letters stand for the following chief properties of the soils of Grant County.

LAY OF THE LAND. Grant County has wide bottoms (B), flats (F) or benches, narrow ravines (R), valley slopes (V), and ridgetops (U). The bottoms have fertile soils, and where these are well drained crop yields are high, providing floods do not cause serious damage. In narrow ravines are soils suited to pasture (see Figure 6). Flats are level, well drained, and generally have loamy, productive soils. The ridgetops are level to sloping and are covered by dark or light colored soils well suited to agriculture. On the valley slopes are steep soils suited to pasture and forestry.

COLOR OF THE TOPSOIL. Some soils of Grant County, such as Tama silt loam, are dark in color (D) to a depth of eight to twenty inches. Other soils are light colored (L) at a depth of four inches or even less. Most of the dark soils were under prairie grass, and most light colored soils were originally in forest. The dark soils have been the more productive of farm crops from the start.

TEXTURE (Coarseness or Fineness of the Surface Soil). Surface soil is made up of a sticky clay, flour-like silt, gritty sand, and organic matter. The principal kinds are:

sc	Silty clay loam soil—contains about 35% clay
s	Silt loam soil—contains about 65% silt
l	Loam soil—contains about 40% silt and 35% sand
ṡl	Sandy loam soil—contains about 60% sand
ṡ	Sand soil—contains about 90% sand

Silt loams and loams are the best for general farming. They contain enough clay and silt to store water and plant nutrients, and enough sand to form a loose, open soil.

DEPTH TO SANDY, GRAVELLY OR STONY MATERIAL. A good soil must be 2 to 4 feet deep to hold ample water and nutrients for plant growth. In Grant County most soils are sufficiently deep except on rocky bluffs and steep valley slopes.

DRAINAGE UNDER NATURAL SOIL CONDITIONS. Internal drainage—wetness or droughtiness—of a soil influences crop growth. To be highly productive, a soil should be neither water-logged nor seriously droughty. Fortunately, most of Grant County has soils with good natural drainage. Soils with fair, slow, or poor drainage have mottled yellowish brown and bluish gray colors in the subsoil.

SOIL TYPE NAMES. For technical purposes, soils are classified into series named after places. For example, the Dubuque silt loam (number 8L on the map) was named for Dubuque, Iowa, near which this soil was first studied. The name is given in parentheses under the proper color block in the legend below the map.

GENERAL DESCRIPTION OF THE SOILS OF GRANT COUNTY

FIVE SOILS COVER MOST OF GRANT COUNTY. Although there are many kinds of soils, only five are extensive in Grant County:

Soil Symbol	Name of Soil	% of Area of County	General Rating
3	Tama silt loam (and related soils)	12	First Class
7	Fayette silt loam (and related soils)	26	Second Class
8	Deep Dubuque silt loam (and related soils)	18	Second Class
14	Shallow Dubuque silt loam (and related soils)	18	Third Class
25	Stony Land	14	Fifth Class
		88	

All of the soils of Grant County are grouped on the soil map and in this introductory report into five classes which indicate general ratings on the basis of agricultural productivity:

GENERAL INDEX LIST OF THE SOILS OF GRANT COUNTY

FIRST CLASS SOILS

(Good Farm Land, shown in shades of green on the map)

Soil Symbol on the Map and Legend	Name of Soil	Percentage of the Area of the County	
1 (FDsVg)	Richwood and Toddville silt loams	0.1	
2 (FLsVg)	Bertrand and Jackson silt loams	0.4	
3 (UDsVg)	Tama, Downs, and Muscatine silt loams	12.0	
		12.5	12.5

SECOND CLASS SOILS

(Fair to Good Farm Land, shown in shades of yellow on the map)

4	(BLsVg)	Arenzville, Ray, Orion, and Lawson silt loams	4.3	
5	(FL1Mg)	Alvin loam	0.4	
6	(FD1Mg)	Dakota loam	0.1	
7	(ULsVg)	Fayette, Stronghurst, and Seaton silt loams	26.4	
8L	(ULsDg)	Dubuque and Dodgeville silt loams,		
8D	(UDsDg)	deep phases	18.0	
9L	(RLsVg)	Chaseburg, Judson, and Lindstrom silt		
9D	(RDsVg)	loams, gently sloping phases	0.1	
			49.3	49.3

THIRD CLASS SOILS

(Poor to Fair Farm Land, shown in shades of red on the map)

10L	(BLsVs)	Alluvial soils, undifferentiated, silt		
10D	(BDsVs)	loams, fair to poor drainage	1.9	
11	(FLsVs)	Curran silt loam	0.1	
12	(FLsMg)	Medary silt loam (over red clay)	0.2	
13	(FDslMe)	Dakota sandy loam	0.1	
14L	(VLsMg)	Dubuque and Dodgeville shallow silt		
14D	(VDsMg)	loams; Gale silt loam	18.3	
15	(VLsVg)	Fayette silt loam, valley phase	0.4	
16	(VDsVg)	Lindstrom silt loam, steep phase	0.1	
17L	(VL1Mg)	Hixton and Hesch loams	0.9	
17D	(VD1Mg)			
18	(UDsVs)	Cashton silt loam	0.1	
19	(UDscVp)	Garwin silty clay loam	0.1	
			22.2	22.2

General Description of Soils of Grant County

(Continued)

FOURTH CLASS SOILS
(Poor Farm Land, shown in blue on the map)

20	(FDsLe)	Sparta loamy sand - - - - - - - -	1.2	1.2

FIFTH CLASS SOILS
(Pasture and Forest Land, shown in shades of brown on the map)

21	(BDpVp)	Marsh soils - - - - - - - - - - -	0.3	
22	(FLsLe)	Sparta fine sand, dune phase - - -	0.4	
23	(VDsLg)	Sogn and Dubuque stony silt loams -	0.1	
24	(VLsLe)	Boone, Chelsea and Lamont sands -	0.3	
25	(VLrLe)	Stony Land - - - - - - - - - -	13.7	
			14.8	14.8
				100.0

FIRST CLASS SOILS (Good Farm Land)

The first class soils are the best agricultural soils of the county. They are level to rolling silt loams. Their waterholding capacity is good and drainage is good. These soils are usually over four feet deep to underlying bedrock, stony material, sand or gravel.

SILT LOAMS ON THE FLATS: 1 (FDsVg, Richwood and Toddville), 2 (FLsVg, Bertrand and Jackson). Richwood silt loam developed under prairie grass from 42 inches or more of silty material resting on sand, gravel, or bedrock. Toddville is a darker, moderately well drained soil developed in moist sites in the prairie areas. Bertrand silt loam is a light colored deep soil, developed under forest. Jackson is the moderately well drained soil associated with Bertrand. All four of these soils are on natural flats or high terrace benches in the large river valleys.

VERY DEEP SILT LOAMS OF THE UPLAND PRAIRIES: 3 (UDsVG, Tama, Downs, and Muscatine). Tama silt loam formed under prairie grass from 42 inches or more of wind-blown calcareous silt ("loess") resting on bedrock. Muscatine silt loam is the moderately well drained (mottled below a depth of 20 inches) deep prairie soil associated with Tama. Downs silt loam is slightly lighter in color than Tama. The Downs developed at the edges of the prairie, where scattered trees were invading the natural grasslands.

SECOND CLASS SOILS (Fair to Good Farm Land)

The soils in this class rate somewhat lower than the first class soils because of shallowness, droughtiness or low bottom position.

SOILS WITH GOOD TO FAIR DRAINAGE ON THE BOTTOMS: 4 (BLsVg, Arenzville, Ray, Orion, and Lawson). Arenzville silt loam is a brown, deep fertile soil which receives several inches of new soil by flooding nearly every year. The Ray silt loam, found in small valleys, consists of one to three feet of light brown alluvium over a buried dark brown soil. Orion silt loam differs from the Arenzville in being slightly less well drained. Lawson resembles Arenzville, but is darker and more fertile.

LOAMS OF THE FLATS: 5 (FL1Mg, Alvin), 6 (FD1Mg, Dakota). The Alvin sandy loam developed under forest from 2 to 2½ feet of sandy loam overlying stratified sands. The Dakota loam is a darker soil developed under prairie grass over stratified sands.

DEEP AND VERY DEEP SILT LOAMS OF THE UPLAND: 7 (ULsVg, Fayette, Stronghurst and Seaton), 8L-8D (ULsDg-UDsDg, Dubuque and Dodgeville, deep phases), 9L-9D (RLsVg-RDsVg, Chaseburg, Judson, Lindstrom, gently sloping). Fayette and Seaton silt loams are very deep soils developed under forest on wind-blown calcareous silt ("loess") resting on bedrock. They are lighter colored than Tama and Downs. Seaton contains less clay and fine silt than Fayette. Stronghurst is a slightly wetter soil than Fayette, as indicated by mottled coloring below a depth of 20 inches. The Dubuque and Dodgeville silt loams are the light colored and dark colored soils, respectively, developed from 18 inches to 42 inches of wind-blown silt resting on cherty red clay over dolomitic bedrock. Chaseburg silt loam is found in the bottoms of narrow ravines and small valleys. It resembles the Fayette soil, but is more gritty and contains less clay in the subsoil. The Judson silt loam is similar to Chaseburg but is dark in color. Lindstrom resembles Downs and Tama, but is found on valley slopes, rather than on ridge-tops.

General Description of Soils of Grant County

(Continued)

THIRD CLASS SOILS (Poor to Fair Farm Land)

The soils in this class are rated lower than the second class soils because of poor drainage, droughtiness, shallowness, or steep slopes.

SOILS WITH FAIR TO POOR DRAINAGE ON THE BOTTOMS (mottled at 6-16"): 10L-10D (BlsVs-BDsVs, Alluvial soils, undifferentiated, fair to poor drainage). These soils, subject to flooding nearly every year, occur in wide areas in large valleys and in narrow strips in the small valleys.

SOILS WITH SLOW TO EXCESSIVE DRAINAGE ON THE FLATS: 11 (FlsVs, Curran), 12 (FLsMg, Medary), 13 (FDs̈lMe, Dakota). The Curran silt loam resembles the Bertrand and Jackson (2,FLsVg) soils, but is less well drained than they. The Medary silt loam is underlain at 30-40 inches by reddish brown clay. The Dakota sandy loam is a dark, droughty soil.

SILT LOAMS AND LOAMS OF THE VALLEY SLOPES: 14L-14D (VLsMg-VDsMg, shallow Dubuque and Dodgeville, Gale), 15 (VLsVg, valley Fayette), 16 (VDsVg, steep Lindstrom), 17L-17D (VLlMg, VDlMg, Hixton and Hesch). The Dubuque and Dodgeville silt loams are light colored and dark colored soils developed from about 18 inches of wind-blown silt resting on cherty red clay over dolomitic limestone bedrock. Gale silt loam overlies sandstone bedrock at 24-30 inches. Fayette and Lindstrom silt loams are deep light colored and dark colored soils on steep valley slopes. Hixton and Hesch loams are light colored and dark colored soils which overlie fine-grained sandstone at 18-28 inches.

UPLAND SOILS WITH SLOW TO POOR DRAINAGE: 18 (UDsVs, Cashton), 19 (UDscVp, Garwin). The Cashton silt loam resembles the Downs (3) but is slowly drained. The Garwin silty clay loam is a wet soil associated with the fairly well drained Muscatine and well drained Tama soils (3).

FOURTH CLASS SOILS (Poor Farm Land)

The soil of this class is more droughty and shallower than any discussed thus far.

LOAMY SAND SOIL OF THE FLATS: 20 (FDs̈Le, Sparta). The Sparta loamy sand is a fairly dark, very droughty soil which overlies loose sand at 12-30 inches.

FIFTH CLASS SOILS (Pasture and Forest Land)

The soils of this class are non-agricultural because of excessive stoniness, steepness, droughtiness, or poor drainage. They are best suited to pasture, to forestry, to wildlife refuges, and to the development of recreational areas.

MARSH SOILS: 21 (BDpVp). These black and bluish gray mucks, silt loams, and sandy loams are very wet during most of the year.

DUNES OF THE FLATS: 22 (FLs̈Le, Sparta). The Sparta fine sand, dune phase, is found on sandy flats in the Wisconsin River Valley.

STEEP STONY SILT LOAMS AND LOAMS OF THE VALLEY SLOPES: 23 (VDsLg, Sogn and Dubuque). These are cherty soils which are 8-18 inches deep to reddish brown stony clay and bedrock dolomitic limestone.

STEEP SANDY SOILS OF THE VALLEY SLOPES: 24 (VLs̈Le, Boone, Chelsea and Lamont). The Chelsea sand is a very droughty, shallow soil found on deposits of stratified and unstratified sand near the foot of steep valley slopes. The Lamont loamy sand is found on the upland ridges near the Mississippi River. It appears to have developed from a coarse-textured wind-laid deposit. Boone formed from sandstone.

STONY LAND: 25 (VLrLe). Stony land includes cliffs and rocky slopes where the soil is shallow or where rocks outcrop.

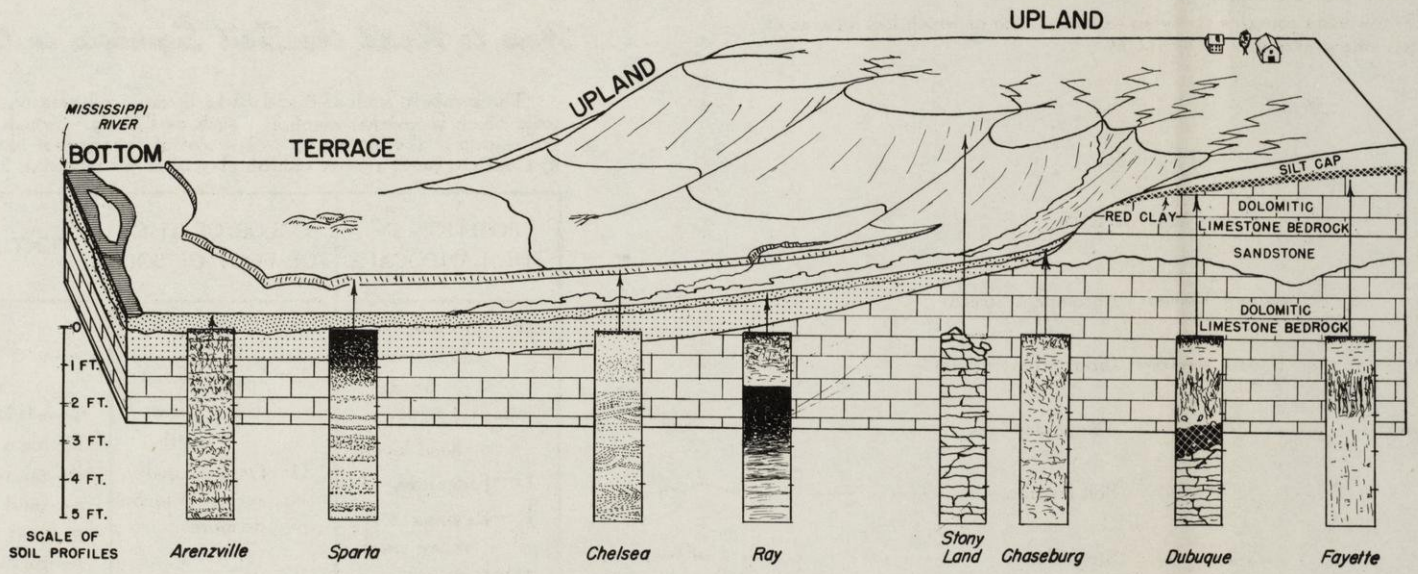


Figure 2. This diagram shows the relative positions of some typical soils of the bottoms, flats, valley slopes and ridgetops in Grant County.

Crop Yields Vary With The Soils In Grant County

The five most extensive soils in Grant County (see page 4) and 37 others have been grouped under 25 numbers and 5 classes. The first four classes of soils are considered suitable for cropland or pasture. The soils differ widely in their capacities to produce crops. The soils also differ in their abilities to respond to fertilizers and conservation practices.

AVERAGE CORN YIELDS ON GRANT COUNTY SOILS. Although much higher yields of corn can be obtained with best soil management, average yields in recent years in Grant County have been estimated by various observers as follows: First class soils, 65 bushels per acre; Second class soils, 55 bushels; Third class soils, 40 bushels; and Fourth class soils, 25 bushels. The lowest yield was 18 bushels on Sparta loamy sand, and the highest common yield under fairly good management was 70 bushels for Tama silt loam.

AVERAGE OATS YIELDS ON GRANT COUNTY SOILS.[1] First class soils have been producing an estimated 55 bushels of oats under slightly better than average management. Second class soils have yielded 49 bushels; Third class soils, 41 bushels; and Fourth class soils, 26 bushels. Sparta loamy sand went as low as 21 bushels, and Tama silt loam, 65 bushels under fairly good management.

AVERAGE CORN SILAGE YIELDS ON GRANT COUNTY SOILS.[1] First class soils have been giving 10 tons of corn silage to the acre, according to estimates. Second class soils have produced 9 tons; Third class soils, 7 tons; and Fourth class soils, 4 tons. Sparta loamy sand showed a low of 3.5 tons, and Tama silt loam a high of 11 tons per acre under fairly good management.

AVERAGE ALFALFA HAY YIELDS ON GRANT COUNTY SOILS.[1] The estimated average yield under slightly better than average management on first class soils has been 3.2 tons of alfalfa hay per acre. Second class soils yielded 3 tons; Third class soils, 2½ tons; and Fourth class soils, 1½ tons. One ton was the lowest common figure, from fields of Sparta loamy sand. Tama silt loam has produced 4 tons on some fields where management was very good.

AVERAGE CLOVER-TIMOTHY YIELDS ON GRANT COUNTY SOILS.[1] First class soils gave 2.3 tons per acre; Second class soils, 2.2 tons; Third class soils, 1.8 tons; and Fourth class soils, 1.7 tons. A little over a half a ton has been a common yield in some fields of Sparta loamy sand, while 2.6 tons per acre are frequent on Tama silt loam.

PASTURE YIELDS (in number of days a cow can profitably graze on one acre).[1] First class soils have been supporting a cow on an acre for 95 days; Second class soils, for 87 days; Third class soils, 72 days; and Fourth class soils, 40 days. Sparta loamy sand frequently drops as low as 30 days in a given season. Tama silt loam often supports a cow for 120 days on an acre.

[1]The information in this section is adapted from an unpublished thesis at the College of Agriculture written by A. J. Klingelhoets.

How to Increase Crop Yields On the Soils of Grant County

Lime. Most of the soils in Grant County which have not been limed are acid. For best results with most farm crops, especially clover and alfalfa, fields should be limed according to the soil test. A farmer can have his soil tested by his County Agent, Vocational Agriculture Teacher or by sending samples to the State Soil Testing Laboratory, College of Agriculture, Madison, Wisconsin. Field experiments in Grant County show that about 70 lbs. of available phosphorus and 200 lbs. of available potassium are needed for good yields.

Function of Plant Food In Commercial Fertilizer. A 3-12-12 fertilizer contains 3 lbs. of nitrogen (N), 12 lbs. of phosphate (P_2O_5) and 12 lbs. of potash (K_2O) per 100 lbs. Nitrogen promotes rapid lush growth of plants and gives them a dark green color. Phosphate stimulates root formation, hastens maturity and aids in seed formation. Acid soil ties up some of the available phosphorus. Potash gives plants disease resistance, lessens danger of lodging, gives legumes winter hardiness and increases yields.

Renovation of Permanent Pastures. Yields of grass from permanent pastures can be increased three to five times by applying lime and fertilizer according to the soil test and seeding to a mixture of 8 lbs. brome grass, 8 lbs. alfalfa and 3 lbs. of red clover in a seed-bed prepared by either digging with a field cultivator or shallow plowing.

Nitrogen for Small Grain. There are many fields in Grant County, especially on steep slopes, that will respond to the application of nitrogen. Yields of grain are increased from 20 to 50 per cent on soils low in nitrogen. On fertile soils the nitrogen will tend to increase lodging.

Corn Feeds Heavily on Nitrogen. Yields of corn can be doubled on low fertility fields by plowing down 700-800 lbs. of 8-8-8 fertilizer per acre. Yields can also be boosted by side-dressing corn with 125-150 lbs. ammonium nitrate at cultivating time on fields low in available nitrogen. Early firing of corn, commonly thought of as dry weather firing, is principally due to the lack of available nitrogen in the soil.

Conserve Barnyard Manure. On livestock farms in Grant County, manure from livestock supplies valuable plant food and organic matter. Best returns from it are obtained by spreading daily on land which is not subject to severe erosion. A ton of barnyard manure contains about 10 lbs. of nitrogen, 5 lbs. of phosphate and 10 lbs. of potash.

Green Manure Crops Increase Organic Matter in the Soil. Plowing under a good growth of sweet clover, alfalfa or rye will help build up the organic matter of the soil and increase the nitrogen content. Soils high in organic matter are productive, easy to work, and have a high water holding capacity.

Use Soil Conservation Practices. One of the principal aids to erosion control is a crop rotation which includes two or three years of hay or pasture. In addition, contour strip cropping, terracing, and grass waterways are needed on rolling to steep land. Farmers can receive help on these practices through the Grant County Soil Conservation District office at Lancaster.

Grant County and Its Farms

LAY OF THE LAND. The county is roughly triangular in shape with one of its sides bounded by the Wisconsin River and one by the Mississippi River. The total area is 1,137 square miles or 740,480 acres. Water covers 2,560 acres, most of which is under the large rivers. The sketch in the upper left-hand corner of the map side of this sheet shows Military Ridge as a white band running from east to west, with somewhat narrower ridges branching off to the north and south. On these ridges the main cities and villages and the best farm land are located. Elevations are 600 feet above sea level at the southwest corner of the county to 620 on the west, to 690 on the northeast. Military Ridge reaches an elevation of 1,211 feet at Mt. Ida, and the smooth upland slopes south to elevations around 900 feet. West Platte Mound, just across the line in Lafayette County, reaches 1420 feet above sea level, and Sinsinawa Mound, 1185 feet. These two mounds have a local relief of about 300 feet. The bluffs along the Mississippi River are 500 feet high near Prairie du Chien, 300 near Cassville, and 260 near Dubuque.

BEDROCK AND LOESS. Military Ridge is a divide between streams flowing north down the steep slope of the Galena-Platteville bluff or cuesta, and streams flowing south down the long, gentle back-slope of the same cuesta. The Galena-Platteville bedrocks are resistant dolomitic limestones about 300 feet thick. There are some shale layers and a thin decomposed volcanic ash bed, called bentonite, near the bottom of this bedrock formation. Below the Galena-Platteville rocks are about 200 feet of St. Peter sandstone, then 200 feet of the lower Magnesian dolomitic limestone, and finally, at the bottom of the Wisconsin River Valley, Cambrian sandstone. At Platteville Mound and Sinsinawa Mound, Maquoketa shale overlies the Galena-Platteville. The Maquoketa shale is rather extensive in the southeastern corner of the county.

The deposits of lead and zinc ores in the Galena dolomitic limestone have been mined for years in the county. The dolomite itself has been crushed for road material and for agricultural lime. There are approximately 300 dolomitic limestone quarries in the county, some of which are abandoned. In the Wisconsin River Valley are about a half dozen sand and gravel pits.

Thousands of years ago, during the ice age, winds from the southwest blew dust off the Mississippi valley bottom onto the upland. This made a fertile soil material overlying the bedrock. Between Beetown and Cassville this dust, called "loess", is from 8 to 20 feet thick on the smooth upland areas; between Beetown and Fennimore, it is 4 to 8 feet thick in places; it is about 4 feet thick northeast of Fennimore. Directly beneath this loess blanket is a cherty reddish brown clay weathered from the dolomitic limestone below.

The ice-sheet did not enter Grant County. Therefore, the upland is well dissected by the Grant, Platte, and other rivers. The power of these streams in flood is great after unusually heavy rains. Sand and gravel fill the bottoms of the Wisconsin and Mississippi River valleys to a depth of about 100 feet. In these valleys are some high terraces or benches of gravel, sand, silt and clay deposited by meltwaters which came from the glaciers.

CLIMATE. The average length of the frost-free period is about 160 days in Grant County (see Figure 4). This period is considered to be the growing season for corn, potatoes, and other tender crops. The latest and earliest frosts on record come on May 27 and September 10, respectively. The average dates at Lancaster are May 1 and October 6, giving an average frost-free season of 157 days. Small grains and hay have a growing season about 6 weeks longer. The highest temperature ever recorded at Lancaster was 108°F., the lowest, -30°F. The mean annual temperature is 46°F., the mean July temperature, 72.1°F., and the mean January temperature, 16.6°F. The mean annual precipitation is 32.2 inches, nearly two thirds of which comes during the growing season. On the average, 36 inches of snow falls during the course of the winter.

WATER SUPPLY. There are approximately 1,000 springs in the stream valleys of Grant County. About 50 artificial ponds had been built by 1950 on land standing above the springs and permanent streams. However, most of the water for farm home and barn use is pumped from the St. Peter and Cambrian sandstone formations at depths of 100 to 200 feet. The water table stands at about 50 to 150 feet below the surface. The water is hard. Analyses of samples from 9 drilled city wells show an average of 406 parts per million of dissolved solids. Spring water at Lancaster contains 283 parts per million of dissolved solids. A drilled well at Montfort furnishes water having 583 ppm.

SETTLEMENT AND DEVELOPMENT. Grant County was probably visited by Marquette and Joliet, who in 1673 portaged from the Fox River to the Wisconsin River. By 1725 there was a trading post in what is now the town of Bloomington. A fur trader named Grant had his headquarters in Prairie du Chien and operated in the Grant River Valley. The river, and later, the county itself, were named after him.

Lead miners came from Kentucky, Tennessee, Missouri and Illinois about 1825, and established the village of Hazel Green. From 1830-50 Cornish miners immigrated to the area. The English thus formed the predominant immigrant group. By 1905 the percentage of English in the total population had dropped from 12% to 2%, while Germans accounted for more than 5% of the population. Bohemians constituted another group of foreign-born residents. Population figures taken at intervals are: 1850 - 16,169; 1860 - 31,189; 1870 - 37,979; 1900 - 38,881; 1920 - 39,044; 1940 - 40,639.

By 1870 the fertile prairie soils of the area were settled and 4,301 farms were established, the largest number of farms ever reported by a census in Grant County. In 1945 there were 3,842 farms, occupying 93.4 percent of the total land area. Fifty per cent of the farm land was in cropland. The average size of farm had changed from 146 acres in 1880 to 179 acres in 1945. Popular sizes were 120 acres, 160 acres, and 250 acres. There are five incorporated places in the county, including Lancaster (3,245) and Platteville (5,718). In 1940, 81% of the total population lived on farms or in villages. Forty-eight percent of the people depended directly on farming for a livelihood.

HIGHWAYS. There are approximately 85 miles of concrete highways and 370 miles of bituminous highways in Grant County. A network of gravel roads connects the farms and villages with these main arteries.

Agricultural Production

Grant County ranks first among Wisconsin counties in hog production. The 1950 census listed a total of 176,504 hogs on farms, compared to a total of 104,049 in 1945. Forty-six percent of the total farm income is derived from the sale of hogs. The total number of hogs sold from Grant County farms during 1949 was 239,610.

The sale of milk provides the second most important source of income (28%). Although there are fewer cattle in the county than in 1944, milk production has increased to 7,089,997 pounds. In 1950, Grant County had 119,934 cattle. However, only 45% of these were milk cows. This shows the presence of many beef type cattle.

Grant County also ranks first in the State in the total number of stock sheep. In 1950 this figure was 16,959.

A peak in numbers of chickens was reached in 1944. In 1949, 236,055 chickens were marketed and 3,165,326 dozen eggs were sold. Twenty-eight farms raised 10,308 turkeys in 1950.

For many years farmers have fed their crops to livestock. They have found that there is more profit from the sale of livestock and livestock products than from the sale of crops.

Corn is the leading crop in the county. In 1949, 104,989 acres of corn were harvested, with an average yield of 60.8 bushels per acre. A record low of 9,959 acres of corn were cut for silage. The 160-day growing season and warm summer temperatures in Grant County are favorable to corn production.

Tame hay has been the second most important crop. In 1949 there were 106,108 acres in hay. Hay cropland has increased since 1934 as a result of less winter killing of the plants, adequate rainfall, and increased interest in soil conservation. Alfalfa-Brome hay mixtures are the most productive. Since 1924 the total acreage of alfalfa has increased from 2,350 acres to 60,377 in 1949. Clover and Timothy have shown a downward trend from 86,426 in 1944 to 42,692 in 1949. Seed harvested from the various hay varieties totalled 6,624 bushels in 1949. Eighty-seven per cent was red clover seed.

Oats rank third in importance. In 1949, 79,536 acres were devoted to this crop. This is a decrease over past years. Of the other small grains, barley totalled 674 acres; wheat, 1,808 acres; rye, 512 acres; and buckwheat, 44 acres. A total of 777 acres of soybeans were grown for beans and hay in 1949, as compared to 1,778 acres in 1944.

Small crops sold for cash were as follows for 1949: tobacco, 145,490 pounds; sweet corn, 577 acres; peas, 840 acres.

Farm woodlots in the fiscal year 1944-45 yielded $268,100 worth of fuel wood, fence posts, saw logs, railroad ties and pulpwood. Woodland pastures yield one-tenth as much forage per acre as open pastures, and yield virtually no new timber. Woodland pastures have therefore been found unproductive of both forage and timber, as compared with fence woodlots and open pastures.

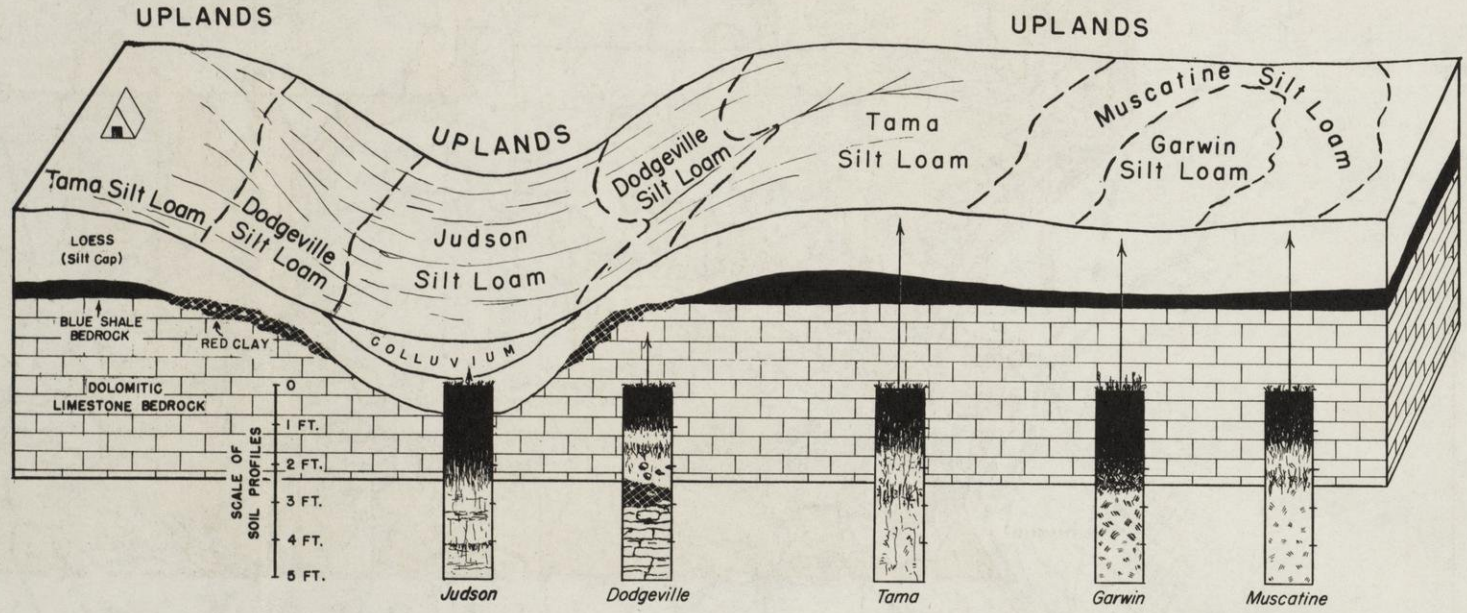


Figure 3. This diagram shows the relative positions of some typical prairie soils on the uplands of Grant County.

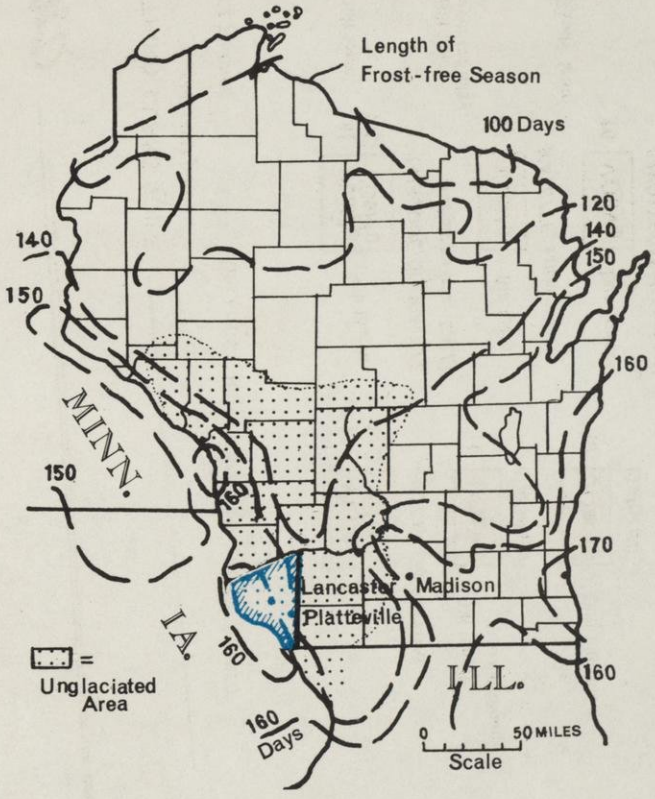


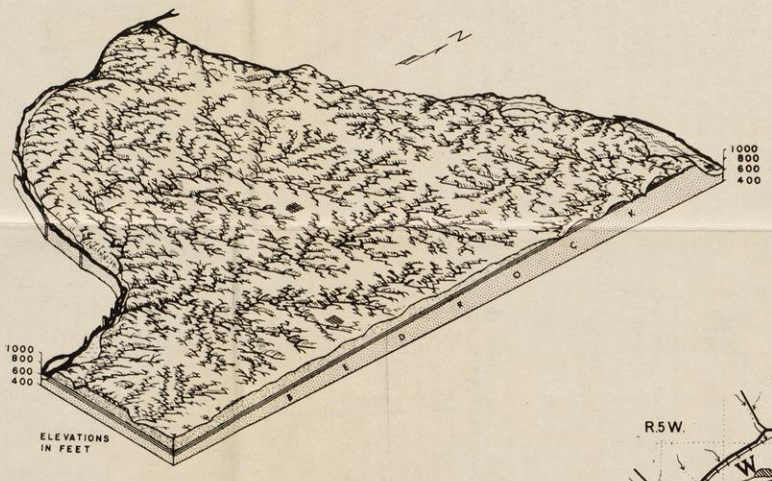
Figure 4. Index Map of Wisconsin

Figure 5. View of Tama silt loam, a prairie soil, with the shallower Dodgeville silt loam under cover of oak trees in the distant drainage way.

Figure 6. A typical pasture on Alluvial Soils in a rougher part of Grant County.

INTRODUCTORY SOIL MAP OF GRANT COUNTY, WISCONSIN

LANDSCAPE TYPES OF GRANT COUNTY



INDEX MAP

N

SCALE IN MILES

1 0 1 2 3 4 5 6 7

How to Locate Areas on the Map

GEOGRAPHICAL LOCATION:

Township and Range numbers are given in the margins of the map. For example, T. 3 N. means the third township north of a reference parallel or base line at the southern state line, and R. 4 W. means the fourth township west of a reference meridian. Latitude and longitude are also given by figures in the margin in terms of degrees and minutes, as latitude 42° 45′ north, and longitude 90° 45′ west.

SECTIONS AND U.S. TOWNSHIPS:

Each U.S. township contains thirty-six sections, each of which has an area of approximately one square mile or 640 acres.

MAP SIGNS

State boundary
County boundary
U.S. Township line
Section line
Railroad
Permanent stream
Intermittent stream
Temporary lake
Soil boundary
Steep slopes

Roads & Highways:

U.S. highway
State highway
County highway
Town road

How to Read the Soil Symbols in the Color Blocks of the Legend below

The symbols, such as 8 and 15 L, in each soil area on the map, refer to the color blocks in the Legend. In each color block is another symbol, such as FDsVg, which indicates the following facts about the soil in this order: 1) Position in the landscape, 2) Color of the top foot of soil, 3) Texture (coarseness or fineness of the surface soil), 4) Depth to sand, gravel, reddish clay or stony material, 5) Drainage under natural soil conditions.

POSITION IN THE LANDSCAPE	COLOR OF THE TOP FOOT OF SOIL	TEXTURE	DEPTH TO SANDY, GRAVELLY OR STONY MATERIAL	DRAINAGE UNDER NATURAL SOIL CONDITIONS
B—Bottoms, subject to floods F—Flats, above flood levels U—Ridgetops R—Ravines in valley sides V—Valley slopes	L—Light colored below 4-inch depth D—Dark colored surface 8 inches or more	sc—silty clay loam s—silt loam l—loam sl—sandy loam s—sand p—peat r—rock	V—Very deep (42"+) D—Deep (32"-42") M—Medium (20"-32") S—Shallow (10"-20") L—Least (0"-10") (Includes Lithosols)	p—poor s—slow f—fair g—good e—excessive

For technical purposes soils are classified into series named after places. These series names are given in parentheses under the symbols in the legend below the map.

Sample soil symbols: 1 FDsVg — A soil on the flats, with 8 inches or more of dark topsoil, a silt loam which is very deep and has good drainage (Richwood and Toddville soil series).

SOIL SURVEY, 1949-50, BY THE SOIL SURVEY DIVISION, WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY, IN COOPERATION WITH THE SOIL SURVEY DIVISION, U.S. BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING, AND THE SOIL CONSERVATION SERVICE, AND THE COLLEGE OF AGRICULTURE.

Map by J. R. GOETSCH

LEGEND

FIRST CLASS SOILS — GOOD FARM LAND

FLATS (TERRACE BENCHES)

1 FDsVg — Silt loams (RICHWOOD and TODDVILLE)

2 FLsVg — Silt loams (BERTRAND and JACKSON)

UPLANDS: RIDGETOPS AND VALLEY SLOPES

3 UDsVg — Silt loams (TAMA, DOWNS, and MUSCATINE)

SECOND CLASS SOILS — GOOD to FAIR FARM LAND

BOTTOMS

4 BLsVg — Silt loams, good to fair drainage (ARENZVILLE RAY, ORION and LAWSON)

FLATS (TERRACE BENCHES)

5 FLlMg — Loam (ALVIN)

6 FDlMg — Loam (DAKOTA)

UPLANDS: RIDGETOPS, VALLEY SLOPES AND RAVINES

7 ULsVg — Silt loams (FAYETTE, STRONGHURST, SEATON)

8L 8D ULsDg UDsDg — Silt loams (DUBUQUE and DODGEVILLE, deep phases)

9L 9D RLsVg RDsVg — Silt loams (CHASEBURG, JUDSON, and LINDSTROM)

THIRD CLASS SOILS — FAIR FARM LAND

BOTTOMS

10L 10D BLsVs BDsVs — Silt loams; fair to poor drainage (ALLUVIAL SOILS, undifferentiated)

FLATS (TERRACE BENCHES)

11 FLsVs — Silt loam (CURRAN)

12 FLsMg — Silt loam over red clay (MEDARY)

13 FDslMe — Sandy loam (DAKOTA)

UPLANDS: RIDGETOPS AND VALLEY SLOPES

14L 14D VLsMg VDsMg — Silt loams (DUBUQUE, DODGEVILLE, shallow phases; GALE)

15 VLsVg — Silt loam (FAYETTE, valley phase)

16 VDsVg — Silt loam (LINDSTROM, steep phase)

17L 17D VLlMg VDlMg — (HESCH and HIXTON)

18 UDsVs — Silt loam: slow drainage (CASHTON)

19 UDscVp — Silty clay loam (GARWIN)

FOURTH CLASS SOILS — POOR FARM LAND

FLATS (TERRACE BENCHES)

20 FDsLe — Loamy sand (SPARTA)

FIFTH CLASS SOILS — PASTURE or FOREST LAND - DROUGHTY, STEEP, STONY, or WET

BOTTOMS

21 BDpVp — Peat (MARSH)

FLATS (TERRACE BENCHES)

22 FLslLe — Sand dunes (SPARTA, dune phase)

UPLANDS: STEEP VALLEY SLOPES

23 VDsLg — Stony silt loams (SOGN and DUBUQUE, stony phase)

24 VLslLe — Sands (BOONE, CHELSEA, LAMONT)

25 VLrLe — Rocky slopes and Cliffs (STONY LAND)

WISCONSIN SOIL MAPS AND REPORTS

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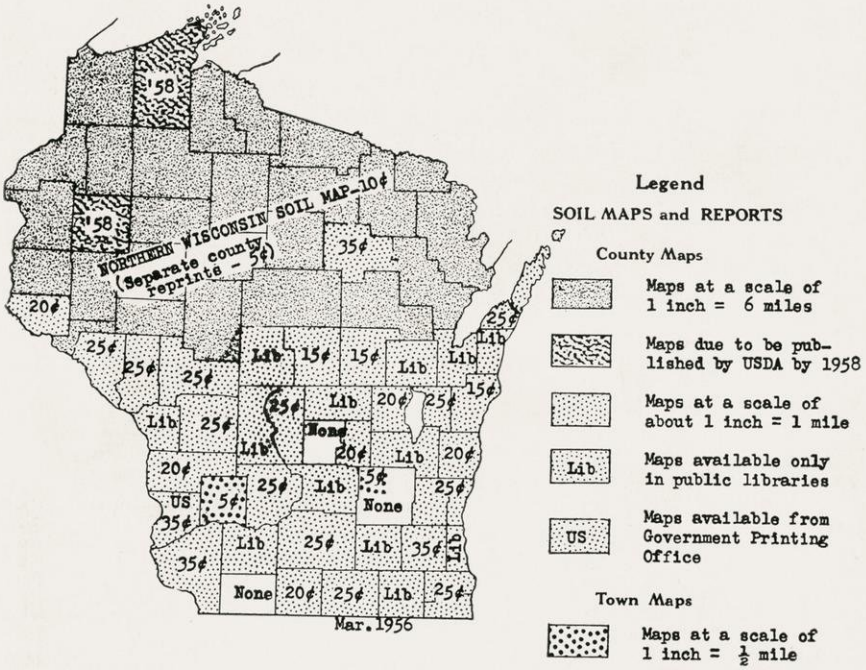

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