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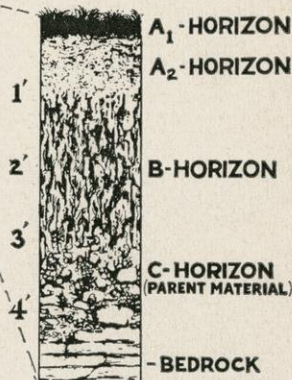
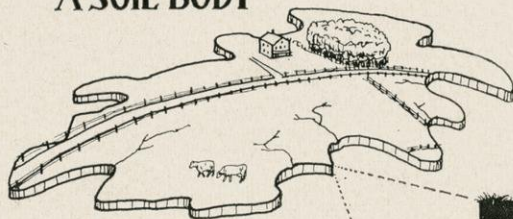
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Introduction to the **SOILS OF WISCONSIN**

A General Scheme of Classification of the Principal Soils of Wisconsin

A SOIL BODY



BULLETIN NO. 79
EDUCATIONAL SERIES NO. 10

SOIL SURVEY DIVISION,
WISCONSIN GEOLOGICAL AND
NATURAL HISTORY SURVEY,
203 SOILS BUILDING,
UNIVERSITY OF WISCONSIN,
MADISON

IN COOPERATION WITH THE
SOILS DEPARTMENT, WISCONSIN
COLLEGE OF AGRICULTURE

A SOIL PROFILE

1955



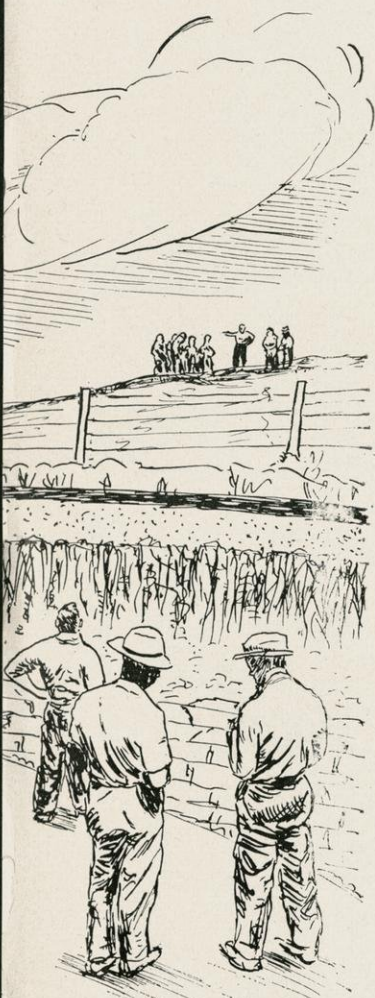
Farmers and agricultural agents studying soil classification
around a pit dug in Kewaunee loam in Shawano County,
Wisconsin.

Soil Classification in Brief

1. There are usually several kinds of soils on a Wisconsin farm, and sometimes half a dozen in a single field. All told, there are hundreds of kinds of soils in the state of Wisconsin.
2. Each kind of soil is different . . . in appearance, in mode of formation, in native fertility, in water-holding capacity, in ability to respond to management, and so on.
3. Each kind of soil is given a place name . . . the name of the city or village or lake near which the soil was first studied. Like the name of a person, a soil name stands for a complex of characteristics and conditions. The cross-section of a soil, called the soil profile, shows soil differences to a depth of 3 to 5 feet.
4. By means of simplified groupings, the hundreds of soils in our state can be arranged in orderly fashion. Publications like this one are issued to report the latest findings in soil classification. This bulletin is an introductory report on soil classification in Wisconsin. Farmers, teachers, students, county agents, farm appraisers, highway engineers, and many others who are dealing with the soils of the state will find that information on soil classification is both useful and interesting.

Soil Textural Classes

Soil texture refers to the proportions of clay, silt and sand in a soil. A loam is a soil which is a mixture or blend of all three . . . about 20% clay, 40% silt, and the rest sand. Soils which contain somewhat more clay are called clay loams; those made up predominantly of silt are silt loams; those higher in content of sand are sandy loams. Sands and clays are soils which do not contain enough of the other constituents to merit the use of the term "loam."



INTRODUCTION TO THE SOILS OF WISCONSIN

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1955

In cooperation with the Soils Department,
Wisconsin College of Agriculture

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Each kind of soil has a characteristic profile (cross-section) and landscape, as illustrated by the two examples below, taken from extreme northern and southern points in Wisconsin.

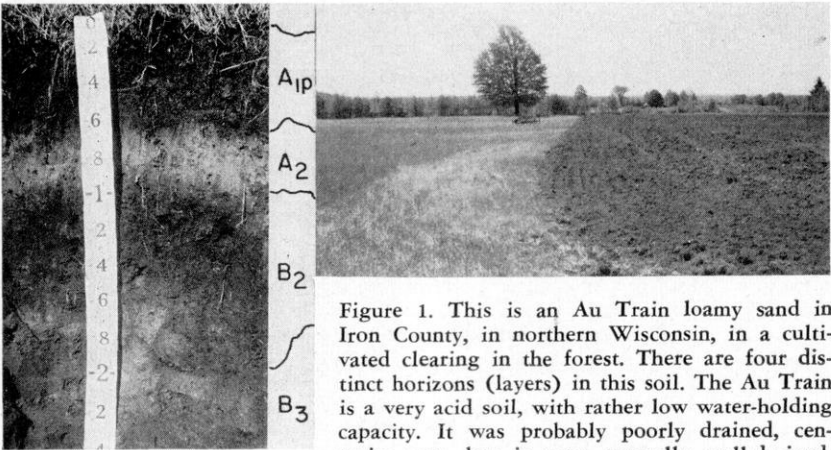


Figure 1. This is an Au Train loamy sand in Iron County, in northern Wisconsin, in a cultivated clearing in the forest. There are four distinct horizons (layers) in this soil. The Au Train is a very acid soil, with rather low water-holding capacity. It was probably poorly drained, centuries ago, but is now naturally well-drained. It is not extensive, but is shown here because of its striking profile. It has a relatively low native fertility.

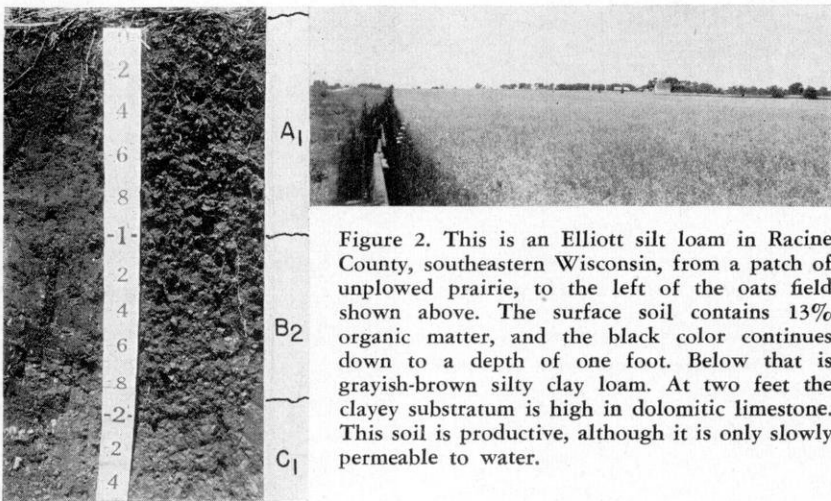


Figure 2. This is an Elliott silt loam in Racine County, southeastern Wisconsin, from a patch of unplowed prairie, to the left of the oats field shown above. The surface soil contains 13% organic matter, and the black color continues down to a depth of one foot. Below that is grayish-brown silty clay loam. At two feet the clayey substratum is high in dolomitic limestone. This soil is productive, although it is only slowly permeable to water.

Introduction to the **SOILS OF WISCONSIN**

SOIL extends as an almost continuous blanket over the land surface of the earth. We recognize that there are many kinds of soils in this blanket, which is made up of millions of distinct patches. Figure 3 shows a Wisconsin landscape in which two kinds of soils are prominent, one of which plows up light colored and one which plows up dark. Under the cover of crops, these differences were not immediately evident. And it is only by studying soils to a depth of at least three or four feet, as a soil surveyor does, that the significant contrasts between them can be discovered. Soil variations are great not only in a single field (Fig. 3), but also from one part of the state to another (Figs. 1 and 2). Some of these differences are reflected in quality and quantity of crops and of animals feeding on the crops.

There Are Many Kinds of Soils in Wisconsin

Now that soil scientists have been mapping and studying soils intensively for about 50 years in Wisconsin, we have a list of several hundred kinds of soils, and dozens of maps. The list of soils continues

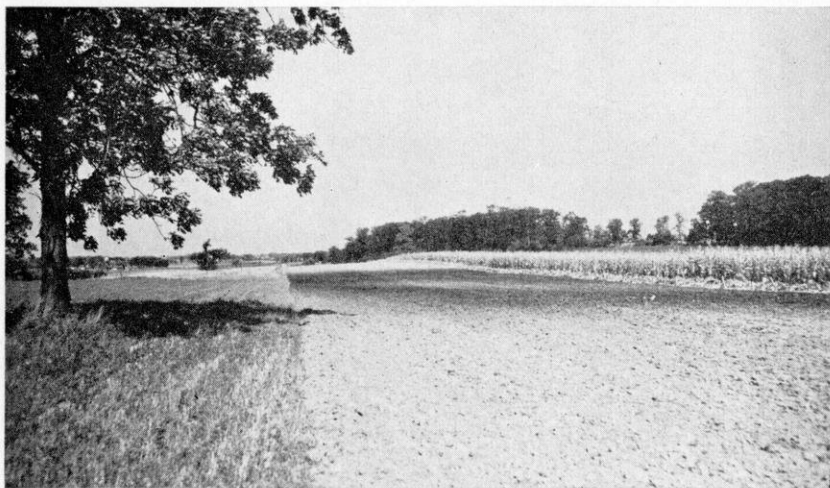


Figure 3. A field of Elba (dark) and Clyman (light colored) silt loams in Dodge County, Wisconsin.

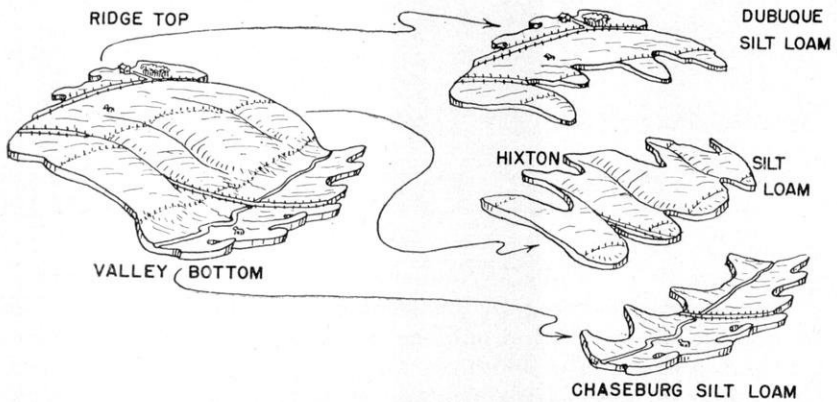


Figure 4. This diagram shows, left, a segment of a landscape extending from a ridge top to a valley bottom. Sketches, right, are of the three soil bodies which constitute this landscape segment.

to grow, as more careful study is made of soil variations. This is inevitable, because natural soil conditions differ so much from place to place. Soil materials have been moved by oceans, lavas, ice-sheets, winds, rivers, and lakes. Plants and animals, and climatic influences have changed these materials to soils. Because conditions varied so greatly, many different kinds of soils were formed, and soil scientists are only now beginning to record the pattern in detail.

The diagram on the front of this bulletin shows that an individual body of soil has a characteristic cross-section or soil profile several feet



Figure 5. Profile of a soil in Dodge County, Wisconsin, showing a wavy A₂ horizon (light colored) over a wavy B horizon (dark colored) over light colored dolomitic loam till.

thick. Figure 4 indicates how soil bodies fit together like pieces of a jig-saw puzzle to form a landscape. Each soil body may have an area of about 5 to 500 acres, and may be said to have an irregular border like that of a leaf, but with notable variations in slope of surface, and in smoothness or roughness of both the upper and lower surfaces. The soil shown in Figure 5 has a fairly smooth upper surface, but a rather rough under surface.

Some Important Soil Constituents

Soils may be considered to be combinations of rock materials, water, air, and organic matter. Rock materials are commonly referred to in soils studies as parent materials, because soils are derived from them. In Wisconsin, parent materials range from red clays to light brown loams to white and even green sands. These materials may be dry or wet. In general, the wetter they are the more organic matter they contain. Black soils occur in wet lowlands, and lighter colored soils on highlands. However, dark gray soils have formed even on highlands under some types of vegetation, such as the prairie. Topography, or the lay of the land, influences the distribution of water, organic matter, and parent material. Figure 6 shows the major topographic features of the state.

Soil texture, which means fineness or coarseness of the soil, is probably the most important characteristic in a general scheme of classification. Figure 7 shows the four chief textural separations in soils. Gravel particles are larger than 8 hundredths of an inch in diameter, sand particles measure from 2 thousandths to eight hundredths of an inch across, silt particles are 8 hundred-thousandths to 2 thousandths of an inch in diameter, and clay particles are still smaller. By rubbing moist soil between the fingers, one can feel about how much of each of these sticky, floury, and gritty materials is present. In this way soils can be recognized as clays, sands, sandy loams, loams, and silt loams.



Figure 6. View of a relief map of Wisconsin.

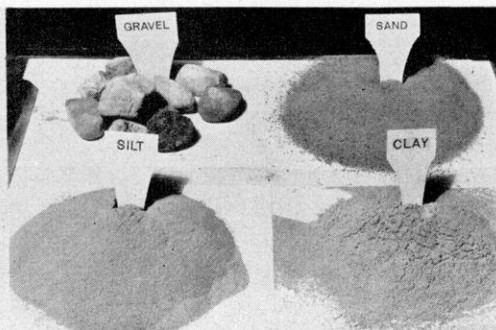


Figure 7. All soils, except peats and mucks, consist of mineral particles of one or more of these four sizes.

How to Classify the Soils Where You Are

To classify the soils where you are, find on the soil map, page 11, the region in which you live. Then look at the general soil classification keys as listed on pages 10 and 12. Consult the alphabetical list of soil names near the back of the bulletin for brief soil characterizations. Your agricultural leader can help set up additional soil keys, as needed in your area.

The name of a soil, such as *Almena*, is called the series name. It is like *Acer*, the genus name for maple trees. The texture of the surface soil, such as *silt loam*, is the type designation of a soil. It is like *saccharum*, the species name of sugar maple. *Acer saccharum* is the full name of the sugar maple; *Almena silt loam* is the complete soil type name for the "yellow clay" of north central Wisconsin.

A soil association is a grouping of two or more soils which occur together in a particular landscape. The Almena-Freer association is an example which is illustrated on page 21. There are, of course, many other soils in this part of Wisconsin, but the Almena and Freer soils are the most extensive ones. The table below lists over 50 important soils of Wisconsin in 22 soil associations.

TABLE OF MAJOR SOIL ASSOCIATIONS IN WISCONSIN

Soil Association	Approximate Area		Soil Key page
	Thousands of Acres	% of Land Area of State	
1. Fayette-Dubuque.....	4,100	12.2	26
2. Almena-Freer.....	3,600	10.5	21
3. Plainfield-Sparta-Nekoosa.....	3,540	9.9	17
4. Omega-Hiawatha.....	3,300	9.2	16
5. Dodge-McHenry-Elba.....	2,800	8.2	23
6. Milaca-Cloquet-Peat.....	2,780	7.8	19
7. Hixton-Gale-Arland.....	2,000	5.6	17
8. Kewaunee-Poygan.....	1,800	5.1	14
9. Onaway-Emmet.....	1,400	3.9	15
10. Kennan-Elderon.....	1,300	3.7	18
11. Iron River-Elderon.....	1,200	3.4	18
12. Wakefield-Gogebic.....	1,140	3.3	18
13. Coloma-Wyocena.....	900	2.7	17
14. Parr-Corwin-Warsaw.....	740	2.1	25
15. Tama-Dodgeville.....	700	1.9	27
16. Oshkosh-Poygan.....	700	1.9	14
17. Blount-Elliott-Ashkum.....	605	1.8	22
18. Ontonagon-Bergland.....	600	1.8	13
19. Antigo-Onamia.....	505	1.5	20
20. Vesper-Hixton-Peat.....	450	1.4	17
21. Rozellville-Rudolph-Marathon.....	400	1.2	-----
22. Fox-Rodman.....	300	0.9	24

The profile of a soil is the vertical cross-section showing the various horizons or layers (see front cover). The A_0 horizon is the humus layer on a forest floor. This is gone in cultivated fields. The A_1 is a mixture of humus and mineral soil. Some soils, like the Hiawatha, have no A_1 horizon, but have an A_2 horizon. The A_2 horizon is a lighter-colored layer. Below the A horizons or surface soil layers is the B horizon. This is usually a dark brown layer. In the Plainfield and Omega soils it is quite sandy, but in many soils the B is rather clayey.

The substratum of a soil is the material lying below the A and B horizons, ordinarily at a depth of about 3 feet. This material is usually thought of as the parent material of the soil, or the material from which the A and B horizons formed. In some cases, however, it is quite different from the original A and B materials. In Wisconsin, a soil may be formed from a thin blanket of sediment, overlying a substratum which is a deposit made by an ice-sheet, or an ancient river, lake, or a dust-storm thousands of years ago, or is bedrock. A few soils, like the one pictured in Figure 8, are young river-laid soils, still in the making. The maps on pages 40 to 45 show the distribution of bedrocks, glacial deposits, wind-blown materials, native vegetation and climatic influences in Wisconsin which determined the soil pattern.

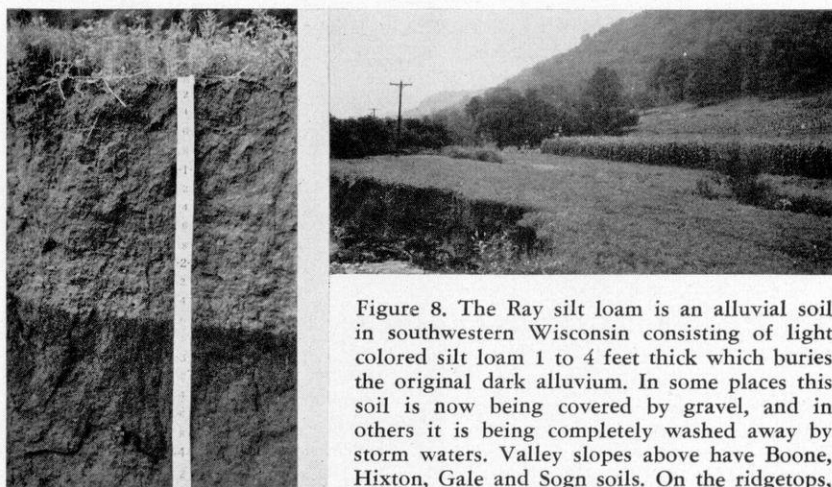


Figure 8. The Ray silt loam is an alluvial soil in southwestern Wisconsin consisting of light colored silt loam 1 to 4 feet thick which buries the original dark alluvium. In some places this soil is now being covered by gravel, and in others it is being completely washed away by storm waters. Valley slopes above have Boone, Hixton, Gale and Sogn soils. On the ridgetops, Dubuque, Fayette, Dodgeville and Tama soils occur.

Wisconsin Soils May Be Classified Under a Few Headings

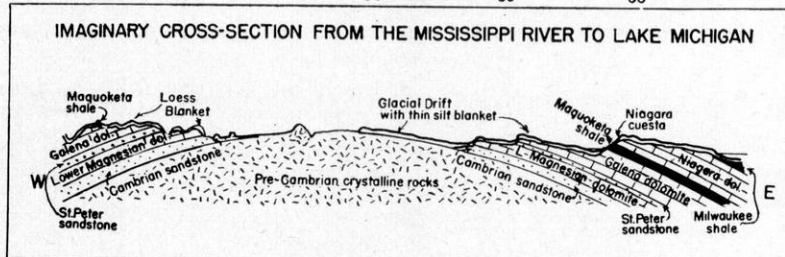
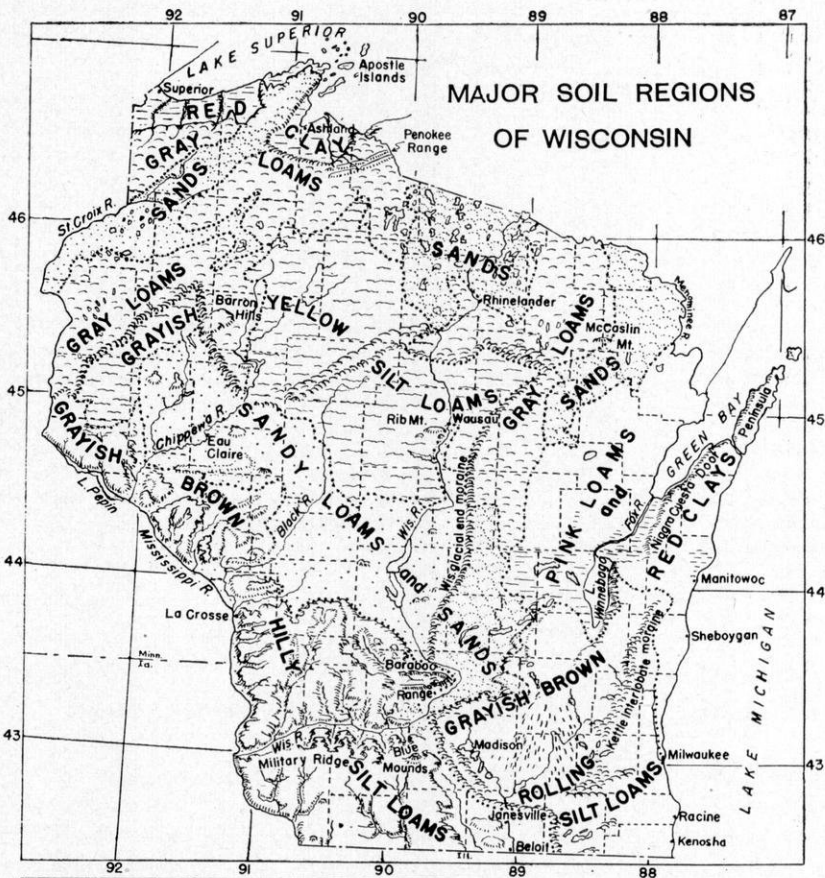
The generalized state map on page 11 groups the major soils of Wisconsin under eight headings, which in a general way indicate colors, textures, and topographic conditions, as follows:

Soil Regions	Major Soil Associations	Page Numbers of Soil Keys
1. Red clay -----	Ontonagon-Bergland-----	13
2. Pink loams and red clays -----	{ Oshkosh-Poygan Kewaunee-Poygan Onaway-Emmet }	14, 15
3. Sands -----	Omega-Hiawatha-----	16
4. Sandy loams and sands -----	{ Plainfield-Sparta-Nekoosa Coloma-Wyocena Hixton-Gale-Arland Vesper-Hixton-Peat }	17
5. Gray loams -----	{ Kennan-Elderon Iron River-Elderon Wakefield-Gogebic Milaca-Cloquet-Peat Antigo-Onamia }	18, 19, 20
6. Grayish-yellow silt loams -----	Almena-Freer-----	21
7. Grayish-brown rolling silt loams --	{ Blount-Elliott-Ashkum Dodge-McHenry-Elba Fox-Rodman Parr-Corwin-Warsaw }	22, 23, 24, 25
8. Grayish-brown hilly silt loams ---	{ Fayette-Dubuque Tama-Dodgeville }	26, 27

A ninth general soil grouping is organic soils, called peats and mucks (Carlisle-Greenwood-Spalding) which occur in bodies scattered throughout the state.

LIST OF COUNTIES AND PAGE NUMBERS FOR RELEVANT SOIL KEYS

	Page		Page
Adams -----	17	Columbia -----	17, 23, 25
Ashland -----	13, 18	Crawford -----	26, 27
Barron -----	16, 17, 21	Dane -----	23, 25, 26, 27
Bayfield -----	13, 16, 19, 20	Dodge -----	17, 23, 25
Brown -----	14, 15	Door -----	14, 15
Buffalo -----	17, 26	Douglas -----	13, 16, 19, 20
Burnett -----	16, 19, 20	Dunn -----	16, 17
Calumet -----	14, 23	Eau Claire -----	16, 17, 26
Chippewa -----	16, 17, 18, 19, 20	Florence -----	15, 18
Clark -----	17, 21	Fond du Lac -----	14, 23, 24, 25



THE SOIL SURVEY DIVISION, WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

	Page		Page
Forest	18	Pierce	26, 27
Grant	26, 27	Polk	16, 19, 20, 21
Green	26, 27	Portage	17, 20, 21
Green Lake	14, 17, 23, 25	Price	18, 19, 20, 21
Iowa	26, 27	Racine	22, 23, 24
Iron	13, 18	Richland	26, 27
Jackson	17, 26	Rock	23, 25, 26
Jefferson	23, 24	Rusk	19, 20, 21
Juneau	14, 17, 26	St. Croix	19, 20, 21, 26, 27
Kenosha	22, 23, 24	Sauk	17, 23, 26
Kewaunee	14, 15	Sawyer	16, 19, 20, 21
La Crosse	26	Shawano	14, 15, 16, 20
Lafayette	26, 27	Sheboygan	14, 22, 23, 24
Langlade	16, 20, 21	Taylor	18, 19, 21
Lincoln	16, 21	Trempealeau	17, 26
Manitowoc	14, 15, 23, 24	Vernon	26, 27
Marathon	20, 21	Vilas	16, 18
Marinette	15, 16, 18	Walworth	23, 24, 25
Marquette	17	Washburn	16, 19, 20
Milwaukee	14, 22	Washington	22, 23, 24
Monroe	14, 17, 26	Waukesha	22, 23, 24
Oconto	14, 15, 16, 18, 20	Waupaca	14, 17, 20
Oneida	16	Waushara	14, 17
Outagamie	14, 15	Winnebago	14, 23, 25
Ozaukee	14, 22	Wood	21
Pepin	16, 26		

APPENDIX

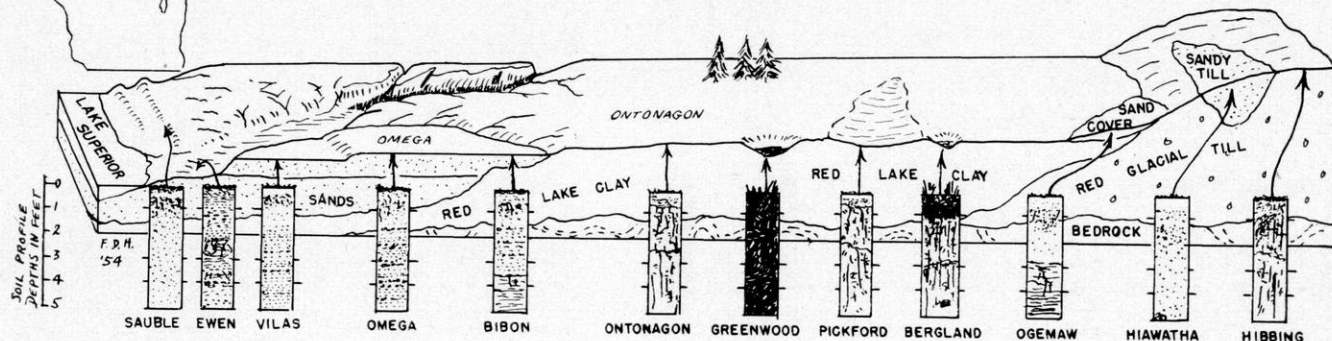
A. LIST OF SOME COMMON SOIL SERIES IN WISCONSIN

Soil Series Name	Page in this Bulletin	General Characterization
Abington	24	Very poorly drained silt loams underlain at 4 to 5' feet by dolomitic gravel and sand. A ₀ -A ₁ -G-D. Humic-Gley. Fox associated.
Adolph	19, 20, 21	Very poorly drained silt loams and loams. A ₀ -A ₁ -G-C. A ₁ is 8 to 12 inches thick. Humic-Gley.
Ahmeek	18	Moderately well drained silt loams, loams, and sandy loams, shallow over dark crystalline rocks. A ₀ -A ₁ -B-C. Acid Brown Forest.
Almena	21	Imperfectly drained silt loams underlain at 30-42" by reddish brown sandy clay loam glacial till. A ₀ -A ₁ -A ₂ -B-C-D, mottled below A ₁ . Planosolic, weak Podzol.
Alpena	15	Excessively drained old beach gravels and gravelly loams. A ₀ -A ₁ -D. Regosol.
Alvin	26	Well drained, light colored loams and sandy loams 2 or 3 feet deep over sandy outwash. A ₀ -A ₁ -A ₂ -B-C. Gray-Brown Podzolic.

GENERALIZED SOIL KEY FOR USE IN THE FIELD IN THE RED CLAY SOIL REGION (ONTONAGON-BERGLAND SOIL ASSOCIATION) OF NORTHERN 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.)

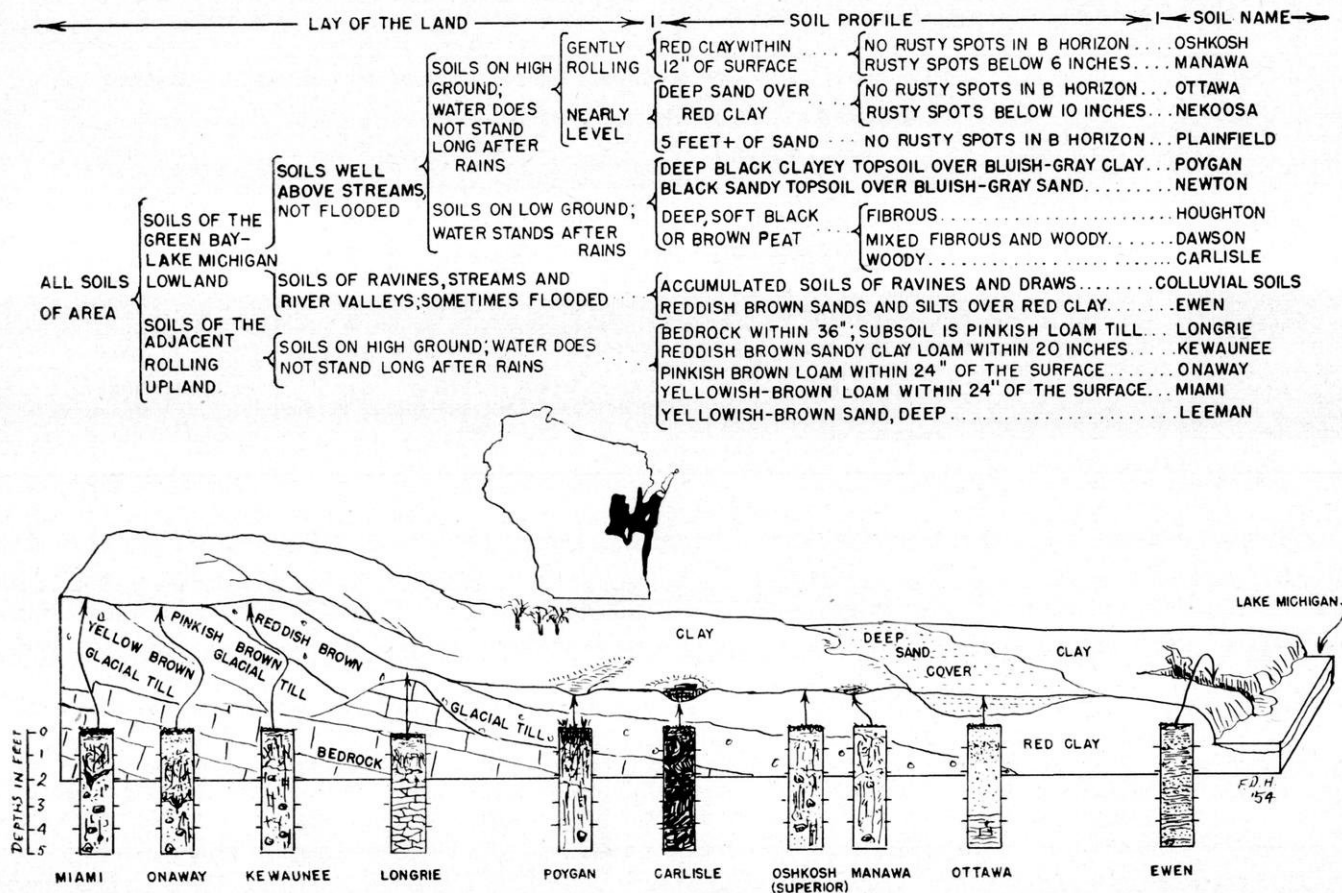
LAY OF THE LAND		SOIL PROFILE		SOIL NAME
ALL SOILS OF AREA	SOILS OF LAKE SUPER- IOR LOWLAND	SOILS WELL ABOVE STREAMS NOT FLOODED	DUNES. ASHY GRAY A ₂ HORIZON OVER COFFEE-BROWN B; SAND.	SAUBLE
			GENTLY ROLLING. RED CLAY MAY	ONTONAGON
			HAVE SILT CAP	PICKFORD
			DEEP SAND OVER	OGEMAW
			RED CLAY	BIBON
	SOILS ON LOW GROUND; WATER STANDS AFTER RAINS	NEARLY LEVEL	SAND 1 TO 3 FEET THICK	OMEGA
			SAND 3 TO 5 FEET THICK	VILAS
			LITTLE OR NO ASHY-GRAY A ₂ ; YELLOW-BROWN B. THICK, PALE A ₂ ; B IS CEMENTED LOOSELY.	AU TRAIN
			DARK BROWN B IS CEMENTED HARD.	BERGLAND
			DEEP BLACK TOPSOIL OVER BLUISH-GRAY CLAY OVER RED CLAY.	GREENWOOD
SOILS OF RAVINES, STREAM AND RIVER VALLEYS; SOMETIMES FLOODED	SOILS ON HIGH GROUND; WATER DOES NOT STAND LONG AFTER RAINS	DEEP, SOFT BLACK OR BROWN PEAT	SPALDING	
		FIBROUS	RIFLE	
		MIXED FIBROUS AND WOODY.	COLLUVIAL SOILS	
		WOODY.	EWEN	
		ACCUMULATED SOILS OF RAVINES AND DRAWS; VARIABLE	HIBBING	
SOILS OF ADJACENT ROLLING UPLAND	SOILS ON HIGH GROUND; WATER DOES NOT STAND LONG AFTER RAINS	REDDISH BROWN SANDS AND SILTS OVER RED CLAY.	HIAWATHA	
		REDDISH BROWN SANDY CLAY LOAM WITHIN 20 INCHES OF SURFACE. DEEP REDDISH BROWN SAND; ASHY-GRAY A ₂ IS THICK.		

[13]

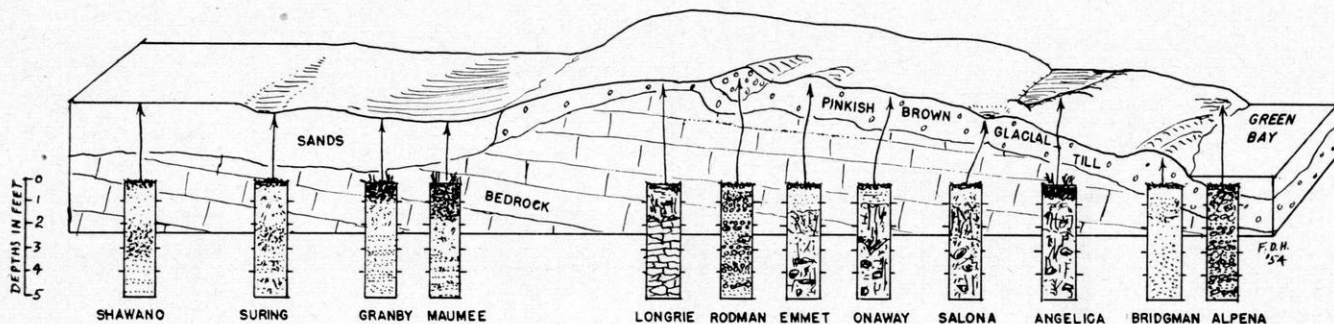
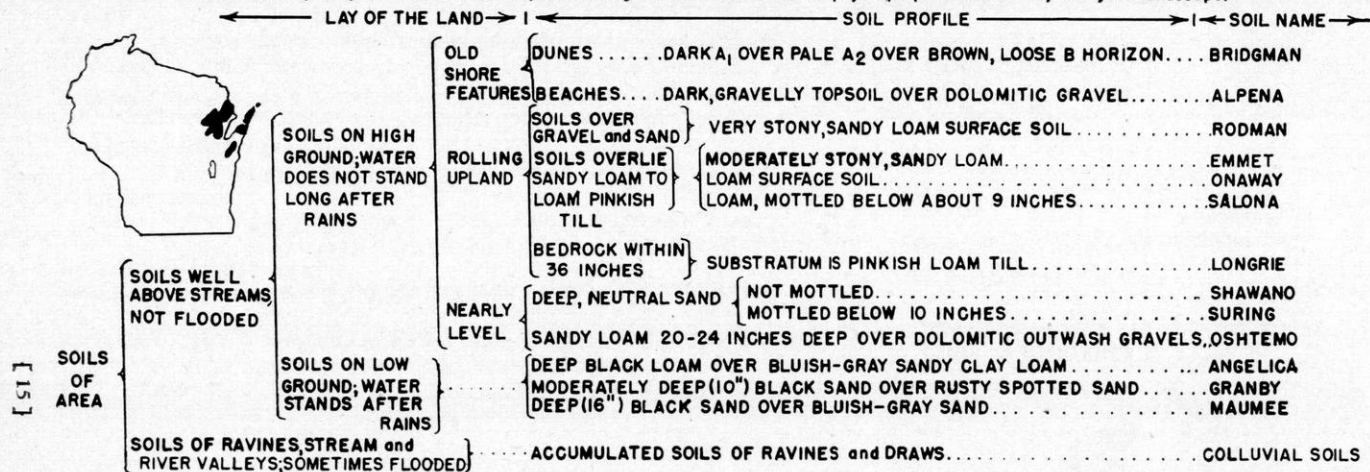


GENERALIZED SOIL KEY FOR USE IN THE FIELD IN THE RED CLAY REGION (OSHKOSH-POYGAN; KEWAUNEE-POYGAN SOIL ASSOCIATIONS) OF E. WISC.

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



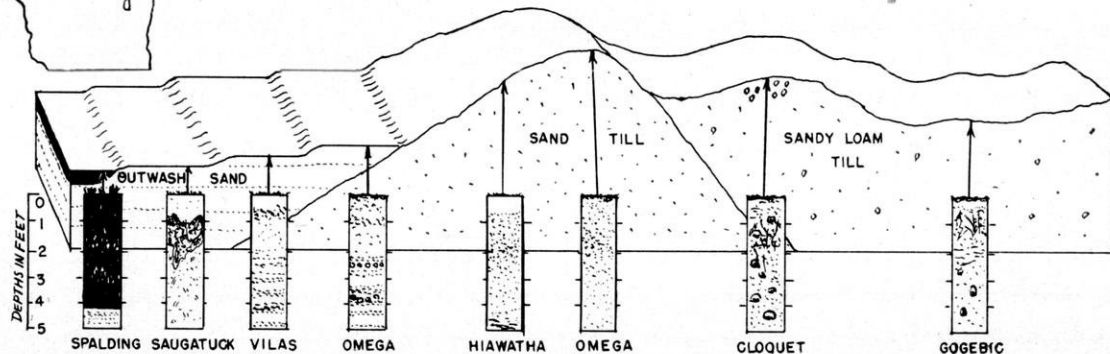
GENERALIZED SOIL KEY FOR USE IN THE FIELD IN THE PINK LOAM REGION (ONAWAY-EMMET SOIL ASSOCIATION), EASTERN WISCONSIN
 (Note: A soil key for your farm will be simpler. Your agricultural leader can help you prepare a small key for your landscape)



GENERALIZED SOIL KEY FOR USE IN THE FIELD IN THE SANDS (OMEGA-HIAWATHA SOIL ASSOCIATION), NORTHERN WISCONSIN

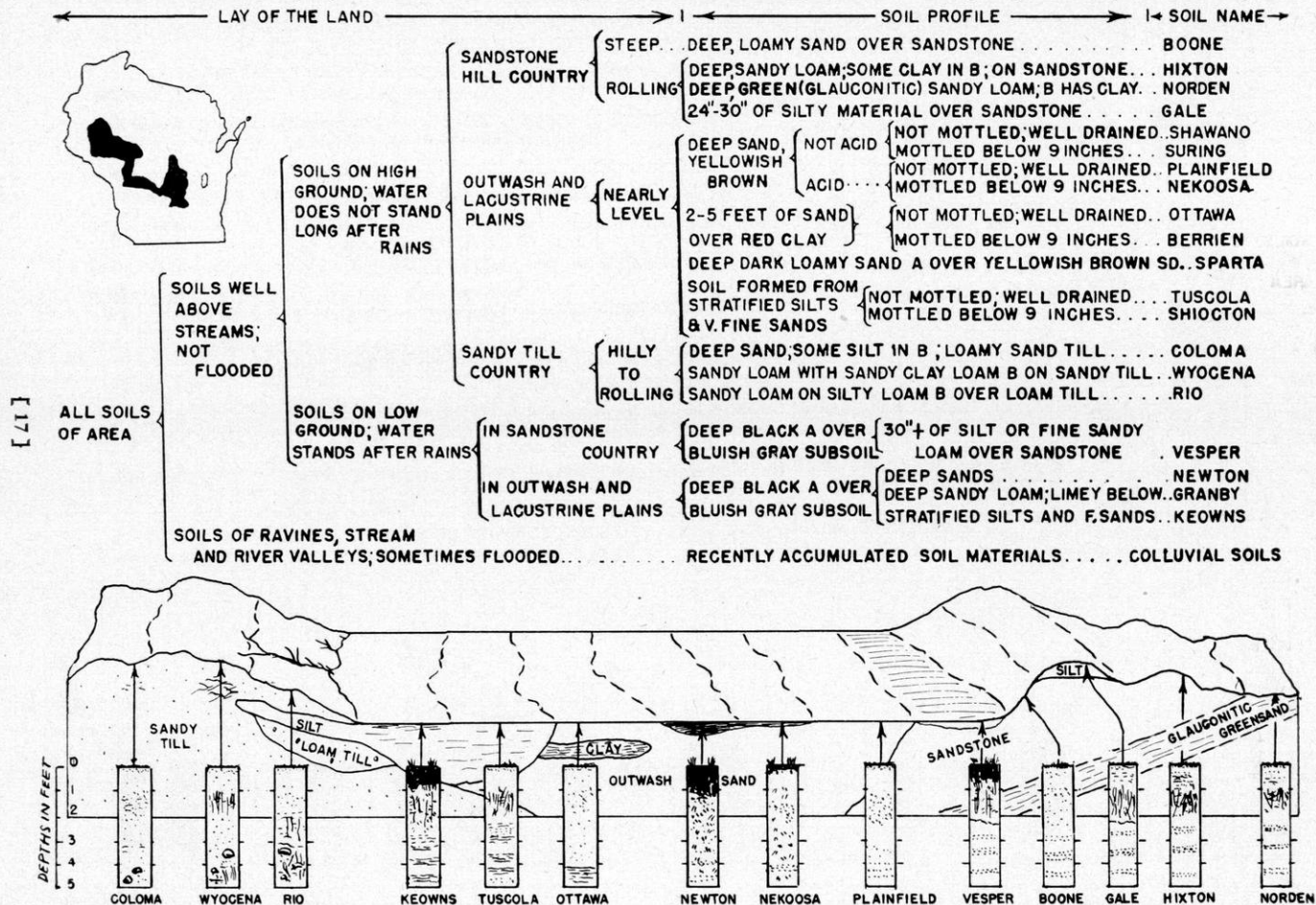
(Note; A soil key for your farm will be simpler. Your agricultural leader can help you prepare a small key for your place)

LAY OF THE LAND		SOIL PROFILE	SOIL NAME
ALL SOILS OF AREA	SOILS ON HIGH GROUND; WATER DOES NOT STAND LONG AFTER RAINS	STEEP	SANDY LOAM, STONY, SHALLOW OVER STONY, LOOSE TILL CLOQUET
		ROLLING	SAND; THIN (1/4") ASHY-GRAY A ₂ OVER YELLOWISH BROWN B OVER SAND OMEGA
			SAND; THICK (2"+) ASHY-GRAY A ₂ ; PINKISH BROWN B OVER SAND . . HIAWATHA
			FINE SANDY LOAM; THICK ASHY-GRAY A ₂ OVER PINKISH BROWN B OVER SANDY LOAM . . GOGEBIC
SOILS WELL ABOVE STREAMS; NOT FLOODED		NEARLY LEVEL	SAND; LITTLE OR NO ASHY-GRAY A ₂ ; YELLOWISH BROWN B OVER SAND . . OMEGA
			SAND; THICK, PALE A ₂ ON LOOSELY CEMENTED B OVER SAND . . VILAS
SOILS ON LOW GROUND; WATER STANDS			THICK ORGANIC MAT OVER THICK A ₂ OVER CEMENTED BROWN B OVER SAND . . SAUGATUCK
			DEEP SOFT BLACK OR BROWN PEAT; MIXED FIBROUS-WOODY . . SPALDING
SOILS OF RAVINES, STREAM AND RIVER VALLEYS; SOMETIMES FLOODED		RECENTLY ACCUMULATED SOIL MATERIAL (OVERWASH). COLLUVIAL SOILS	



GENERALIZED SOIL KEY FOR USE IN THE FIELD IN THE CENTRAL REGION OF SANDY LOAMS AND SANDS (COLOMA-WYOCENA; PLAINFIELD-SPARTA-NEKOOSA; HIXTON-GALE; VESPER-HIXTON SOIL ASSOCIATIONS), WISCONSIN

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



GENERALIZED SOIL KEY FOR USE IN THE FIELD IN THE GRAY LOAMS REGION (WAKEFIELD-GOGEBIC; KENNAN-ELDERON; IRON RIVER-ELDERON SOIL ASSOCIATIONS) OF NORTHERN WISCONSIN

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

← LAY OF THE LAND → | ← SOIL PROFILE → | ← SOIL NAME →



SOILS ON HIGH
GROUND; WATER DOES
NOT STAND LONG
AFTER RAINS

STEEP

ROLLING

SHALLOW STONY SANDY LOAM; SOME DOLOMITE IN TILL . . . ELDERON
NO DOLOMITE { THICK (2") ASHY-GRAY A OVER BROWN B . . . CLOQUET
IN TILL { THIN (1/2") ASHY-GRAY A OVER YELL.-BR. B . . . SCANDIA
SAND; THICK ASHY-GRAY A OVER PINKISH-BROWN B . . . HIAWATHA
SAND; THIN ASHY-GRAY A OVER YELLOWISH-BROWN B . . . OMEGA
FINE SANDY LOAM; } { OVER LOAMY SAND TILL . . . MARENISCO
THICK ASHY-GRAY A } { OVER SANDY LOAM TILL . . . GOGEBIC
OVER PINKISH-BR. B } { OVER LOAM TILL . . . WAKEFIELD
0-36" OF SILTY SOIL { OVER PINK.-BR. SDY. LOAM TILL . . . IRON RIVER
{ OVER YELL.-BR. SDY. L. TILL. THIN A₂ . . . KENNAN
0-36" OF LOAM OVER TILL HIGH IN CONTENT OF DARK IGNEOUS
ROCKS OF WHICH ACTUAL OUTCROPS ARE COMMON.
DEEP DARK A₁; NO A₂ . . . AHMEEK
THIN PEAT OVER BLACK A { A₁ IS 8-12" THICK . . . ADOLPH
OVER BLUISH-GRAY LOAM { A₁ IS 3-6" THICK . . . CABLE
ORGANIC SOILS; BROWN FIBROUS AND WOODY PEAT . . . SPALDING

ALL
SOILS
OF
AREA

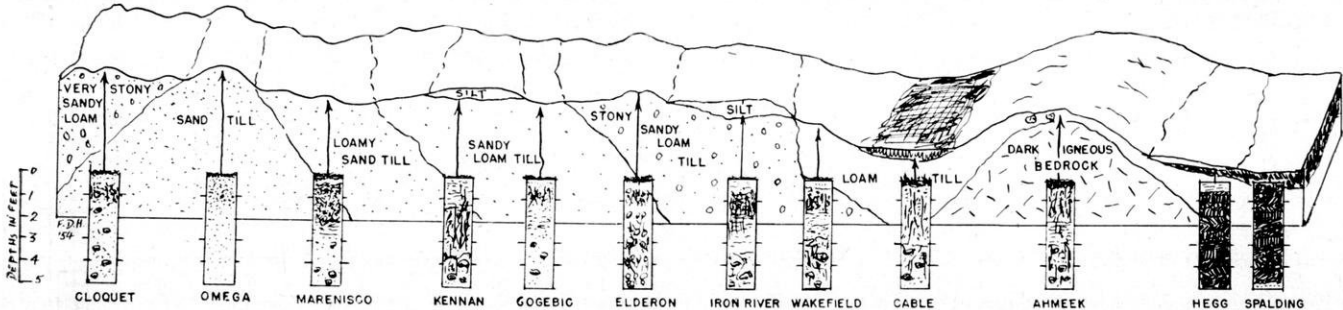
SOILS WELL ABOVE
STREAMS; NOT
FLOODED

SOILS ON LOW GROUND; WATER
STANDS AFTER RAINS

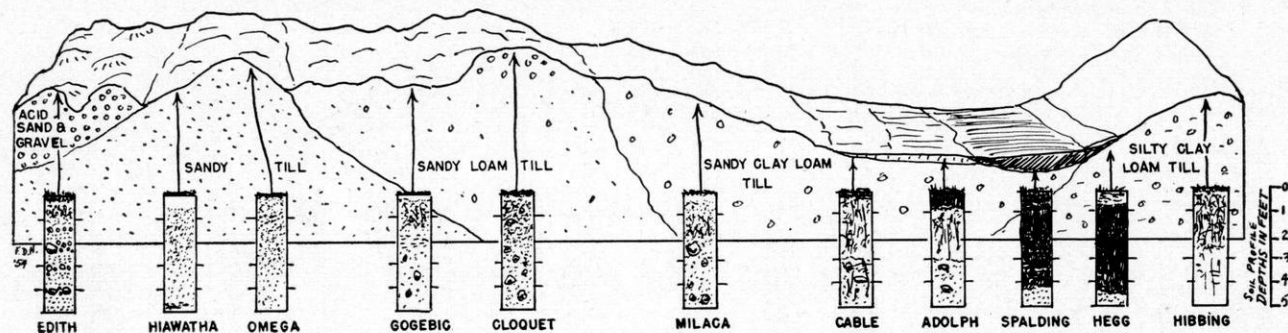
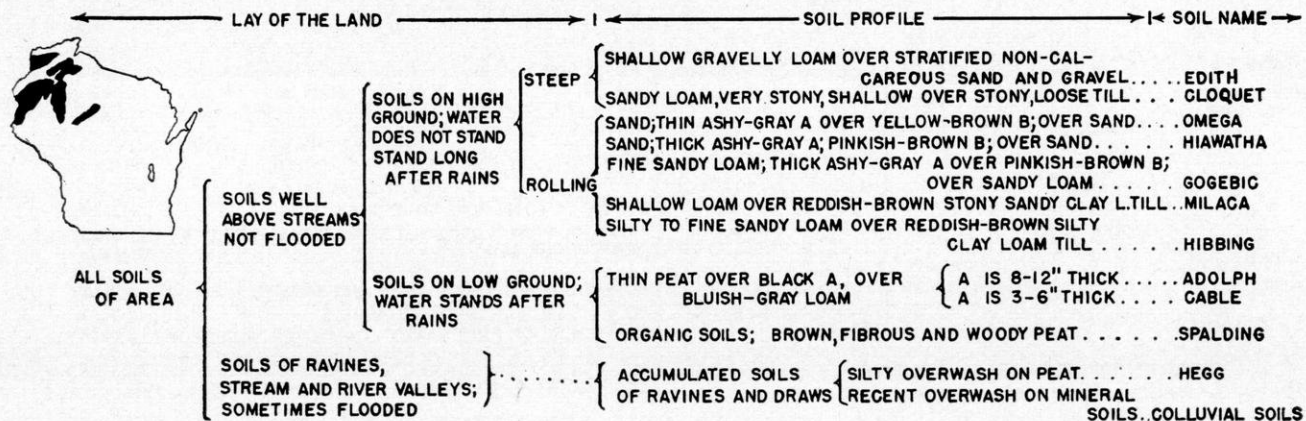
SOILS OF RAVINES,
STREAM AND RIVER VALLEYS;
SOMETIMES FLOODED

{ RECENTLY ACCUMULATED SOILS
OF RAVINES AND DRAWS

{ SILTY OVERWASH ON PEAT . . . HEGG
{ DEEP OVERWASH DEPOSITS . . . COLLUVIAL SOILS



GENERALIZED SOIL KEY FOR USE IN THE FIELD IN THE GRAY LOAMS REGION (MILACA-CLOQUET SOIL ASSOCIATION), NORTHERN WISCONSIN
(Note: A soil key for your farm will be simpler. Your agricultural leader can help you prepare a soil key for your landscape.)



GENERALIZED SOIL KEY FOR USE IN THE GRAYISH YELLOW SILT LOAM REGION (ALMENA-FREER SOIL ASSOCIATION) OF NORTHERN WISCONSIN
(Note; A soil key for your farm will be simpler. Your agricultural leader can help you prepare a small soil key for your particular landscape.)

← LAY OF THE LAND → | ← SOIL PROFILE → | ← SOIL NAME →

[21]

ALL SOILS
OF AREA



SOILS ON HIGH
GROUND; WATER
DOES NOT
STAND LONG
AFTER RAINS

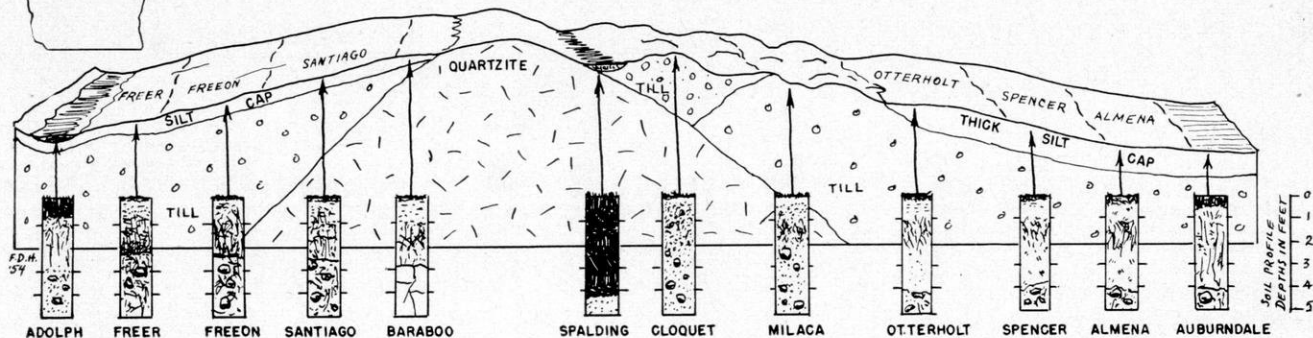
SOILS WELL
ABOVE STREAMS;
NOT FLOODED

SOILS ON LOW
GROUND; WATER STANDS
AFTER RAINS

SOILS OF RAVINES,
STREAM AND RIVER VALLEYS;
SOMETIMES FLOODED

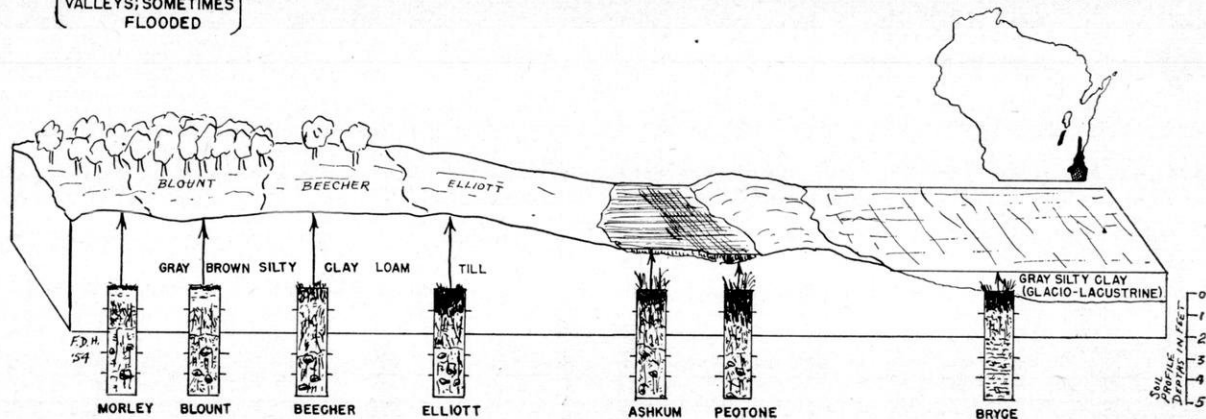
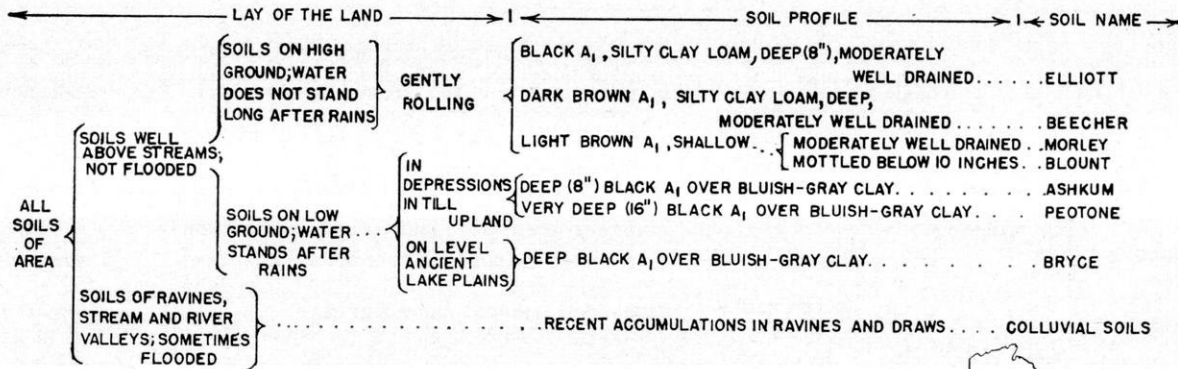
STEEP
ROLLING
TO
GENTLY
ROLLING

SANDY LOAM, VERY STONY, SHALLOW OVER STONY LOOSE TILL... CLOQUET
0-12" OF SILTY SOIL OVER REDDISH BROWN SANDY CLAY LO. . . MILAGA
12-36" OF SILTY SOIL OVER QUARTZITE BEDROCK... BARABOO
12-24" OF SILTY SOIL OVER REDDISH BROWN SANDY CLAY LOAM { NO MOTTLING... SANTIAGO
MOTTLED BELOW 18 INCHES... FREEON
MOTTLED BELOW 9 INCHES... FREER
24-42" OF SILTY SOIL OVER REDDISH BROWN SANDY CLAY LOAM { NO MOTTLING... OTTERHOLT
MOTTLING BELOW 18 INCHES... SPENCER
MOTTLED BELOW 9 INCHES... ALMENA
BLACK LOAM OVER RUSTY SPOTTED BLUISH-GRAY LOAM. AUBURNDALE
SHALLOW(6") PEAT OVER BLACK LOAM OVER BLUE-GRAY LO. . . ADOLPH
ORGANIC SOIL; FIBROUS AND WOODY PEAT SPALDING
BLACK SILT LOAM 12-36" DEEP OVER PEAT. HEGG
RECENTLY ACCUMULATED DEPOSITS OF SOIL MATERIAL... COLLUVIAL SOILS



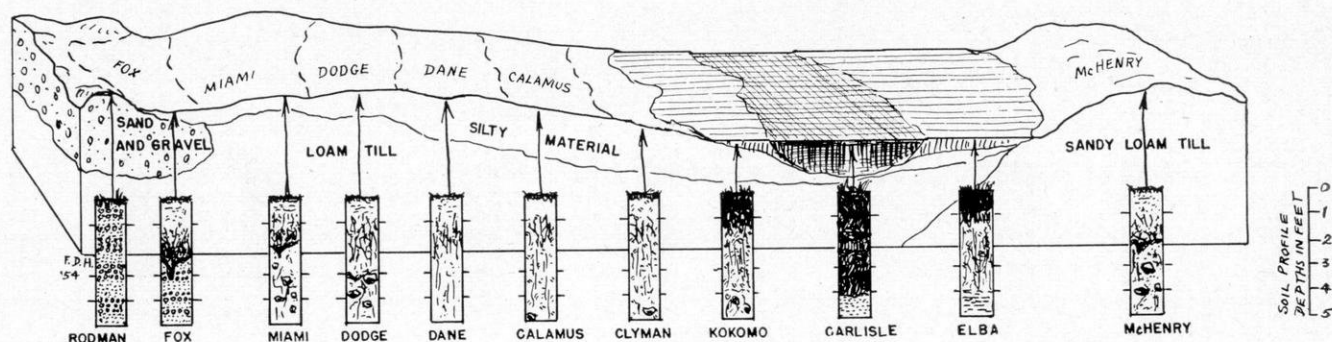
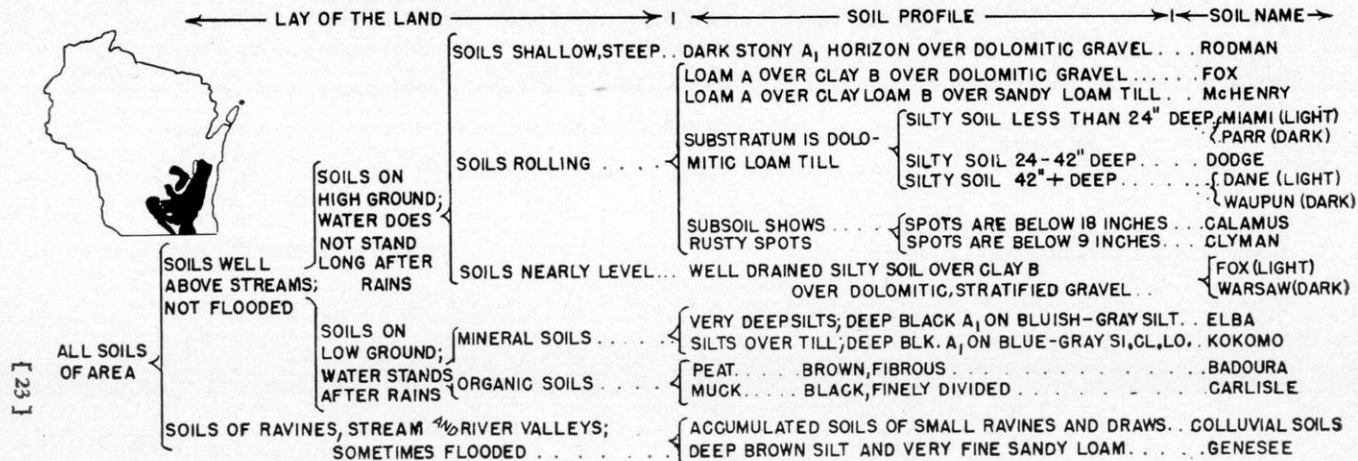
GENERALIZED SOIL KEY FOR USE IN THE CLAY PRAIRIE OF THE GRAYISH BROWN ROLLING SILT LOAMS REGION (BLOUNT-ELLIOTT-ASHKUM SOIL ASSOCIATION), SOUTHEASTERN WISCONSIN

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



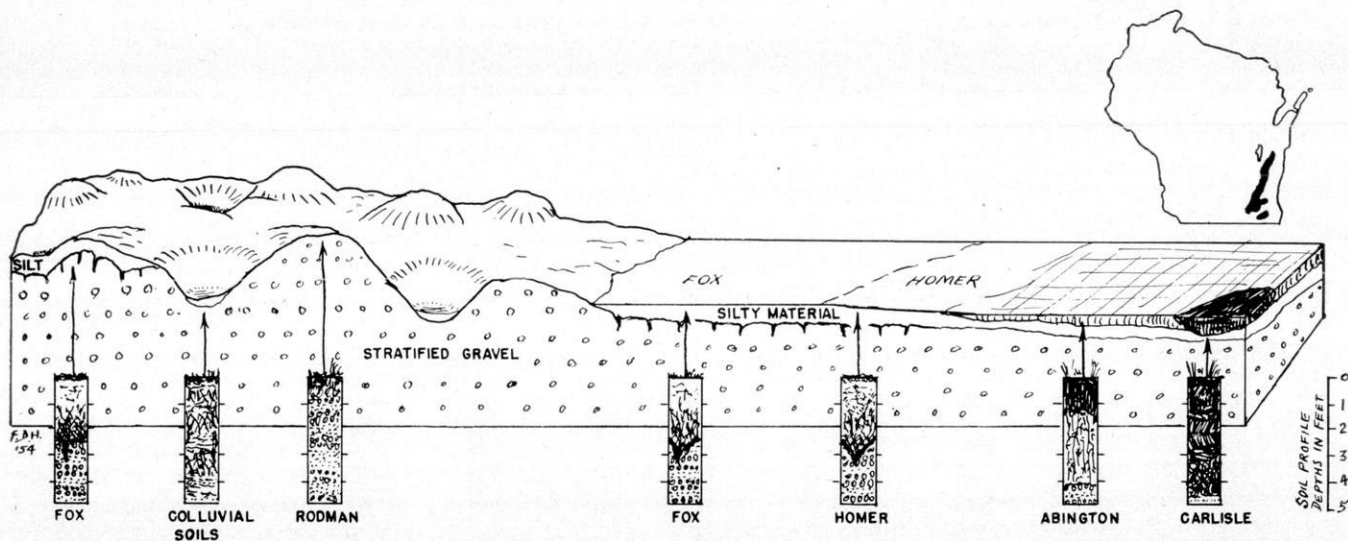
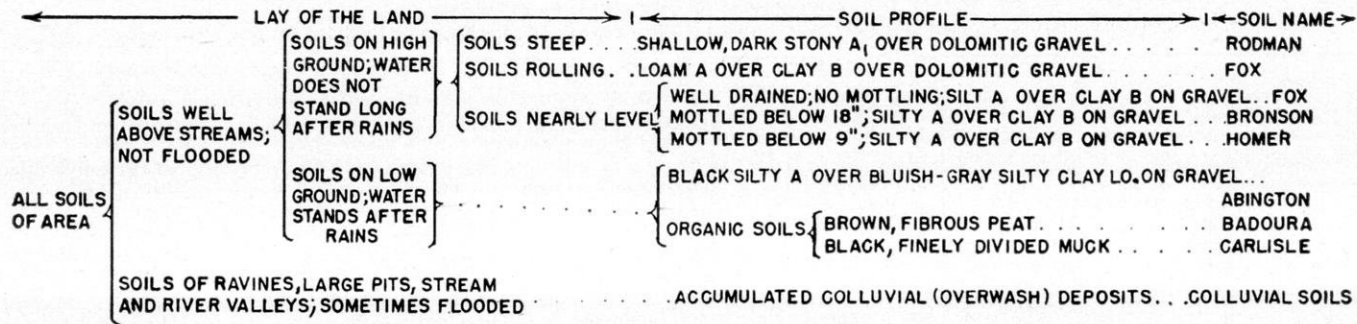
GENERALIZED SOIL KEY FOR USE IN THE GRAYISH-BROWN ROLLING SILT LOAMS REGION (DODGE-McHENRY-ELBA; FOX-RODMAN SOIL ASSOCIATIONS) OF SOUTHEASTERN WISCONSIN

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



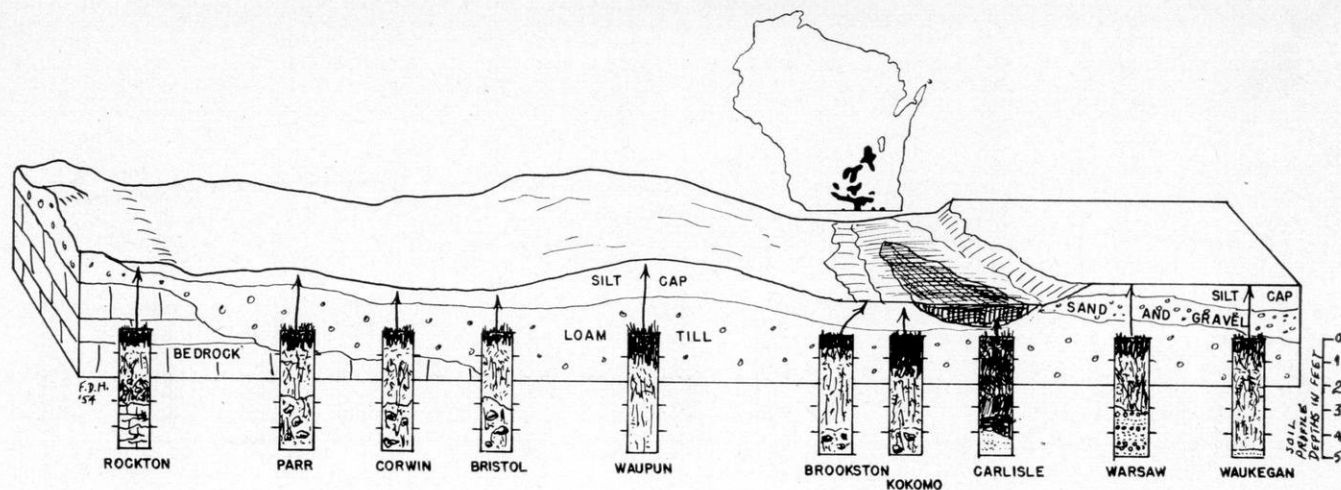
GENERALIZED SOIL KEY FOR USE ON THE GRAYISH BROWN SOILS OF THE KETTLE MORaine (FOX-RODMAN SOIL ASSOCIATION), WISCONSIN

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



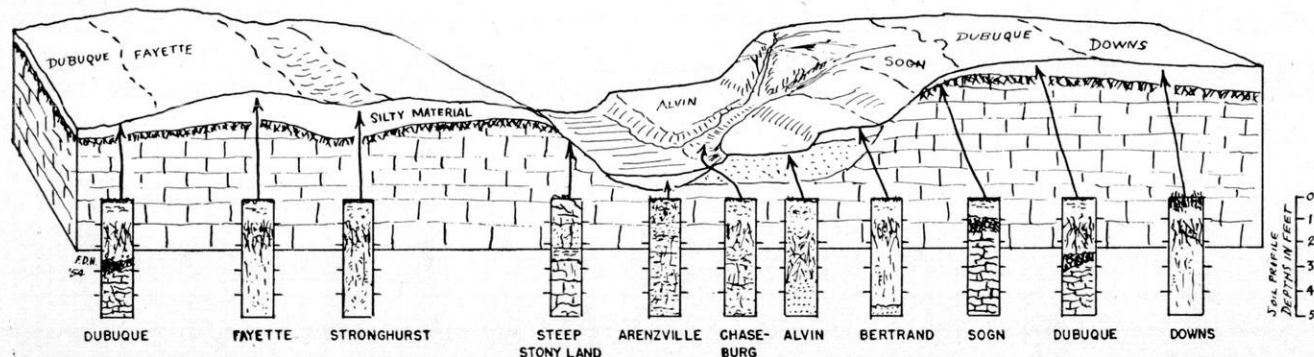
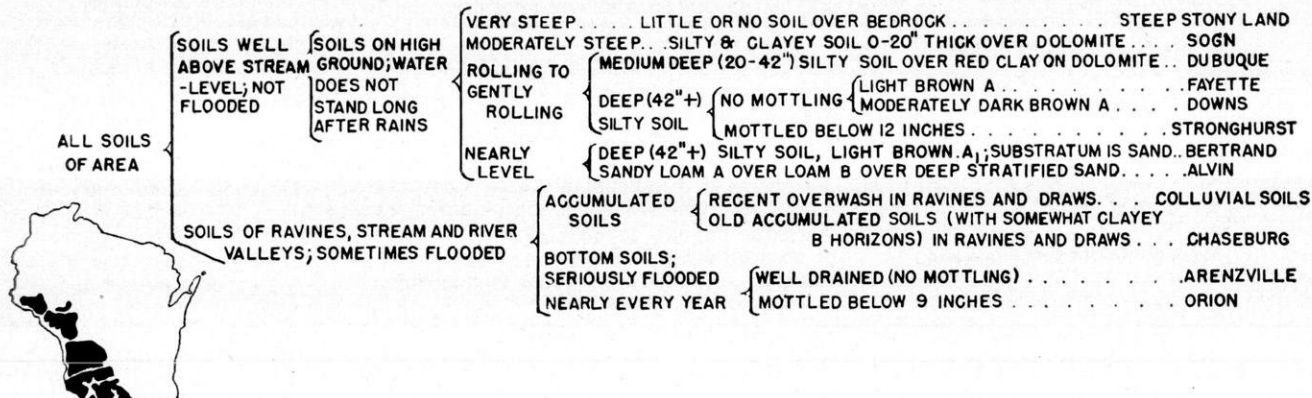
GENERALIZED SOIL KEY FOR USE IN THE SILTY PRAIRIES (PARR-CORWIN-WARSAW SOIL ASSOCIATION), IN SOUTHEASTERN WISCONSIN
(Note: A soil key for your farm will be simpler. Your agricultural leader can help you prepare a soil key for your landscape.)

LAY OF THE LAND		SOIL PROFILE		SOIL NAME
ALL SOILS OF AREA	SOILS WELL ABOVE STREAMS; DOES NOT STAND LONG AFTER RAINS	STEEP	SHALLOW SOILS; DARK STONY A ₁ OVER DOLOMITIC GRAVEL	RODMAN
			DEEP (42") SILTY SOIL OVER DOLOMITIC LOAM TILL	WAUPUN
		GENTLY ROLLING	Moderately Deep (20-42") Silty Soil over Dolomitic Loam Till	MOTTLED BELOW 18" CORWIN MOTTLED BELOW 9" BRISTOL NOT MOTTLED PARR
			Moderately Deep (18-36") Loam Soil over Dolomitic Bedrock	ROCKTON
	SOILS ON LOW GROUND; WATER STANDS AFTER RAINS	NEARLY LEVEL	DARK A ₁ OVER DEEP (42"+) SILTY SOIL OVER DOLOMITIC BEDROCK	ROCKTON
			DARK A ₁ OVER 12-36" OF LOAM SOIL OVER SAND & DOL. GRAVEL	WAUKEGAN
	SOILS OF RAVINES, STREAM AND RIVER VALLEYS; SOMETIMES FLOODED		SILTY SOILS	DEEP A (8"), BLACK, OVER BLUE-GRAY SILTY CLAY LOAM... BROOKSTON VERY DEEP (14") BLK. A ON BLUE-GRAY SILTY CLAY LOAM... KOKOMO VERY DEEP (14") BLK. A ON BLuish-GRAY SILTS... ELBA
			ORGANIC SOILS	BROWN, FIBROUS PEAT... BADOURA BLACK, FINELY DIVIDED MUCK... CARLISLE
			RECENT ACCUMULATIONS (OVERWASH DEPOSITS)	COLLUVIAL SOILS



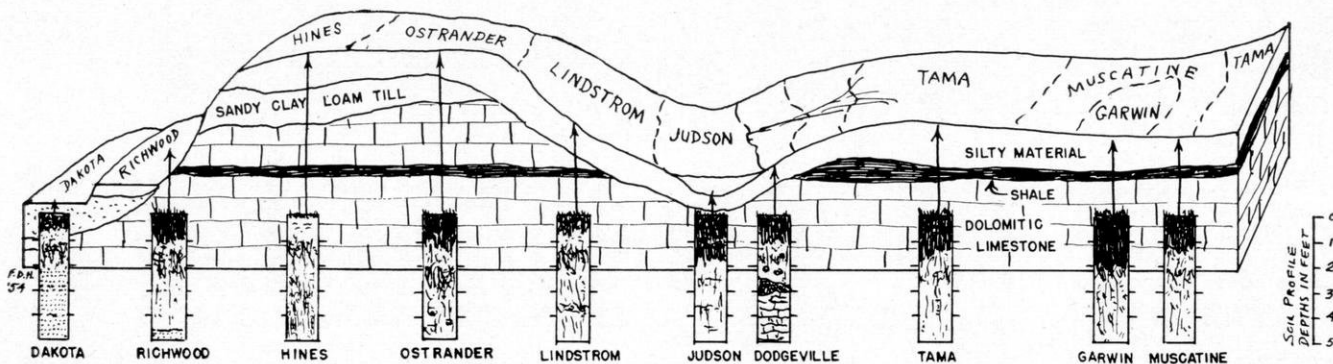
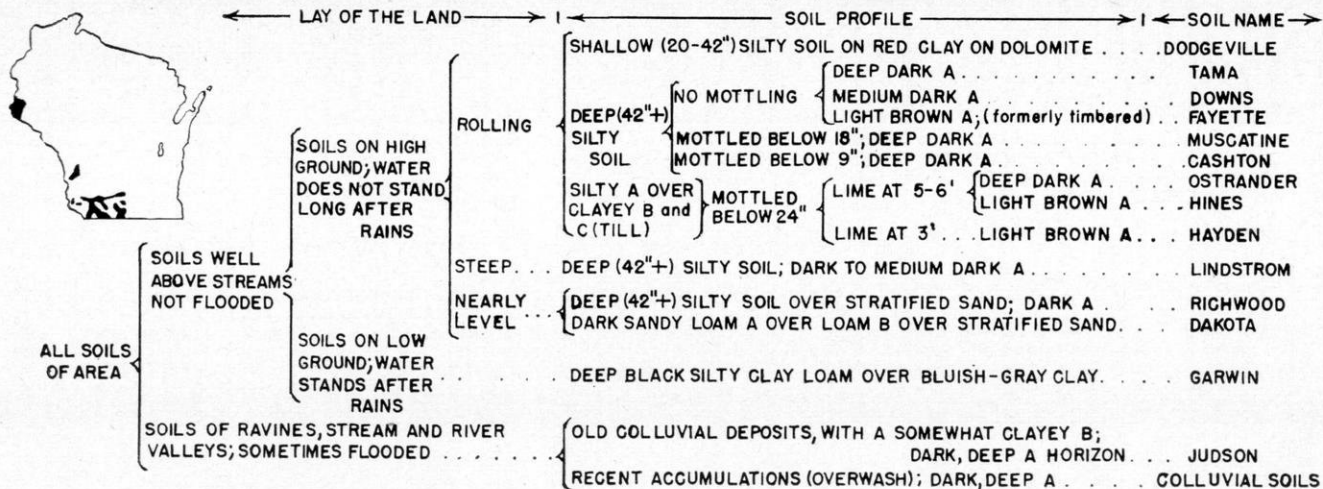
GENERALIZED SOIL KEY FOR USE IN THE GRAYISH BROWN HILLY SILT LOAMS REGION (FAYETTE-DUBUQUE SOIL ASSOCIATION), S.W. WISCONSIN
(Note: A soil key for your farm will be simpler. Your agricultural leader can help you prepare a small soil key for your landscape.)

← LAY OF THE LAND → | ← SOIL PROFILE → | ← SOIL NAME →



GENERALIZED SOIL KEY FOR USE IN THE FIELD IN THE PRAIRIE AREAS (TAMA-DODGEVILLE SOIL ASSOCIATION) OF WESTERN WISCONSIN.

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



Soil Series Name	Page in this Bulletin	General Characterization
Angelica -----	15 -----	Very poorly drained silt loams underlain at 3 to 5 feet by sandy loam to sandy clay loam glacial till. A ₀ -A ₁ -G-D. Humic-Gley. Associated with Onaway.
Antigo -----	20 -----	Well drained silt loams underlain at 2 to 4 feet by coarse sand and gravel outwash containing little or no carbonates. A ₀ -A ₁ -A ₂ -B-(C)-D. Gray-Brown Podzolic to weak Podzol.
Arenzville -----	26 -----	Well drained, deep, light colored silt loam alluvium, recent. A ₁₁ -A _{12b} -A _{13b} ---. Alluvial.
Arland -----	20 -----	Well drained silt loams and loams underlain at 2 to 3 feet by Cambrian sandstone. Formed from both loess and till. A ₀ -A ₁ -A ₂ -BD ₁ -BD ₂ -D ₃ . Gray-Brown Podzolic.
Ashkum -----	22 -----	Poorly drained clayey soil underlain at 2 to 4 feet by dolomitic silty clay loam glacial till. A ₀ -A ₁ -G-C. Humic-Gley. Associated with Elliott and Morley.
(Auburn) -----	-----	Now called Boone.
Auburndale -----	21 -----	Poorly drained silt loams, wetter than Almena and better drained than Adolph. A ₀ -A ₁ -A ₂ -G-C-D. A ₂ is mottled. Planosolic Humic-Gley.
Au Train -----	4 -----	Well drained sands on level outwash plains. A ₀ -A ₂ -B ₂ -C. The A ₂ is about 1 foot thick and the B ₂ is 1 to 2 feet thick and is cemented. Podzol.
Badoura -----	25 -----	Fibrous mucky peat. 1-2-3-4. Bog.
(Baldwin) -----	-----	Now called Hines.
Baraboo -----	21 -----	Well drained silt loams underlain at 2 to 4 feet by quartzite bedrock. A ₀ -A ₁ -A ₂ -B-(C)-D. Gray-Brown Podzolic.
(Baxter) -----	-----	Now called Dubuque.
Beecher -----	22 -----	Imperfectly drained silty clay loam over dolomitic silty clay till. A ₀ -A ₁ (deep)-A ₂ -B-C. Mottled below A ₂ . Gray-Brown Podzolic-Prairie (Brunizem). Associated with Morley and Elliott.
(Bellefontaine) -----	-----	Now called Casco and Fox.
Bergland -----	13 -----	Very poorly drained black clay underlain at about 2 feet by pink clay. A ₀ -A ₁ -G-C. Humic-Gley. Associated with Ontonagon.
Berrien -----	-----	Moderately well drained loamy sands and sandy loams 3 to 5 feet deep over lacustrine clays. A ₀ -A ₁ -A ₂ -B-(C)-D. Mottled in B. Gray-Brown Podzolic.
Bertrand -----	26 -----	Well drained silt loams underlain at 5 feet or so by outwash sand. A ₀ -A ₁ -A ₂ -B-C-D. Gray-Brown Podzolic.

Soil Series Name	Page in this Bulletin	General Characterization
Bibon -----	13 -----	Well drained sands 3 to 5 feet deep over lacustrine red clay. Northern Wisconsin. $A_0-A_2-B-(C)-D$. Podzol.
Blount -----	22 -----	Imperfectly drained silty clay loams on dolomitic clayey till. $A_0-A_1-A_2-B-C$. Planosolic-Gray-Brown Podzolic. Mottled below A_1 . Associated with Morley.
Boone -----	17, 20 -----	Excessively drained sands to loamy sands without textural profile, developed from sandstone. $A_0-A_1-A_2-B-C$. Weak Gray-Brown Podzolic.
Bridgman -----	15 -----	Excessively drained dune sand, acid. A_0-A_2-B-C . Weak Podzol.
Brill -----	20 -----	Moderately well drained silt loams 2 to 5 feet deep over outwash gravel and sand. $A_0-A_1-A_2-B-(C)-D$. Mottled in B. Gray-Brown Podzolic-weak Podzol. Associated with Antigo.
Bristol -----	25 -----	Imperfectly drained silt loams 3 to 5 feet deep over dolomitic loam till. $A_0-A_1-B-C-D$. Prairie (Brunizem). Mottled below A_1 . Associated with Waupun and Parr.
Bronson -----	-----	Moderately well drained silt loams about 3 feet deep over limestone gravel (outwash). $A_0-A_1-A_2-B-D$. Mottled in B. Gray-Brown Podzolic. Associated with Fox.
Brookston -----	25 -----	Very poorly drained silt loams and silty clay loams 2 to 3 feet deep over dolomitic loam till. $A_0-A_1-G-(C)-D$. Humic-Gley. Associated with Miami.
Bryce -----	22 -----	Very poorly drained silt loams to silty clay loams, underlain at about 4 feet by dolomitic silty glacial till. Humic-Gley. Associated with Elliott. Till is more clayey than under Ashkum.
Cable -----	18, 19 -----	Very poorly drained silt loams and loams. A_0-A_1-G-C . 3 to 6-in. A_1 . Humic-Gley.
Calamus -----	23 -----	Moderately well drained silt loams 3 to 5 feet deep over dolomitic loam till. $A_0-A_1-A_2-B-(C)-D$. Mottling in B. Gray-Brown Podzolic. Associated with Dane and Dodge.
Carlisle -----	14, 23, 24, 25 -----	Muck formed from woody and fibrous peat in southeastern Wisconsin. 1-2-3-G. Bog.
(Carrington) -----	-----	Now called Waupun, Elliott and Parr.
Casco -----	-----	Excessively drained silt loams and loams 12 to 18 inches deep over dolomitic gravel and coarse sand. A_0-A_1-B-D . Gray-Brown Podzolic.
Cashton -----	-----	Imperfectly drained silt loam formed on deep silt in a prairie border situation. $A_0-A_1-A_2-B-C$. Prairie-Gray-Brown Podzolic transition. Mottled below A_1 . Associated with Downs.

Soil Series Name	Page in this Bulletin	General Characterization
Chaseburg -----	26 -----	Well drained silt loams in small ravines and valleys. $A_0-A_1-A_2-B-C$. Gray-Brown Podzolic. Fayette-Dubuque landscape.
Chelsea -----	-----	This name was once used for soils on granitic glacial till, later called Kennan soils. Chelsea is now used for soils formed from wind-blown and colluvial sand terraces in Grant and Richland counties. A_0-A_1-C . Regosol.
Chetek -----	20 -----	Well drained sandy loams and loams with loam to sandy clay loam B horizons and underlain at 10 to 15 inches by outwash gravel and sand. $A_0-A_1-A_2-B-C$. Weak Podzol. Associated with Antigo and Onamia.
Cloquet -----	16, 18, 19, 21 -----	Well drained sandy loams and loams in hilly morainic country. Similar to Chetek except for topography. Very stony in places. $A_0-A_1-A_2-B-C$. Weak Podzol. Associated with Milaca.
(Clyde) -----	-----	This soil is now called Kokomo.
Clyman -----	23 -----	Imperfectly drained silt loam 3 to 5 feet deep over dolomitic loam till, associated with Dodge and Dane. $A_0-A_1-A_2-B-C-D$ profile. Planosolic soil, a transition between Gray-Brown Podzolic and Humic-Gley.
(Colby) -----	-----	This soil is now called Spencer (moderately well drained) and Almena (imperfectly drained). The Almena is the more extensive of the two.
Colluvial soils -----	All keys -----	This term includes the many unnamed soils being formed of deposits of materials eroded from hillsides into lowlands between the hills. Chaseburg and Judson are two named colluvial soils of s.w. Wis.
Coloma -----	17 -----	Excessively drained light colored sandy soils with slight textural B horizons. $A_0-A_1-A_2-B-C$. Weak Gray-Brown Podzolic. Associated with Plainfield and Wyocena.
(Cornucopia) -----	-----	This soil is now called Hiawatha.
Corwin -----	25 -----	Moderately well drained dark silt loam 3 to 5 feet deep over dolomitic loam till, associated with Waupun and Parr. $A_0-A_1-B-C-D$. Mottled in B. Prairie (Brunizem).
(Cushing) -----	-----	This soil is now called Hayden.
Dakota -----	27 -----	Well drained sandy loam and loam soils formed over deep outwash sand. A_0-A_1-B-C profile. Prairie analogue of Alvin.
Dane -----	23 -----	Well drained silt loam underlain by dolomitic loam till at 3 to 5 feet. Solum resembles that of Fayette. $A_0-A_1-A_2-B-C-D$. Gray-Brown Podzolic.

Soil Series Name	Page in this Bulletin	General Characterization
Dawson -----	-----	Mixed fibrous and woody peat of Eastern Wisconsin. 1-2-3-4-G. Bog.
Dodge -----	23 -----	Well drained silt loam underlain by dolomitic loam till at 2 to 3 feet. Solum resembles that of Dubuque. A ₀ -A ₁ -A ₂ -B ₂ -D. Gray-Brown Podzolic.
Dodgeville -----	27 -----	Well drained silt loam with dark deep A ₁ , underlain at 2 or 3 feet by cherty red clay over dolomite. A ₀ -A ₁ -B-D ₁ -D ₂ . Prairie (Brunizem) analogue of Dubuque.
Downs -----	26 -----	Well drained silt loam with a moderately dark A ₁ about 7 inches thick underlain by a weak A ₂ . On uplands or terrace benches. A ₀ -A ₁ -A ₂ -B-C-D. Prairie (Brunizem)-Gray-Brown Podzolic transition, between Tama and Fayette.
Dubuque -----	26 -----	Well drained silt loam similar to Dodgeville, except that it has a shallow A ₁ and a well developed A ₂ . A ₀ -A ₁ -A ₂ -B-D ₁ -D ₂ . Gray-Brown Podzolic.
(Dunning) -----	-----	This soil is now called Newton.
Edith -----	19 -----	Excessively drained soil formed from acid gravel and coarse sand on kames and eskers. More acid than Rodman. A-C. Regosol.
Elba -----	23 -----	Very poorly drained black silt loam or silty clay loam on old lake-laid silts, lying between drumlins. A ₀ -A ₁ -G-C. Humic-Gley.
Elderon -----	18 -----	Excessively drained stony sand loam soil over sandy loam glacial till containing some dolomite. A ₀ -A ₁ -A ₂ -B-C. May have a surficial layer of very fine sand or silt. Weak podzol. Till is more acid than below Cloquet.
Elliott -----	22 -----	Moderately well drained black silty clay loams with dolomitic silty clay loam till at 2 feet. A ₀ -A ₁ -B-C. Prairie (Brunizem).
Emmet -----	15 -----	Excessively drained sandy loams over pink sandy loam to loam glacial till. A ₀ -A ₁ -A ₂ -B-C. A weak podzol. Associated with Onaway.
Ewen -----	13, 14 -----	Red alluvial soil, redeposited red clay or till material. A ₁₁ -A _{12b} -A _{13b} . Alluvial. Associated with Ontonagon and Oshkosh (Superior).
Fayette -----	26 -----	Well drained silt loam formed from calcareous loess 4 or more feet deep, overlying bedrock and residuum. A ₀ -A ₁ -A ₂ -B-C. Gray-Brown Podzolic.

Soil Series Name	Page in this Bulletin	General Characterization
Fenwood -----	-----	Well drained silt loam underlain at 1 to 3 feet by fine grained crystalline rock. Marathon County. Associated with Stettin and Rietbrock. $A_0-A_1-A_2-B-(C)-D$. Gray-Brown Podzolic-Podzol transition.
Fox -----	23, 24 -----	Well drained silt loam and loams underlain at 2 to 5 feet by dolomitic gravel and coarse sand. $A_0-A_1-A_2-B-D$. Gray-Brown Podzolic.
Freeon -----	21 -----	Moderately well drained silt loam 1 to 2 feet deep over reddish brown sandy clay loam till. Associated with Santiago and Freer. $A_0-A_1-A_2-B-D$. Mottling in B. Transitional between Gray-Brown Podzolic and Podzol.
Freer -----	21 -----	Imperfectly drained silt loam one to two feet deep over reddish sandy clay loam till. $A_0-A_1-A_2-B-D$. Mottled below A_1 . Planosolic weak Podzol.
Gale -----	17 -----	Well drained silt loam underlain at 2 to 3 feet by sandstone. $A_0-A_1-A_2-B-(C)-D$. Gray-Brown Podzolic.
Garwin -----	27 -----	Very poorly drained silt loams and silty clay loams, associated with Downs, and Tama. A_0-A_1-G-C . Humic-Gley.
Genesee -----	-----	Well drained light colored silt loam bottom soil of southeastern glaciated Wisconsin. $A_{11}-A_{12b}-A_{13b}$ Alluvial.
Gogebic -----	16, 18, 19 -----	Well drained very fine sandy loam soils over sandy loam acid till at 30 inches. Heavier in texture than Hiawatha. A coarse textured associate of Iron River. A_0-A_2-B-C . Podzol.
Granby -----	15 -----	Very poorly drained sand, with pH above 6.0, on old lake plains. Associated with the better drained Shawano and the more poorly drained Maumee. A_0-A_1-G-C . Humic-Gley.
Greenwood -----	13 -----	Acid fibrous peat of northern Wisconsin. 1-2-3-G. Bog.
Hayden -----	-----	Well drained fine sandy loam formed on calcareous loam till of Mankato age, leached about 4 feet. $A_0-A_1-A_2-B-C_1-C_2$. Gray-Brown Podzolic.
Hegg -----	18, 19 -----	Silty overwash, more than one foot deep, on peat. $A_1-1_b-2_b-G$. Colluvial (local Alluvial).
Hiawatha -----	13, 16, 19 -----	Excessively drained sand formed from deep sandy glacial drift, all acid. A_0-A_2-B-C . Podzol (medial).
Hibbing -----	13, 19 -----	Well drained sandy loams developed over reddish brown sandy clay till south of the Lake Superior lowland. Calcareous at 3 to 4 feet. A_0-A_2-B-C . Weak Podzol.

Soil Series Name	Page in this Bulletin	General Characterization
Hines -----	27 -----	Well drained silt loam formed from 1 to 2 feet of loess over clay loam till, calcareous at 6 feet. A ₀ -A ₁ -A ₂ -BD-CD-D. Gray-Brown Podzolic.
Hixton -----	17 -----	Well drained sandy loams formed from Cambrian sandstone, siltstone and shale. A ₀ -A ₁ -A ₂ -B-C. Gray-Brown Podzolic.
Homer -----	24 -----	Imperfectly drained silt loam, underlain at 2 to 5 feet by dolomitic gravel and sand. A ₀ -A ₁ -A ₂ -B-(C)-D. Mottling below A ₁ . Planosolic soil transitional between Gray-Brown Podzolic and Humic-Gley.
Houghton -----	-----	Fibrous peat of eastern Wisconsin. 1-2-3-G. Bog.
Iron River -----	18 -----	Well drained fine sandy loam or silt loam underlain at 30 inches by purplish-reddish brown sandy loam till, acid. A ₀ -A ₂ -B-C-D. Podzol.
Judson -----	27 -----	Well drained, dark colluvial soil of southwestern Wisconsin associated with Tama and Downs. A ₀ -A ₁ -B-C. Prairie (Brunizem).
Kennan -----	18, 20 -----	Well drained fine sandy loam or silt loam underlain at 2 to 3 feet by brown sandy loam till. A ₀ -A ₁ -A ₂ -B-D. Weak Podzol to Gray-Brown Podzolic.
Keown's -----	17 -----	Poorly drained silt loam formed on lake-laid silts and very fine sands, associated with Elba and Shiocton. A ₀ -A ₁ -G-C. Humic-Gley.
Kewaunee -----	14 -----	Moderately well drained silty clay loam developed from dolomitic till of the same texture. Dolomitic at 2 feet. May have a sandy cap, with dolomitic till at 4 feet. A ₀ -A ₁ -A ₂ -B-C. Weak Gray-Brown Podzolic.
Kibbie -----	-----	See Shiocton.
(Knox) -----	-----	This soil is now called Seaton, Fayette, and Dubuque.
Kokomo -----	23, 25 -----	Very poorly drained black silt loam or silty clay loam formed over dolomitic loam till. Associated with Miami, McHenry, and Parr. A ₀ -A ₁ -G-C-D. Humic-Gley.
Lawson -----	-----	Well drained dark deep silt loam, bottom soil, in the unglaciated region. A ₁₁ -A _{12b} -A _{13b} -. Alluvial. Darker than Arenzville.
Leeman -----	-----	Excessively drained sands developed from neutral to dolomitic till and dune sands in northeastern Wisconsin. A ₀ -A ₁ -C or A ₀ -A ₁ -A ₂ -B-C. Regosol or weak Gray-Brown Podzolic.

Soil Series Name	Page in this Bulletin	General Characterization
(Lindley) -----	-----	This soil is now called Pecatonica and Hines.
Lindstrom -----	27 -----	Well drained, moderately dark silt loams of valley slopes in the unglaciated region. Downs on a valley slope. A_0-A_1-B-C . Transitional between Prairie (Brunizem) and Gray-Brown Podzolic.
(Lintonia) -----	-----	This soil is now called Bertrand.
Longrie -----	14, 15 -----	Well drained shallow silt loam or loam underlain at 1 to 3 feet by dolomite bed-rock. A_0-A_1-B-D or A_0-A_2-B-D . Brown Forest and Podzol soils.
Mackinac -----	-----	See Salona.
Manawa -----	14 -----	Imperfectly drained loams and silty clay loams associated with Kewanee and Oshkosh (Superior). $A_0-A_1-A_2-B-C$. Mottled below A_1 . Planosolic, transitional between Gray-Brown Podzolic and Humic-Gley.
Marathon -----	-----	Well drained shallow silt loams underlain at 18-36 inches by shattered and weathered gneiss. $A_0-A_1-A_2-B-D$. Gray-Brown Podzolic.
Marenisco -----	18 -----	Well drained sandy loam over loamy sand till at 30 inches, acid. A_0-A_2-B-D . Only slightly heavier in texture than Hiawatha. Podzol.
(Marshall) -----	-----	This soil is now called Tama.
(Mason) -----	-----	This soil is now called Ogemaw.
Maumee -----	15 -----	Very poorly drained sandy loams, calcareous at 20 to 36 inches. Associated with Shawano, Suring and Granby. A_0-A_1-G-C . Humic-Gley.
McHenry -----	23 -----	Well drained silt loams and fine sandy loams over dolomitic sandy loam till at 2 to 3 feet. Associated with Dodge and Dane. $A_0-A_1-A_2-B_2-C$. Gray-Brown Podzolic.
Medary -----	-----	Moderately well drained silt loams and silty clay loams formed on terraces of reddish calcareous silts and clays in the valleys of the Wisconsin and Mississippi Rivers. $A_0-A_1-A_2-B-C$. Gray-Brown Podzolic.
(Mellen) -----	-----	This soil is now called Gogebic, Marenisco, Wakefield.
(Meridean) -----	-----	This is now called Meridian.
Meridian -----	-----	Well drained loam or sandy loam formed from water reworked Cambrian sandstone. $A_0-A_1-A_2-B-C$. B is more clayey than that of Alvin. Gray-Brown Podzolic.
Miami -----	14, 23 -----	Well drained silt loams formed in less than 2 feet of silty or loamy material over calcareous loam dolomitic till. $A_0-A_1-A_2-B_2-C$ or D. Gray-Brown Podzolic.

Soil Series Name	Page in this Bulletin	General Characterization
Milaca -----	19, 20, 21 -----	Well drained loams and silt loams over red sandy clay loam till. $A_0-A_1-A_2-B-C$. Surface texture is finer than in Wakefield. Weak Podzol to Gray-Brown Podzolic.
(Milltown) -----	-----	This soil is now called Antigo.
Morley -----	22 -----	Moderately well drained silty clay loam, somewhat better drained than Blount. Dolomitic clayey till occurs at a depth of about 2 feet. $A_0-A_1-A_2-B-C$. Weak Gray-Brown Podzolic.
Muscatine -----	27 -----	Moderately well drained silt loam developed from deep calcareous loess. Associated with Tama. A_0-A_1-B-C . Mottled in B. Prairie (Brunizem).
Nekoosa -----	17 -----	Imperfectly drained sands formed from deep outwash. Associated with Plainfield. $A_0-A_1-A_2-B-C$. Mottled below A_1 . Planosolic, transitional between Gray-Brown Podzolic and Humic-Gley.
Newton -----	17 -----	Poorly drained acid black sands, associated with Plainfield and Nekoosa. A_1 is about 18 inches thick. A_0-A_1-G-C . Humic-Gley.
Norden -----	17 -----	Well drained silt loams and loams formed from Cambrian greensand and greensilt. Associated with Hixton. $A_0-A_1-A_2-B-C$. Gray-Brown Podzolic.
Ogemaw -----	13 -----	Imperfectly drained sandy soils formed from 1 to 3 feet of sand over red dolomitic lake clays. A_0-A_2-B-D . Mottled in B. Groundwater Podzol.
Omega -----	13, 16, 18, 19, 20 -----	Excessively drained sands formed over deep outwash. A_0-A_1-B-C . Brown Podzolic.
Onamia -----	20 -----	Well drained sandy loams or loams overlying acid sand and gravel at 2 to 3 feet. Associated with Antigo and Chetek. $A_0-A_1-A_2-B-C$. Weak Podzol.
Onaway -----	14, 15 -----	Well drained sandy loam over sandy loam dolomitic till, which lies at a depth of 2 to 3 feet. A variety of profiles: Brown Forest (A_0-A_1-B-C), Gray-Brown Podzolic ($A_0-A_1-A_2-B-C$), Podzol (A_0-A_2-B-C), and double ($A_0-A_1-A_2-B-A_2-B-C$), meaning a weak Podzol in a Gray-Brown Podzolic.
Ontonagon -----	13 -----	Moderately well drained silty clay formed from red lake clays, dolomitic at 2 feet, in the Lake Superior Lowland. A_0-A_2-B-C . Weak Gray-Wooded or Podzol.
(Orienta) -----	-----	This soil resembles Saugatuck but is underlain by red clays at 40 to 72 inches.

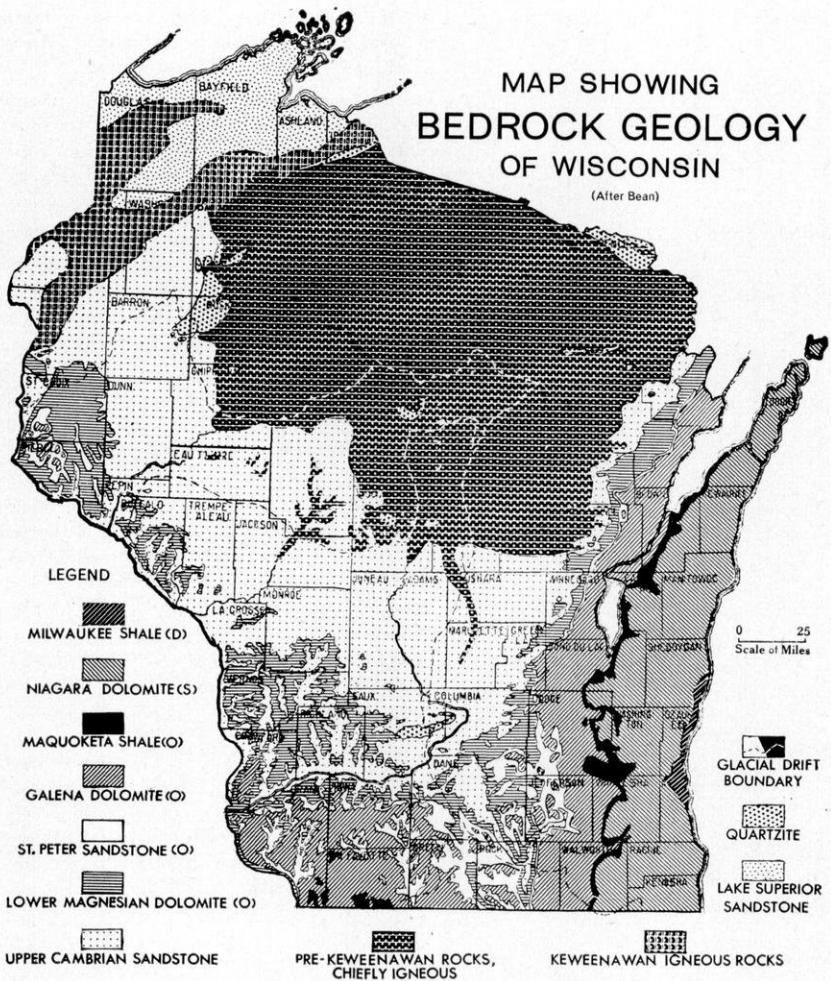
Soil Series Name	Page in this Bulletin	General Characterization
Orion -----		Imperfectly to moderately well drained silt loams, bottom soils, associated with Arenzville in southwestern Wisconsin. $A_{11}-A_{12b}-A_{13b}$ Alluvial.
Oshkosh (Superior) -----	14 -----	Moderately well drained silt loams, fine sandy loams and silty clay loams formed over dolomitic red lacustrine clays. Dolomite occurs at a depth of about 2 feet. Found in the Lake-Winnebago-Green Bay region. $A_0-A_1-A_2-B-C$. Weak Gray-Brown Podzolic.
Oshtemo -----		Well drained loams, somewhat gravelly, on outwash plains. Transitional between Plainfield and Fox as to texture. The Prairie analogue is Warsaw. $A_0-A_1-A_2-B-C$. Gray-Brown Podzolic.
Ostrander -----	27 -----	Well drained silt loam formed over dolomitic clay loam till. Leached 4 feet. $A_0-A_1-BD-C_1D-D$. Prairie (Brunizem).
Ottawa -----	14, 17 -----	Well drained sand overlying dolomitic red clay at 2 to 5 feet. Solum resembles that of Plainfield. $A_0-A_1-A_2-B-C-D$. Gray-Brown Podzolic. Some Podzols.
Otterholt -----	21 -----	Well drained silt loams formed from 3 to 4 feet of silty material over reddish sandy clay loam till. Associated with Santiago, Spencer, and Almena. $A_0-A_1-A_2-B-C-D$. Weak Podzol to Gray-Brown Podzolic.
Parr -----	25 -----	Well drained Prairie (Brunizem) analogues of Miami and Dodge, developed from 1 to 3 feet of loess on dolomitic loam till. $A_0-A_1-B-(C)-D$. Brunizem.
Pecatonica -----		Well drained silt loams over sandy clay loam till, leached 4 to 10 feet. $A_0-A_1-A_2-B-BD-C_1-D-D$. Gray-Brown Podzolic.
Peotone -----	22 -----	Very poorly drained silty clay loams, alkaline, developed on Lake laid clays. Elliott landscape. A_0-A_1-G-C . Humic-Gley.
Pickford -----	13 -----	Imperfectly to poorly drained silty clay loams associated with Ontonagon and Bergland, between which Pickford soils are transitional. $A_0-A_1-A_2-G-C$. Mottled below A_1 . Planosolic, an intergrade between Gray-Wooded and Humic-Gley.
Plainfield -----	17 -----	Excessively drained sands and loamy sands developed from deep outwash. $A_0-A_1-A_2-B-C$. Gray-Brown Podzolic.
Poskin -----	20 -----	Imperfectly drained silt loam underlain at 2 to 4 feet by gravel and sand outwash. Associated with Antigo. $A_0-A_1-A_2-B-(C)-D$. Mottled below A_1 . Planosolic, an intergrade between Gray-Brown Podzolic and Humic-Gley.

Soil Series Name	Page in this Bulletin	General Characterization
Poygan -----	14 -----	Very poorly drained black silty clay soils associated with Kewaunee and Oshkosh (Superior). A ₀ -A ₁ -G-C. Humic-Gley.
Proctor -----	-----	See Tuscola.
Ray -----	9 -----	Well drained silt loams in small valley bottoms, showing 1 to 3 feet of recent alluvium overlying darker silt loam alluvium. A ₁₁ -A _{12b} -A _{13b} ---. Alluvial.
(Rice Lake) -----	-----	This soil is now called Onamia.
Richwood -----	27 -----	Well drained silt loams formed from deep silt overlying outwash sand. A ₀ -A ₁ -B-C-D. Tama on a terrace bench. Prairie (Brunizem) analogue of Bertrand. See Downs.
Rifle -----	-----	Slightly acid to alkaline woody peat of northern Wisconsin. 1-2-3-G. Bog.
Rio -----	17 -----	Well drained loamy fine sands and fine sandy loams formed from about 2 feet of sandy material overlying 2 feet of silty material on dolomitic gravelly loam till. A ₀ -A ₁ -A ₂ -BD ₁ -D ₂ . Gray-Brown Podzolic.
Rockton -----	25 -----	Well drained dark silt loams and loams underlain by dolomitic bedrock at 2 to 3 feet. Prairie (Brunizem) analogue of Whalen. A ₀ -A ₁ -B-D. Prairie (Brunizem).
Rodman -----	15, 23, 24 -----	Excessively drained gravelly loam, formed on gravel and coarse sand of eskers and kames. Kettle moraine. A-C. Rendzina, Brown Forest, and weak Gray-Brown Podzolic.
Rozellville -----	-----	Well drained silt loams formed from silty material overlying micaceous glacial till on schist and phyllite bedrock. Marathon County. Associated with Rozell and Zel. A ₀ -A ₁ -A ₂ -B-D. Intergrade between Gray-Brown Podzolic and Podzol.
Rudolph -----	-----	Well drained silt loams developed over micaceous loam and underlain at about 3 feet by reddish brown sandy clay, probably disturbed by the glacier. Marathon County. Associated with Rudo, Dolph and Altdorph. A ₀ -A ₁ -A ₂ -B-D. Intergrade between Gray-Brown Podzolic and Podzol.
Salona -----	15 -----	Imperfectly drained silt loams and loams overlying dolomitic loam to sandy loam glacial till. Associated with Onaway. A ₀ -A ₁ -A ₂ -B-C. Mottled below A ₁ . Planosolic, and intergrade between Gray-Brown Podzolic and Humic-Gley.

Soil Series Name	Page in this Bulletin	General Characterization
Santiago -----	21 -----	Well drained silt loam one to 2 feet thick over reddish brown sandy clay loam till. Associated with Freer. Shallower than Otterholt. A ₀ -A ₁ -A ₂ -B-BD-D. Weak Podzol.
Sauble -----	13 -----	Excessively drained fine sands developed on dunes. Color profile. A pinkish Bridgman-like profile. A ₀ -A ₁ -A ₂ -B-C. Weak Podzol.
Saugatuck -----	16 -----	Imperfectly drained sands formed near bogs on deep outwash sand. A ₀ -A ₂ -B-C. Ground-water Podzol, extremely developed.
Scandia -----	-----	Gravelly sandy loams developed on pinkish gravelly sandy loam till, in association with Milaca. Acid. A ₀ -A ₁ -A ₂ -B-C. Intergrade, Gray-Brown Podzolic to Podzol.
Shawano -----	15 -----	Excessively drained sands and sandy loams on neutral to alkaline outwash sand. Omega is on acid outwash. A ₀ -A ₁ -B-C. Weak Podzol.
Shiocton -----	-----	Imperfectly drained silts and very fine sands, on lake-laid fine sands, silts, and calcareous pink clays. Associated with Tuscola, Keowns, and Elba. A ₀ -A ₁ -A ₂ -B-C. Mottled below A ₁ . Intergrade between Gray-Brown Podzolic and Humic-Gley.
Sogn -----	26 -----	Well to excessively drained silt loams and stony clay loams formed from thin silt over cherty red clay over dolomitic bedrock in southwestern Wisconsin. A-C. Regosol, Rendzina, Prairie, Gray-Brown Podzolic.
Spalding -----	16, 18, 19, 21 -----	Acid, mixed fibrous to woody peat, northern Wisconsin. 1-2-3-4-G. Bog.
Sparta -----	-----	Excessively drained dark sands and loamy sands on outwash sand. A ₀ -A ₁ -B-C. Prairie (Brunizem) analogue of Plainfield.
Spencer -----	21 -----	Silt loam, moderately well drained, formed from 2 to 4 feet of loess over acid red sandy clay loam till. A ₀ -A ₁ -A ₂ -B-C-D. Mottled in B. Associated with Otterholt and Almena. Weak Podzol to Gray-Brown Podzolic.
Steep stony land -----	26 -----	A miscellaneous land unit including steep undifferentiated soils and rock outcrops or very stony areas.
Stronghurst -----	26 -----	Imperfectly to moderately well drained silt loams, associated with Fayette. A ₀ -A ₁ -A ₂ -B-C. Mottled below A ₁ . Planosolic intergrade between Gray-Brown Podzolic and Humic-Gley.

Soil Series Name	Page in this Bulletin	General Characterization
Superior -----		Well drained sandy loams and loams underlain at 10 to 42 inches by calcareous red lake clay. Associated with Ontonagon. $A_0-A_2-B-(C)-D$. Podzol.
Suring -----	15 -----	Moderately well to imperfectly drained sandy loams associated with Shawano and Granby. $A_0-A_1-A_2-B-C$. Mottled below A_1 . Planosolic intergrade between Gray-Brown Podzolic and Humic-Gley.
Tama -----	27 -----	Well drained deep dark acid silt loams developed from deep calcareous loess. $A_0-A_1-B-C_1-C_2$. Prairie (Brunizem).
Tell -----		Well drained, moderately deep silt loams underlain at 24-30 inches by outwash sand. Shallower than Bertrand. Resembles but is over outwash. $A_0-A_1-A_2-B-D$. Gray-Brown Podzolic.
(Thornapple) -----		This soil is now called Omega, rolling phase.
(Thurston) -----		This soil was mapped in Columbia County as a Prairie analogue of what is now called McHenry, a Gray-Brown Podzolic.
Trenary -----		Sandy loams on loam till which is less dolomitic and more sandy than Onaway till, but more dolomitic and less sandy than Munising and Kennan. A_0-A_2-B-C . Podzol.
Trow -----	20 -----	Imperfectly drained silt loams and loams 1 to 3 feet deep to Cambrian sandstone bedrock. Associated with Arland. $A_0-A_1-A_2-B-D$. Mottled below A_1 . Planosolic intergrade between Gray-Brown Podzolic, weak Podzol, and Humic-Gley.
Tuscola -----	17 -----	Well drained silt loams and very fine sands formed on lake-laid fine sands, silts and calcareous pink clays. $A_0-A_1-A_2-B-C$. Gray-Brown Podzolic.
Vesper -----	17 -----	Very poorly drained acid fine sandy loams with thick A_0 and A_1 over Cambrian sandstone and shale. A_0-A_1-G-C . Humic-Gley.
Vilas -----	13, 16 -----	Excessively drained sands developed from deep sandy outwash, level or hilly. A_0-A_2-B-C . Podzol.
(Wabash) -----		This soil is now called Lawson.
Wakefield -----	18 -----	Well drained loams over loam to sandy clay loam reddish brown acid till, which is intermediate in texture between the till of the Iron River and Hibbing soils. A_0-A_2-B-C . Podzol.

Soil Series Name	Page in this Bulletin	General Characterization
Wallace -----		Sands with thick ashy gray A ₂ and cemented B formed on old dunes. A ₀ -A ₂ -B-C. Podzol, extremely developed.
Warman -----	20 -----	Dark poorly drained silt loam, underlain at 2 to 4 feet by outwash gravel and sand. Associated with Antigo. Profile resembles that of Adolph. A ₀ -A ₁ -G-D. Humic-Gley.

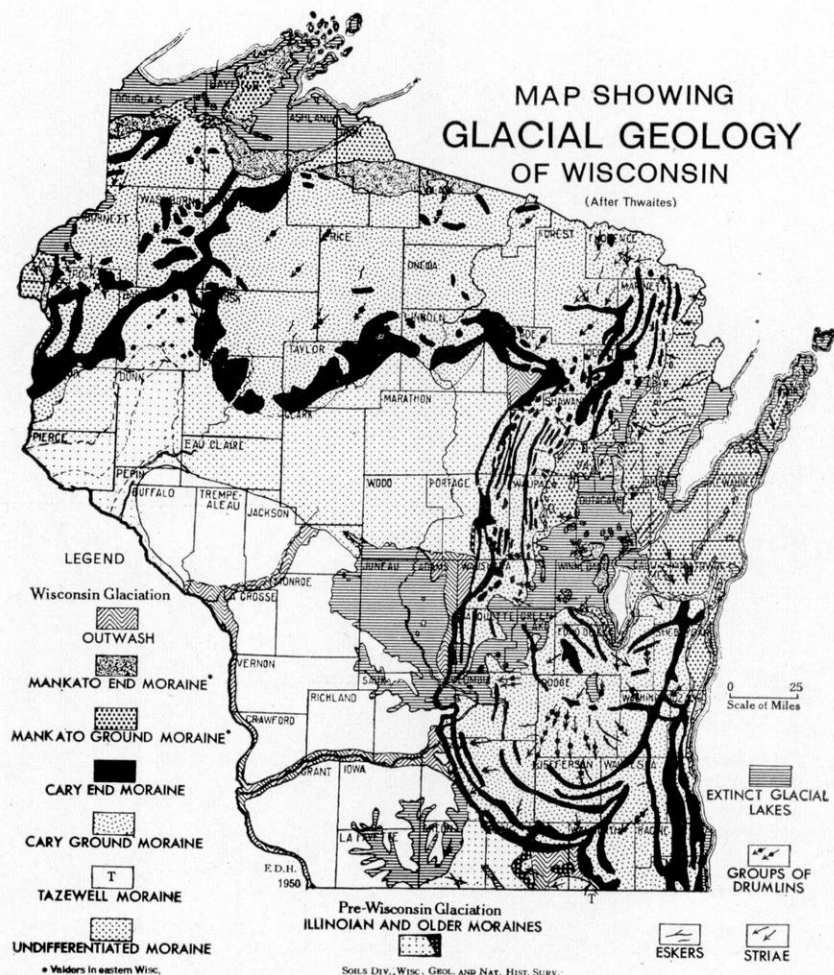


SOLLS DIV., WISC. GEO. AND NAT. HIST. SURV.

• and Platteville.

F. D. H., 1950

Soil Series Name	Page in this Bulletin	General Characterization
Warsaw -----	25 -----	Well drained dark silt loam or loam, underlain at 1 to 3 feet by dolomitic outwash gravel. There is no "B ₃ " as in the Fox. A ₀ -A ₁ -B-D profile. Brunizem.
Waukegan -----	25 -----	Well drained dark silt loam underlain at 4 to 6 feet by dolomitic outwash sand. A ₀ -A ₁ -B-C profile. Brunizem.
(Waukesha) -----	-----	This soil is now called Waukegan.



Soil Series Name Page in this
 Bulletin

Waupun ----- 25 -----

Wauseon -----

Weare -----

(Webster) -----

General Characterization

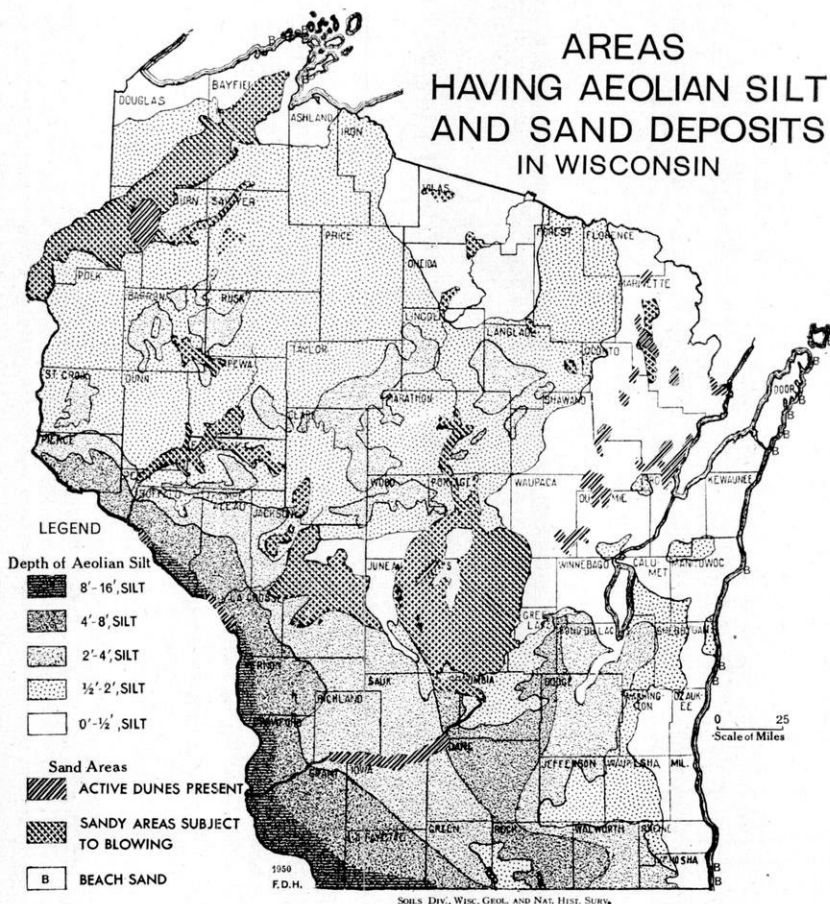
Well drained dark silt loam developed from 3 to 4 feet of loess overlying dolomitic loam till. A₀-A₁-B-C profile. Brunizem analogue of Dane.

Poorly drained sand underlain at 2 to 3 feet by lacustrine clays. Associated with Ottawa. A₀-A₁-G-D profile. Humic-Gley.

Sands with moderately developed ashy-gray A₂, and with slightly cemented B, formed on stable dunes. Intermediate between Bridgman and Wallace as to degree of profile development. A₀-A₂-B-C. Moderately developed Podzol.

This soil is now called Antigo.

AREAS HAVING AEOLIAN SILT AND SAND DEPOSITS IN WISCONSIN



Soil Series Name
(Whitman) -----

Page in this
Bulletin 17 -----

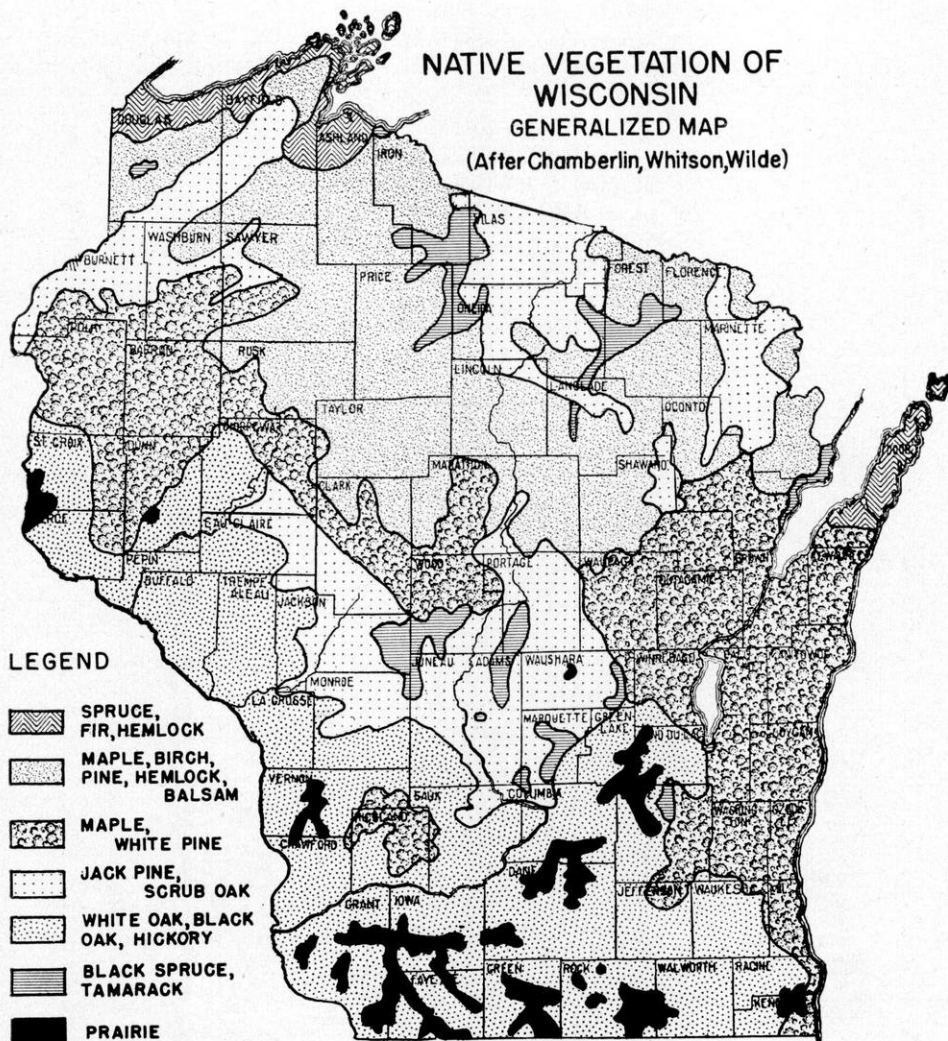
General Characterization

This soil is now called alluvial soils, undifferentiated, poorly drained, in the Almena-Freer landscape.

Wyocena ----- 17 -----

Well drained acid sandy loam with sandy clay loam B over deep sandy till. Associated with Coloma. A₀-A₁-A₂-B-C profile. Gray-Brown Podzolic.

NATIVE VEGETATION OF WISCONSIN GENERALIZED MAP (After Chamberlin, Whitson, Wilde)



F.D. Hole, 1954

B. DEFINITIONS OF SOME TERMS USED IN DESCRIBING SOIL PROFILES

(Quotations are from the Soil Survey Manual,
U.S.D.A. Handbook #18)

1. *Soil horizons defined briefly.* "A soil horizon may be defined as a layer of soil, approximately parallel to the soil surface. . . ."

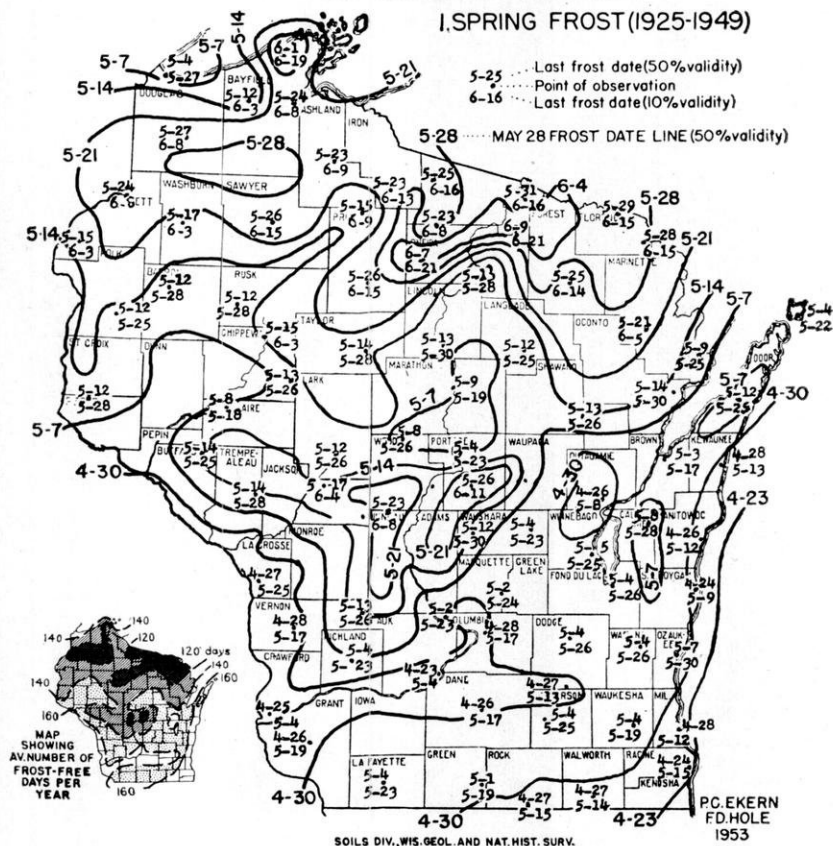
A₀₀-----"Loose leaves and organic debris, largely undecomposed."

A₀-----"Organic debris partially decomposed or matted." Example: Matted leaf litter on a forest floor.

A₁-----"A dark-colored horizon with a high content of organic matter mixed with mineral matter." Example: Topsoil under blue-grass. The A₁₁ is the upper layer of the A₁. The A₁₂ is the

MAP SERIES SHOWING CLIMATIC INFLUENCES ON SOILS AND CROPS IN WISCONSIN

I. SPRING FROST (1925-1949)



D-----Unconsolidated or solid rock or soil material which is different from that from which the overlying A and B horizons formed.

G-----Bluish-gray subsoil, splotted with yellow, in a water-logged soil or a recently drained soil. Example: Subsoil of a marsh-border soil like the Adolph.

1, 2, 3, 4----Horizons in an organic soil. Example: Layers of muck and peat in the Carlisle muck.

2. *Mottling defined.* "The word 'mottled' means marked with spot of color." Example: Yellow spots of color in a bluish-gray G horizon.

3. *Great Soil Groups briefly defined.* Soils are classified into Great Soil Groups on the basis of general kinds of soil profiles and regional environments.

Examples:

Horizons present	Important Features of original Environment	Name of Great Soil Group	Name of representative Soil Series
A ₀₀ -A ₀ -A ₂ -B-C -----	Mixed coniferous and deciduous forest on coarse textured material	Podzol -----	Hiawatha
A ₀₀ -A ₀ -A ₁ -B-C -----	Same -----	Brown Podzolic -----	Omega
A ₀₀ -A ₀ -A ₂ -B-C _{ca} -C ----	Mixed forest on medium fine to fine textured materials	Gray Wooded -----	Ontonagon
A ₀₀ -A ₀ -A ₁ -A ₂ -B-C -----	Deciduous forest -----	Gray-Brown Podzolic -----	Dane
A ₀₀ -A ₀ -A ₁₁ -A ₁₂ -B-C ---	Mixed forest on material unusually high in content of bases	Brown Forest -----	Ahmeek
A ₁₁ -A ₁₂ -B-C -----	Prairie vegetation -----	Prairie (Brunizem) -----	Parr
A ₁₁ -A ₁₂ -G-C -----	Marsh border conditions	Humic-Gley -----	Elba
A ₁₁ -A _{12b} -A _{13b} -----	River flat, often flooded	Alluvial -----	Arenzville
A ₀ -A ₁ -C -----	Steep, shallow soil -----	Regosol -----	Rodman
A ₀₀ -A ₀ -A ₁ -A ₂ -B-C ----	Level, imperfectly drained upland	Planosolic ----- Planosol -----	Almena

C. DEFINITIONS OF SOME USEFUL SOIL SEQUENCES

Soil surveyors group soil series into sequences, several of which are described below briefly:

1. *Textural sequence.* A textural sequence consists of associated soil series arranged in order from coarse to fine textures. Examples are: Chetek-Omega-Onamia-Antigo; Rodman-Casco-Miami-Morley; Hiawatha-Marenisco-Gobebic-Wakefield-Hibbing; Plainfield-Alvin-Tell-Bertrand-Medary.

2. *Natural drainage sequence.* A natural drainage sequence or catena consists of associated soil series arranged in order from very well drained to very poorly drained conditions. Examples are: Otterholt-Spencer-Almena-Auburndale-Adolph; Antigo-Brill-Poskin-Warman; Dane-Calamus-Clyman-Elba; Waupun-Corwin-Bristol-Elba.

3. *Developmental sequence.* A developmental sequence consists of associated soil series arranged in order from those with minimal B development to those with maximal B development. Examples are: Omega-Vilas-Au Train; Bridgman-Weare-Wallace; Vilas-Hiawatha-Strongs; Arenzville-Chaseburg-Fayette.

4. *Lithologic sequence.* A lithologic sequence consists of associated soil series arranged in order of increasing content of a particular parent material. Increase in content of dolomite in the parent material is illustrated by the sequence: Kennan-Trenary-Onaway. Increase in content of red clay in the parent material is shown in the sequence: Dodge-Onaway-Kewaunee.

5. *Depth sequence.* A depth sequence consists of associated soil series arranged in order from those with minimum depth to a particular substratum, to those with maximum depth to the substratum. Examples are: Milaca-Santiago-Otterholt; Dubuque-Deep Dubuque-Fayette; Miami-Dodge-Dane; Alvin-Tell-Bertrand.

6. *Great Soil Group sequence.* A Great Soil Group sequence consists of associated soil series arranged in order from those of one Great Soil Group through a transition to another Great Soil Group. From Gray-Brown Podzolic to Brunizem (Prairie), representative sequences are: Fayette-Downs-Tama; Morley-Beecher-Elliott.

D. SAMPLE DETAILED SOIL PROFILE DESCRIPTION

Au Train Series

This series includes maximal Podzols developed on glacial outwash sands in the Northern Lake States. These soils differ from the associated Vilas soil by having an ortstein instead of an orterde, and from the Saugatuck in being free from mottling.

Soil Profile. Au Train loamy sand. (SE $\frac{1}{4}$, NE $\frac{1}{4}$, Sec. 33, T.47 N., R. 1 W., Iron County, Wisconsin.)

- A₀ 2-0" Very dark gray and dark brown (5YR 3/1 and 3/2 moist) forest litter and organic mat. pH 4.5. 1-4" thick.
- A₂ 0-6" Light reddish brown (5YR 6/3, moist), loose loamy sand; single grain structure; abrupt wavy lower boundary. pH 5.0. 3-9" thick.
- B₂₁ 6-9" Dark reddish brown (5YR 3/3, moist) weakly cemented loamy sand; clear wavy lower boundary. pH. 5.0. 2-5" thick.
- B₂₂ 9-16" Dark brown (7.5YR 4/4, moist) weakly cemented loamy sand; gradual wavy lower boundary. pH. 5.5. 4-10" thick.
- B₃ 16-36" Strong brown (7.5YR 5/6, moist) weakly cemented loamy sand; clear wavy lower boundary. pH 5.5. 15-24" thick.
- C₁ 36-48" Reddish brown (5YR 4/4, moist) loose loamy sand; single grain; clear lower boundary. pH 5.5. 10-20" thick.
- C₂ 48"+ Light reddish brown (5YR 6/3, moist) loose, coarse sand; single grain. pH 5.0.

Range in Characteristics: There is considerable range, as indicated, in thickness of horizons. The degree of cementation of the B₂ horizon varies from weakly cemented to indurated.

Topography: Level to undulating glacial outwash plains and terraces.

Drainage: Well-drained. Runoff is slow and internal drainage is rapid.

Vegetation: The original forest of white and red pine, balsam fir, hard maple, yellow birch and other hardwoods has largely been removed. The invasion or introduction of grasses is producing an A₁ horizon in many bodies of Au Train.

Use: Most of the soil bodies are in cut-over timber land. Some bodies of Au Train are being used for pasture and crops.

Distribution: Northern Wisconsin and Michigan.

Type Location: Ontonagon County, Michigan.

Series established: Alger County, Michigan, 1939.

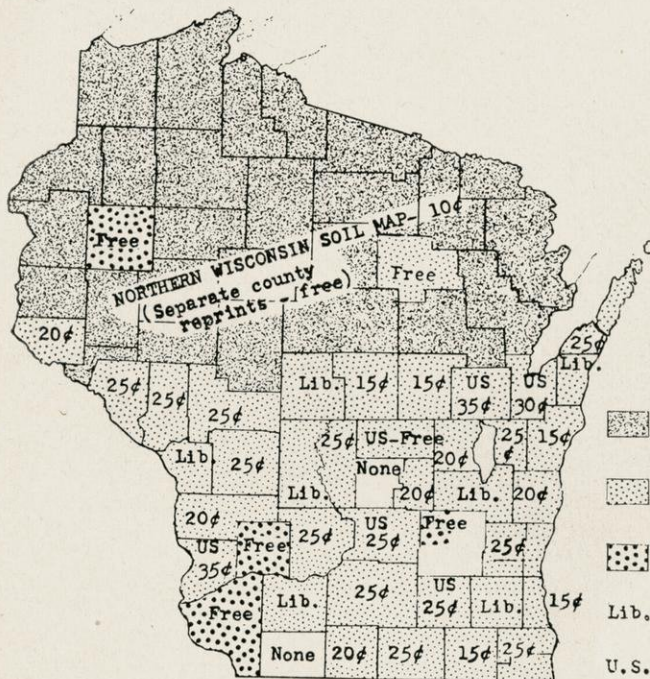
Source of name: Village in Alger County, Michigan.

Note: Soil color names according to Munsell notations.






WISCONSIN SOIL MAPS AND REPORTS



----- Leaflet colored soil map -----	Free
----- Map series illustrating soil forming factors -----	Free
----- Technical bulletin on "Preliminary Study of the Profiles of the Principal Soil Types of Wisconsin" -----	25¢
----- Introduction to the soils of Wisconsin -----	10¢
----- What's in that soil map? -----	Free



COUNTY SOIL MAPS AND REPORTS

-  Maps at a scale of 1 inch = 6 miles
-  Maps at a scale of 1 inch = 1 mile
-  Maps at a scale of 1 inch = 1/2 mile
-  Maps available only in public libraries
-  Maps available from Government Printing Office

Requisitions and payments for soil survey publications are handled by: Secretary, Soils Department, University of Wisconsin, 203 Soils Building, Madison 6, Wisconsin.

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