United States
Department of
Agriculture

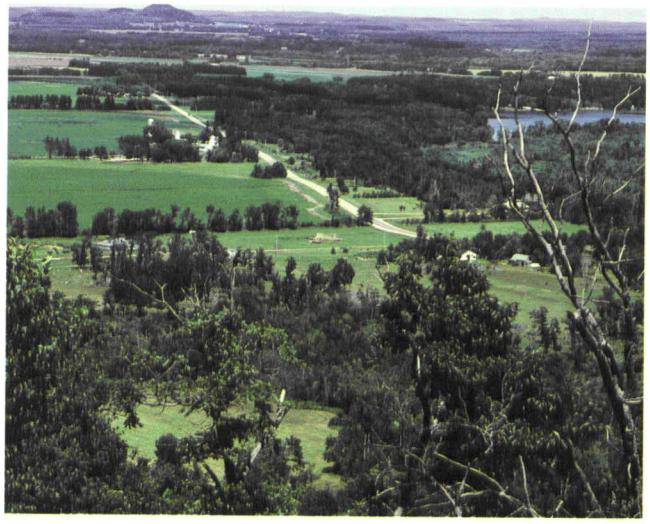
Natural
Resources
Conservation
Service

In cooperation with
the Research Division,
College of Agricultural and
Life Sciences, University of
Wisconsin

Soil Survey of Pepin County, Wisconsin

Subset of MLRA 105

Part I



How To Use This Soil Survey

This survey is divided into three parts. Part I includes general information about the survey area; descriptions of the general soil map units, detailed soil map units, and soil series in the area; and a description of how the soils formed. Part II describes the use and management of the soils and the major soil properties. This part may be updated as further information about soil management becomes available. Part III includes the maps.

On the **general soil map**, the survey area is divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map units in the area on the color-coded map legend, then refer to the section **General Soil Map Units** in Part I of this survey for a general description of the soils in your area.

The **detailed soil maps** can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**. Note the number of the map sheet, and turn to that sheet.

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Contents** in Part I of this survey, which lists the map units and shows the page where each map unit is described.

The **Contents** in Part II shows which table has data on a specific land use for each detailed soil map unit. Also, see the **Contents** in Part I and Part II for other sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1996. Soil names and descriptions were approved in 1997. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1997. This survey was made cooperatively by the Natural Resources Conservation Service and the Research Division of the College of Agricultural and Life Sciences, University of Wisconsin. It is part of the technical assistance furnished to the Pepin County Land Conservation Department, which helped finance the fieldwork.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: *Upper left*—Dead Lake Prairie is a prime agricultural area. It is bordered on the east by Silver Birch Lake and the Chippewa River flood plain. *Upper right*—An area of Urne soils. Maintaining a permanent cover, including mixed conifer plantings, is a requirement in highly erodible areas enrolled in the Conservation Reserve Program. *Lower left*—Lake Pepin, a natural widening of the Mississippi River, offers many miles of open water for sailing and fishing enthusiasts. *Lower right*—Water erosion can be a major concern in many areas because of the slope, the climate, erodible soil textures, and the cropping requirements for dairy farming.

Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service home page on the World Wide Web. The address is http://www.nrcs.usda.gov (click on "Technical Resources").

Contents

Issued 2002

Foreword

This soil survey contains information that can be used in land-planning programs in Pepin County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. The information in this report is intended to identify soil properties that are used in making various land use or land treatment decisions. Statements made in this report are intended to help the land users identify and reduce the effects of soil limitations that affect various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service.

Patricia S. Leavenworth
State Conservationist
Natural Resources Conservation Service

Soil Survey of
Pepin County, Wisconsin, Subset of Major Land Resource Area 105

By Theron A. Meyer, Natural Resources Conservation Service

Fieldwork by Roger A. Dahl, Donna E. Ferren, Theron A. Meyer, and Larry L. Natzke, Natural Resources Conservation Service

United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with the Pepin County Land Conservation Department and the Research Division of the College of Agricultural and Life Sciences, University of Wisconsin

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind or segment of the landscape. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landscape, soil scientists develop a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientists to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Individual soils on the landscape commonly merge into one another as their characteristics gradually change. To construct an accurate map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, soil reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil

scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

In some parts of the survey area, the soil scientists were denied access. The reliability of information on the maps in these areas is limited, since the soil lines were projected using remote sensing techniques. These areas are outlined on the maps and labeled as "Reduced Reliability, Access Denied."

The descriptions, names, and delineations of the soils in this survey area do not fully agree with those of the soils in adjacent survey areas. Differences are the result of a better knowledge of soils, modifications in series concepts, or variations in the intensity of mapping or in the extent of the soils in the survey areas.

Survey Procedures

This soil survey updates the survey of Pepin County published in 1964 (USDA, 1964). It is the first updated subset of a project that will update all of Major Land Resource Area 105 (MLRA 105), The Northern Mississippi Valley Loess Hills. The majority of MLRA 105 occurs in Wisconsin (fig. 1). It consists of all or parts of 21 counties in western Wisconsin, 7 counties in southeastern Minnesota, 9 counties in northeastern Iowa, and 4 counties in northwestern Illinois.

This updated soil survey provides additional and more accurate soil information and has larger maps, which show the soils in greater detail. The soil names may differ from those in the earlier survey because of a change in soil series concepts and a better knowledge of the soils. The maps and soil descriptions in the 1964 survey were used as a reference of soil map units and to plan map unit transects. Before the fieldwork was begun, both black-and-white and color aerial photographs taken in the spring of 1992 and enlarged to a scale of 1:12,000 were studied. Soil scientists studied U.S. Geological Survey topographic maps to relate land and image features. Sample areas were selected to represent the major landscapes in the county. These areas were investigated more closely than the rest of the county. Extensive notes were taken on the composition of map units in these preliminary study areas.

Some areas required remapping, especially where the previous depth of observation did not describe important underlying soil materials, including bedrock, perched and apparent water tables, and contrasting textures. Adjustments of slope lines were made because of improvements in aerial photography and because some slope class ranges used in the past were too wide for current uses.

General Nature of the Survey Area

Betty A. Plummer, county conservationist, Pepin County Land Conservation Department, helped prepare this section.

Pepin County is located along the western border of Wisconsin (fig. 1). Two major rivers form part of its boundaries. The Mississippi River is on the southwest and separates the county from the State of Minnesota. The Chippewa River forms part of the eastern boundary.

The county has a total surface area of approximately 159,000 acres, which includes about 11,000 acres of water. Durand, the county seat, is along the Chippewa River near the center of the county. Durand is about 62 miles southeast of St. Paul, Minnesota, and 170 miles northwest of Madison, Wisconsin.

Dairy farming is the main livestock enterprise in the county. Beef operations also are important. Specialty crops, such as potatoes, sweet corn, beans, squash, melons, and strawberries, are grown on some of the sandy soils and support a fair amount of truck farms. Small industries include a tire retread operation, a

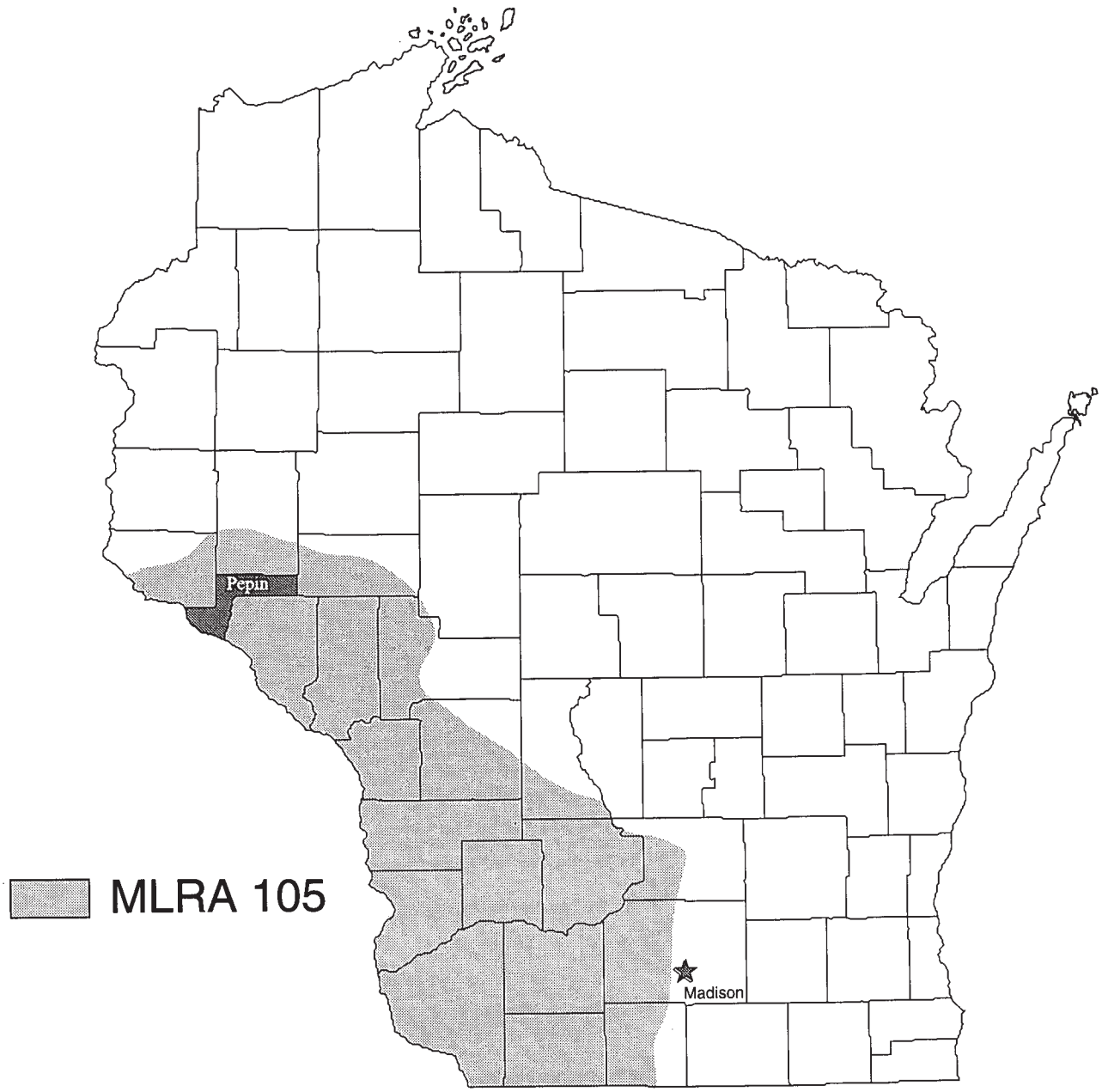


Figure 1.—Location of Pepin County and MLRA 105 in Wisconsin.

cheese factory, sawmills, and logging. Woodland makes up about one-third of the land area.

History and Development

The Chippewa and Sioux Indians alternately occupied the land that makes up the survey area. The last battle fought between these two tribes occurred in 1851.

Lake Pepin appears for the first time on a map of New France in 1703. While being held prisoner on the shores of the lake, Father Louis Hennepin called it "Lake of Tears" when some of the Sioux captors wept all night because their comrades would not permit the death of their captives.

In 1845, John McCain laid out a claim and built a log cabin, which was the first settlement in the county and today is known as the Village of Pepin. The first school was built in 1853 and had 20 students. Louisa Ingalls was the first teacher; she was the aunt of

author Laura Ingalls Wilder, who was born on February 7, 1867, in a log cabin near Pepin, Wisconsin. In 1976, the Little House Wayside was created along County Highway CC. A log cabin was constructed on the site to replicate the one that Wilder wrote about in her first book, "Little House in the Big Woods," published in 1932 (Anderson, 1990).

Between the years of 1849 to 1857, settlements sprang up in Stockholm, Waterville, Frankfort, Lima, Durand, and Waubeek. In 1856, the City of Durand was surveyed and platted out by Miles Durand Prindle.

In 1857, a ferry was started across the Chippewa River. It was a pole ferry propelled by two horses walking up a revolving plank platform or treadmill. In 1884, a wood and steel toll bridge was built across the river at a cost of $15,000. The toll charge was 25 cents for a team and 5 cents for foot passengers.

The first settlers established creameries, feed grinding mills, sawmills, and a furniture factory in the Village of Arkansaw. Lumbering was quite important; in 1852 at Waubeek, a sawmill was erected that employed 100 people. With the development of the lumber industry, Pepin occupied a strategic position. This area grew with the lumber industry, and in 1860 Pepin became the first incorporated village in the county. Pepin also became an important port.

Fourteen years after the first settlement, the population had grown to 2,392. The population rose steadily until 1900, when it reached a peak of 7,905. The 1993 census estimated 7,156 people living in the county.

Early agriculture in the county consisted mainly of growing wheat. The production declined after 1880, and dairying became the main source of income on the farm. Most of the crops are used for feed and livestock purposes.

Physiography, Relief, and Drainage

In the western and southern parts of Pepin County, the terrain is some of the most rugged in Wisconsin. The most striking topographic features in the county are along the major rivers that drain the county—the Mississippi, Chippewa, and Eau Galle Rivers. Glacial meltwater streams were responsible for the creation of Lake Pepin. As ice melted, the Chippewa River deposited more sand and gravel at its mouth than the Mississippi River could transport. As a result, a delta was built at the mouth of the Chippewa River, partially damming the Mississippi and creating Lake Pepin. Lake Pepin is 2.5 miles wide and 22 miles long. It has a maximum depth of 56 feet and an average depth of 25 to 35 feet.

The great gorge of the Mississippi River west of Lake Pepin is bounded on both sides by very steep bluffs that rise 300 to 500 feet above the level of the river. Near its confluence with the Mississippi, the Chippewa River valley is deep and wide. In many places relief ranges from 200 to 400 feet from the sandy flood plain to the summits of the hills.

In contrast, the northern and eastern parts of the county typically have a much less rugged landscape typified by sandstone hills rising a maximum of about 150 feet above a nearly level to undulating valley train. Multiple levels of terraces and steep terrace risers emerge above the present flood plains along the major rivers. The terraces were formed by the entrenchment of these rivers, which cut deep into the previous flood plains.

Bear, Arkansaw, and Plum Creeks, which are tributaries of the Chippewa River, also drain the county. In addition, Bogus Creek and Lost Creek flow south into Lake Pepin.

It is probable that Bear Creek once provided the main channel for the Buffalo River, which now flows southward at Mondovi in Buffalo County. The headwaters of the Buffalo River formerly were a part of Bear Creek and flowed westward to the Chippewa River (Martin, 1932). One theory that has been advanced as the reason for the change in the course of the Buffalo River is that, during the glacial period, the mouth of Bear Creek was blocked by glacial drift and outwash and the water was forced to take a more southward course. Another theory is that a smaller, northward-flowing tributary, through the process of headwater erosion, intercepted the Buffalo River.

Transportation Facilities and Markets

Pepin and Stockholm are served by the Burlington-Northern main railway line.

U.S. Highway 10 dissects the northern part of the county. State Highway 35 runs along the south and west borders along the Mississippi River. State Highway 25 runs along the east border along the Chippewa River. State Highway 85 is the connecting highway from Durand to Eau Claire.

Pepin County has numerous county highways that service rural areas. Generally, livestock is taken by truck to South St. Paul and other livestock markets in the general area.

About 85 percent of the milk produced in the county is used for cheese products within the State, and 15 percent is used as powdered milk, butter, and ice cream products.

Agriculture and the Conservation Ethic

The average size of a farm in Pepin County is 216 acres. Hay crops, corn, soybeans, and some rye and oats are grown, along with specialty crops, such as snap beans, sweet corn, kidney beans, potatoes, melons, squash, and strawberries.

Citizens of Pepin County have developed a strong conservation ethic that dates back to the 1930's. In 1933, camps of the Civilian Conservation Corps were located in Pepin County. Much of the topography in Pepin County is rolling and rough, and workers from these camps completed a number of dams and planted trees to control erosion. In 1939, the Pepin County Soil Conservation District was established to promote soil conservation. In the early 1980's, Soil and Water Conservation Districts were converted to the present Land Conservation Committee structure, which resulted in the growth of the conservation workforce and enhanced local decision making.

Watershed structures were constructed during the years 1958 to 1967 in the Lost Creek, Bogus Creek, and Plum Creek Valleys. These watersheds were organized to assist landowners in conserving their soils and to control gullies.

Resource conservation plans were implemented to encourage management of the soils through proper rotations. Pasture improvement, contour stripcropping, waterways, and diversions were among the practices used widely throughout the county. Grazing of woodlots and steep marginal lands is being reduced as landowners realize the benefits of erosion control and forest management. As a result, woodlots have improved and the vegetation of the marginal areas has provided better food and cover for wildlife.

In the 1980's, conservation tillage was adopted. This tillage system is used extensively throughout the county.

Water Supply

Dan Simonson, Chippewa River Basin Team, Wisconsin Department of Natural Resources, prepared this section.

Ground water supplies most of the water for human consumption in Pepin County. Surface water and ground water are used for livestock. Since most of Pepin County was glaciated, with the exception of the extreme southeast corner of the county, glacial materials are present to various depths and provide the dominant ground-water sources. Windblown loess also covers much of the landscape and is quite deep in places. About 44 percent of the county has bedrock within 10 feet of the surface. Shallow ground water in Pepin County is contained mainly in glacial deposits as an unconfined aquifer.

Selected well drilling records for relatively recent wells (1977 to 1994) indicate that most water supply comes from drilled wells that terminate in sandstone with some mixture of sandstone and shale. The unconfined sand and gravel aquifers supply water for 20 percent of the wells in the county. A smaller percentage of wells are in dolostone. Some older wells are in the unconsolidated glacial sand and gravel aquifer.

Because a high proportion of the county has soils of poor contaminant attenuation capacity (47 percent), occurrences of nitrate concentrations exceeding 10mg/l are not uncommon. Sampling reports indicate that 15 to 20 percent of the wells in the glacial material aquifer exceed the 10mg/l standard, a rate which is significantly higher than in other areas in Wisconsin. Nitrate levels are much lower in the bedrock aquifer and are almost 10 times higher in the unconsolidated aquifer of the Village of Pepin. Many of the wells in the unconfined aquifer extend to depths of 160 feet (WDNR, 1996).

Wells drilled into the sandstone or dolostone bedrock aquifer are likely to find water quality that reflects a need for the removal of iron and manganese. This removal is currently being accomplished in the City of Durand. The Village of Pepin uses a 163-foot well terminating in the unconsolidated aquifer but requiring no treatment. Both iron and manganese are less concentrated in this aquifer than in the bedrock aquifer used by the City of Durand.

Climate

The three tables at the end of this section ("Temperature and Precipitation," "Freeze Dates in Spring and Fall," and "Growing Season") provide climate data for the survey area as recorded at Mondovi in the period 1961 to 1990.

In winter, the average temperature is 16.6 degrees F and the average daily minimum temperature is 6.1 degrees. The lowest temperature on record, which occurred at Mondovi on January 30, 1951, is -45 degrees. In summer, the average temperature is 69 degrees and the average daily maximum temperature is 81 degrees. The highest temperature, which occurred at Mondovi on August 24, 1948, is 104 degrees.

Growing degree days are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The

normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 31.86 inches. Of this, 19.55 inches, or about 61 percent, usually falls in May through September. The growing season for most crops falls within this period. The heaviest 1-day rainfall during the period of record was 6.3 inches at Mondovi on September 16, 1992. Thunderstorms occur on about 37 days each year, and most occur in July.

The average seasonal snowfall is 44.4 inches. The greatest snow depth at any one time during the period of record was 30 inches recorded on February 5, 1971. An average of 72 days per year have at least 1 inch of snow on the ground. The heaviest 1-day snowfall on record was 11.5 inches recorded on December 1, 1985.

The average relative humidity in midafternoon is about 59 percent. Humidity is higher at night, and the average at dawn is about 78 percent. The sun shines about 68 percent of the time possible in summer and 51 percent in winter. The prevailing wind is from the northwest. Average windspeed is highest, 12.3 miles per hour, in April.

Temperature and Precipitation

(Recorded in the period 1961-90 at Mondovi, Wisconsin)

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	*Units*	*In*	*In*	*In*		*In*
January----	23.1	1.8	12.5	47	-33	0	0.86	0.30	1.38	3	10.2
February---	30.0	7.3	18.7	53	-29	0	.84	.19	1.36	2	7.7
March------	41.7	20.8	31.2	71	-13	7	2.00	1.22	2.69	5	9.1
April------	59.0	34.3	46.7	85	12	77	3.03	1.79	4.15	6	1.8
May--------	71.3	45.2	58.2	89	25	263	3.83	2.24	5.25	7	.0
June-------	78.9	54.4	66.6	94	36	478	3.81	2.26	5.20	7	.0
July-------	83.6	59.5	71.6	96	43	652	4.18	2.24	5.89	6	.0
August-----	80.6	56.9	68.8	94	39	565	3.70	1.71	5.40	6	.0
September--	71.1	48.4	59.7	90	28	295	4.03	2.23	5.62	6	.0
October----	60.4	37.5	48.9	83	16	99	2.54	1.12	3.75	5	.0
November---	42.7	24.4	33.6	67	-4	7	1.74	.61	2.68	4	4.8
December---	27.6	9.3	18.4	54	-26	0	1.30	.61	1.98	3	10.9
Yearly:											
Average---	55.8	33.3	44.6	---	---	---	---	---	---	---	---
Extreme---	---	---	---	97	-34	---	---	---	---	---	---
Total-----	---	---	---	---	---	2,444	31.86	23.48	35.81	60	44.4

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

Freeze Dates in Spring and Fall

(Recorded in the period 1961-90 at Mondovi, Wisconsin)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	May 2	May 15	May 28
2 years in 10 later than--	Apr. 27	May 10	May 23
5 years in 10 later than--	Apr. 18	May 1	May 14
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 4	Sept. 24	Sept. 17
2 years in 10 earlier than--	Oct. 9	Sept. 29	Sept. 20
5 years in 10 earlier than--	Oct. 19	Oct. 8	Sept. 27

Growing Season

(Recorded in the period 1961-90 at Mondovi, Wisconsin)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	*Days*	*Days*
9 years in 10	160	142	120
8 years in 10	168	148	126
5 years in 10	183	161	138
2 years in 10	198	174	149
1 year in 10	205	181	155

General Soil Map Units

The general soil map in this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. These areas are called associations. Each association on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The soils or miscellaneous areas making up one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils or miscellaneous areas can be identified on the map. Likewise, areas that are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

1. Pepin-Dorerton-Churchtown Association

Setting

Landform: Hills
Slope range: 2 to 60 percent

Composition

Percent of the survey area: 36
Extent of the components in the association (fig. 2):
Pepin and similar soils—45 percent
Dorerton and similar soils—26 percent
Churchtown soils—19 percent
Minor components—10 percent

Soil Properties and Qualities

Pepin

Depth class: Deep
Drainage class: Well drained
Position on the landform: Summits, shoulders, and backslopes
Dominant parent material: Loess over clayey pedisediment over loamy residuum
Texture of the surface layer: Silt loam
Slope range: 2 to 30 percent

Dorerton

Depth class: Very deep
Drainage class: Well drained
Position on the landform: Backslopes
Dominant parent material: Loamy colluvium over loamy residuum
Texture of the surface layer: Loam
Slope range: 30 to 60 percent

Churchtown

Depth class: Very deep
Drainage class: Well drained
Position on the landform: Footslopes
Dominant parent material: Loamy slope alluvium over loess
Texture of the surface layer: Silt loam
Slope range: 12 to 30 percent

Minor Components

Similar soils:
- Brodale soils on shoulders and backslopes
- Elbaville and Gaphill soils on backslopes
- Hersey, Seaton, Mt. Carroll, and NewGlarus soils on summits, shoulders, and backslopes of hills

Contrasting components:
- Bellechester soils on backslopes
- Norden soils on summits, shoulders, and backslopes
- Rockbluff soils and Rock outcrop on shoulders and nose slopes
- Pits, quarry, hard bedrock, on summits and shoulders

Use and Management

Major uses: Dorerton—forest land and pasture; Pepin—cropland; Churchtown—cropland, forest land, and pasture

For general and detailed information concerning these uses, see Part II of this publication:

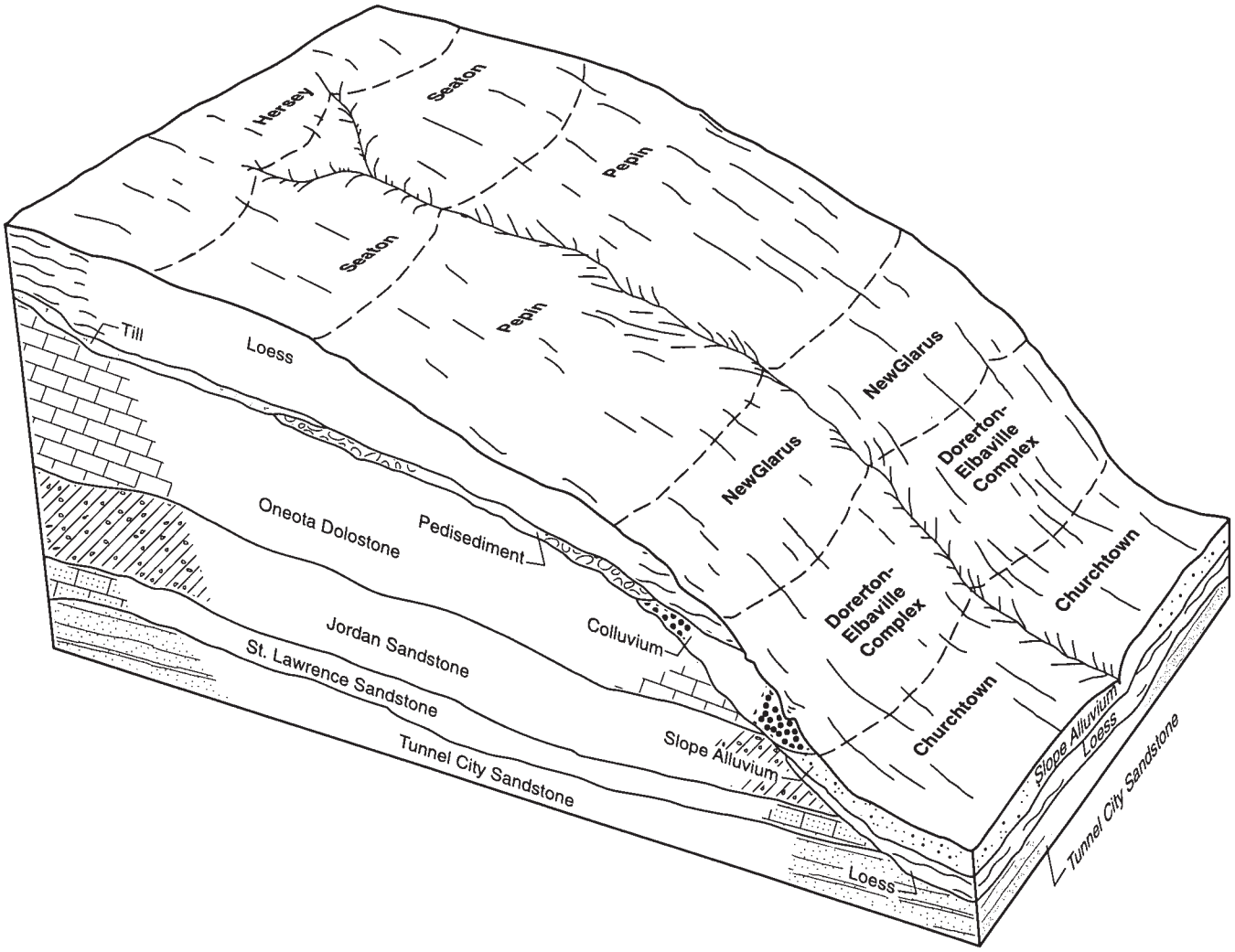


Figure 2.—Typical pattern of soils and parent material in the Pepin-Dorerton-Churchtown association.

- "Agronomy" section
- "Forest Land" section

2. Ella-Orion-Plumcreek Association

Setting

Landform: Stream terraces
Slope range: 0 to 45 percent

Composition

Percent of the survey area: 16
Extent of the components in the association (fig. 3):
Ella and similar soils—54 percent
Orion and similar soils—23 percent
Plumcreek and similar soils—12 percent
Minor components—11 percent

Soil Properties and Qualities

Ella

Depth class: Very deep
Drainage class: Moderately well drained
Position on the landform: Treads
Dominant parent material: Silty alluvium over silty to sandy slackwater deposits
Texture of the surface layer: Silt loam
Slope range: 1 to 12 percent

Orion

Depth class: Very deep
Drainage class: Somewhat poorly drained
Position on the landform: Drainageways
Dominant parent material: Silty alluvium
Texture of the surface layer: Silt loam

Slope range: 0 to 3 percent

Plumcreek

Depth class: Very deep
Drainage class: Well drained
Position on the landform: Risers
Dominant parent material: Silty and loamy slope alluvium over silty to sandy slackwater deposits
Texture of the surface layer: Silt loam
Slope range: 12 to 45 percent

Minor Components

Similar soils:
- Arenzville soils in drainageways on stream terraces
- Bearpen and Medary soils on treads of stream terraces
- Chaseburg soils on toeslopes of hills
- Churchtown soils on footslopes of hills
- Seaton soils on shoulders and backslopes of hills

Contrasting components:
- Ettrick, Houghton, and Palms soils in depressions and drainageways on stream terraces
- Plainfield soils on treads and risers of valley trains

Use and Management

Major uses: Ella—cropland; Orion—cropland, forest land, and pasture; Plumcreek—forest land and pasture

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

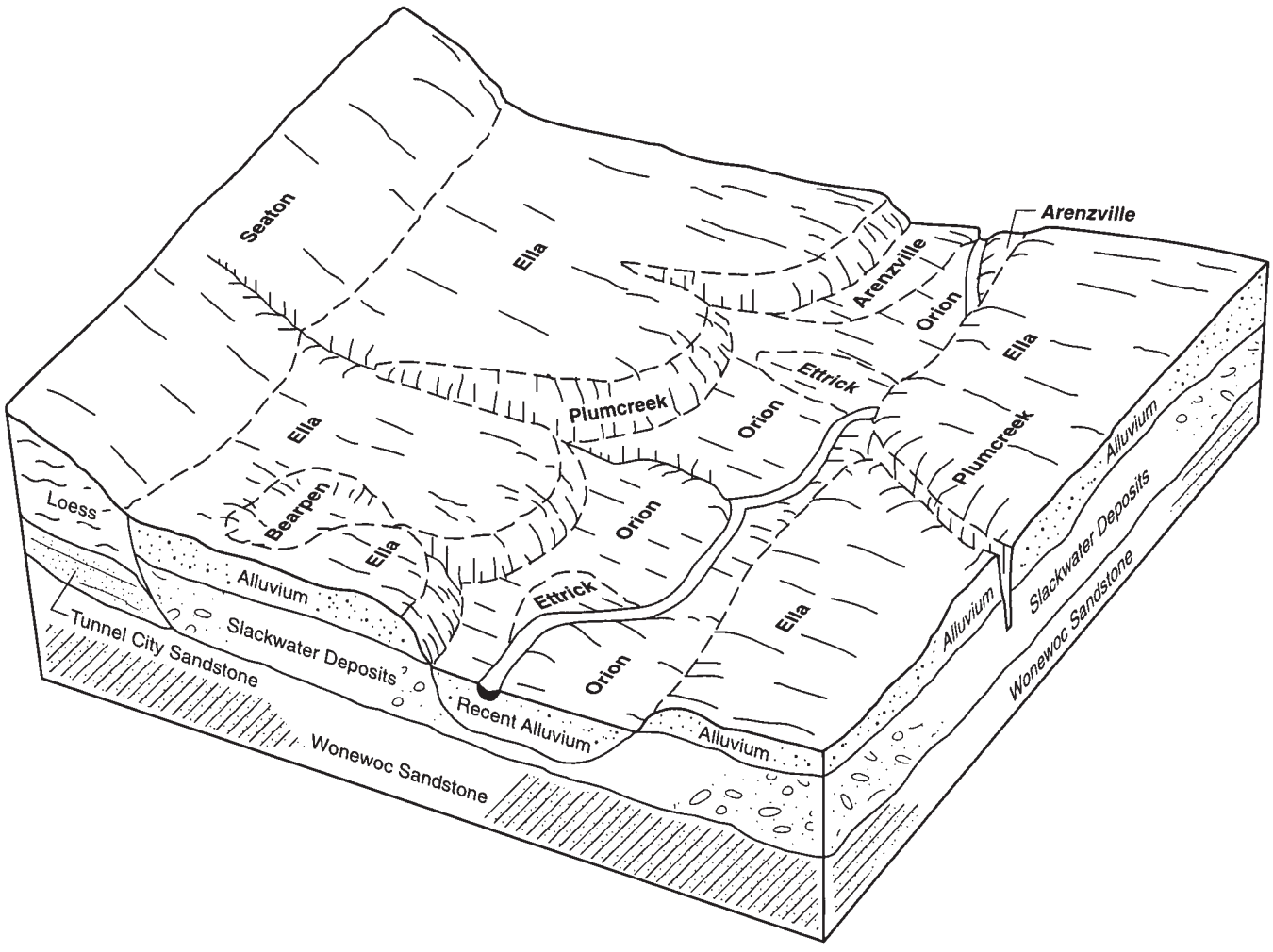


Figure 3.—Typical pattern of soils and parent material in the Ella-Orion-Plumcreek association.

3. Finchford-Plainfield-Burkhardt Association

Setting

Landform: Valley trains
Slope range: 0 to 60 percent

Composition

Percent of the survey area: 15
Extent of the components in the association (fig. 4):
Finchford and similar soils—41 percent
Plainfield and similar soils—25 percent
Burkhardt and similar soils—19 percent
Minor components—15 percent

Soil Properties and Qualities

Finchford

Depth class: Very deep
Drainage class: Excessively drained
Position on the landform: Treads
Dominant parent material: Sandy and gravelly outwash
Texture of the surface layer: Loamy sand
Slope range: 0 to 6 percent

Plainfield

Depth class: Very deep
Drainage class: Excessively drained
Position on the landform: Treads and risers

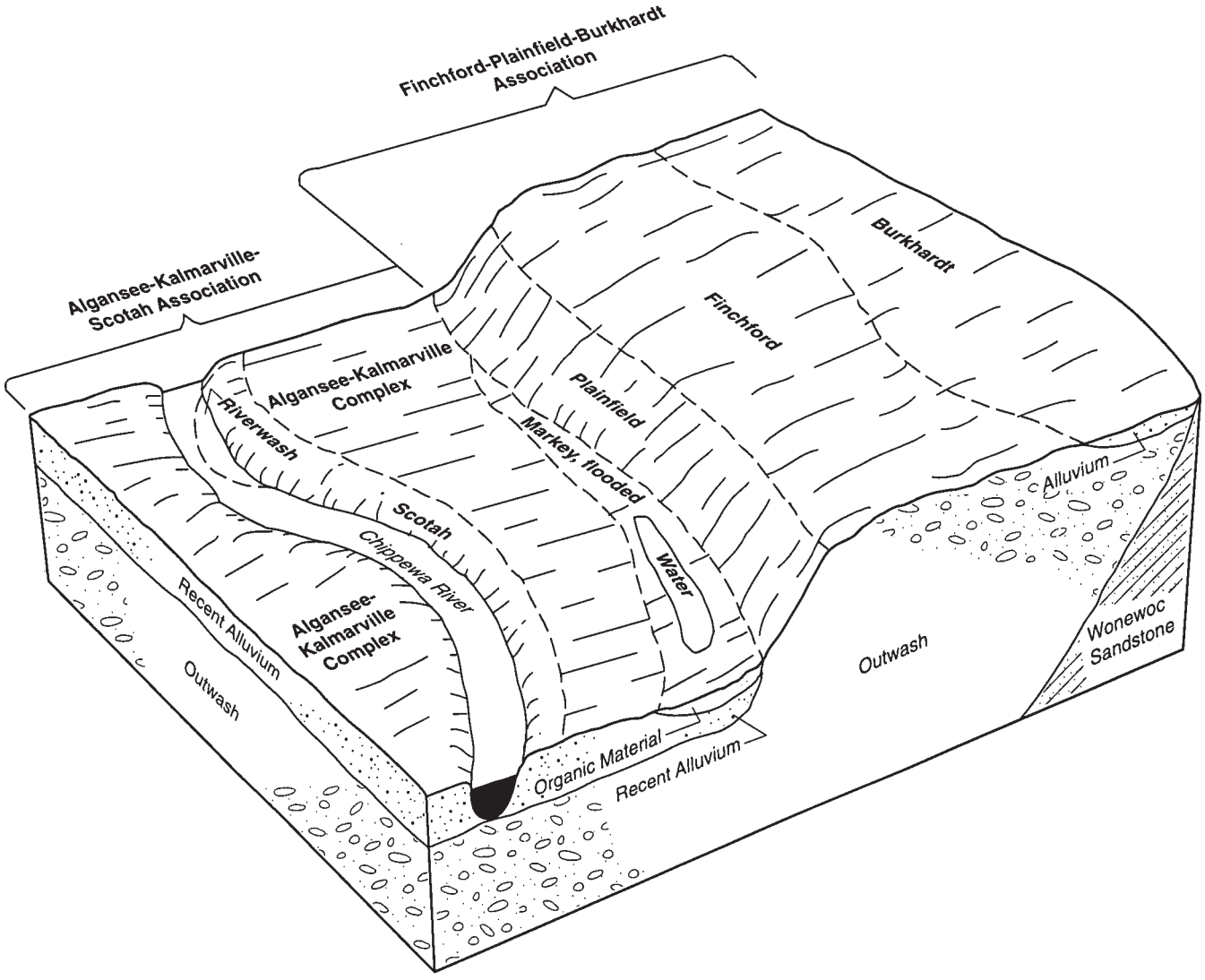


Figure 4.—Typical pattern of soils and parent material in the Finchford-Plainfield-Burkhardt and Algansee-Kalmarville-Scotah associations.

Dominant parent material: Sandy and gravelly outwash
Texture of the surface layer: Sand
Slope range: 0 to 60 percent

Burkhardt

Depth class: Very deep
Drainage class: Somewhat excessively drained
Position on the landform: Treads
Dominant parent material: Loamy alluvium over sandy and gravelly outwash
Texture of the surface layer: Sandy loam
Slope range: 0 to 6 percent

Minor Components

Similar soils:
- Aldo, Dakota, Komro, and Rasset soils on treads of valley trains
- Boplain soils on sand sheets and risers of valley trains
- Chelsea soils on dunes
- Prissel soils on treads and risers of valley trains

Contrasting components:
- Boguscreek soils in drainageways of valley trains
- Farrington, Hoopeston, Meridian, and Rusktown soils on treads of valley trains
- Forkhorn soils on treads and risers of valley trains
- Pits, gravel, on valley trains

Use and Management

Major uses: Finchford—cropland; Plainfield—cropland, forest land, and pasture; Burkhardt—cropland

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

4. Algansee-Kalmarville-Scotah Association

Setting

Landform: Flood plains
Slope range: 0 to 3 percent

Composition

Percent of the survey area: 7
Extent of the components in the association (fig. 4):
Algansee and similar soils—50 percent
Kalmarville and similar soils—28 percent
Scotah and similar soils—14 percent
Minor components—8 percent

Soil Properties and Qualities

Algansee

Depth class: Very deep
Drainage class: Somewhat poorly drained
Position on the landform: Low flats
Dominant parent material: Thin mantle of loamy alluvium over sandy alluvium
Texture of the surface layer: Fine sandy loam
Slope range: 0 to 3 percent

Kalmarville

Depth class: Very deep
Drainage class: Poorly drained
Position on the landform: Depressions and drainageways
Dominant parent material: Silty and loamy alluvium over sandy alluvium
Texture of the surface layer: Silt loam
Slope range: 0 to 1 percent

Scotah

Depth class: Very deep
Drainage class: Moderately well drained
Position on the landform: High flats and natural levees
Dominant parent material: Sandy alluvium
Texture of the surface layer: Loamy fine sand
Slope range: 0 to 3 percent

Minor Components

Similar soils:
- Ettrick soils in depressions and drainageways of flood plains
- Northbend soils on low flats of flood plains
- Dunnbot soils on high flats and natural levees of flood plains

Contrasting components:
- Markey and Palms soils in backswamps of flood plains
- Riverwash
- Water

Use and Management

Major uses: Algansee—forest land and wildlife habitat; Kalmarville—forest land and wildlife habitat; Scotah—cropland, forest land, and wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section
- "Wildlife Habitat" section

5. Urne-Drammen Association

Setting

Landform: Hills and sand sheets
Slope range: 1 to 45 percent

Composition

Percent of the survey area: 14
Extent of the components in the association (fig. 5):
Urne and similar soils—48 percent
Drammen and similar soils—42 percent
Minor components—10 percent

Soil Properties and Qualities

Urne

Depth class: Moderately deep
Drainage class: Well drained
Position on the landform: Summits, shoulders, and backslopes
Dominant parent material: Loamy slope alluvium over loamy residuum
Texture of the surface layer: Fine sandy loam
Slope range: 2 to 45 percent

Drammen

Depth class: Very deep
Drainage class: Somewhat excessively drained
Dominant parent material: Eolian sands and/or sandy alluvium
Texture of the surface layer: Loamy sand
Slope range: 1 to 20 percent

Minor Components

Similar soils:
- Boone soils on shoulders of hills

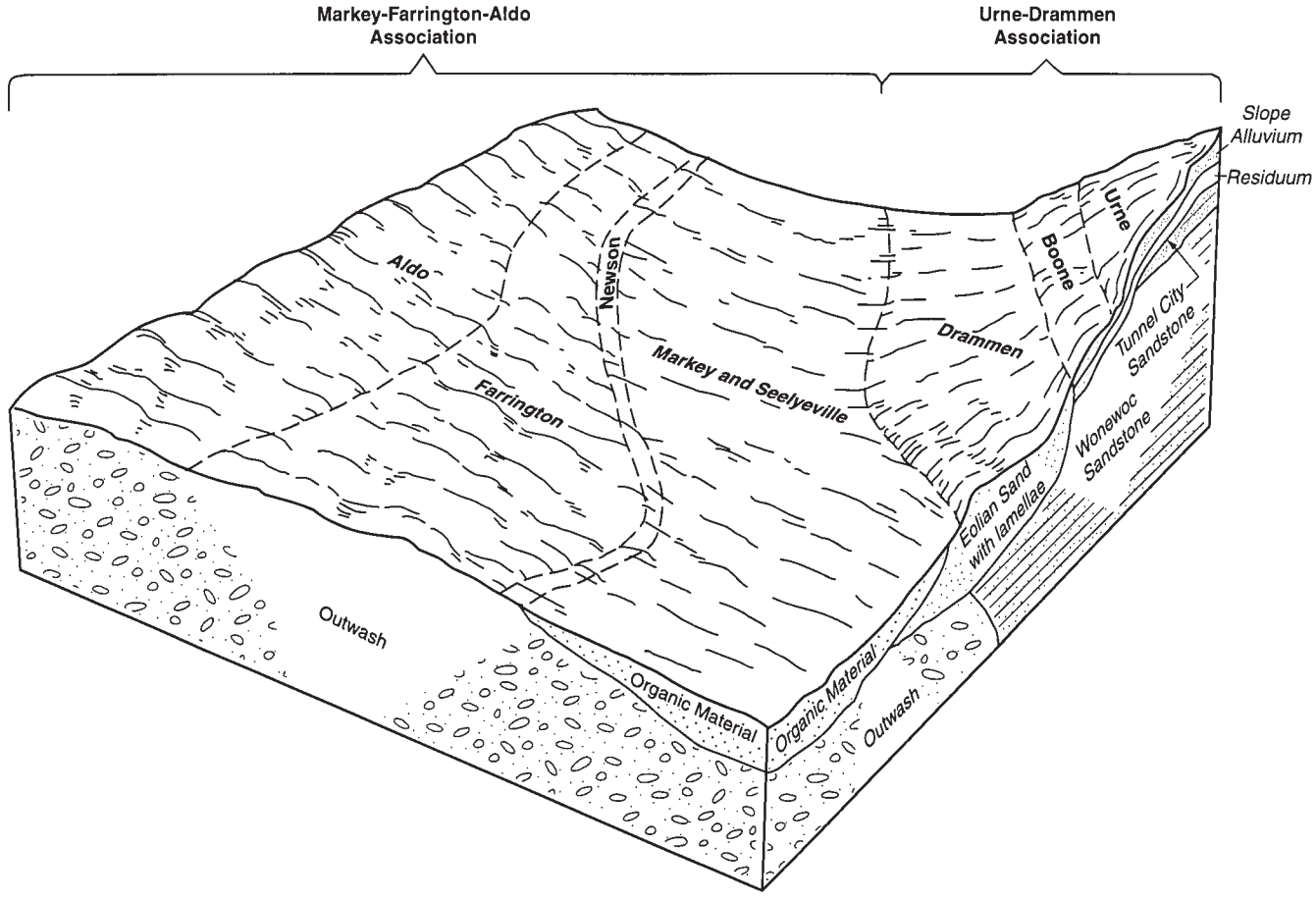


Figure 5.—Typical pattern of soils and parent material in the Urne-Drammen and Markey-Farrington-Aldo associations.

- Elevasil soils on summits, shoulders, and backslopes of hills
- Garne soils on sand sheets

Contrasting components:
- Churchtown soils on footslopes of hills
- Hoopeston soils on treads of valley trains
- Kevilar soils on valley trains
- Norden and Seaton soils on summits, shoulders, and backslopes of hills
- Plainfield and Prissel soils on treads of valley trains

Use and Management

Major uses: Cropland, forest land, and pasture

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

6. Markey-Farrington-Aldo Association

Setting

Landform: Valley trains
Slope range: 0 to 3 percent

Composition

Percent of the survey area: 6
Extent of the components in the association (fig. 5):
Markey and similar soils—50 percent
Farrington soils—28 percent
Aldo soils—18 percent
Minor components—4 percent

Soil Properties and Qualities

Markey

Depth class: Very deep
Drainage class: Very poorly drained
Position on the landform: Depressions
Dominant parent material: Organic materials over sandy and gravelly outwash
Texture of the surface layer: Muck
Slope range: 0 to 1 percent

Farrington

Depth class: Very deep
Drainage class: Somewhat poorly drained
Position on the landform: Treads
Dominant parent material: Sandy and gravelly outwash
Texture of the surface layer: Loamy sand
Slope range: 1 to 3 percent

Aldo

Depth class: Very deep
Drainage class: Moderately well drained
Position on the landform: Treads
Dominant parent material: Sandy and gravelly outwash
Texture of the surface layer: Sand

Minor Components

Similar soils:
- Komro soils on treads of valley trains
- Lows soils in drainageways of valley trains
- Newson soils in depressions and drainageways of valley trains
- Seelyeville soils in depressions of valley trains

Contrasting components:
- Finchford and Plainfield soils on treads of valley trains

Use and Management

Major uses: Markey—wetland wildlife habitat; Farrington and Aldo—cropland

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Wildlife Habitat" section

7. Norden-Seaton Association

Setting

Landform: Hills
Slope range: 2 to 45 percent

Composition

Percent of the survey area: 6
Extent of the components in the association:
Norden soils—54 percent
Seaton soils—42 percent
Minor components—4 percent

Soil Properties and Qualities

Norden

Depth class: Moderately deep
Drainage class: Well drained
Position on the landform: Summits, shoulders, and backslopes
Dominant parent material: Loess over loamy residuum
Texture of the surface layer: Silt loam
Slope range: 2 to 45 percent

Seaton

Depth class: Very deep
Drainage class: Well drained
Position on the landform: Summits, shoulders, and backslopes
Dominant parent material: Loess
Texture of the surface layer: Silt loam
Slope range: 2 to 20 percent

Minor Components

Similar soils:
- Churchtown soils on footslopes of hills
- Hixton soils on shoulders and backslopes of hills

Contrasting components:
- Elevasil and Urne soils on shoulders and backslopes of hills

Use and Management

Major uses: Cropland, forest land, and pasture

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Formation and Classification of the Soils

In this section, the evolution of the general landscape of the survey area is described and the soils in the survey area are related to the major factors of soil formation. Also, the system of soil classification is described.

Landscape Evolution

Robert W. Baker, Ph.D., geologist, University of Wisconsin-River Falls, and Kent M. Syverson, Ph.D., geologist, University of Wisconsin-Eau Claire, helped prepare this section.

The ridge-and-valley landscape of Pepin County is the eroded remnants of an ancient plain that covered Wisconsin and the adjacent states. The development of the ridges and valleys from the ancient plain has spanned eons of time. Geologists divide this time frame based on rock mineralogy and fossils. A sequence of events through these eons of time shaped the presentday landscape.

Ancient Seas

About 540 million years ago, a series of shallow seas began to invade or transgress the low-lying parts of the continent. The onset of this invasion marks the beginning of the Cambrian Period, the earliest part of the Paleozoic Era.

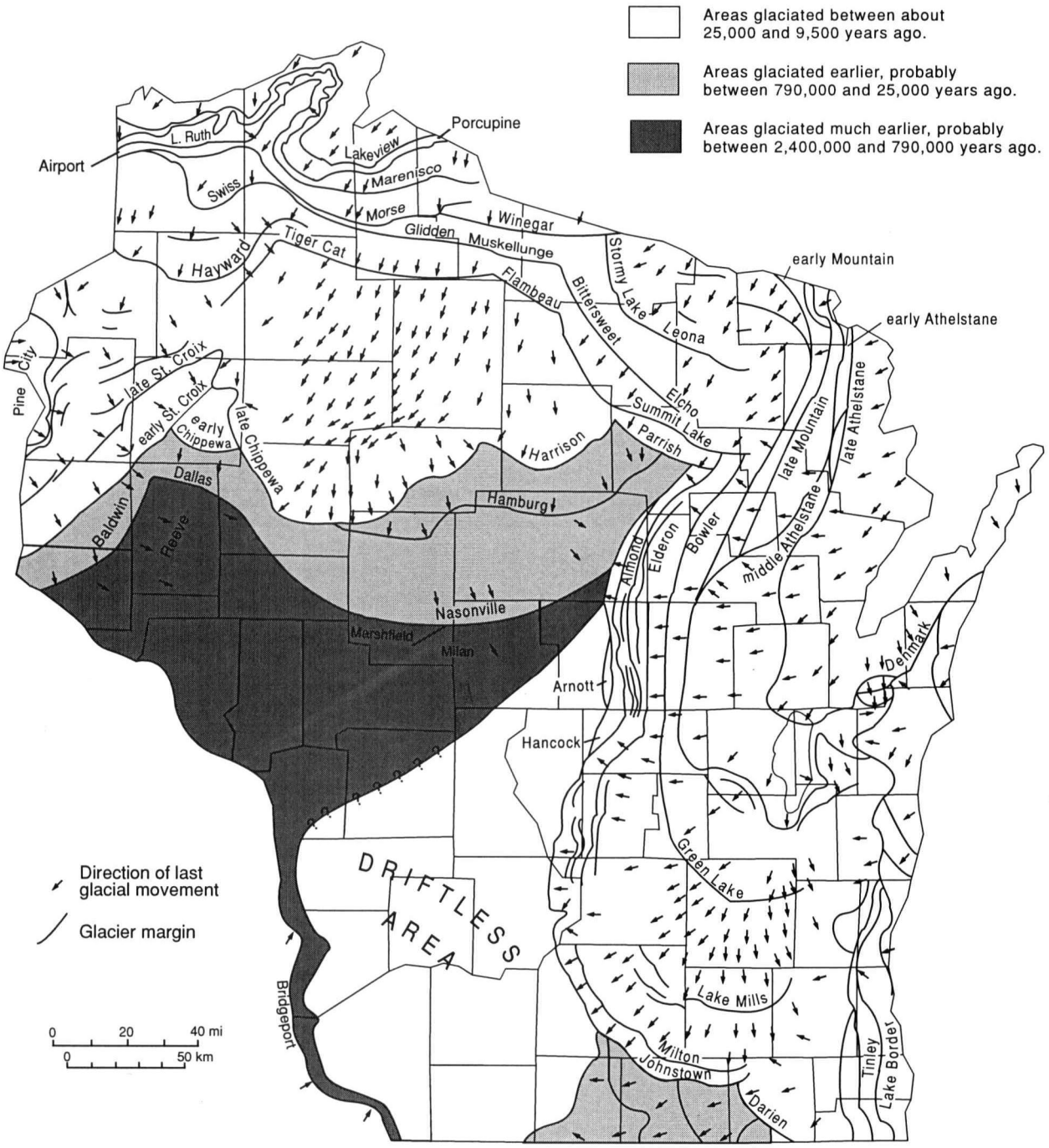
Later, during the Ordovician Period of the Paleozoic Era, another invasion of the sea took place and about 70 percent of North America was under water. During Cambrian and Ordovician time, streams carried upland sediment to the seas. The kinds of minerals and particle size of the sediment were dependent upon the chemical and physical makeup of the upland material and on the nearness to the mineral source. The source probably varied with time as surrounding lands were elevated or lowered by subsidence or erosion (Austin, 1972). During the Cambrian, dominantly sandy sediment was deposited. Clastic sediment supply decreased during the Ordovician Period, so the sediment was characterized dominantly by the deposition of limy mud, a mixture of minerals and the remains of teeming plant and animal life. Mollusks, brachiopods, corals, and crinoids, animals that build calcium-carbonate skeletons, were common.

The sediment was cemented and compressed into rock. The sandy sediment formed sandstone, and the limy mud formed limestone, dolostone, or shale.

Pre-Illinoian Ice Age

The Pleistocene Epoch, known as the ice age, is a more recent major geological event that helped to shape the presentday landscape. During this period, ice fields formed in the polar and mountainous regions and glaciers advanced several times into western Wisconsin (Attig, 1993). This pre-Illinoian glacial history is sketchy because of erosion and truncation of deposits by later glacial events, postglacial erosion, and limited exposures of glacial deposits. The earliest known glacial advance in western Wisconsin was from the west and has been called the Reeve Advance (Johnson, 1986). During the Reeve Advance, the Des Moines Lobe flowed eastward from Minnesota into western Wisconsin. The minimum extent of the ice is defined by the eastern boundary of tills of the Pierce Formation (fig. 6). In the western part of Pepin County, a thin mantle of till persists. This till is formally known as the Hersey Member of the Pierce Formation. In the unweathered state, typically below the depths of observation in Pepin County, the Hersey Member is consistently dark gray to black loam and is strongly calcareous. The weathered till is typically noncalcareous, yellowish brown, dark yellowish brown, light olive brown, or olive brown loam or clay loam. The calcareous nature, color, texture, and lithology of the unweathered Hersey Member are typical of glacial deposits in Iowa and Minnesota that have northwestern (Manitoba) sources. The Reeve Advance occurred during pre-Illinoian time at least 460,000 years ago and possibly as much as 770,000 years ago (Baker and others, 1983). Hersey soils are associated with these till remnants.

Recent research in Wisconsin and Minnesota indicates that the deeply incised valley of the Upper Mississippi River and its adjacent tributaries were in



existence well before mid-Pleistocene time. Stratigraphic relationships and Uranium-series and paleomagnetic dating strongly suggest that the deep landscape incision had already occurred prior to the occurrence of the first glaciers in this region (Baker and others, 1997).

Illinoian and Wisconsinan Glaciation

The next glacial units observed in west-central Wisconsin were deposited by the Superior and Chippewa Lobes during the Illinoian or Early Wisconsinan Glaciations and are found as far south as

Pierce and Dunn Counties. This glacial sediment is part of the River Falls Formation (fig. 7) and was deposited by the Baldwin Advance of the Superior Lobe and the Dallas Advance of the Chippewa Lobe (Johnson, 1986). These units probably were deposited during the Late Illinoian or Early Wisconsinan Glaciations, but no accurate dates have been obtained (Attig and others, 1988). It is not known whether these units extended south into Pepin County.

This major episode of glacial advance was followed by glacial retreat, a period of weathering, and then several episodes of Late Wisconsinan Glaciation, which terminated more than 20 miles north of Pepin County.

Glaciers may have covered all of Pepin County, based on glacial evidence found in other counties (Clayton and others, 1991). Recent research has uncovered evidence 3 to 5 km into an area in Eau Claire County formerly considered part of the Driftless Area. Lithology of the erratics suggest a northern Wisconsin source and an ice advance from the northeast during pre-Wisconsinan time. This proposed ice margin is within 15 miles of the Pepin-Eau Claire County line (Bement and Syverson, 1995).

Even if these later ice advances never reached Pepin County, the frigid glacial climate undoubtedly accelerated erosional processes in the area. Permafrost is believed to have persisted in central Wisconsin during the last part of the Wisconsinan Glaciation when the Laurentide Ice Sheet stood at its maximum extent. Permafrost resulted in arrested soil development and accelerated erosion of the landscape well beyond the ice sheet. Since the end of permafrost, the landscape has been relatively stable. The landscape continued to be modified, however, by many geomorphic processes (Attig, 1993). Valleys continued to widen, deepen, and lengthen. Streams continued to carve their way headward into the landscape. They intercepted many solution cavities in the dolostone layers. Rock was easily removed from these settings. Gravitational forces along with water carried the rock downslope, reducing the fragments from stones and boulders to cobbles and pebbles. This cobbly loamy colluvium is coarser textured and thinner near the shoulder slope and is finer and thicker where deposited near the footslopes. Dorerton soils are associated with loamy colluvium derived from dolostone on steep backslopes.

Resultant Bedrock Landscape

The remaining bedrock-controlled plain, or Prairie du Chien surface, is the largest upland surface in the county. The only remaining member of the Prairie du Chien Group, the Oneota dolostone, forms the bedrock surface at the highest elevations on the landscape.

The Prairie du Chien surface is thinly mantled with a dominantly reddish, clayey pedisediment that is thickest on the ridgetops and becomes thinner downslope. The pedisediment is believed to be derived from the weathering and associated erosion of the bedrock surfaces above the Prairie du Chien during the long period of time between the retreat of the seas and the onset of the glacial age. It is likely that glaciation has altered and contributed to this clayey material in Pepin County. Texture is extremely variable, ranging from sandy to very clayey. The sediment contains an abundance of chert channers and flagstones. NewGlarus and Pepin soils are associated with the dolostone and the clayey pedisediment.

The Oneota Formation and the underlying Upper Cambrian sandstones and siltstones—the Jordan, St. Lawrence, Lone Rock, and Wonewoc Formations—are the influential bedrock types in the county (fig. 8). Where ridges are thinly capped by the more resistant Oneota dolostone and underlain by the softer Jordan sandstone, the tops are narrow, craggy, and castellated and the valleys tend to be V-shaped. Gaphill and Rockbluff soils are associated with the Jordan sandstone. Where the ridges are capped by the relatively soft Lone Rock sandstone and siltstone, the crests are broad and well rounded and the valleys are a mile or more in width. Norden and Urne soils are associated with the Lone Rock sandstone and siltstone.

Sandstone of the Wonewoc Formation is found at the lower elevations on hills and at various depths underlying the valley trains. Soils associated with the Wonewoc sandstone formation are Boone and Elevasil soils on hills and Boplain soils on sand sheets and valley trains.

Dry Winds

Another significant landscape modifier was wind. During the latter stages of the most recent ice age, called the Wisconsin stage, intense winds carried loess onto the landscapes. On hillslopes the Peoria Formation, deposited between about 12,000 and 26,000 years before present (Ruhe, 1969), is typically the only loess unit present. The mostly silt-sized particles were deposited on the deeply dissected land surface much like a blanket of snow during winter storms. The unweathered basal portion of the Peorian Formation is massive and calcareous, and the weathered upper portion is leached and noncalcareous (Leigh and Knox, 1994). Loess is

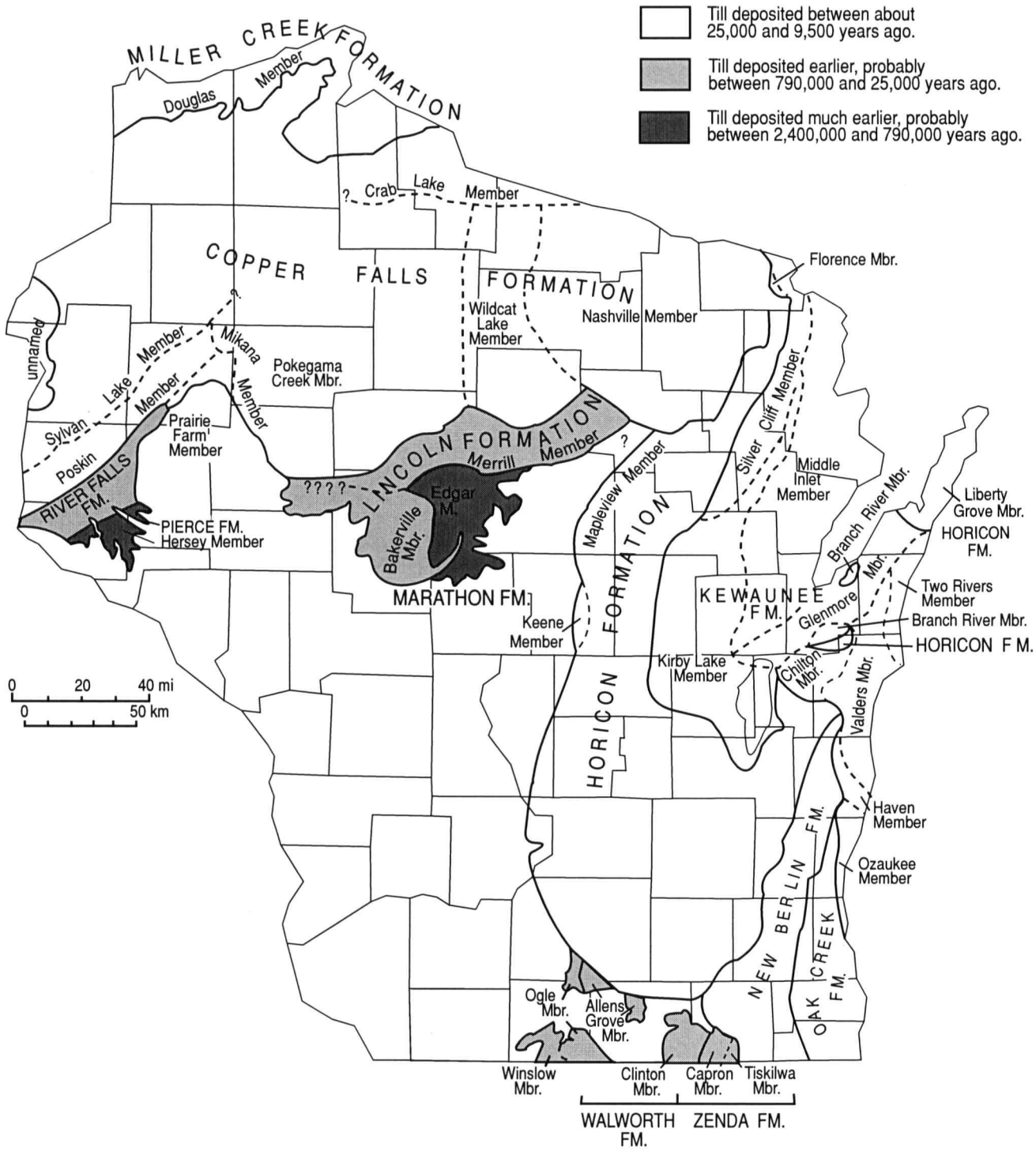


Figure 7.—Distribution of Pleistocene lithographic units in Wisconsin. In this illustration, formations are separated by solid lines and members are separated by dashed lines. Only the extent of fairly continuous till in each member is shown; scattered small patches of till and meltwater-stream and glacial-lake sediment are not shown. (Lee Clayton, John W. Attig, David M. Mickelson, and Mark D. Johnson, University of Wisconsin-Extension Educational Series 36, revised 1992)

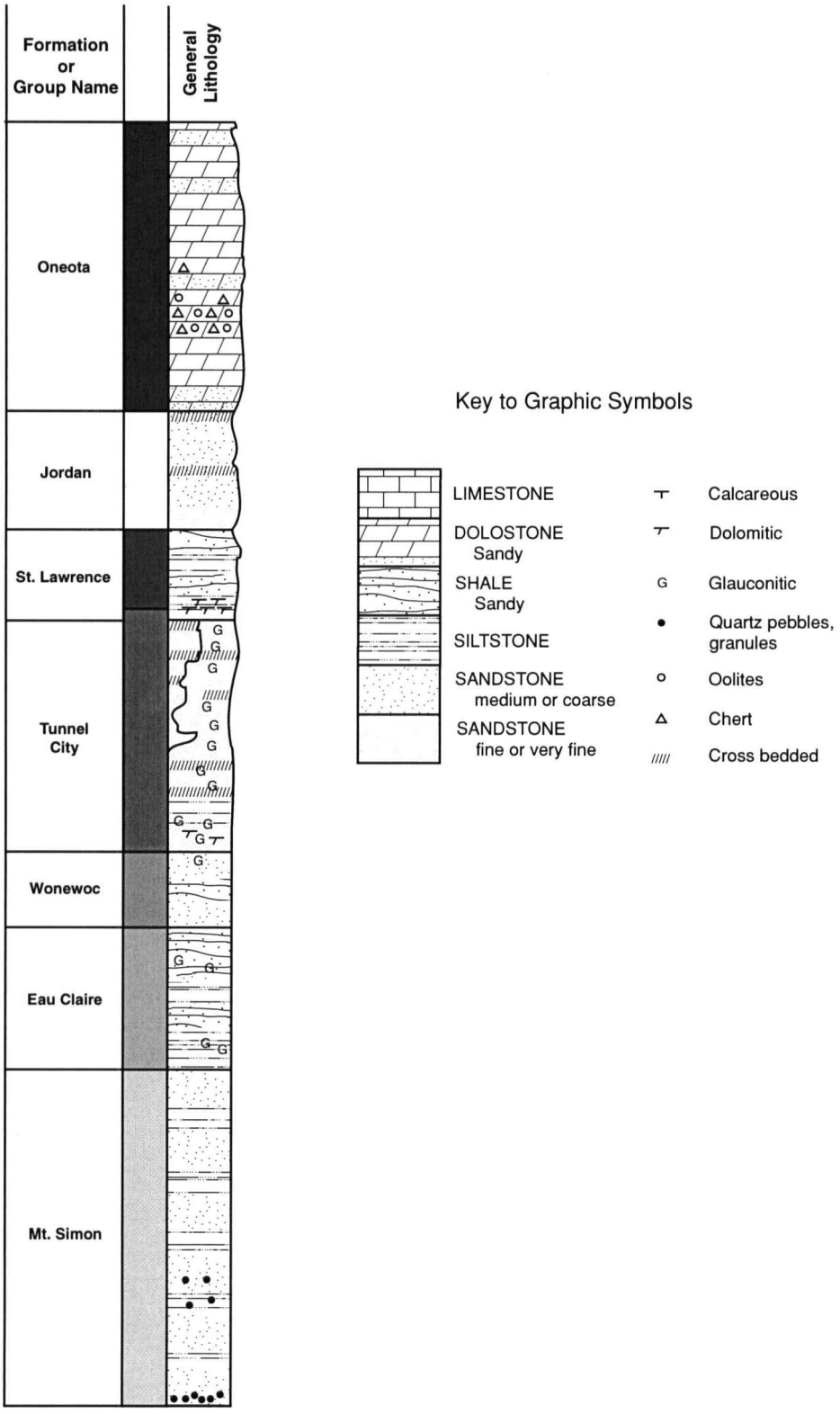


Figure 8.—Stratigraphic column showing the sequence of bedrock formations in the survey area and their general lithology.

generally coarsest and thickest near large river valleys, and it becomes finer and thinner with increasing distance from the valleys. The main source of the loess was the valley floors of the Mississippi River and its tributaries (Ruhe, 1969). The loess is as much as 10 feet thick, or even thicker, on the broader summits near the main sources and becomes thinner as ridges narrow and slope increases. Seaton and Mt. Carroll soils formed in very deep loess. Where slope gradient and width of ridges are equal, the loess is thinnest on northwest aspects and thickest on southeast aspects.

Wind also was able to move coarser particles of sand size into dunes in places on the valley trains where air currents were able to generate sufficient energy. Chelsea soils formed in eolian sand on dunes. East of the Chippewa River and to the east of the valley train, many valleys have a surficial mantle of eolian sand that lacks both the coarser sands and gravel common to the valley train and the discernible slip faces that are common with dunes. Drammen soils formed in eolian sand on sand sheets.

Melting Ice

During the latter stages of the Pleistocene, which ended about 9,500 years ago, massive ice fields to the north and west melted. Torrential flows of meltwater swelled streams that served as meltwater outlets. The Mississippi, Chippewa, and Eau Galle Rivers and Bear and Plum Creeks carried the meltwater from receding ice sheets. Large quantities of gravel and sand carried from the ice fields were deposited as outwash, forming the valley trains. Later successive river incisement left these coarse textured materials as terraces. Finchford and Burkhardt soils are associated with these valley train terraces. The oldest terraces may be covered by younger sand dunes and thick eolian sand sheets in the main valley.

In some smaller tributaries, terraces at similar elevations formed from much finer material through a unique process. Sediment aggradation from glacial meltwaters in the adjacent major river channels hydraulically dammed tributary mouths. This damming resulted in periodic flooding of the lower reaches of the tributaries, between about 18,000 and 13,000 years before present, creating slackwater conditions. During this same period the loess blanket covering the sediment on the ridges and footslopes was partially stripped by erosion. Much of the eroded loess was deposited in valleys below as a thin layer, mostly of silt. Also during this period, large floods produced by glacial lake outbursts passed down the valley repeatedly, backflooding the lower reaches of tributaries and adding to the slackwater conditions in the tributaries (Bettis and others, 1992). Superior-Basin source floods carried distinctive reddish brown silty clays, but western-source floodwaters did not. Alluvial deposits underlying the tributary-valley terraces are predominantly laminated and thinly bedded silt that, in areas closer to the major river channel, is interbedded with sand. The dominance of silt reflects the significant contributions from local loess deposition on adjacent landscapes and slope erosion as well as the large silt load of the glacier-fed rivers. Beds of reddish brown clay are commonly interstratified with the silt. These clays may be a result of the Superior-Basin source floods, the clayey pedisediment present on the nearby ridgetops, or both. Ella, Bearpen, Medary, and Plumcreek soils are underlain by slackwater deposits.

The lower younger terraces are dominantly sandy and gravelly outwash in the Mississippi Valley and correlative terraces in some tributaries. Some swales and paleochannels on the terrace surface have a veneer of finer textured sediment that may be overbank deposits from later floods (Bettis and others, 1992).

Stream Cutting

When the glacial ice retreated and the sediment-laden, torrential flows ceased, the water level in the Mississippi River and its tributaries fell and a new incisement cycle, enhanced by a much-reduced sediment load, began in the valleys. Tributary streams cut into their flood plains, adjusting to the lowered water level of the Mississippi River. In a relatively short time period, a large portion of the flood plains of glacial times was removed. Narrow, dissected terraces, mere remnants of the original valley train, are all that remain. Plainfield soils formed on the narrow, very steep, elongated terrace risers.

Recent Deposition

During the past 9,500 years, sediment has continually been deposited on the floor of flood plains. However, a dramatic change in the environment took place about 150 years ago. Agricultural practices of the European settlers destroyed the protective covering of sod and forest litter and accelerated erosion processes. In some drainageways this post-settlement alluvium is quite significant. Deposits of 2 to more than 5 feet of alluvium are common. Arenzville, Orion, and Ettrick soils formed in post-settlement silty alluvium.

Factors of Soil Formation

The characteristics and properties of soil are a result of interactions, over time, of climate, living organisms, parent material, and landscape setting. The interaction of these factors generates complex physical, chemical, and biological processes. These processes, working over time, form definite layers, or horizons, in the soil. These layers—surface layer, subsurface layer, subsoil, and substratum—are defined in the Glossary.

Climate

Climate influences soil formation by providing moisture and heat necessary for the weathering of parent material. Water dissolves soluble materials and transfers nutrients to the lower parts of the soil. Water also is needed to alter minerals to clay and transfer the clay to the lower layers. Reaction, or pH, is largely influenced by climate. Temperature affects the rate at which chemical reactions proceed. Chemical reactions are slower at freezing than at a higher temperature. Moisture and temperature affect the kinds of plants that grow on the soil. Further organic matter accumulation and decomposition are influenced by moisture and temperature and by vegetation.

The effects of climate are modified by landscape setting and parent material. Relatively large amounts of water are available for soil-forming processes in loess on the hill summits. Little is available for plants in outwash on the valley trains, where much of the rainfall passes through the soil rapidly or where slopes are steep and water runs off quickly. Climate may not remain constant throughout the development of the soil. When drastic climate changes take place, soil-forming processes most likely are altered and a new cycle of soil formation begins. These climate changes can modify the time factor, as the age of the new soil development must be measured from the beginning of the climatic change. Pepin County's oldest landscapes have most likely seen several climatic changes and gone through several cycles of soil formation.

Wind can affect the development of soil by adding or removing fine particles of soil or organic matter. It affects the moisture content of soils by influencing the rate of evaporation.

Climate can also have more localized effects. For example, north- and east-facing slopes tend to be cooler and wetter than south- and west-facing slopes. Depressional areas generally have cooler temperatures for a longer part of the year than summits and slopes of hills.

Pepin County has a cool, subhumid continental climate that favors the growth of trees and the formation of leached, acid soils with a thin, dark surface layer and a clay-enriched subsoil. Present climatic differences within the county are too small to have resulted in major differences among the soils.

Living Organisms

Living organisms, both plants and animals, affect soil formation by providing organic matter and transferring nutrients from the lower layers of the soil to the upper layers. Plants influence the development of specific layers in the soil. Vegetation influences the rate at which clay is transferred from the surface layer to the subsoil. Plants and animals are related to other factors of soil formation, such as soil microclimate, parent material, and landscape setting, all of which collectively can determine the vegetation that grows on a soil.

At the time of settlement, forests covered most of Pepin County. Mean annual precipitation is sufficient to grow trees on any of the soils; however, natural fires on some soils, such as Burkhardt soils, were common and helped to maintain the grass vegetation. Native Americans who lived in the area and used these soils also used fire to maintain grass vegetation for ease of cultivation and for attracting game animals. When protected from fire, these soils would follow a succession from grass and forbs to shrubs and finally to oak and pine forest. Many soils on the broad valley trains of the Chippewa and Mississippi Rivers formed under tall grass prairie. Areas between the prairies and the deciduous forests were called savannas.

The most striking feature of a prairie or savanna soil profile is the deep layer of organic matter accumulation—commonly 20 inches or more—and the somewhat darkened subsoil beneath. Examples of this process are the thick, darkened A and AB horizons in the Finchford soils. Prairie soils contain as much as 120 tons of organic matter per acre, compared with 70 tons per acre for forested soils. A dense network of grass roots fills the profile, and most of the roots extend to a depth of 5 to 7 feet. Forb roots of various shapes and lengths are interspersed; some penetrate to a depth of 20 feet. In contrast to forest soils, where organic matter enters the soil from the surface and must be "plowed in" by earthworms, the organic matter deeply incorporated in prairie soils comes from the roots as they decay in place. There is little input from litter at the surface.

Mound-building ants play an important role in the development of prairie soils. They mix and aerate the

soil as they build their tunnels and bring up nutrients and clay particles from the subsoil. Their activities increase potassium and phosphorus levels in the topsoil.

When a prairie burns, nitrogen in the litter is oxidized and escapes from the prairie ecosystem. Nitrogen is returned to the system through nitrogen-fixing bacteria in the root nodules of the plentiful prairie legumes and also through free-living nitrogen-fixing bacteria in the root zones of the prairie grasses.

It was the deep, rich prairie soils that eventually led to the nearly total conversion of tall grass prairie to agricultural crops (Packard and Mutel, 1997).

Landscape Setting

The term landscape setting involves many facets. Landscape setting indicates the broad location of the soil, such as hills, stream terraces, valley trains, or flood plains (fig. 9). It also includes such characteristics as slope gradient, length, shape, uniformity, and aspect. Landscape setting interrelates with climate by affecting runoff, which influences the amount of moisture available for the soil-forming processes and the removal of material by erosion. Where runoff is very rapid, as on a steep nose slope, soil formation proceeds slowly. Where runoff is slow, moisture may be abundant and soil formation proceeds at a faster rate.

Parent Material

Parent material largely determines the physical and chemical properties of the soil, such as the capacity or ability of the soil to store water and nutrients for plants and the rate at which water can pass through the soil. In Pepin County the soils formed in a wide variety of parent materials. The soils on hills formed in loess, till, pedisediment, residuum, slope alluvium, and colluvium. The soils on valley trains formed dominantly in outwash with influence from alluvium, eolian sands, and organic materials. The soils on stream terraces and flood plains formed in alluvium, slackwater deposits, and organic materials.

Time

Time is required by climate, by plants, and by animals to form soil from the parent material. Various soils have developed over periods of time ranging from a few years to many thousands of years. The effect of time on soil is modified by all the other factors of soil formation.

The length of time in which soils are exposed at the surface is a modifying factor in soil formation. Soils can be no older than the age of the landscape surface upon which they form (Ruhe, 1975). Not all the soils that form the surface of the landscape in Pepin County are the same age. Landscapes erode back from their base level along streams and rivers to near the landscape summit. The summit remains stable, little affected by erosive forces. Where carbonates were present in the loess, they are typically deeply leached, and the soils are well developed and are relatively older than the soils downslope. Downslope erosion over long periods of time has exposed fresh material. The Lone Rock sandstone, for example, was exposed to weathering much later in time than the sediment overlying the Oneota dolostone formation several hundred feet higher on the landscape. Urne soils formed in the Lone Rock Formation and are therefore younger than the Pepin soils that formed in the Oneota Formation.

Another factor modifying the effects of time is the rate at which parent material can be transformed into soils. The small particles in loess, for example, weather relatively rapidly. On the other hand, the larger particles in sandstone bedrock and in outwash on valley trains have a high proportion of slowly weatherable minerals, such as quartz, and are transformed very slowly into soils that have distinct layers.

Landscape setting modifies the time factor because rainfall runs rapidly off steep slopes. Only a small amount of water enters the soil to form clay or leach carbonates and other soluble material.

Time is also modified by the effects of climate. The soils of Pepin County formed in a climate that has varied during their formation. During the early stages of soil formation, the climate was cold because of the proximity to glacial ice to the west, north, and east. The early vegetation consisted of conifers followed briefly by oaks. These species were short lived following the retreat of glacial ice northward. The ensuing climate was warmer and drier and caused prairie plants to migrate eastward (Borchart, 1950).

About 4,000 to 5,000 years ago, the climate became cooler and more moist. The big woods spread westward once again. Aspect and topography were also factors in the expansion of the woodland. Timber probably became established first on the sheltered north- and east-facing footslopes. Trees may have even persisted here during the eastward migration of the prairie. From these sheltered sites, timber spread out onto the silty and loamy terraces and upward onto the ridgetops. Except for very steep south- and west-

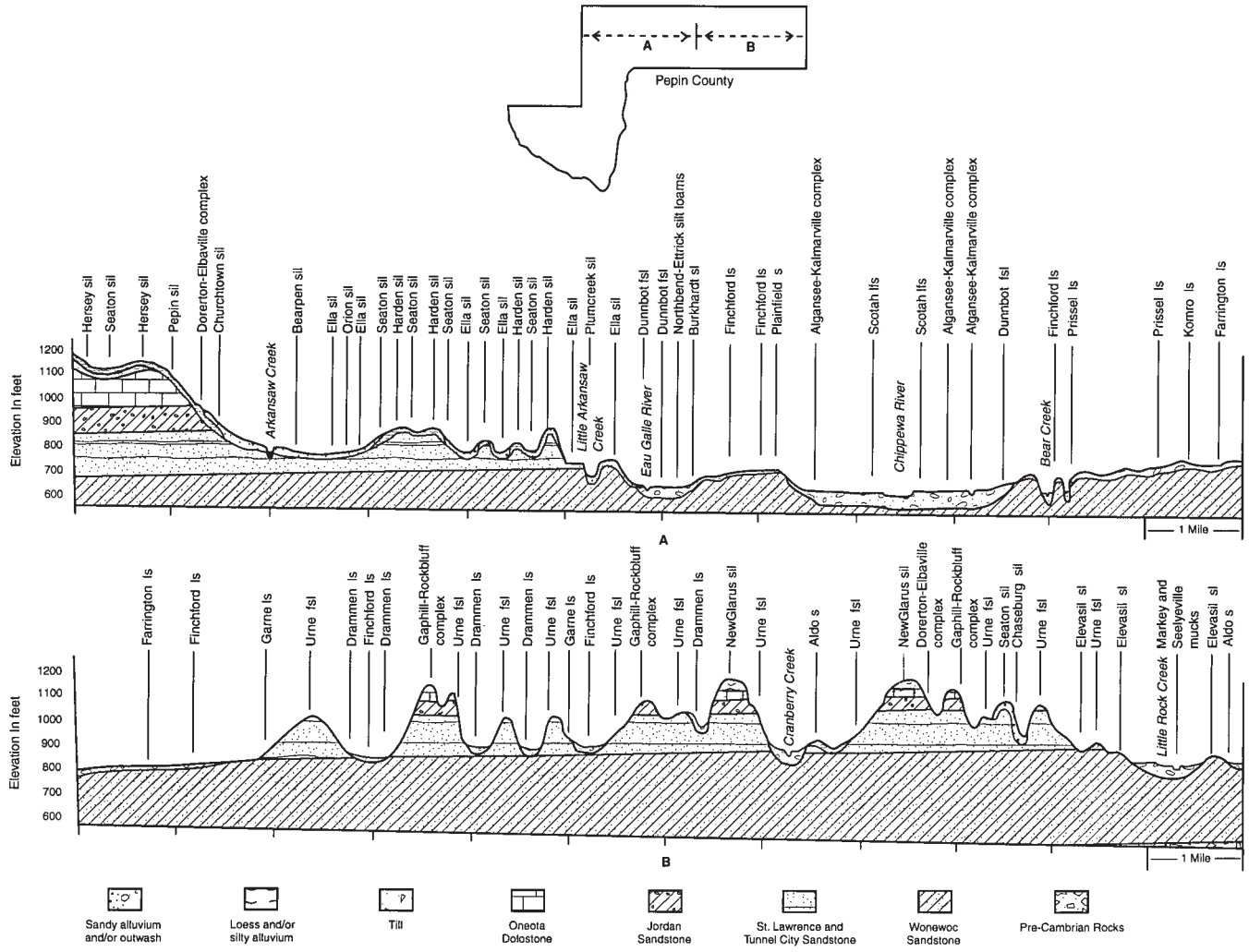


Figure 9.—Cross section showing the geology and the associated soils in Pepin County.

facing slopes along the Mississippi River and broad sandy areas along major rivers, the county at the time of settlement was covered with woodland.

The character of the soils encroached upon by woodland changed in response to processes generated by the timber. Forests produce little organic matter, most of which accumulates on the soil surface. In contrast, the prairie soils build up large amounts of organic matter and form a thick dark surface layer.

The organic matter produced by the decay of leaves, limbs, and trunks is more acid than that produced by prairie vegetation. The strong acids formed by water percolating through the surface litter and into the soil increased the mobility of clay, organic matter, and oxides and allowed them to be leached away or to accumulate in the subsoil. The dark surface layer of soils that had previously formed under prairie vegetation gradually became thinner. As clay and organic matter were removed, a thin bleached subsurface layer began to form just below the thinning surface layer. Clay and organic matter accumulated as thin waxy films on blocky peds in the subsoil and along cracks and pores formerly occupied by roots. Fully developed forest soils, such as Seaton and Norden soils, have a black or very dark brown surface layer 2 to 4 inches thick; an ashy, grayish subsurface layer that is low in clay and organic matter and is 5 to 10 inches thick; and a subsoil with structural development and clay and organic matter on blocky structural surfaces. When the land was cleared and cultivated, the thin surface and subsurface layers were commonly lost to erosion, and in many places tillage mixed the remaining upper layers with material from the upper part of the subsoil.

Some soils, such as Mt. Carroll soils, reflect the influence of both prairie and woodland because

woodland did not persist long enough to alter the prairie soils completely.

Assuming all other factors are equal, soils form more rapidly in warmer, more humid conditions than the present climate affecting Pepin County. Soils are frozen to some depth and the soil-forming process is drastically reduced for much of the year in a cool, subhumid continental climate.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (USDA, 1999). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. The table "Classification of the Soils" in Parts I and II of this publication shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Twelve soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Alfisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udalf (*Ud*, meaning dry, plus *alf*, from Alfisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludalfs (*Hapl*, meaning minimal horizonation, plus *udalfs*, the suborder of the Alfisols that has a udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludalfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, thickness of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-silty, mixed, superactive, mesic Typic Hapludalfs.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Classification of the Soils

Soil name	Family or higher taxonomic class
Aldo	Mixed, mesic Typic Udipsamments
Algansee	Mixed, mesic Aquic Udipsamments
Arenzville	Coarse-silty, mixed, superactive, nonacid, mesic Typic Udifluvents
Bearpen	Fine-silty, mixed, superactive, mesic Aquic Argiudolls
Bellechester	Sandy, mixed, mesic Entic Hapludolls
Boguscreek	Coarse-silty, mixed, superactive, nonacid, mesic Mollic Udifluvents
Boone	Mesic, uncoated Typic Quartzipsamments
Boplain	Mixed, mesic Typic Udipsamments
Brodale	Loamy-skeletal, carbonatic, mesic Entic Hapludolls
Burkhardt	Sandy, mixed, mesic Typic Hapludolls
Chaseburg	Coarse-silty, mixed, superactive, nonacid, mesic Typic Udifluvents
Chelsea	Mixed, mesic Argic Udipsamments
Churchtown	Fine-silty, mixed, superactive, mesic Mollic Hapludalfs
Dakota	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, mesic Typic Argiudolls
Dorerton	Loamy-skeletal, mixed, active, mesic Typic Hapludalfs
Drammen	Sandy, mixed, mesic Lamellic Hapludalfs
Dunnbot	Coarse-loamy, mixed, superactive, nonacid, mesic Mollic Udifluvents
Elbaville	Fine-loamy, mixed, superactive, mesic Glossoboric Hapludalfs
Elevasil	Coarse-loamy, siliceous, active, mesic Ultic Hapludalfs
Ella	Fine-silty, mixed, superactive, mesic Mollic Hapludalfs
Ettrick	Fine-silty, mixed, superactive, mesic Fluvaquentic Endoaquolls
Farrington	Sandy, mixed, mesic Aquic Hapludolls
Finchford	Sandy, mixed, mesic Entic Hapludolls
Forkhorn	Coarse-loamy, mixed, active, mesic Mollic Hapludalfs
Gaphill	Coarse-loamy, siliceous, active, mesic Typic Hapludalfs
Garne	Sandy over loamy, mixed, active, mesic Typic Hapludolls
Hersey	Fine-silty, mixed, superactive, mesic Mollic Hapludalfs
Hixton	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, mesic Typic Hapludalfs
Hoopeston	Coarse-loamy, mixed, superactive, mesic Aquic Hapludolls
Houghton	Euic, mesic Typic Medisaprists
Kalmarville	Coarse-loamy, mixed, superactive, nonacid, mesic Mollic Fluvaquents
Kevilar	Coarse-loamy, mixed, active, mesic Mollic Hapludalfs
Komro	Sandy, mixed, mesic Entic Hapludolls
Lows	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, nonacid, frigid Mollic Endoaquepts
Markey	Sandy or sandy-skeletal, mixed, euic Terric Borosaprists
Medary	Fine, mixed, superactive, mesic Oxyaquic Hapludalfs
Meridian	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, mesic Mollic Hapludalfs
Mt. Carroll	Fine-silty, mixed, superactive, mesic Mollic Hapludalfs
NewGlarus	Fine-silty over clayey, mixed, superactive, mesic Typic Hapludalfs
Newson	Mixed, frigid Humaqueptic Psammaquents
Norden	Fine-loamy, mixed, superactive, mesic Typic Hapludalfs
Northbend	Coarse-loamy over sandy or sandy-skeletal, mixed, active, mesic Fluvaquentic Dystrochrepts
Orion	Coarse-silty, mixed, superactive, nonacid, mesic Aquic Udifluvents
Palms	Loamy, mixed, euic, mesic Terric Medisaprists
Pepin	Fine-silty, mixed, superactive, mesic Typic Hapludalfs
Plainfield	Mixed, mesic Typic Udipsamments
Plumcreek	Fine-loamy, mixed, superactive, mesic Typic Hapludalfs
Prissel	Loamy, mixed, active, mesic Arenic Hapludalfs
Rasset	Coarse-loamy, mixed, superactive, mesic Typic Argiudolls
Rockbluff	Mesic, coated Typic Quartzipsamments
Rusktown	Coarse-loamy, mixed, active, mesic Mollic Hapludalfs
Scotah	Mixed, mesic Typic Udipsamments
Seaton	Fine-silty, mixed, superactive, mesic Typic Hapludalfs
Seelyeville	Euic Typic Borosaprists
Tarr	Mesic, uncoated Typic Quartzipsamments
Tint	Mesic, uncoated Typic Quartzipsamments
Udipsamments	Udipsamments
Urne	Coarse-loamy, mixed, active, mesic Dystric Eutrochrepts

Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
11A	Markey muck, flooded, 0 to 1 percent slopes	564	0.4
20A	Palms and Houghton mucks, 0 to 1 percent slopes	256	0.2
21A	Palms muck, flooded, 0 to 1 percent slopes	78	*
40A	Markey and Seelyeville mucks, 0 to 1 percent slopes	2,828	1.8
114B2	Mt. Carroll silt loam, 2 to 6 percent slopes, eroded	581	0.4
114C2	Mt. Carroll silt loam, 6 to 12 percent slopes, eroded	556	0.3
115B2	Seaton silt loam, 2 to 6 percent slopes, eroded	1,806	1.1
115C2	Seaton silt loam, 6 to 12 percent slopes, eroded	5,481	3.4
115D2	Seaton silt loam, 12 to 20 percent slopes, eroded	4,299	2.7
116C2	Churchtown silt loam, 6 to 12 percent slopes, eroded	465	0.3
116D2	Churchtown silt loam, 12 to 20 percent slopes, eroded	3,046	1.9
116E	Churchtown silt loam, 20 to 30 percent slopes	3,868	2.4
125B2	Pepin silt loam, 2 to 6 percent slopes, eroded	2,013	1.3
125C2	Pepin silt loam, 6 to 12 percent slopes, eroded	8,195	5.2
125D2	Pepin silt loam, 12 to 20 percent slopes, eroded	4,463	2.8
125E2	Pepin silt loam, 20 to 30 percent slopes, eroded	283	0.2
144B2	NewGlarus silt loam, 2 to 6 percent slopes, eroded	156	0.1
144C2	NewGlarus silt loam, 6 to 12 percent slopes, eroded	1,183	0.7
144D2	NewGlarus silt loam, 12 to 20 percent slopes, eroded	1,840	1.2
144E	NewGlarus silt loam, 20 to 30 percent slopes	585	0.4
213C2	Hixton silt loam, 6 to 12 percent slopes, eroded	60	*
213D2	Hixton silt loam, 12 to 20 percent slopes, eroded	136	0.1
213E2	Hixton silt loam, 20 to 30 percent slopes, eroded	351	0.2
224B	Elevasil sandy loam, 2 to 6 percent slopes	68	*
224C2	Elevasil sandy loam, 6 to 12 percent slopes, eroded	68	*
224D2	Elevasil sandy loam, 12 to 20 percent slopes, eroded	62	*
233C	Boone sand, 6 to 15 percent slopes	721	0.5
254B2	Norden silt loam, 2 to 6 percent slopes, eroded	175	0.1
254C2	Norden silt loam, 6 to 12 percent slopes, eroded	377	0.2
254D2	Norden silt loam, 12 to 20 percent slopes, eroded	1,004	0.6
254E2	Norden silt loam, 20 to 30 percent slopes, eroded	3,800	2.4
254F	Norden silt loam, 30 to 45 percent slopes	384	0.2
255B2	Urne fine sandy loam, 2 to 6 percent slopes, eroded	1,062	0.7
255C2	Urne fine sandy loam, 6 to 12 percent slopes, eroded	1,806	1.1
255D2	Urne fine sandy loam, 12 to 20 percent slopes, eroded	3,121	2.0
255E	Urne fine sandy loam, 20 to 30 percent slopes	761	0.5
255F	Urne fine sandy loam, 30 to 45 percent slopes	3,158	2.0
265B	Garne loamy sand, 2 to 6 percent slopes	539	0.3
265C	Garne loamy sand, 6 to 12 percent slopes	753	0.5
303A	Boguscreek silt loam, 0 to 3 percent slopes	104	0.1
313D2	Plumcreek silt loam, 12 to 20 percent slopes, eroded	88	0.1
313F	Plumcreek silt loam, 20 to 45 percent slopes	2,604	1.6
316B2	Ella silt loam, 1 to 6 percent slopes, eroded	7,076	4.5
316C2	Ella silt loam, 6 to 12 percent slopes, eroded	497	0.3
318A	Bearpen silt loam, 0 to 3 percent slopes	1,562	1.0
326B2	Medary silt loam, 1 to 6 percent slopes, eroded	96	0.1
403A	Dakota silt loam, 0 to 3 percent slopes	107	0.1
413A	Rasset sandy loam, 0 to 3 percent slopes	302	0.2
413B	Rasset sandy loam, 2 to 6 percent slopes	37	*
423A	Meridian silt loam, 0 to 3 percent slopes	752	0.5
423B2	Meridian silt loam, 2 to 6 percent slopes, eroded	502	0.3
429A	Lows loam, 0 to 2 percent slopes	233	0.1
432A	Kevilar sandy loam, 0 to 3 percent slopes	507	0.3
432B	Kevilar sandy loam, 2 to 6 percent slopes	318	0.2
432C2	Kevilar sandy loam, 6 to 12 percent slopes, eroded	67	*
433A	Forkhorn sandy loam, 0 to 3 percent slopes	181	0.1
433B	Forkhorn sandy loam, 2 to 6 percent slopes	126	0.1
433C2	Forkhorn sandy loam, 6 to 12 percent slopes, eroded	86	0.1
436A	Rusktown sandy loam, 0 to 3 percent slopes	25	*
438A	Hoopeston sandy loam, 0 to 3 percent slopes	404	0.3
453A	Burkhardt sandy loam, 0 to 3 percent slopes	3,514	2.2
453B	Burkhardt sandy loam, 2 to 6 percent slopes	382	0.2

See footnote at end of table.

Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
501A	Finchford loamy sand, 0 to 3 percent slopes	3,007	1.9
501B	Finchford loamy sand, 2 to 6 percent slopes	3,237	2.0
502B2	Chelsea fine sand, 2 to 6 percent slopes, eroded	1,781	1.1
502C2	Chelsea fine sand, 6 to 15 percent slopes, eroded	546	0.3
506A	Komro loamy sand, 0 to 3 percent slopes	1,419	0.9
508A	Farrington loamy sand, 0 to 3 percent slopes	2,472	1.6
510B	Boplain sand, 0 to 6 percent slopes	202	0.1
510C	Boplain sand, 6 to 15 percent slopes	17	*
510F	Boplain sand, 15 to 60 percent slopes	41	*
511A	Plainfield sand, 0 to 3 percent slopes	663	0.4
511B	Plainfield sand, 2 to 6 percent slopes	832	0.5
511C	Plainfield sand, 6 to 15 percent slopes	758	0.5
511F	Plainfield sand, 15 to 60 percent slopes	2,206	1.4
512B	Drammen loamy sand, 1 to 6 percent slopes	4,673	2.9
512C	Drammen loamy sand, 6 to 12 percent slopes	2,520	1.6
512D	Drammen loamy sand, 12 to 20 percent slopes	333	0.2
516A	Aldo sand, 0 to 3 percent slopes	1,518	1.0
546A	Prissel loamy sand, 0 to 3 percent slopes	751	0.5
546B	Prissel loamy sand, 2 to 6 percent slopes	212	0.1
546F	Prissel loamy sand, 15 to 60 percent slopes	264	0.2
561B	Tarr sand, 1 to 6 percent slopes	84	0.1
566A	Tint sand, 0 to 3 percent slopes	92	0.1
589A	Newson mucky loamy sand, 0 to 2 percent slopes	1,358	0.9
616B	Chaseburg silt loam, 1 to 4 percent slopes	2,359	1.5
626A	Arenzville silt loam, 0 to 3 percent slopes	1,695	1.1
628A	Orion silt loam, 0 to 3 percent slopes	2,157	1.4
629A	Ettrick silt loam, 0 to 2 percent slopes	1,031	0.6
646A	Dunnbot fine sandy loam, 0 to 3 percent slopes	319	0.2
656A	Scotah loamy fine sand, 0 to 3 percent slopes	1,060	0.7
826B2	Hersey silt loam, 2 to 6 percent slopes, eroded	3,027	1.9
826C2	Hersey silt loam, 6 to 12 percent slopes, eroded	134	0.1
1135F	Dorerton-Elbaville complex, 30 to 60 percent slopes	10,979	6.9
1145F	Gaphill-Rockbluff complex, 30 to 60 percent slopes	5,495	3.5
1155F	Brodale-Bellechester-Rock outcrop complex, 60 to 90 percent slopes	712	0.4
1224F	Boone-Elevasil complex, 15 to 50 percent slopes	351	0.2
1648A	Northbend-Ettrick silt loams, 0 to 3 percent slopes	2,878	1.8
1658A	Algansee-Kalmarville complex, 0 to 3 percent slopes	6,137	3.9
2003A	Riverwash, nearly level	193	0.1
2013	Pits, gravel	76	*
2014	Pits, quarry, hard bedrock	98	0.1
2040	Udipsamments, dredge material	12	*
2050	Landfill	17	*
W	Water	10,679	6.7
M-W	Miscellaneous water	8	*
	Total	158,925	100.0

* Less than 0.1 percent.

Soil Series and Detailed Soil Map Units

In this section, arranged in alphabetical order, each soil series recognized in the survey area is described. Each series description is followed by descriptions of the associated detailed soil map units.

Characteristics of the soil and the material in which it formed are identified for each soil series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (USDA, 1993). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (USDA, 1999). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units on the detailed soil maps in this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. More information about each map unit is given in Part II of this survey.

A map unit delineation on the detailed soil maps represents an area on the landscape and consists of one or more soils or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class.

Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some "included" areas that belong to other taxonomic classes.

Most included soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit. The principal hazards and limitations to be considered in planning for specific uses are described in Part II of this survey.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying layers, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying layers. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on

the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Plainfield sand, 15 to 60 percent slopes, is a phase of the Plainfield series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Dorerton-Elbaville complex, 30 to 60 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Markey and Seelyeville mucks, 0 to 1 percent slopes, is an undifferentiated group in this survey area.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Riverwash, nearly level, is an example.

The table "Acreage and Proportionate Extent of the Soils" in Parts I and II of this survey gives the acreage and proportionate extent of each map unit. Other tables (see Contents) give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

Aldo Series

Typical Pedon

Typical pedon for the Aldo series, 1,740 feet north and 1,615 feet west of the southeast corner of sec. 3, T. 25 N., R. 12 W., Pepin County, Wisconsin:

Ap—0 to 7 inches; dark brown (10YR 3/3) sand, brown (10YR 5/3) dry; weak medium subangular blocky structure; very friable; many fine and medium roots; moderately acid; abrupt smooth boundary.

Bw1—7 to 13 inches; brown (7.5YR 4/4) sand; weak coarse subangular blocky structure; very friable; common fine roots; moderately acid; gradual wavy boundary.

Bw2—13 to 23 inches; strong brown (7.5YR 4/6) sand; weak coarse subangular blocky structure; very friable; moderately acid; gradual wavy boundary.

Bw3—23 to 42 inches; dark yellowish brown (10YR 4/6) sand; single grain; loose; moderately acid; gradual wavy boundary.

C1—42 to 51 inches; yellowish brown (10YR 5/6) sand; single grain; loose; common medium distinct strong brown (7.5YR 5/6) masses of iron accumulation; moderately acid; gradual wavy boundary.

C2—51 to 80 inches; yellowish brown (10YR 5/6) sand; single grain; loose; many medium prominent strong brown (7.5YR 5/8) masses of iron accumulation; slightly acid.

Range in Characteristics

Note: Some pedons have an E horizon.

Ap or A horizon (if it occurs):
- Hue—7.5YR or 10YR
- Value—2 to 4
- Chroma—1 to 3
- Texture—sand
- Content of gravel—0 to 15 percent

Bw horizon:
- Hue—7.5YR or 10YR
- Value—4 or 5
- Chroma—3 to 6
- Texture—sand, coarse sand, loamy sand, loamy coarse sand, or the gravelly analogs of these textures
- Content of gravel—0 to 35 percent
- Content of cobbles—0 to 5 percent

C horizon:
- Hue—7.5YR or 10YR
- Value—5 to 7
- Chroma—3 to 6
- Texture—sand, coarse sand, or the gravelly analogs of these textures
- Content of gravel—0 to 35 percent
- Content of cobbles—0 to 5 percent

516A—Aldo sand, 0 to 3 percent slopes

Composition

Aldo and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Valley trains
Position on the landform: Treads
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Sand
Depth to bedrock: Greater than 80 inches
Drainage class: Moderately well drained
Dominant parent material: Sandy and gravelly outwash
Flooding: None
Depth to the water table: 3.5 to 6.0 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 3.8 inches (low)
Content of organic matter in the surface layer: About 1.25 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Farrington and similar soils
- Plainfield and similar soils
- Soils that have loamy textures in the substratum
- Soils that have sandstone within a depth of 60 inches

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Algansee Series

Typical Pedon

The location of a representative pedon of Algansee fine sandy loam in Pepin County is NW¼NW¼ sec. 27, T. 23 N., R. 15 W. The typical pedon for the Algansee series is 2,475 feet north and 1,120 feet west of the southeast corner of sec. 5, T. 26 N., R. 11 W., Dunn County, Wisconsin:

A—0 to 4 inches; black (10YR 2/1) fine sandy loam, very dark gray (10YR 3/1) dry; moderate fine and medium granular structure; very friable; common very fine to coarse roots; strongly acid; clear wavy boundary.

Bw1—4 to 16 inches; dark brown (7.5YR 3/4) loamy fine sand; weak medium subangular blocky structure; very friable; common very fine to medium roots; few thin strata of black (10YR 2/1) fine sandy loam and loamy fine sand; strongly acid; clear wavy boundary.

Bw2—16 to 31 inches; dark brown (7.5YR 3/4) fine sand; single grain; loose; few very fine and fine roots; common medium prominent pale brown (10YR 6/3) and few fine prominent light brownish gray (10YR 6/2) redox depletions; few thin strata of black (10YR 2/1) fine sandy loam and loamy fine sand; few fine and medium dark red (2.5YR 3/6) iron concretions; strongly acid; clear wavy boundary.

C1—31 to 38 inches; brown (10YR 5/3) fine sand; single grain; loose; common medium faint grayish brown (10YR 5/2) redox depletions; many thin strata of loamy fine sand and fine sandy loam; moderately acid; gradual wavy boundary.

C2—38 to 57 inches; light brownish gray (10YR 6/2) sand; single grain; loose; many medium prominent brownish yellow (10YR 6/6) redox concentrations; many thin strata of loamy fine sand, fine sandy loam, and sand; slightly acid; gradual wavy boundary.

Cg—57 to 60 inches; grayish brown (10YR 5/2) gravelly sand; single grain; loose; 20 percent gravel; slightly acid.

Range in Characteristics

A horizon:
Hue—7.5YR or 10YR
Value—2 or 3
Chroma—1 or 2
Texture—fine sandy loam

Bw horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—3 to 6
Texture—loamy fine sand, fine sand, sand, or loamy sand (thin strata of finer textures are common)
Content of gravel—0 to 15 percent

C horizon:
Hue—7.5YR, 10YR, or 2.5Y
Value—3 to 7
Chroma—2 to 4
Texture—fine sand, sand, loamy fine sand, coarse sand, loamy sand, or the gravelly analogs of sand or coarse sand (thin strata of finer textures are common)
Content of gravel—0 to 35 percent

1658A—Algansee-Kalmarville complex, 0 to 3 percent slopes

Composition

Algansee and similar soils: About 60 percent
Kalmarville and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Algansee—low flats on flood plains; Kalmarville—depressions and drainageways on flood plains
Slope range: Algansee—0 to 3 percent; Kalmarville—0 to 1 percent

Component Description

Algansee

Texture of the surface layer: Fine sandy loam
Depth to bedrock: Greater than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Thin mantle of loamy alluvium over sandy alluvium
Frequency of flooding: Frequent (fig. 10)
Depth to the water table: 1.0 to 2.5 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 4.7 inches (low)
Content of organic matter in the surface layer: About 3 percent (moderate)

Kalmarville

Texture of the surface layer: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Poorly drained
Dominant parent material: Loamy alluvium over sandy alluvium
Frequency of flooding: Frequent
Water table depth: At the surface to 1 foot below the surface
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 8.3 inches (moderate)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Dunnbot and similar soils
- Markey and similar soils
- Scotah and similar soils
- Riverwash
- Water

Major Uses of the Unit

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Arenzville Series

Typical Pedon

The location of a representative pedon of Arenzville silt loam in Pepin County is NE¼NE¼ sec. 20, T. 25 N., R. 14 W. The typical pedon for the Arenzville series is 745 feet south and 1,250 feet west of the northeast corner of sec. 23, T. 23 N., R. 13 W., Buffalo County, Wisconsin:

A—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam with thin strata of yellowish brown (10YR 5/4) and very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium granular structure; friable; neutral; clear smooth boundary.
C—10 to 25 inches; stratified brown (10YR 5/3), dark grayish brown (10YR 4/2), and very dark grayish brown (10YR 3/2) silt loam; massive breaking to medium plates along depositional strata; friable; few thin lenses of very fine sand; slightly acid; abrupt wavy boundary.
Ab—25 to 40 inches; black (10YR 2/1) silt loam; weak medium and thick platy structure parting to weak medium granular; friable; few fine prominent dark brown (7.5YR 4/4) masses of iron accumulations; slightly acid; gradual smooth boundary.
C′—40 to 60 inches; dark grayish brown (10YR 4/2) silt loam stratified with a few thin lenses of fine and very fine sand; massive breaking to thick plates along depositional strata; friable; common medium prominent dark brown (7.5YR 4/4) and dark reddish brown (5YR 3/4) masses of iron accumulation and common medium distinct grayish brown (2.5Y 5/2) iron depletions; neutral.

Range in Characteristics

Depth to a buried A horizon: 20 to 60 inches
Other features: Some pedons have a Bwb or Btb horizon.

A or Ap horizon:
Hue—10YR
Value—3 to 5 (thin strata with darker colors are common)
Chroma—2 or 3
Texture—silt loam (thin strata of coarser material are common)

C horizon:
Hue—10YR
Value—3 to 5
Chroma—2 to 4 (thin strata with lighter or darker colors are common)
Texture—dominantly silt loam (thin strata of coarser material are common)

Ab horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—dominantly silt loam or silty clay loam (thin strata of coarser material are common)

C´ horizon:
Hue—10YR
Value—4 to 6
Chroma—1 to 6
Texture—typically silt loam (thin strata of coarser material are common)
Content of channers—0 to 15 percent

626A—Arenzville silt loam, 0 to 3 percent slopes

Composition

Arenzville and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Drainageways on stream terraces
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Moderately well drained
Dominant parent material: Alluvium
Frequency of flooding: Occasional
Depth to the water table: 3.5 to 6.0 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 12.7 inches (high)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Chaseburg and similar soils
- Orion and similar soils
- Soils that have sandy textures below a depth of 40 inches
- Soils that are not subject to flooding

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Bearpen Series

Mean annual precipitation is sufficient to grow trees on these soils. The thick dark surface layer is a result of a combination of accumulation from erosional and depositional processes, both natural and post-settlement, and fire. Natural fires helped to maintain grass vegetation, which contributed to the thick, dark, humus-rich upper horizons. The Native Americans who lived in the area and used these soils also used fire to maintain the grass vegetation for ease of cultivation and for attracting game animals.

Typical Pedon

Typical pedon for the Bearpen series, 15 feet north and 665 feet west of the southeast corner of sec. 9, T. 23 N., R. 15 W., Pepin County, Wisconsin:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate coarse and medium subangular blocky structure; friable; common fine and medium roots; neutral; clear smooth boundary.
A—8 to 18 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate medium subangular blocky structure; friable; common fine and medium roots; neutral; gradual wavy boundary.
Bt—18 to 30 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; friable; common fine and medium roots;

few fine prominent yellowish brown (10YR 5/6) masses of iron accumulation and few prominent light brownish gray (10YR 6/2) masses of iron depletion; few faint patchy brown (10YR 5/3) clay films on faces of peds and in pores and few distinct discontinuous pale brown (10YR 6/3) silt coatings on faces of peds; strongly acid; gradual wavy boundary.

Btg—30 to 41 inches; light brownish gray (10YR 6/2) silt loam; moderate medium subangular blocky structure; friable; few very fine roots; common fine and medium prominent yellowish brown (10YR 5/8) masses of iron accumulation; few faint patchy brown (10YR 5/3) clay films on faces of peds and in pores; strongly acid; clear smooth boundary.

2Bt—41 to 50 inches; yellowish brown (10YR 5/4) silt loam with strata of yellowish brown (10YR 5/4) fine sand and sandy loam; weak coarse subangular blocky structure; friable; breaks to weak thick plates along depositional strata; many fine and medium distinct yellowish brown (10YR 5/6) masses of iron accumulation; few faint patchy brown (10YR 5/3) clay films on faces of peds and in pores; slightly acid; clear smooth boundary.

2C1—50 to 57 inches; brown (10YR 5/3) and reddish brown (5YR 4/4) silty clay loam with strata of strong brown (7.5YR 5/6) sand; massive; friable; breaks to weak thick plates along depositional strata; few fine distinct yellowish brown (10YR 5/6) masses of iron accumulation; slightly acid; clear smooth boundary.

2C2—57 to 60 inches; brown (10YR 5/3) fine sandy loam with strata of silt loam and fine sand; massive; friable; breaks to weak thick plates along depositional strata; common fine and medium prominent yellowish brown (10YR 5/6) masses of iron accumulations; slightly acid.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 24 inches
Depth to slackwater deposits: 40 to 80 inches
Depth to carbonates: 60 to more than 80 inches
Other features: Some pedons have a 2Btg horizon, and some have a 2Cg horizon.

Ap and A horizons:
Hue—10YR or 2.5Y
Value—2 or 3
Chroma—1 to 3
Texture—silt loam

Bt horizon:
Hue—7.5YR, 10YR, or 2.5Y
Value—4 or 5
Chroma—3 or 4
Texture—silt loam or silty clay loam

Btg horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—1 or 2
Texture—silt loam or silty clay loam

2Bt horizon:
Hue—5YR, 7.5YR, 10YR, or 2.5Y
Value—4 or 5
Chroma—3 or 4
Texture—stratified silty clay loam to sandy loam (very thin strata of coarser material are common)

2C horizon:
Hue—5YR, 7.5YR, 10YR, or 2.5Y
Value—4 to 7
Chroma—3 to 8
Texture—stratified silty clay loam to sandy loam (very thin strata of coarser material are common)

318A—Bearpen silt loam, 0 to 3 percent slopes

Composition

Bearpen and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Stream terraces
Position on the landform: Treads
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Silty alluvium over silty to sandy slackwater deposits
Frequency of flooding: Rare
Depth to the water table: 1.0 to 2.5 feet
Kind of water table: Perched
Available water capacity to 60 inches or root-limiting layer: About 11.4 inches (high)
Content of organic matter in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit,

such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Ella and similar soils
- Poorly drained soils
- Soils that have a sandy substratum

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Bellechester Series

Mean annual precipitation is sufficient to grow trees on these droughty soils. The very steep south- and west-facing slopes result in a very dry environment conducive to grass and scattered small trees and shrubs. Natural fires helped to maintain the grass vegetation, which produced the dark, humus-rich upper horizons. The Native Americans who lived in the area and used these soils also may have used fire to maintain the grass vegetation for attracting game animals.

Typical Pedon

The location of a representative pedon of Bellechester sand in Pepin County is NW1/4SW1/4 sec. 17, T. 23 N., R. 15 W. The typical pedon for the Bellechester series is 330 feet south and 790 feet east of the northwest corner of sec. 11, T. 112 N., R. 13 W., Goodhue County, Minnesota:

A1—0 to 7 inches; very dark brown (10YR 2/2) sand, dark gray (10YR 4/1) dry; single grain; loose; many roots; slightly alkaline; gradual wavy boundary.

A2—7 to 16 inches; very dark gray (10YR 3/1) sand, dark grayish brown (10YR 4/2) dry; single grain; loose; many roots; slightly alkaline; clear irregular boundary.

BA—16 to 23 inches; very dark gray (10YR 3/1) and dark brown (10YR 4/3) sand, dark grayish brown (10YR 4/2) rubbed; single grain; loose; common roots; about 5 percent rock fragments consisting mostly of hard dolostone channers; slightly alkaline; clear irregular boundary.

Bw—23 to 28 inches; yellowish brown (10YR 5/6) sand with some masses of dark grayish brown (10YR 4/2), dark yellowish brown (10YR 4/4) rubbed; single grain; loose; about 10 percent flagstones consisting mostly of sandstone and dolostone; moderately alkaline; slight effervescence; clear wavy boundary.

BC—28 to 42 inches; yellowish brown (10YR 5/8) sand; single grain; loose; stone line in the upper part and about 10 percent flagstones consisting mostly of sandstone and dolostone in the lower part; slightly alkaline; slight effervescence; clear wavy boundary.

Cr—42 inches; white (10YR 8/1), soft sandstone.

Range in Characteristics

Depth to sandstone: 40 to 70 inches
Thickness of the mollic epipedon: 7 to 24 inches
Other features: Some pedons have an AB or BA horizon, and some have a C horizon.

A horizon:
Hue—7.5YR or 10YR
Value—2 or 3
Chroma—1 or 2
Texture—sand
Content of channers—0 to 10 percent
Content of flagstones—0 to 5 percent

Bw horizon:
Hue—7.5YR or 10YR
Value—4 to 8
Chroma—4 to 8
Texture—sand, loamy sand, or the channery or flaggy analogs of these textures
Content of channers—0 to 10 percent
Content of flagstones—0 to 20 percent

Boguscreek Series

Typical Pedon

Typical pedon for the Boguscreek series, 1,000 feet north and 1,300 feet east of the southwest corner of sec. 24, T. 23 N., R. 15 W., Pepin County, Wisconsin:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; weak medium and coarse subangular blocky structure; friable; common fine and medium roots; abrupt smooth boundary.

A1—9 to 18 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; weak medium and coarse subangular blocky structure; friable; common fine and medium roots;

few thin brown (10YR 5/3) strata; gradual smooth boundary.
A2—18 to 27 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; weak medium subangular blocky structure; friable; common very fine and fine roots; few very thin brown (10YR 5/3) strata; gradual smooth boundary.
A3—27 to 45 inches; very dark brown (10YR 2/2) silt loam, very dark grayish brown (10YR 3/2) dry; moderate medium subangular blocky structure; friable; common very fine and fine roots; few very thin brown (10YR 5/3) strata; clear smooth boundary.
A4—45 to 50 inches; dark brown (10YR 3/3) silt loam, brown (10YR 4/3) dry; moderate coarse subangular blocky structure; friable; gradual smooth boundary.
Bw—50 to 57 inches; dark yellowish brown (10YR 3/4) silt loam; weak coarse subangular blocky structure; friable; gradual smooth boundary.
2C—57 to 80 inches; yellowish brown (10YR 5/4) sand; single grain; loose.

Range in Characteristics

Thickness of the mollic epipedon: More than 24 inches
Depth to outwash: 40 to 80 inches

Ap and A horizons:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—silt loam
Content of channers—0 to 15 percent

Bw horizon:
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—3 to 6
Texture—silt loam, loam, or sandy loam
Content of channers—0 to 15 percent

2C horizon:
Hue—7.5YR or 10YR
Value—5 to 7
Chroma—3 to 6 or multicolored
Texture—sand, coarse sand, or the gravelly analogs of these textures
Content of gravel—0 to 35 percent
Content of cobbles—0 to 5 percent

303A—Boguscreek silt loam, 0 to 3 percent slopes

Composition

Boguscreek and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Drainageways on valley trains
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: Greater than 80 inches
Drainage class: Well drained
Dominant parent material: Silty alluvium over sandy and gravelly outwash
Frequency of flooding: Occasional
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.8 inches (high)
Content of organic matter in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Chaseburg and similar soils
- Dakota and similar soils
- Soils that have slopes of more than 3 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Boone Series

Typical Pedon

The location of a representative pedon of Boone sand in Pepin County is SW¼NW¼ sec. 8, T. 25 N., R. 11 W. The typical pedon for the Boone series is 1,280 feet north and 2,000 feet west of the southeast corner of sec. 24, T. 19 N., R. 6 W., Jackson County, Wisconsin:

Oe—0 to 1 inch; very dark grayish brown (10YR 3/2) mucky peat (hemic material consisting of a mat of partially decomposed forest litter); about 45 percent fiber, 20 percent rubbed; weak thin platy

structure; nonsticky; very strongly acid; abrupt smooth boundary.
A—1 to 3 inches; very dark grayish brown (10YR 3/2) sand, dark grayish brown (10YR 4/2) dry; weak fine granular structure; very friable; many very fine and fine roots; pale brown (10YR 6/3) clean sand grains throughout; strongly acid; abrupt wavy boundary.
E—3 to 8 inches; brown (10YR 4/3) sand, pale brown (10YR 6/3) dry; weak medium subangular blocky structure; very friable; common very fine and fine roots; about 14 percent sandstone channers; strongly acid; abrupt wavy boundary.
Bw—8 to 21 inches; dark yellowish brown (10YR 4/4) sand; weak coarse subangular blocky structure; very friable; few fine roots; about 13 percent sandstone channers; strongly acid; clear wavy boundary.
C—21 to 35 inches; brownish yellow (10YR 6/6) sand; single grain; loose; few fine roots; about 10 percent sandstone channers; strongly acid; gradual smooth boundary.
Cr—35 to 60 inches; white (10YR 8/2), weakly cemented sandstone.

Range in Characteristics

Depth to sandstone: 20 to 40 inches

A or Ap horizon (if it occurs):
Hue—10YR
Value—2 to 5
Chroma—1 to 3
Texture—sand
Content of channers—0 to 15 percent

E horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—2 or 3
Texture—sand, fine sand, loamy sand, loamy fine sand, or the channery analogs of these textures
Content of channers—0 to 35 percent
Content of flagstones—0 to 5 percent

Bw horizon:
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—3 to 6
Texture—sand, fine sand, loamy sand, loamy fine sand, or the channery analogs of these textures
Content of channers—0 to 35 percent
Content of flagstones—0 to 5 percent

C horizon:
Hue—7.5YR or 10YR
Value—5 to 8
Chroma—1 to 6
Texture—sand, fine sand, or the channery analogs of these textures
Content of channers—0 to 35 percent
Content of flagstones—0 to 5 percent

233C—Boone sand, 6 to 15 percent slopes

Composition

Boone and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on the landform: Shoulders
Slope range: 6 to 15 percent

Component Description

Texture of the surface layer: Sand
Depth to bedrock: 20 to 40 inches
Drainage class: Excessively drained
Dominant parent material: Sandy slope alluvium over sandy residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 2.4 inches (very low)
Content of organic matter in the surface layer: About 0.75 percent (low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Tarr and similar soils
- Urne and similar soils
- Soils that are more than 40 inches deep over sandstone
- Soils that are less than 20 inches deep over sandstone
- Soils that have slopes of more than 15 percent or less than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

1224F—Boone-Elevasil complex, 15 to 50 percent slopes

Composition

Boone and similar soils: About 60 percent
Elevasil and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on the landform: Boone—shoulders; Elevasil—backslopes and shoulders
Slope range: 15 to 50 percent

Component Description

Boone

Texture of the surface layer: Sand
Depth to bedrock: 20 to 40 inches
Drainage class: Excessively drained
Dominant parent material: Sandy slope alluvium over sandy residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 2.4 inches (very low)
Content of organic matter in the surface layer: About 0.75 percent (low)

Elevasil

Texture of the surface layer: Sandy loam
Depth to bedrock: 20 to 40 inches
Drainage class: Somewhat excessively drained
Dominant parent material: Loamy slope alluvium over sandy residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.5 inches (low)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Tarr and similar soils
- Urne and similar soils
- Soils that have a channery or flaggy surface layer
- Soils that have slopes of less than 15 percent

Major Uses of the Unit

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Boplain Series

Typical Pedon

Typical pedon for the Boplain series, 1,430 feet south and 700 feet west of the northeast corner of sec. 11, T. 25 N., R. 13 W., Pepin County, Wisconsin:

Ap—0 to 9 inches; very dark brown (10YR 2/2) sand, brown (10YR 4/3) dry; weak fine and medium subangular blocky structure; very friable; many fine and medium roots; 2 percent gravel; neutral; abrupt smooth boundary.

Bw1—9 to 15 inches; dark yellowish brown (10YR 3/4) sand; weak medium and coarse subangular blocky structure; very friable; many fine and medium roots; 2 percent gravel; neutral; abrupt smooth boundary.

Bw2—15 to 27 inches; strong brown (7.5YR 4/6) sand; weak medium and coarse subangular blocky structure; very friable; many fine and medium roots; 2 percent gravel; neutral; gradual smooth boundary.

Bw3—27 to 32 inches; yellowish brown (10YR 5/6) coarse sand; single grain; loose; 2 percent gravel; neutral; clear smooth boundary.

2C—32 to 37 inches; brownish yellow (10YR 6/8) sand; single grain; loose; 5 percent sandstone channers; slightly acid; clear smooth boundary.

2Cr—37 to 44 inches; brownish yellow (10YR 6/8) sandstone bedrock; gradual wavy boundary.

2R—44 inches; 40 percent brownish yellow (10YR 6/8), 40 percent yellowish brown (10YR 5/8), and 20 percent yellow (10YR 7/6) sandstone bedrock.

Range in Characteristics

Depth to sandstone: 20 to 40 inches

Other features: Some pedons have an E horizon.

Ap or A horizon (if it occurs):
Hue—7.5YR or 10YR
Value—2 or 3
Chroma—1 to 3
Texture—sand
Content of gravel—0 to 15 percent

Bw horizon:
Hue—7.5YR or 10YR
Value—3 to 6
Chroma—3 to 6
Texture—sand, coarse sand, loamy sand, or loamy coarse sand
Content of gravel—0 to 15 percent

2C horizon (if it occurs):
Hue—7.5YR, 10YR, or 2.5Y
Value—4 to 7
Chroma—3 to 8
Texture—sand or fine sand
Content of channers—0 to 15 percent

510B—Boplain sand, 0 to 6 percent slopes

Composition

Boplain and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Sand sheets
Slope range: 0 to 6 percent

Component Description

Texture of the surface layer: Sand
Depth to bedrock: 20 to 40 inches
Drainage class: Excessively drained
Dominant parent material: Eolian sands or sandy outwash over sandy residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 2.6 inches (very low)
Content of organic matter in the surface layer: About 1.25 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Aldo and similar soils
- Plainfield and similar soils
- Soils that have slopes of more than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

510C—Boplain sand, 6 to 15 percent slopes

Composition

Boplain and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Valley trains
Position on the landform: Risers
Slope range: 6 to 15 percent

Component Description

Texture of the surface layer: Sand
Depth to bedrock: 20 to 40 inches
Drainage class: Excessively drained
Dominant parent material: Eolian sands or sandy outwash over sandy residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 2.6 inches (very low)
Content of organic matter in the surface layer: About 1.25 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Plainfield and similar soils
- Soils that have slopes of more than 15 percent or less than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

510F—Boplain sand, 15 to 60 percent slopes

Composition

Boplain and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Valley trains
Position on the landform: Risers
Slope range: 15 to 60 percent

Component Description

Texture of the surface layer: Sand
Depth to bedrock: 20 to 40 inches
Drainage class: Excessively drained
Dominant parent material: Sandy outwash over sandy residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 2.6 inches (very low)
Content of organic matter in the surface layer: About 1.25 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Plainfield and similar soils
- Poorly drained seep areas
- Soils that have slopes of less than 15 percent

Major Uses of the Unit

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Brodale Series

Mean annual precipitation is sufficient to grow trees on these soils. The very steep south- and west-facing slopes result in a very dry environment conducive to grass and scattered small trees and shrubs. Natural fires helped to maintain the grass vegetation, which produced the dark, humus-rich upper horizons. The Native Americans who lived in the area and used these soils also may have used fire to maintain the grass vegetation for attracting game animals.

Typical Pedon

The location of a representative pedon of Brodale very flaggy loam in Pepin County is NW¼SW¼ sec. 17, T. 23 N., R. 15 W. The typical pedon for the Brodale series is 132 feet south and 1,160 feet east of the northwest corner of sec. 22, T. 112 N., R. 14 W., Goodhue County, Minnesota:

A—0 to 6 inches; very dark brown (10YR 2/2) very flaggy loam, very dark grayish brown (10YR 3/2) dry; weak fine granular structure; friable; common roots; many very fine and medium pores; about 45 percent coarse fragments, mostly flagstones (about 15 percent stones and a few flat fragments); strong effervescence; moderately alkaline; abrupt wavy boundary.

C1—6 to 10 inches; yellowish brown (10YR 5/4) very flaggy very fine sandy loam; massive; friable; common roots; about 40 percent coarse fragments, mostly flagstones (about 15 percent stones and some flat fragments); many coatings of lime ranging from 2 to 5 mm in thickness on the undersides of rock fragments; strong effervescence; moderately alkaline; clear wavy boundary.

C2—10 to 50 inches; yellowish brown (10YR 5/6) very flaggy very fine sandy loam; massive; friable; about 50 percent coarse fragments, mostly flagstones (about 20 percent stones and a few flat fragments); strong effervescence; moderately alkaline; clear wavy boundary.

R—50 inches; weathered dolostone bedrock.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 20 inches (after mixing)
Depth to dolostone: 40 to 80 inches
Depth to carbonates: Typically, carbonates are

throughout the profile, but some pedons are leached of free carbonates to a depth of as much as 12 inches.

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—very flaggy loam
Content of rock fragments—35 to 60 percent

C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—3 to 6
Texture—the flaggy, very flaggy, extremely flaggy, cobbly, very cobbly, or extremely cobbly analogs of very fine sandy loam, sandy loam, fine sandy loam, or loam
Content of rock fragments—35 to 70 percent

1155F—Brodale-Bellechester-Rock outcrop complex, 60 to 90 percent slopes

Composition

Brodale and similar soils: About 40 percent
Bellechester and similar soils: About 30 percent
Rock outcrop: About 15 percent
Inclusions: About 15 percent

Setting

Landform: Hills
Position on the landform: Brodale—backslopes and shoulders; Bellechester—backslopes; Rock outcrop—shoulders
Slope range: Brodale—60 to 80 percent; Bellechester—60 to 90 percent; Rock outcrop—60 to 90 percent

Component Description

Brodale

Texture of the surface layer: Very flaggy loam
Depth to bedrock: 40 to 80 inches
Drainage class: Excessively drained
Dominant parent material: Loamy colluvium over loamy residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.4 inches (low)
Content of organic matter in the surface layer: About 3.5 percent (moderate)

Bellechester

Texture of the surface layer: Sand
Depth to bedrock: 40 to 70 inches
Drainage class: Excessively drained
Dominant parent material: Sandy colluvium over sandy residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 2.8 inches (very low)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

Rock outcrop

General description: Weathered bedrock
Drainage class: Excessively drained
Dominant parent material: Dolostone and sandstone bedrock
Flooding: None
Depth to the water table: Greater than 6.0 feet

A typical soil series description with range in characteristics is included for the Brodale and Bellechester soils, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Elbaville and similar soils
- Churchtown and similar soils
- Tarr and similar soils
- Soils that have slopes of less than 60 percent
- Talus slopes

Major Uses of the Unit

- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section

Burkhardt Series

Mean annual precipitation is sufficient to grow trees on these soils. Natural fires were common and helped to maintain the grass vegetation, which produced the thick, dark, humus-rich upper horizons. The Native Americans who lived in the area and used these soils also used fire to maintain the grass vegetation for ease of cultivation and for attracting game animals.

Typical Pedon

Typical pedon for the Burkhardt series (fig. 11), 100

feet north and 300 feet east of the southwest corner of sec. 24, T. 25 N., R. 14 W., Pepin County, Wisconsin:

Ap—0 to 10 inches; very dark brown (10YR 2/2) sandy loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; very friable; many fine fibrous roots; slightly acid; abrupt smooth boundary.

Bt—10 to 17 inches; dark brown (7.5YR 3/2) sandy loam; moderate fine subangular blocky structure; friable; few faint clay films on faces of peds; few faint clay bridges between sand grains; content of clay similar to that in the horizon above; few fine fibrous roots; moderately acid; clear smooth boundary.

2BC—17 to 19 inches; brown (7.5YR 4/4) loamy sand; weak medium subangular blocky structure; dark stains from organic matter on faces of some peds; very friable; about 12 percent gravel; moderately acid; clear smooth boundary.

2C1—19 to 29 inches; strong brown (7.5YR 5/6) and brown (7.5YR 4/4), stratified sand and gravelly coarse sand; single grain; loose; about 20 percent gravel as an average; moderately acid; gradual wavy boundary.

2C2—29 to 60 inches; strong brown (7.5YR 5/6), stratified sand and gravelly coarse sand; single grain; loose; about 25 percent gravel as an average; moderately acid.

Range in Characteristics

Depth to outwash: 10 to 20 inches
Thickness of the mollic epipedon: 10 to 20 inches
Other features: Some pedons have an AB horizon, and some have a 2Bt horizon.

Ap and A horizons:
Hue—7.5YR or 10YR
Value—2 or 3
Chroma—1 to 3
Texture—sandy loam
Content of gravel—0 to 15 percent
Content of cobbles—0 to 5 percent

Bt horizon:
Hue—7.5YR or 10YR
Value—3 or 4
Chroma—2 to 4
Texture—sandy loam or loam
Content of gravel—0 to 15 percent
Content of cobbles—0 to 5 percent

2BC horizon:
Hue—7.5YR or 10YR
Value—3 or 4
Chroma—4 to 6
Texture—loamy sand, sand, loamy coarse sand, coarse sand, or the gravelly or very gravelly analogs of these textures
Content of gravel—0 to 60 percent
Content of cobbles—0 to 5 percent

2C horizon:
Hue—7.5YR or 10YR
Value—5 or 6
Chroma—4 to 6
Texture—coarse sand, sand, or the gravelly or very gravelly analogs of these textures
Content of gravel—0 to 60 percent
Content of cobbles—0 to 5 percent

453A—Burkhardt sandy loam, 0 to 3 percent slopes

Composition

Burkhardt and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Valley trains
Position on the landform: Treads
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Sandy loam
Depth to bedrock: Greater than 60 inches
Drainage class: Somewhat excessively drained
Dominant parent material: Loamy alluvium over sandy and gravelly outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.6 inches (low)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Finchford and similar soils
- Rasset and similar soils
- Soils that have slopes of more than 3 percent

Major Uses of the Unit

- Cropland
- Hayland

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

453B—Burkhardt sandy loam, 2 to 6 percent slopes

Composition

Burkhardt and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Valley trains
Position on the landform: Treads
Slope range: 2 to 6 percent

Component Description

Texture of the surface layer: Sandy loam
Depth to bedrock: Greater than 60 inches
Drainage class: Somewhat excessively drained
Dominant parent material: Loamy alluvium over sandy and gravelly outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.6 inches (low)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Finchford and similar soils
- Rasset and similar soils
- Soils that have slopes of more than 6 percent or less than 2 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Chaseburg Series

Typical Pedon

Typical pedon for the Chaseburg series, 300 feet north and 300 feet east of the southwest corner of sec. 22, T. 25 N., R. 14 W., Pepin County, Wisconsin:

A—0 to 4 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate thin platy structure; friable; common fine fibrous roots and pores; neutral; clear wavy boundary.
C1—4 to 24 inches; dark grayish brown (10YR 4/2) silt loam with thin very dark grayish brown (10YR 3/2) lenses; massive with thin weak strata that resulted largely from stratification during deposition; friable; common fine fibrous roots; neutral; gradual wavy boundary.
C2—24 to 32 inches; dark grayish brown (10YR 4/2) silt loam; massive with weak thin and medium strata that resulted largely from stratification during deposition; friable; slightly acid; gradual smooth boundary.
C3—32 to 42 inches; dark brown (10YR 4/3) silt loam; massive with weak medium strata that resulted largely from stratification during deposition; friable; slightly acid; gradual smooth boundary.
C4—42 to 60 inches; yellowish brown (10YR 5/4) silt loam; massive with weak medium strata that resulted largely from stratification during deposition; friable; moderately acid.

Range in Characteristics

A or Ap horizon (if it occurs):
Hue—10YR
Value—3 to 5
Chroma—2 or 3
Texture—silt loam

C horizon:
Hue—10YR
Value—4 to 6
Chroma—2 to 4
Texture—silt loam (very thin layers of coarser textures or different colors are common)
Content of channers—0 to 15 percent

616B—Chaseburg silt loam, 1 to 4 percent slopes

Composition

Chaseburg and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on the landform: Toeslopes
Slope range: 1 to 4 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Silty slope alluvium
Frequency of flooding: Occasional
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.1 inches (high)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Arenzville and similar soils
- Soils that are not subject to flooding
- Soils that have slopes of more than 4 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Chelsea Series

Typical Pedon

The location of a representative pedon of Chelsea fine sand in Pepin County is SE¼NE¼ sec. 25, T. 23 N., R. 15 W. The typical pedon for the Chelsea series is 150 feet north and 1,820 feet east of the southwest corner of sec. 35, T. 18 N., R. 8 W., La Crosse County, Wisconsin:

Ap—0 to 9 inches; dark brown (10YR 3/3) fine sand, pale brown (10YR 6/3) dry; weak fine subangular blocky structure; very friable; common very fine to medium roots between peds; neutral; abrupt smooth boundary.

Bw1—9 to 21 inches; dark yellowish brown (10YR 4/4) fine sand; weak coarse subangular blocky structure; very friable; common very fine and fine roots between peds; slightly acid; gradual wavy boundary.

Bw2—21 to 30 inches; yellowish brown (10YR 5/4) fine sand; weak medium subangular blocky structure; friable; common very fine and fine roots between peds; slightly acid; abrupt wavy boundary.

E&Bt—30 to 60 inches; brown (10YR 5/3) fine sand (E); very friable; lamellae of brown (7.5YR 4/4) fine sand (Bt); weak medium subangular blocky structure; friable; common very fine and fine roots between peds; few faint dark brown (7.5YR 3/4) clay films between sand grains; neutral.

Range in Characteristics

Ap or A horizon (if it occurs):
Hue—10YR
Value—3 or 4
Chroma—1 to 4
Texture—fine sand

Bw horizon:
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—3 to 6
Texture—fine sand or loamy fine sand

E part of E&Bt horizon:
Hue—10YR
Value—4 to 6
Chroma—2 to 6
Texture—fine sand, sand, or loamy fine sand

Bt part of E&Bt horizon:
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—3 to 6
Texture—fine sand, fine sandy loam, sandy loam, or loamy fine sand

502B2—Chelsea fine sand, 2 to 6 percent slopes, eroded

Composition

Chelsea and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Dunes on valley trains
Slope range: 2 to 6 percent

Component Description

Texture of the surface layer: Fine sand
Depth to bedrock: Greater than 60 inches
Drainage class: Excessively drained
Dominant parent material: Eolian sands
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.2 inches (low)
Content of organic matter in the surface layer: About 0.75 percent (low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Finchford and similar soils
- Soils that have slopes of more than 6 percent or less than 2 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

502C2—Chelsea fine sand, 6 to 15 percent slopes, eroded

Composition

Chelsea and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Dunes on valley trains
Slope range: 6 to 15 percent

Component Description

Texture of the surface layer: Fine sand
Depth to bedrock: Greater than 60 inches
Drainage class: Excessively drained
Dominant parent material: Eolian sands
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.2 inches (low)
Content of organic matter in the surface layer: About 0.75 percent (low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Plainfield and similar soils
- Soils that have slopes of more than 15 percent or less than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Churchtown Series

Typical Pedon

The location of a representative pedon of Churchtown silt loam in Pepin County is NE¼NE¼ sec. 20, T. 23 N., R. 15 W. The typical pedon for the Churchtown series is 1,400 feet east and 180 feet north of the southwest corner of sec. 31, T. 16 N., R. 5 W., La Crosse County, Wisconsin:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; friable; common fine and fine roots; neutral; abrupt smooth boundary.
Bt1—9 to 17 inches; brown (10YR 4/3) silt loam; moderate fine subangular blocky structure; friable; common very fine and fine roots; few faint discontinuous dark brown (10YR 3/3) clay films on faces of peds; few distinct discontinuous light gray (10YR 7/2 dry) silt coatings on faces of peds; neutral; gradual smooth boundary.
Bt2—17 to 26 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; friable; few very fine and fine roots; few faint discontinuous dark brown (10YR 3/3) clay films on faces of peds; few distinct discontinuous

light gray (10YR 7/2 dry) silt coatings on faces of peds; neutral; clear smooth boundary.

2Bt3—26 to 31 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; friable; few very fine roots; few faint discontinuous brown (10YR 4/3) clay films on faces of peds; common distinct discontinuous light gray (10YR 7/2 dry) silt coatings on faces of peds; few faint discontinuous dark brown (10YR 3/3) organic coatings on faces of peds; neutral; gradual smooth boundary.

2Bt4—31 to 46 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; friable; few very fine roots; common faint discontinuous brown or dark brown (10YR 4/3) clay films on faces of peds; few distinct discontinuous light gray (10YR 7/2 dry) silt coatings on faces of peds; few faint discontinuous dark brown (10YR 3/3) organic coatings on faces of peds; neutral; gradual smooth boundary.

2Bt5—46 to 63 inches; yellowish brown (10YR 5/4) silt loam; weak medium prismatic structure; friable; few very fine roots; few faint discontinuous brown (10YR 4/3) clay films on faces of peds; very few distinct discontinuous light gray (10YR 7/2 dry) silt coatings on faces of peds; very few distinct discontinuous dark brown (10YR 3/3) organic coatings on faces of peds; neutral; gradual smooth boundary.

2BC—63 to 80 inches; yellowish brown (10YR 5/6) silt loam; weak coarse prismatic structure; very friable; very few faint discontinuous yellowish brown (10YR 5/4) clay films in root channels and/or pores; very few distinct continuous pale brown (10YR 6/3) silt coatings in root channels and/or pores; slightly acid.

Range in Characteristics

Depth to carbonates: More than 60 inches
Other features: Some pedons have an E horizon.

Ap or A horizon (if it occurs):
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—silt loam
Content of channers—0 to 10 percent
Content of flagstones—0 to 5 percent

Bt horizon:
Hue—10YR
Value—4 or 5
Chroma—3 to 6
Texture—silt loam or loam
Content of channers—0 to 10 percent
Content of flagstones—0 to 5 percent

2Bt horizon:
Hue—10YR
Value—4 or 5
Chroma—3 to 6
Texture—silt loam or silty clay loam

2BC or 2C horizon (if it occurs):
Hue—10YR
Value—4 to 6
Chroma—4 to 6
Texture—silt loam

116C2—Churchtown silt loam, 6 to 12 percent slopes, eroded

Composition

Churchtown and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on the landform: Footslopes
Slope range: 6 to 12 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loamy slope alluvium over loess
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.2 inches (high)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Norden and similar soils
- Soils that have slopes of more than 12 percent or less than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

116D2—Churchtown silt loam, 12 to 20 percent slopes, eroded

Composition

Churchtown and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on the landform: Footslopes
Slope range: 12 to 20 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loamy slope alluvium over loess
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.2 inches (high)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Norden and similar soils
- Soils that have slopes of more than 20 percent or less than 12 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

116E—Churchtown silt loam, 20 to 30 percent slopes

Composition

Churchtown and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on the landform: Footslopes
Slope range: 20 to 30 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Slope alluvium over loess
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.2 inches (high)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Norden and similar soils
- Soils that are stony or bouldery at the surface
- Soils that have slopes of more than 30 percent or less than 20 percent
- Soils that have sandy textures in the upper part of the solum

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Dakota Series

Mean annual precipitation is sufficient to grow trees on these soils. The thick dark surface layer is a result of a combination of accumulation from erosional and depositional processes, both natural and post-

settlement, and fire. Natural fires were common and helped to maintain grass vegetation, which contributed to the thick, dark, humus-rich upper horizons. The Native Americans who lived in the area and used these soils also used fire to maintain the grass vegetation for ease of cultivation and for attracting game animals.

Typical Pedon

The location of a representative pedon of Dakota silt loam in Pepin County is SW¼SW¼ sec. 23, T. 23 N., R. 15 W. The typical pedon for the Dakota series is 250 feet south and 1,025 feet west of the northeast corner of sec. 6, T. 24 N., R. 17 E., Pierce County, Wisconsin:

Ap—0 to 10 inches; very dark gray (10YR 3/1) silt loam, dark grayish brown (10YR 4/2) dry; weak and moderate fine and medium subangular blocky structure; friable; common very fine and fine and few medium roots; slightly acid; clear smooth boundary.

AB—10 to 13 inches; very dark gray (10YR 3/1) silt loam, brown (10YR 4/3) dry; moderate medium subangular blocky structure; friable; few very fine and fine roots; slightly acid; gradual wavy boundary.

Bt1—13 to 20 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; friable; few very fine and fine roots; common faint yellowish brown (10YR 5/4) clay films on faces of peds and in pores; slightly acid; gradual wavy boundary.

Bt2—20 to 35 inches; yellowish brown (10YR 5/4) loam; moderate medium subangular blocky structure; friable; few very fine and fine roots; common faint dark yellowish brown (10YR 4/4) clay films on faces of peds and in pores; slightly acid; clear wavy boundary.

2Bt3—35 to 38 inches; dark yellowish brown (10YR 4/4) loamy sand; moderate medium subangular blocky structure; very friable; common faint dark yellowish brown (10YR 4/4) clay films between sand grains; moderately acid; gradual wavy boundary.

2C—38 to 60 inches; brown (10YR 4/3) sand; single grain; loose; strongly acid.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 18 inches
Depth to outwash: 20 to 40 inches

Ap or A horizon (if it occurs):
Hue—7.5YR or 10YR
Value—2 or 3
Chroma—1 to 3
Texture—silt loam
Content of gravel—0 to 5 percent

AB or BA horizon (if it occurs):
Hue—7.5YR or 10YR
Value—3 or 4
Chroma—2 or 3
Texture—silt loam, loam, or sandy clay loam
Content of gravel—0 to 10 percent

Bt horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—3 or 4
Texture—silt loam, silty clay loam, loam, sandy clay loam, or sandy loam
Content of gravel—0 to 10 percent

2Bt horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—3 or 4
Texture—loamy sand, coarse sand, sand, loamy coarse sand, or the gravelly analogs of these textures
Content of gravel—0 to 35 percent
Content of cobbles—0 to 5 percent

2C horizon:
Hue—7.5YR or 10YR
Value—4 to 7
Chroma—3 to 6 or multicolored
Texture—sand, coarse sand, or the gravelly analogs of these textures
Content of gravel—0 to 35 percent
Content of cobbles—0 to 5 percent

403A—Dakota silt loam, 0 to 3 percent slopes

Composition

Dakota and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Valley trains
Position on the landform: Treads
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Silty alluvium over sandy and gravelly outwash

Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 7.6 inches (moderate)
Content of organic matter in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Rasset and similar soils
- Soils that have loamy textures in the substratum

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Dorerton Series

Typical Pedon

The location of a representative pedon of Dorerton loam (fig. 12) in Pepin County is NE¼NW¼ sec. 13, T. 23 N., R. 15 W. The typical pedon for the Dorerton series is 800 feet north and 1,700 feet west of the southeast corner of sec. 11, T. 108 N., R. 14 W., Olmsted County, Minnesota:

A—0 to 3 inches; very dark brown (10YR 2/2) loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; very friable; abundant roots; slightly acid; abrupt smooth boundary.
E1—3 to 5 inches; dark grayish brown (10YR 4/2) loam; weak fine subangular blocky structure; very friable; many very dark grayish brown (10YR 3/2) wormcasts; many very fine to medium tubular pores; common roots; strongly acid; abrupt wavy boundary.
E2—5 to 10 inches; dark brown (10YR 4/3) loam; weak medium platy structure; very friable; many very fine to large tubular pores; common roots; strongly acid; clear irregular boundary.
BE—10 to 15 inches; brown (10YR 5/3) loam; moderate medium subangular blocky structure; friable; many very fine to medium tubular pores; few roots; many thin coatings of clean silt and sand particles on faces of peds; strongly acid; clear wavy boundary.
Bt1—15 to 18 inches; dark brown (7.5YR 4/4) loam; moderate medium subangular blocky structure; firm; common medium tubular pores; many faint dark brown (7.5YR 3/2) clay films on faces of peds; slightly acid; abrupt wavy boundary.
2Bt2—18 to 30 inches; dark brown (7.5YR 4/4) very channery clay loam; strong medium subangular blocky structure; firm; about 50 percent dolostone fragments of pebble to flagstone size; many distinct dark brown (7.5YR 3/2) clay films on faces of peds; slightly acid; clear irregular boundary.
2C—30 to 60 inches; very pale brown (10YR 7/3) extremely flaggy loamy sand; single grain; loose; about 75 percent dolostone fragments of pebble to flagstone size; slightly alkaline; strong effervescence.

Range in Characteristics

Depth to dolostone: 45 to 70 inches
Depth to carbonates: 16 to 45 inches

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam
Content of channers—0 to 10 percent

E and BE horizons:
Hue—10YR
Value—3 to 5
Chroma—2 or 3
Texture—loam, sandy loam, fine sandy loam, or silt loam
Content of channers—0 to 10 percent
Content of flagstones—0 to 5 percent

Bt horizon:
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—3 or 4
Texture—loam, silt loam, silty clay loam, or clay loam
Content of channers—0 to 10 percent
Content of flagstones—0 to 5 percent

2Bt horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—3 or 4
Texture—the very channery, extremely channery,

very flaggy, or extremely flaggy analogs of loam or clay loam
Content of channers—20 to 50 percent
Content of flagstones—10 to 35 percent

2C horizon:
Hue—10YR
Value—4 to 7
Chroma—3 to 6
Texture—the very flaggy, extremely flaggy, very channery, or extremely flaggy analogs of loamy sand, sand, fine sand, loamy fine sand, sandy loam, fine sandy loam, or loam
Content of channers—20 to 50 percent
Content of flagstones—10 to 35 percent

1135F—Dorerton-Elbaville complex, 30 to 60 percent slopes

Composition

Dorerton and similar soils: About 60 percent
Elbaville and similar soils: About 25 percent
Inclusions: About 15 percent

Setting

Landform: Hills
Position on the landform: Dorerton—backslopes; Elbaville—shoulders
Slope range: Dorerton—30 to 60 percent; Elbaville—30 to 45 percent

Component Description

Dorerton

Texture of the surface layer: Loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loamy colluvium over loamy residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.8 inches (moderate)
Content of organic matter in the surface layer: About 2 percent (moderate)

Elbaville

Texture of the surface layer: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess over loamy colluvium and loamy residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 8.3 inches (moderate)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Dorerton soils that have a surface layer of very stony loam
- Churchtown and similar soils
- Gaphill and similar soils
- Norden and similar soils
- Rockbluff and similar soils
- Soils that have slopes of less than 30 percent

Major Uses of the Unit

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Drammen Series

Typical Pedon

Typical pedon for the Drammen series, 2,325 feet east and 2,615 feet south of the northwest corner of sec. 18, T. 25 N., R. 11 W., Pepin County, Wisconsin:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loamy sand, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; very friable; many fine and medium roots; neutral; abrupt smooth boundary.
Bw1—9 to 15 inches; dark yellowish brown (10YR 4/4) sand; weak medium subangular blocky structure; very friable; many fine and medium roots; neutral; clear smooth boundary.
Bw2—15 to 21 inches; yellowish brown (10YR 5/4) sand; weak coarse subangular blocky structure; very friable; common fine roots; neutral; gradual wavy boundary.
Bw3—21 to 44 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; neutral; gradual wavy boundary.

E&Bt—44 to 65 inches; about 75 percent yellowish brown (10YR 5/4) sand (E); single grain; loose; slightly acid; lamellae of brown (7.5YR 4/4) and strong brown (7.5YR 4/6) loamy sand and sand (Bt) (2 to 7.5 cm thick; more than 15 cm total thickness); weak medium subangular blocky structure; friable; many faint brown (7.5YR 4/3) clay bridges between sand grains; 3 percent sandstone channers; slightly acid; gradual wavy boundary.
C—65 to 72 inches; yellowish brown (10YR 5/6) sand; single grain; loose; slightly acid.

Range in Characteristics

Depth to lamellae: 40 to more than 60 inches
Other features: Some pedons have an E horizon.

Ap or A horizon (if it occurs):
Hue—7.5YR or 10YR
Value—2 to 4
Chroma—1 to 3
Texture—loamy sand
Content of channers—0 to 15 percent

Bw horizon:
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—3 to 6
Texture—sand, loamy sand, fine sand, or loamy fine sand
Content of channers—0 to 15 percent

E part of E&Bt horizon:
Hue—7.5YR or 10YR
Value—5 or 6
Chroma—3 or 4
Texture—sand, fine sand, loamy fine sand, or loamy sand
Content of channers—0 to 15 percent

Bt part of E&Bt horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—3 to 6
Texture—sand, loamy sand, fine sand, loamy fine sand, fine sandy loam, or sandy loam
Content of channers—0 to 15 percent

C horizon:
Hue—7.5YR or 10YR
Value—5 to 7
Chroma—3 to 8
Texture—sand or coarse sand
Content of channers—0 to 15 percent

512B—Drammen loamy sand, 1 to 6 percent slopes

Composition

Drammen and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Sand sheets (fig. 13)
Slope range: 1 to 6 percent

Component Description

Texture of the surface layer: Loamy sand
Depth to bedrock: Greater than 80 inches
Drainage class: Somewhat excessively drained
Dominant parent material: Eolian sands and/or sandy alluvium
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.4 inches (low)
Content of organic matter in the surface layer: About 1.25 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Garne and similar soils
- Prissel and similar soils
- Soils that are less than 60 inches deep over sandstone
- Soils that have slopes of more than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

512C—Drammen loamy sand, 6 to 12 percent slopes

Composition

Drammen and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Sand sheets
Slope range: 6 to 12 percent

Component Description

Texture of the surface layer: Loamy sand
Depth to bedrock: Greater than 80 inches
Drainage class: Somewhat excessively drained
Dominant parent material: Eolian sands and/or sandy alluvium
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.4 inches (low)
Content of organic matter in the surface layer: About 1.25 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Boone and similar soils
- Urne and similar soils
- Soils that have slopes of more than 12 percent or less than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

512D—Drammen loamy sand, 12 to 20 percent slopes

Composition

Drammen and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Sand sheets
Slope range: 12 to 20 percent

Component Description

Texture of the surface layer: Loamy sand
Depth to bedrock: Greater than 80 inches
Drainage class: Somewhat excessively drained
Dominant parent material: Eolian sands and/or sandy alluvium
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.4 inches (low)
Content of organic matter in the surface layer: About 1.25 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Boone and similar soils
- Urne and similar soils
- Soils that have slopes of more than 20 percent or less than 12 percent

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Dunnbot Series

Mean annual precipitation is sufficient to grow trees on these soils. The thick dark surface layer is dominantly a result of accumulation from erosional and depositional processes, both natural and post-settlement, and partly a result of fire. Natural fires were common and helped to maintain the grass vegetation, which contributed to the thick, dark, humus-rich upper horizons. The Native Americans who lived in the area and used these soils also used fire to maintain the grass vegetation for ease of cultivation and for attracting game animals.

Typical Pedon

Typical pedon for the Dunnbot series, 1,650 feet south and 1,570 feet east of the northwest corner of sec. 7, T. 25 N., R. 13 W., Pepin County, Wisconsin:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry;

weak fine and medium subangular blocky structure; very friable; few very fine and fine roots; slightly alkaline; abrupt irregular boundary.

A1—9 to 18 inches; mostly stratified very dark brown (10YR 2/2) very fine sandy loam, dark grayish brown (10YR 4/2) dry; weak coarse subangular blocky structure parting to weak thick platy along depositional strata; very friable; few very fine and fine roots; few thin strata of brown (10YR 5/3) silt loam and very fine sandy loam, pale brown (10YR 6/3) dry; slightly alkaline; abrupt wavy boundary.

A2—18 to 28 inches; about 60 percent thinly stratified very dark brown (10YR 2/2) very fine sandy loam, dark grayish brown (10YR 4/2) dry, and 40 percent brown (10YR 5/3) silt loam, pale brown (10YR 6/3) dry; weak thin platy structure; very friable; few very fine and fine roots; slightly alkaline; abrupt wavy boundary.

A3—28 to 36 inches; very dark brown (10YR 2/2) very fine sandy loam, dark grayish brown (10YR 4/2) dry; weak fine and medium subangular blocky structure; very friable; neutral; gradual wavy boundary.

Bw—36 to 45 inches; brown (10YR 4/3) sandy loam; weak fine and medium subangular blocky structure; friable; many medium prominent strong brown (7.5YR 5/6) masses of iron accumulation; neutral; gradual wavy boundary.

C—45 to 72 inches; yellowish brown (10YR 5/4) fine sand; single grain; loose; many fine prominent strong brown (7.5YR 5/6) masses of iron accumulation; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 40 inches
Depth to sandy alluvium: 30 to 60 inches

Ap and A horizons:
Hue—10YR
Value—2 or 3
Chroma—2 or 3
Texture—fine sandy loam (strata and subhorizons of very fine sandy loam, silt loam, sandy loam, or loam)

Bw horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—3 to 6
Texture—sandy loam or fine sandy loam

C horizon:
Hue—7.5YR, 10YR, or 2.5Y
Value—2 to 8
Chroma—1 to 4
Texture—fine sand, sand, coarse sand, or the gravelly or very gravelly analogs of these textures
Content of gravel—0 to 35 percent
Content of cobbles—0 to 5 percent

646A—Dunnbot fine sandy loam, 0 to 3 percent slopes

Composition

Dunnbot and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: High flats and natural levees on flood plains
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Fine sandy loam
Depth to bedrock: Greater than 80 inches
Drainage class: Moderately well drained
Dominant parent material: Loamy alluvium over sandy alluvium
Frequency of flooding: Occasional
Depth to the water table: 3.5 to 6.0 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 8.3 inches (moderate)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Algansee and similar soils
- Kalmarville and similar soils
- Scotah and similar soils
- Rusktown and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Elbaville Series

Typical Pedon

The location of a representative pedon of Elbaville silt loam (fig. 14) in Pepin County is NE¼NW¼ sec. 13, T. 23 N., R. 15 W. The typical pedon for the Elbaville series is 75 feet south and 800 feet east of the northwest corner of sec. 8, T. 107 N., R. 15 W., Olmsted County, Minnesota:

Oe—0 to 1 inch; moderately decomposed plant material.

A—1 to 5 inches; black (10YR 2/1) silt loam, dark grayish brown (10YR 4/2) dry; weak very fine granular structure; very friable; neutral; abrupt wavy boundary.

E1—5 to 8 inches; dark grayish brown (10YR 4/2) silt loam; weak thin platy structure; very friable; many black (10YR 2/1) wormcasts; neutral; clear irregular boundary.

E2—8 to 11 inches; grayish brown (10YR 5/2) silt, light gray (10YR 7/2) dry; weak fine subangular blocky structure; very friable; neutral; clear irregular boundary.

B/E—11 to 17 inches; brown (10YR 5/3) silt loam (Bt); many interfingerings of grayish brown (10YR 5/2) silt (E), light gray (10YR 7/2) dry; moderate fine subangular blocky structure; very friable; many very fine to medium tubular pores; neutral; clear irregular boundary.

Bt1—17 to 21 inches; brown (10YR 5/3) silty clay loam; moderate fine subangular blocky structure; friable; few faint clay films on faces of peds; many very fine to medium tubular pores; neutral; abrupt wavy boundary.

2Bt2—21 to 26 inches; dark brown (7.5YR 4/2) silty clay; strong very fine angular blocky structure; firm; few very fine and fine tubular pores; many faint dark brown (7.5YR 3/2) clay films on faces of peds; neutral; abrupt wavy boundary.

3Bt3—26 to 37 inches; dark brown (10YR 4/3) very flaggy silty clay loam; strong very fine angular blocky structure; friable; many distinct clay films on faces of peds; about 50 percent coarse fragments, mostly flagstones and some channers; slightly alkaline; gradual wavy boundary.

3C—37 to 61 inches; yellowish brown (10YR 5/4) very flaggy sandy loam; massive; friable; about 70 percent coarse fragments, mostly flagstones and some channers; slight effervescence; slightly alkaline.

Range in Characteristics

Thickness of the loess: 15 to 30 inches

Depth to dolostone: 60 to more than 80 inches
Depth to carbonates: 30 to 70 inches

A horizon:
- Hue—10YR
- Value—2 or 3
- Chroma—1 or 2
- Texture—silt loam

E horizon and E part of B/E horizon:
- Hue—10YR
- Value—4 or 5
- Chroma—2 or 3
- Texture—silt loam or silt

Bt horizon and Bt part of B/E horizon:
- Hue—10YR
- Value—4 or 5
- Chroma—3 or 4
- Texture—silty clay loam, silt loam, or loam

2Bt horizon:
- Hue—5YR, 7.5YR, or 10YR
- Value—4 or 5
- Chroma—2 to 4
- Texture—silty clay, silty clay loam, clay, or clay loam
- Content of channers—0 to 10 percent
- Content of flagstones—0 to 10 percent

3Bt horizon:
- Hue—7.5YR or 10YR
- Value—4 or 5
- Chroma—2 to 4
- Texture—the very flaggy, extremely flaggy, very channery, or extremely channery analogs of silty clay loam, loam, clay loam, clay, or silty clay
- Content of channers—15 to 50 percent
- Content of flagstones—10 to 50 percent

3C horizon:
- Hue—10YR or 2.5Y
- Value—5 to 7
- Chroma—3 or 4
- Texture—the very flaggy, extremely flaggy, very channery, or extremely channery analogs of sandy loam, sand, fine sand, loamy sand, loamy fine sand, fine sandy loam, or loam
- Content of channers—15 to 50 percent
- Content of flagstones—10 to 50 percent

Elevasil Series

Typical Pedon

The location of a representative pedon of Elevasil sandy loam in Pepin County is NE¼NW¼ sec. 3, T. 25

N., R. 11 W. The typical pedon for the Elevasil series is 1,000 feet east and 1,300 feet south of the northwest corner of sec. 30, T. 19 N., R. 6 W., Jackson County, Wisconsin:

Oe—0 to 1 inch; very dark grayish brown (10YR 3/2) mucky peat (hemic material consisting of a mat of partially decomposed forest litter); about 45 percent fiber, 25 percent rubbed; weak thin platy structure; nonsticky; very strongly acid; abrupt smooth boundary.

A—1 to 3 inches; very dark brown (10YR 2/2) sandy loam, brown (10YR 5/3) dry; weak fine granular structure; very friable; many fine and medium roots; very strongly acid; abrupt wavy boundary.

Bt1—3 to 9 inches; dark yellowish brown (10YR 4/4) sandy loam, weak medium subangular blocky structure; friable; common fine and medium roots; few distinct dark brown (7.5YR 4/4) clay films on faces of peds; strongly acid; abrupt irregular boundary.

Bt2—9 to 27 inches; strong brown (7.5YR 5/6) sandy loam; moderate medium subangular blocky structure; friable; common very fine to medium roots; few distinct dark brown (7.5YR 4/4) clay films on faces of peds; about 5 percent sandstone channers in the lower part of the horizon; very strongly acid; abrupt irregular boundary.

2BC—27 to 31 inches; strong brown (7.5YR 5/6) loamy sand; weak medium subangular blocky structure; very friable; few very fine roots; about 10 percent sandstone channers; very strongly acid; abrupt wavy boundary.

2C—31 to 39 inches; reddish yellow (7.5YR 6/6) sand; single grain; loose; about 14 percent sandstone channers; strongly acid; clear smooth boundary.

2Cr—39 to 60 inches; very pale brown (10YR 7/4), weakly cemented sandstone.

Range in Characteristics

Depth to sandstone: 20 to 40 inches
Other features: Some pedons have an E horizon.

A or Ap horizon (if it occurs):
Hue—7.5YR or 10YR
Value—2 to 4
Chroma—1 to 3
Texture—sandy loam
Content of channers—0 to 15 percent

Bt horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—4 to 6
Texture—sandy loam, loam, or the channery analogs of these textures
Content of channers—0 to 35 percent
Content of flagstones—0 to 5 percent

2Bt horizon (if it occurs):
Hue—7.5YR or 10YR
Value—4 to 7
Chroma—4 to 6
Texture—loamy sand, loamy fine sand, sand, fine sand, or the channery analogs of these textures
Content of channers—0 to 35 percent
Content of flagstones—0 to 5 percent

2BC horizon:
Hue—7.5YR or 10YR
Value—4 to 7
Chroma—4 to 6
Texture—loamy sand, loamy fine sand, sand, fine sand, or the channery analogs of these textures
Content of channers—0 to 35 percent
Content of flagstones—0 to 5 percent

2C horizon:
Hue—7.5YR or 10YR
Value—4 to 7
Chroma—2 to 6
Texture—sand, fine sand, or the channery analogs of these textures
Content of channers—0 to 35 percent
Content of flagstones—0 to 5 percent

224B—Elevasil sandy loam, 2 to 6 percent slopes

Composition

Elevasil and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on the landform: Summits
Slope range: 2 to 6 percent

Component Description

Texture of the surface layer: Sandy loam
Depth to bedrock: 20 to 40 inches
Drainage class: Somewhat excessively drained
Dominant parent material: Loamy slope alluvium over sandy residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.5 inches (low)

Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Boone and similar soils
- Hixton and similar soils
- Soils that have slopes of more than 6 percent or less than 2 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

224C2—Elevasil sandy loam, 6 to 12 percent slopes, eroded

Composition

Elevasil and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on the landform: Backslopes and shoulders
Slope range: 6 to 12 percent

Component Description

Texture of the surface layer: Sandy loam
Depth to bedrock: 20 to 40 inches
Drainage class: Somewhat excessively drained
Dominant parent material: Loamy slope alluvium over sandy residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.5 inches (low)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Boone and similar soils
- Hixton and similar soils
- Soils that have slopes of more than 12 percent or less than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

224D2—Elevasil sandy loam, 12 to 20 percent slopes, eroded

Composition

Elevasil and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on the landform: Backslopes and shoulders
Slope range: 12 to 20 percent

Component Description

Texture of the surface layer: Sandy loam
Depth to bedrock: 20 to 40 inches
Drainage class: Somewhat excessively drained
Dominant parent material: Loamy slope alluvium over sandy residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.5 inches (low)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Boone and similar soils
- Hixton and similar soils

- Soils that have slopes of more than 20 percent or less than 12 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Ella Series

Typical Pedon

Typical pedon for the Ella series, 2,600 feet south and 1,250 feet east of the northwest corner of sec. 13, T. 25 N., R. 14 W., Pepin County, Wisconsin:

Ap—0 to 8 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate medium granular structure; friable; many fine and medium roots; slightly alkaline; abrupt smooth boundary.

Bt1—8 to 25 inches; brown (10YR 4/3) silt loam; moderate fine and medium subangular blocky structure; friable; many fine and medium roots; few faint dark brown (10YR 3/3) clay films on faces of peds and in pores; neutral; clear smooth boundary.

Bt2—25 to 43 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; friable; common fine roots; common faint brown (10YR 4/3) clay films on faces of peds and in pores; neutral; clear smooth boundary.

Bt3—43 to 55 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; friable; common faint brown (10YR 4/3) clay films on faces of peds and in pores; many prominent strong brown (7.5YR 5/6) masses of iron accumulation; neutral; gradual smooth boundary.

2Bt4—55 to 64 inches; mostly brown (7.5YR 4/3), stratified silt loam and sandy loam with thin strata of brown (7.5YR 4/4) fine sand; weak fine and medium subangular blocky structure; friable; breaks to weak thick plates along depositional strata; friable and loose; few faint brown (7.5YR 4/3) clay films on faces of peds and in pores; many prominent strong brown (7.5YR 5/6) masses of iron accumulation; neutral; gradual smooth boundary.

2Bt5—64 to 72 inches; brown (7.5YR 5/4) silt loam with strata of brown (7.5YR 5/4) fine sand; weak fine and medium subangular blocky structure; friable; breaks to weak thick plates along depositional strata; few faint brown (7.5YR 4/3) clay films on faces of peds and in pores; common distinct strong brown (7.5YR 5/6) masses of iron accumulation; neutral; abrupt smooth boundary.

2C—72 to 80 inches; brown (10YR 5/3) silt loam with very thin strata of silt and very fine sand; massive; friable; breaks to weak thick plates along depositional strata; common fine irregular very pale brown (10YR 8/2), soft threads of calcium carbonate; slightly effervescent; moderately alkaline.

Range in Characteristics

Depth to slackwater deposits: 40 to 80 inches
Depth to carbonates: 60 to more than 80 inches
Other features: Some pedons have an E horizon.

Ap or A horizon (if it occurs):
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—silt loam

Bt horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—3 or 4
Texture—silt loam or silty clay loam

2Bt horizon:
Hue—5YR, 7.5YR, or 10YR
Value—4 or 5
Chroma—3 or 4
Texture—stratified silty clay loam to sand

2C horizon:
Hue—5YR, 7.5YR, 10YR
Value—4 to 7
Chroma—3 to 8
Texture—stratified silty clay loam to sand

316B2—Ella silt loam, 1 to 6 percent slopes, eroded

Composition

Ella and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Stream terraces
Position on the landform: Treads
Slope range: 1 to 6 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: Greater than 80 inches
Drainage class: Moderately well drained
Dominant parent material: Silty alluvium over silty to sandy slackwater deposits
Flooding: None
Depth to the water table: 3.5 to 6.0 feet
Kind of water table: Perched
Available water capacity to 60 inches or root-limiting layer: About 12.4 inches (high)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Arenzville and similar soils
- Bearpen and similar soils
- Ella soils that are well drained
- Soils that have slopes of more than 6 percent or less than 1 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

316C2—Ella silt loam, 6 to 12 percent slopes, eroded

Composition

Ella and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Stream terraces
Position on the landform: Risers
Slope range: 6 to 12 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: Greater than 80 inches
Drainage class: Moderately well drained
Dominant parent material: Silty alluvium over silty to sandy slackwater deposits
Flooding: None
Depth to the water table: 3.5 to 6.0 feet
Kind of water table: Perched
Available water capacity to 60 inches or root-limiting layer: About 12.4 inches (high)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Arenzville and similar soils
- Ella soils that are well drained
- Soils that have slopes of more than 12 percent or less than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Ettrick Series

Mean annual precipitation is sufficient to grow trees on these soils. The thick dark surface layer is dominantly a result of accumulation from erosional and depositional processes, both natural and post-settlement.

Typical Pedon

The location of a representative pedon of Ettrick silt loam in Pepin County is SE¼NW¼ sec. 3, T. 25 N., R. 14 W. The typical pedon for the Ettrick series is 166 feet north and 1,642 feet west of the southeast corner of sec. 33, T. 15 N., R. 2 W., Monroe County, Wisconsin:

Ap—0 to 10 inches; very dark gray (10YR 3/1) silt loam, dark grayish brown (10YR 4/2) dry; weak medium granular and weak fine subangular blocky structure; friable; common fine roots; neutral; abrupt smooth boundary.

A—10 to 16 inches; black (N 2/0) silt loam, dark gray (10YR 4/1) dry; moderate medium granular and very fine and fine subangular blocky structure; friable; few very fine roots; few very fine and fine pores; few prominent grayish brown (10YR 5/2) masses of iron depletion; about 1 percent black (10YR 2/1), soft accumulations of iron and manganese oxides; neutral; clear smooth boundary.

Bg1—16 to 20 inches; dark gray (5Y 4/1) silt loam; weak medium and coarse subangular blocky structure; friable; few very fine roots; few very fine pores; many root channels coated with black (10YR 2/1) soil; few fine prominent brown (7.5YR 4/4) masses of iron accumulation; about 1 percent black (10YR 2/1), soft accumulations of iron and manganese oxides; neutral; clear smooth boundary.

Bg2—20 to 26 inches; gray (5Y 5/1) silt loam; weak medium and coarse subangular blocky structure; friable; few very fine roots; few fine pores; common fine prominent strong brown (7.5YR 5/6) masses of iron accumulation; about 1 percent black (10YR 2/1) and some strong brown (7.5YR 5/6), soft accumulations of iron and manganese oxides; krotovina filled with black (10YR 2/1) silt loam; neutral; clear smooth boundary.

Bg3—26 to 31 inches; silt loam, 50 percent gray (5Y 5/1) and 50 percent yellowish red (5YR 4/6); weak coarse prismatic structure parting to weak coarse subangular blocky; friable; few very fine roots; about 5 percent, by volume, yellowish red (5YR 4/6) and some strong brown (7.5YR 5/6) segregated iron as pipe stems; neutral; gradual smooth boundary.

Bg4—31 to 35 inches; gray (5Y 5/1) silt loam; weak coarse prismatic structure parting to weak coarse subangular blocky; friable; common very fine and few fine roots; reddish brown (5YR 4/4) masses of iron accumulation radiate from old root channels for a distance of 2 mm; few rounded and tubular concretions (iron oxides); neutral; abrupt smooth boundary.

Cg—35 to 60 inches; gray (N 5/0) silt loam; massive; friable; common fine and very fine roots; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 24 inches

Ap and A horizons:
Hue—10YR or neutral
Value—2 or 3
Chroma—0 to 2
Texture—silt loam

Bg horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—4 to 6
Chroma—0 to 2
Texture—typically silt loam (thin strata or subhorizons of silty clay loam)

Cg horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—4 to 6
Chroma—0 to 6
Texture—typically silt loam (thin strata of coarser textures are common)

629A—Ettrick silt loam, 0 to 2 percent slopes

Composition

Ettrick and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Depressions and drainageways on stream terraces
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Poorly drained
Dominant parent material: Silty alluvium
Frequency of flooding: Frequent
Water table depth: 1 foot above to 1 foot below the surface
Kind of water table: Apparent
Ponding duration: Long
Available water capacity to 60 inches or root-limiting layer: About 14.2 inches (high)
Content of organic matter in the surface layer: About 8 percent (very high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Orion and similar soils
- Palms and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Farrington Series

Mean annual precipitation is sufficient to grow trees on these droughty soils. The thick dark surface layer is a result of a combination of accumulation from erosional and depositional processes, both natural and post-settlement, and fire. Natural fires were common and helped to maintain the grass vegetation, which contributed to the thick, dark, humus-rich upper horizons. The Native Americans who lived in the area and used these soils also used fire to maintain the grass vegetation for ease of cultivation and for attracting game animals.

Typical Pedon

Typical pedon for the Farrington series, 200 feet north and 600 feet east of the southwest corner of sec. 7, T. 25 N., R. 12 W., Pepin County, Wisconsin:

Ap—0 to 9 inches; very dark brown (10YR 2/2) loamy sand, very dark grayish brown (10YR 3/2) dry; weak medium subangular blocky structure; friable; few very fine and fine roots; 1 percent gravel; neutral; clear smooth boundary.

A—9 to 14 inches; very dark grayish brown (10YR 3/2) loamy sand, dark grayish brown (10YR 4/2) dry; weak medium subangular blocky structure; friable; few very fine and fine roots; 1 percent gravel; strongly acid; clear irregular boundary.

AB—14 to 18 inches; dark brown (10YR 3/3) loamy sand, brown (10YR 4/3) dry; weak coarse subangular blocky structure; very friable; few very fine and fine roots; 1 percent gravel; strongly acid; clear smooth boundary.

Bw1—18 to 23 inches; dark yellowish brown (10YR 4/4) loamy sand; weak coarse subangular blocky structure; very friable; few very fine and fine roots; common fine and medium prominent strong brown (7.5YR 5/6) masses of iron accumulation and common fine distinct grayish brown (10YR 5/2) iron depletions; 1 percent gravel; strongly acid; gradual smooth boundary.

Bw2—23 to 41 inches; strong brown (7.5YR 4/6) sand; single grain; loose; common coarse faint strong brown (7.5YR 5/6) masses of iron accumulation and common fine prominent grayish brown (10YR 5/2) iron depletions; 1 percent gravel; strongly acid; gradual smooth boundary.

C—41 to 72 inches; yellowish brown (10YR 5/4) coarse sand; single grain; loose; common coarse distinct strong brown (7.5YR 5/8) masses of iron accumulation and common fine prominent grayish brown (10YR 5/2) iron depletions; 1 percent gravel; moderately acid.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 24 inches
Other features: Some pedons have a Cg horizon.

Ap and A horizons:
Hue—7.5YR or 10YR
Value—2 or 3
Chroma—1 or 2
Texture—loamy sand
Content of gravel—0 to 15 percent

AB horizon:
Hue—7.5YR or 10YR
Value—3
Chroma—2 or 3
Texture—loamy sand, sand, coarse sand, or loamy coarse sand
Content of gravel—0 to 15 percent

Bw horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—4 to 6
Texture—loamy sand, sand, coarse sand, or loamy coarse sand
Content of gravel—0 to 15 percent

Bg horizon (if it occurs):
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—1 or 2
Texture—sand, coarse sand, loamy coarse sand, or loamy sand
Content of gravel—0 to 15 percent

C horizon:
Hue—7.5YR, 10YR, or 2.5Y
Value—4 to 6
Chroma—3 to 6
Texture—coarse sand or sand
Content of gravel—0 to 15 percent

508A—Farrington loamy sand, 0 to 3 percent slopes

Composition

Farrington and similar soils: About 90 percent

Inclusions: About 10 percent

Setting

Landform: Valley trains
Position on the landform: Treads
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Loamy sand
Depth to bedrock: Greater than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Sandy and gravelly outwash
Flooding: None
Depth to the water table: 1.0 to 2.5 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 3.9 inches (low)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Komro and similar soils
- Newson and similar soils
- Farrington soils that have a loamy substratum

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Finchford Series

Mean annual precipitation is sufficient to grow trees on these droughty soils. Natural fires were common and helped to maintain the grass vegetation, which contributed to the thick, dark, humus-rich upper horizons. The Native Americans who lived in the area and used these soils also used fire to maintain the grass vegetation for ease of cultivation and for attracting game animals.

Typical Pedon

The location of a representative pedon of Finchford loamy sand in Pepin County is SE¼NW¼ sec. 17, T. 25 N., R. 13 W. The typical pedon for the Finchford series is 1,560 feet north and 1,255 feet east of the southwest corner of sec. 18, T. 26 N., R. 12 W., Dunn County, Wisconsin:

Ap—0 to 10 inches; black (10YR 2/1) loamy sand, very dark gray (10YR 3/1) dry; moderate medium subangular blocky structure; friable; common very fine and fine roots; 1 percent rounded mixed gravel; neutral; abrupt smooth boundary.

A—10 to 15 inches; very dark brown (10YR 2/2) loamy sand, very dark grayish brown (10YR 3/2) dry; weak medium subangular blocky structure; very friable; common very fine and fine roots; 1 percent rounded mixed gravel; neutral; clear smooth boundary.

AB—15 to 19 inches; very dark brown (10YR 3/2) loamy sand, dark brown (10YR 3/3) dry; weak fine subangular blocky structure; very friable; common very fine and fine roots; 1 percent rounded mixed gravel; neutral; clear smooth boundary.

Bw—19 to 26 inches; dark yellowish brown (10YR 3/4) sand; weak fine subangular blocky structure; very friable; common very fine and fine roots; 10 percent rounded mixed gravel; neutral; gradual wavy boundary.

C1—26 to 49 inches; multicolored gravelly coarse sand; single grain; loose; 30 percent rounded mixed gravel; neutral; gradual wavy boundary.

C2—49 to 80 inches; multicolored sand; single grain; 3 percent rounded mixed gravel; slightly acid.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 24 inches

Ap and A horizons:
Hue—7.5YR or 10YR
Value—2 or 3
Chroma—1 or 2
Texture—loamy sand
Content of gravel—0 to 15 percent

AB horizon:
Hue—7.5YR or 10YR
Value—3 or 4
Chroma—2 or 3
Texture—loamy sand, loamy coarse sand, sand, or coarse sand
Content of gravel—0 to 15 percent

Bw horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—3 or 4
Texture—sand, loamy sand, coarse sand, loamy

coarse sand, or the gravelly analogs of these textures
Content of gravel—0 to 35 percent
Content of cobbles—0 to 5 percent

C horizon:
Hue—7.5YR or 10YR
Value—3 to 6
Chroma—3 to 6 or multicolored
Texture—coarse sand, sand, or the gravelly analogs of these textures
Content of gravel—0 to 35 percent
Content of cobbles—0 to 5 percent

501A—Finchford loamy sand, 0 to 3 percent slopes

Composition

Finchford and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Valley trains
Position on the landform: Treads
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Loamy sand
Depth to bedrock: Greater than 80 inches
Drainage class: Excessively drained
Dominant parent material: Sandy and gravelly outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.1 inches (low)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Chelsea and similar soils
- Prissel and similar soils
- Rasset and similar soils
- Soils that have slopes of more than 3 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

501B—Finchford loamy sand, 2 to 6 percent slopes

Composition

Finchford and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Valley trains
Position on the landform: Treads
Slope range: 2 to 6 percent

Component Description

Texture of the surface layer: Loamy sand
Depth to bedrock: Greater than 80 inches
Drainage class: Excessively drained
Dominant parent material: Sandy and gravelly outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 4.1 inches (low)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Burkhardt and similar soils
- Chelsea and similar soils
- Prissel and similar soils
- Soils that have slopes of more than 6 percent or less than 2 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Forkhorn Series

Typical Pedon

Typical pedon for the Forkhorn series, 1,850 feet north and 1,780 feet west of the southeast corner of sec. 4, T. 25 N., R. 13 W., Pepin County, Wisconsin:

Ap—0 to 9 inches; very dark brown (10YR 2/2) sandy loam, dark grayish brown (10YR 4/2) dry; weak medium and coarse subangular blocky structure; friable; many very fine to medium roots; 3 percent gravel; slightly acid; abrupt smooth boundary.

Bt1—9 to 17 inches; brown (7.5YR 4/4) sandy loam; moderate medium subangular blocky structure; friable; many very fine and fine roots; few faint brown (7.5YR 4/3) clay films on faces of peds and in pores; common fine very dark brown (10YR 2/2) wormcasts; 10 percent gravel; slightly acid; clear smooth boundary.

Bt2—17 to 25 inches; brown (7.5YR 4/4) sandy loam; moderate fine and medium subangular blocky structure; friable; common very fine and fine roots; common faint brown (7.5YR 4/3) clay films on faces of peds and in pores; 5 percent gravel; slightly acid; gradual smooth boundary.

2Bt3—25 to 32 inches; strong brown (7.5YR 4/6) gravelly loamy sand; weak coarse subangular blocky structure; very friable; few very fine and fine roots; common faint brown (7.5YR 4/3) clay bridges; 30 percent gravel; slightly acid; gradual smooth boundary.

2BC—32 to 46 inches; strong brown (7.5YR 5/6), stratified gravelly coarse sand; single grain; loose; about 25 percent gravel as an average; slightly acid; gradual smooth boundary.

2C—46 to 72 inches; brown (7.5YR 5/4) and multicolored, stratified sand and coarse sand; single grain; loose; about 10 percent gravel as an average; slightly acid.

Range in Characteristics

Depth to outwash: 20 to 40 inches
Other features: Some pedons have an E horizon.

Ap or A horizon:
Hue—7.5YR or 10YR
Value—2 or 3
Chroma—1 to 3
Texture—sandy loam
Content of gravel—0 to 15 percent

Bt horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—3 to 6
Texture—sandy loam, fine sandy loam, or loam
Content of gravel—0 to 15 percent

2Bt horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—4 to 6
Texture—loamy sand, coarse sand, sand, loamy coarse sand, or the gravelly analogs of these textures
Content of gravel—0 to 35 percent
Content of cobbles—0 to 5 percent

2BC and 2C horizons:
Hue—7.5YR or 10YR
Value—5 to 7
Chroma—3 to 6 or multicolored
Texture—sand, coarse sand, or the gravelly analogs of these textures
Content of gravel—0 to 35 percent
Content of cobbles—0 to 5 percent

433A—Forkhorn sandy loam, 0 to 3 percent slopes

Composition

Forkhorn and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Valley trains
Position on the landform: Treads
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Sandy loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loamy alluvium over sandy and gravelly outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.1 inches (low)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Kevilar and similar soils

- Soils that have sandstone at a depth of less than 60 inches
- Soils that have slopes of more than 3 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

433B—Forkhorn sandy loam, 2 to 6 percent slopes

Composition

Forkhorn and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Valley trains
Position on the landform: Treads
Slope range: 2 to 6 percent

Component Description

Texture of the surface layer: Sandy loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loamy alluvium over sandy and gravelly outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.1 inches (low)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Kevilar and similar soils
- Plainfield and similar soils
- Soils that have sandstone at a depth of less than 60 inches
- Soils that have slopes of more than 6 percent or less than 2 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

433C2—Forkhorn sandy loam, 6 to 12 percent slopes, eroded

Composition

Forkhorn and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Valley trains
Position on the landform: Risers
Slope range: 6 to 12 percent

Component Description

Texture of the surface layer: Sandy loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loamy alluvium over sandy and gravelly outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.1 inches (low)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Kevilar and similar soils
- Soils that have sandstone at a depth of less than 60 inches
- Soils that have slopes of more than 12 percent or less than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Gaphill Series

Typical Pedon

Typical pedon for the Gaphill series, 1,500 feet south and 2,300 feet east of the northwest corner of sec. 32, T. 24 N., R. 14 W., Pepin County, Wisconsin:

Oe—0 to 2 inches; very dark brown (10YR 2/2) mucky peat (hemic material consisting of a mat of partially decomposed forest litter); about 55 percent fiber, 25 percent rubbed; weak thin platy structure; very friable; moderately acid; abrupt smooth boundary.

A—2 to 5 inches; black (10YR 2/1) sandy loam, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure; friable; many fine and medium roots; about 1 percent dolostone flagstones; about 1 percent dolostone channers; slightly acid; abrupt smooth boundary.

E—5 to 11 inches; brown (10YR 4/3) sandy loam, brown (10YR 5/3) dry; weak thick platy structure; friable; many fine and medium roots; about 1 percent dolostone channers; slightly acid; clear smooth boundary.

Bt1—11 to 17 inches; dark yellowish brown (10YR 4/4) sandy loam; moderate medium and coarse subangular blocky structure; friable; common fine and medium roots; few faint brown (10YR 4/3) clay films on faces of peds and in pores; 1 percent dolostone channers; slightly acid; gradual smooth boundary.

Bt2—17 to 24 inches; dark yellowish brown (10YR 4/4) sandy loam; moderate medium and coarse subangular blocky structure; friable; common fine and medium roots; common faint brown (10YR 4/3) clay films on faces of peds and in pores; about 1 percent dolostone channers; neutral; gradual smooth boundary.

Bt3—24 to 32 inches; dark yellowish brown (10YR 4/4) sandy loam; moderate coarse subangular blocky structure; friable; common fine and medium roots; many faint brown (10YR 4/3) clay films on faces of peds and in pores; about 1 percent dolostone channers; neutral; clear smooth boundary.

2BC—32 to 50 inches; dark yellowish brown (10YR 4/6) sand; single grain; loose; few fine roots; about 2 percent sandstone channers; moderately acid; gradual smooth boundary.

2C—50 to 56 inches; yellowish brown (10YR 5/6) sand; single grain; loose; few fine roots; about 5 percent sandstone channers; moderately acid; gradual irregular boundary.

2Cr—56 to 66 inches; yellowish brown (10YR 5/6 and 5/8) and light yellowish brown (10YR 6/4) sandstone.

Range in Characteristics

Thickness of the loamy slope alluvium: 20 to 40 inches
Depth to sandstone: 40 to 80 inches

A horizon:
Hue—7.5YR or 10YR
Value—2 or 3
Chroma—1 to 3
Texture—sandy loam
Content of channers—0 to 15 percent
Content of flagstones—0 to 5 percent

E horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—2 or 3
Texture—sandy loam, fine sandy loam, or loam
Content of channers—0 to 15 percent
Content of flagstones—0 to 5 percent

Bt horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—4 to 6
Texture—sandy loam, fine sandy loam, or loam
Content of channers—0 to 15 percent
Content of flagstones—0 to 5 percent

2BC horizon:
Hue—7.5YR or 10YR
Value—4 to 7
Chroma—4 to 6
Texture—sand, fine sand, loamy sand, loamy fine sand, or the channery or flaggy analogs of these textures
Content of channers—0 to 35 percent
Content of flagstones—0 to 5 percent

2C horizon:
Hue—7.5YR or 10YR
Value—5 to 8
Chroma—3 to 8
Texture—sand, fine sand, or the channery or flaggy analogs of these textures
Content of channers—0 to 35 percent
Content of flagstones—0 to 5 percent

1145F—Gaphill-Rockbluff complex, 30 to 60 percent slopes

Composition

Gaphill and similar soils: About 50 percent
Rockbluff and similar soils: About 35 percent
Inclusions: About 15 percent

Setting

Landform: Hills
Position on the landform: Gaphill—backslopes; Rockbluff—shoulders
Slope range: 30 to 60 percent

Component Description

Gaphill

Texture of the surface layer: Sandy loam
Depth to bedrock: 40 to 80 inches
Drainage class: Well drained
Dominant parent material: Loamy slope alluvium over sandy residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.9 inches (low)
Content of organic matter in the surface layer: About 6 percent (high)

Rockbluff

Texture of the surface layer: Loamy sand
Depth to bedrock: 40 to 80 inches
Drainage class: Excessively drained
Dominant parent material: Sandy slope alluvium over sandy residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.7 inches (low)
Content of organic matter in the surface layer: About 6 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Churchtown and similar soils
- Dorerton and similar soils
- Gaphill soils that have a surface layer of very flaggy sandy loam
- Rock outcrop
- Soils that have slopes of less than 30 percent

Major Uses of the Unit

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Garne Series

Mean annual precipitation is sufficient to grow trees on these droughty soils. Natural fires were common and helped to maintain the grass vegetation, which contributed to the thick, dark, humus-rich upper horizons. The Native Americans who lived in the area and used these soils also used fire to maintain the grass vegetation for ease of cultivation and for attracting game animals.

Typical Pedon

Typical pedon for the Garne series, 2,000 feet north and 2,330 feet west of the southeast corner of sec. 18, T. 25 N., R. 12 W., Pepin County, Wisconsin:

Ap—0 to 10 inches; black (10YR 2/1) loamy sand, very dark gray (10YR 3/1) dry; moderate fine and medium subangular blocky structure; very friable; common very fine and fine roots; neutral; clear smooth boundary.

A—10 to 18 inches; very dark brown (10YR 2/2) loamy sand, very dark grayish brown (10YR 3/2) dry; weak fine and medium subangular blocky structure; very friable; common very fine and fine roots; slightly acid; clear smooth boundary.

AB—18 to 23 inches; dark brown (7.5YR 3/3) sand, brown (7.5YR 4/3) dry; weak medium subangular blocky structure; very friable; common very fine and fine roots; slightly acid; gradual smooth boundary.

Bw1—23 to 27 inches; brown (7.5YR 4/4) sand; weak coarse subangular blocky structure; very friable; common very fine and fine roots; slightly acid; clear wavy boundary.

2Bw2—27 to 34 inches; olive (5Y 5/3) very fine sandy loam; weak coarse subangular blocky structure; friable; common very fine and fine roots; 10 percent sandstone channers; moderately acid; gradual wavy boundary.

2Cr—34 to 48 inches; olive (70 percent 5Y 4/4 and 30 percent 5Y 5/4), weakly cemented, fine grained glauconitic sandstone; gradual wavy boundary.

2R—48 inches; pale olive (5Y 6/4), weakly cemented, fine grained glauconitic sandstone.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 24 inches
Thickness of the sandy mantle: 15 to 35 inches
Depth to sandstone: 20 to 40 inches

Ap horizon:
Hue—7.5YR or 10YR
Value—2 or 3
Chroma—1 or 2
Texture—loamy sand
Content of channers—0 to 15 percent

A horizon:
Hue—7.5YR or 10YR
Value—2 or 3
Chroma—1 or 2
Texture—loamy sand, sand, fine sand, or loamy fine sand
Content of channers—0 to 15 percent

AB horizon:
Hue—7.5YR or 10YR
Value—3 or 4
Chroma—2 or 3
Texture—sand, fine sand, loamy sand, or loamy fine sand
Content of channers—0 to 15 percent

Bw horizon:
Hue—7.5YR or 10YR
Value—3 or 4
Chroma—4 to 6
Texture—sand, fine sand, loamy sand, or loamy fine sand
Content of channers—0 to 15 percent

2Bw horizon:
Hue—7.5YR, 10YR, 2.5Y, 5Y, or 5G
Value—4 or 5
Chroma—3 to 6
Texture—very fine sandy loam, fine sandy loam, loam, or the channery analogs of these textures

265B—Garne loamy sand, 2 to 6 percent slopes

Composition

Garne and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Sand sheets
Slope range: 2 to 6 percent

Component Description

Texture of the surface layer: Loamy sand
Depth to bedrock: 20 to 40 inches
Drainage class: Somewhat excessively drained
Dominant parent material: Eolian sands over loamy residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.8 inches (low)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Drammen and similar soils
- Finchford and similar soils
- Urne and similar soils
- Soils that have slopes of more than 6 percent or less than 2 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

265C—Garne loamy sand, 6 to 12 percent slopes

Composition

Garne and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Sand sheets
Slope range: 6 to 12 percent

Component Description

Texture of the surface layer: Loamy sand
Depth to bedrock: 20 to 40 inches
Drainage class: Somewhat excessively drained
Dominant parent material: Eolian sands over loamy residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet

Available water capacity to 60 inches or root-limiting layer: About 3.8 inches (low)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Drammen and similar soils
- Plainfield and similar soils
- Urne and similar soils
- Soils that have slopes of more than 12 percent or less than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Hersey Series

Typical Pedon

Typical pedon for the Hersey series, 300 feet south and 1,900 feet east of the northwest corner of sec. 1, T. 23 N., R. 15 W., Pepin County, Wisconsin:

Ap—0 to 8 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; weak coarse subangular blocky structure; friable; few very fine to medium roots; moderately acid; abrupt smooth boundary.
Bt1—8 to 15 inches; dark yellowish brown (10YR 4/4) silt loam; moderate fine and medium subangular blocky structure; friable; few very fine and fine roots; few faint brown (10YR 4/3) clay films on faces of peds and in pores; few distinct light brownish gray (10YR 6/2) silt coatings on vertical faces of peds; common dark brown (10YR 3/3) wormcasts; moderately acid; clear smooth boundary.
Bt2—15 to 22 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; friable; few very fine and fine roots; common faint brown (10YR 4/3) clay films on faces of peds and in pores; few distinct light brownish gray (10YR 6/2) silt coatings on vertical faces of peds; strongly acid; clear smooth boundary.
Bt3—22 to 36 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium and coarse subangular blocky structure; friable; few very fine roots; common faint brown (10YR 4/3) clay films on faces of peds and in pores; few distinct light brownish gray (10YR 6/2) silt coatings on vertical faces of peds; strongly acid; clear smooth boundary.
Bt4—36 to 58 inches; yellowish brown (10YR 5/4) silt loam; weak coarse subangular blocky structure; friable; few faint brown (10YR 4/3) clay films on faces of peds and in pores; common distinct light brownish gray (10YR 6/2) silt coatings on vertical faces of peds; few medium prominent strong brown (7.5YR 5/6) masses of iron accumulation and few medium distinct grayish brown (10YR 5/2) iron depletions; strongly acid; gradual wavy boundary.
2Bt5—58 to 88 inches; yellowish brown (10YR 5/6) clay loam; moderate very coarse subangular blocky structure; firm; common faint dark yellowish brown (10YR 4/6) clay films on faces of peds; common distinct light brownish gray (10YR 6/2) silt coatings on vertical faces of peds; about 3 percent gravel; moderately acid; gradual wavy boundary.
2Bt6—88 to 115 inches; light olive brown (2.5Y 5/4) loam; weak very coarse subangular blocky structure; firm; few faint olive brown (2.5Y 4/4) clay films on faces of peds; about 3 percent gravel; slightly acid.

Range in Characteristics

Depth to till: 40 to 80 inches
Other features: Some pedons have an E horizon.

Ap or A horizon (if it occurs):
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—silt loam

Bt horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—4 to 6
Texture—silt loam

2Bt horizon:
Hue—7.5YR, 10YR, or 2.5Y
Value—4 or 5
Chroma—4 to 6
Texture—clay loam, loam, or sandy clay loam

Content of gravel—2 to 15 percent
Content of cobbles—0 to 5 percent

826B2—Hersey silt loam, 2 to 6 percent slopes, eroded

Composition

Hersey and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Ground moraines
Position on the landform: Summits
Slope range: 2 to 6 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: Greater than 80 inches
Drainage class: Moderately well drained
Dominant parent material: Loess over loamy till
Flooding: None
Depth to the water table: 3.5 to 6.0 feet
Kind of water table: Perched
Available water capacity to 60 inches or root-limiting layer: About 12.6 inches (high)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Pepin and similar soils
- Seaton and similar soils
- Soils that have slopes of more than 6 percent or less than 2 percent
- Soils that have a water table above a depth of 3.5 feet

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

826C2—Hersey silt loam, 6 to 12 percent slopes, eroded

Composition

Hersey and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Ground moraines
Position on the landform: Backslopes and shoulders
Slope range: 6 to 12 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: Greater than 80 inches
Drainage class: Moderately well drained
Dominant parent material: Loess over loamy till
Flooding: None
Depth to the water table: 3.5 to 6.0 feet
Kind of water table: Perched
Available water capacity to 60 inches or root-limiting layer: About 12.6 inches (high)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Pepin and similar soils
- Seaton and similar soils
- Soils that have slopes of more than 12 percent or less than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Hixton Series

Typical Pedon

Typical pedon for the Hixton series, 500 feet south and 625 feet east of the northwest corner of sec. 36, T. 25 N., R. 11 W., Pepin County, Wisconsin:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine and medium subangular blocky structure; friable; many very fine to medium roots; slightly acid; abrupt smooth boundary.

Bt1—8 to 13 inches; yellowish brown (10YR 5/4) silt loam; weak coarse subangular blocky structure; friable; many very fine to medium roots; few faint dark yellowish brown (10YR 4/4) clay films on faces of peds and in pores; common very dark grayish brown (10YR 3/2) wormcasts; slightly acid; clear smooth boundary.

Bt2—13 to 20 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; friable; common very fine and fine roots; common faint brown (10YR 4/3) clay films on faces of peds and in pores and few faint yellowish brown (10YR 5/4) silt coatings on faces of peds and in pores; slightly acid; clear smooth boundary.

2Bt3—20 to 25 inches; brown (7.5YR 4/4) loam; moderate medium and coarse subangular blocky structure; friable; common very fine and fine roots; common faint brown (7.5YR 4/3) clay films on faces of peds and in pores; strongly acid; clear smooth boundary.

2Bt4—25 to 32 inches; yellowish brown (10YR 5/6) sandy loam; weak fine and medium subangular blocky structure; very friable; few very fine and fine roots; few faint yellowish brown (10YR 5/4) clay films on faces of peds and in pores; 5 percent sandstone channers; strongly acid; clear smooth boundary.

3C—32 to 37 inches; 50 percent very pale brown (10YR 7/3) and 50 percent strong brown (7.5YR 5/8) channery sand; single grain; loose; few very fine roots; 20 percent sandstone channers; strongly acid; gradual smooth boundary.

3Cr—37 to 55 inches; 50 percent very pale brown (10YR 7/3) and 50 percent strong brown (7.5YR 5/8), weathered bedrock.

Range in Characteristics

Thickness of the loess: 8 to 25 inches
Depth to sandstone: 20 to 40 inches
Other features: Some pedons have an E horizon.

Ap or A horizon (if it occurs):
Hue—10YR
Value—2 to 4
Chroma—1 to 3
Texture—silt loam

Bt horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—3 or 4
Texture—silt loam or silty clay loam

2Bt horizon:
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—4 to 6
Texture—loam, sandy loam, fine sandy loam, or the channery analogs of these textures
Content of channers—0 to 35 percent
Content of flagstones—0 to 5 percent

3C horizon:
Hue—7.5YR or 10YR
Value—4 to 7
Chroma—3 to 8
Texture—sand, fine sand, or the channery analogs of these textures
Content of channers—0 to 35 percent
Content of flagstones—0 to 5 percent

213C2—Hixton silt loam, 6 to 12 percent slopes, eroded

Composition

Hixton and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on the landform: Backslopes and shoulders
Slope range: 6 to 12 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: 20 to 40 inches
Drainage class: Well drained
Dominant parent material: Loess over sandy residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.3 inches (moderate)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Elevasil and similar soils
- Soils that are more than 40 inches deep over sandstone

- Soils that have slopes of more than 12 percent or less than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

213D2—Hixton silt loam, 12 to 20 percent slopes, eroded

Composition

Hixton and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on the landform: Backslopes and shoulders
Slope range: 12 to 20 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: 20 to 40 inches
Drainage class: Well drained
Dominant parent material: Loess over sandy residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.5 inches (low)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Elevasil and similar soils
- Soils that are more than 40 inches deep over sandstone
- Soils that have slopes of more than 20 percent or less than 12 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

213E2—Hixton silt loam, 20 to 30 percent slopes, eroded

Composition

Hixton and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Hills
Position on the landform: Shoulders
Slope range: 20 to 30 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: 20 to 40 inches
Drainage class: Well drained
Dominant parent material: Loess over sandy residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.5 inches (low)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Elevasil and similar soils
- Soils that are more than 40 inches deep over sandstone
- Soils that are less than 20 inches deep over sandstone
- Soils that have slopes of less than 20 percent

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Hoopeston Series

Mean annual precipitation is sufficient to grow trees on these soils. The thick dark surface layer is a result of a combination of accumulation from erosional and depositional processes, both natural and post-settlement, and fire. In many areas, natural fires were common and helped to maintain the grass vegetation, which contributed to the thick, dark, humus-rich upper horizons. The Native Americans who lived in the area and used these soils also used fire to maintain the grass vegetation for ease of cultivation and for attracting game animals.

Typical Pedon

The location of a representative pedon of Hoopeston sandy loam in Pepin County is NW¼NW¼ sec. 25, T. 25 N., R. 13 W. The typical pedon for the Hoopeston series is 1,000 feet north and 615 feet east of the southwest corner of sec. 13, T. 27 N., R. 12 W., Dunn County, Wisconsin:

Ap—0 to 9 inches; very dark brown (10YR 2/2) sandy loam, dark grayish brown (10YR 4/2) dry; moderate medium and coarse subangular blocky structure; friable; many very fine to medium roots; slightly acid; abrupt smooth boundary.

A—9 to 13 inches; very dark brown (10YR 2/2) sandy loam, dark grayish brown (10YR 4/2) dry; moderate coarse subangular blocky structure; friable; many very fine to medium roots; slightly acid; clear smooth boundary.

Bw1—13 to 22 inches; yellowish brown (10YR 5/4) fine sandy loam; moderate medium subangular blocky structure; friable; common fine and medium roots; common distinct strong brown (7.5YR 5/6) masses of iron accumulation and few prominent grayish brown (10YR 5/2) masses of iron depletion; common very dark brown (10YR 2/2) wormcasts; neutral; clear smooth boundary.

Bw2—22 to 28 inches; dark yellowish brown (10YR 4/4) loamy sand; weak coarse subangular blocky structure; very friable; few fine and medium roots; few prominent strong brown (7.5YR 5/8) masses of iron accumulation; neutral; clear smooth boundary.

Bw3—28 to 37 inches; strong brown (7.5YR 5/6) loamy sand; single grain; loose; common faint strong brown (7.5YR 5/8) masses of iron accumulation; strongly acid; gradual wavy boundary.

2C—37 to 72 inches; brownish yellow (10YR 6/6) sand; single grain; loose; many prominent grayish brown (10YR 5/2) masses of iron depletion and common faint strong brown (7.5YR 5/6) masses of iron accumulation; few thin (less than 1 inch thick) strata of brownish yellow (10YR 6/6) loamy sand and strong brown (7.5YR 5/6) fine sand; strongly acid.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 24 inches
Depth to outwash: 20 to 40 inches

Ap and A horizons:
- Hue—7.5YR or 10YR
- Value—2 or 3
- Chroma—1 to 3
- Texture—sandy loam
- Content of gravel—0 to 10 percent

Bw, Bg, Bt, or Btg horizon (if it occurs):
- Hue—7.5YR, 10YR, or 2.5Y
- Value—4 to 6
- Chroma—1 to 6
- Texture—fine sandy loam, loamy sand, loam, sandy loam, or sand
- Content of gravel—0 to 10 percent

2C or 2Cg horizon (if it occurs):
- Hue—7.5YR, 10YR, or 2.5Y
- Value—3 to 6
- Chroma—1 to 8
- Texture—sand, loamy sand, or fine sand (thin strata of finer textures are common)
- Content of gravel—0 to 10 percent

438A—Hoopeston sandy loam, 0 to 3 percent slopes

Composition

Hoopeston and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Valley trains
Position on the landform: Treads
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Sandy loam
Depth to bedrock: Greater than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Loamy alluvium over sandy outwash
Flooding: None
Depth to the water table: 1.0 to 2.5 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 5.9 inches (low)

Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Lows and similar soils
- Rusktown and similar soils
- Hoopeston soils that have a loamy substratum
- Soils that are less than 60 inches deep over sandstone

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Houghton Series

Typical Pedon

The location of a representative pedon of Houghton muck in Pepin County is NW¼SE¼ sec. 36, T. 25 N., R. 11 W. The typical pedon for the Houghton series is 1,240 feet south and 2,000 feet east of the northwest corner of sec. 22, T. 22 N., R. 6 W., Jackson County, Wisconsin:

Oa1—0 to 4 inches; muck (sapric material), very dark brown (10YR 2/2) broken face and rubbed; about 30 percent fiber, 15 percent rubbed; nonsticky; many very fine to medium roots; slightly acid (pH 6.4 in water); clear smooth boundary.

Oa2—4 to 16 inches; muck (sapric material), black (10YR 2/1) broken face and rubbed; about 20 percent fiber, 5 percent rubbed; weak medium subangular blocky structure; nonsticky; common very fine and fine roots; strongly acid (pH 5.5 in water); gradual wavy boundary.

Oa3—16 to 22 inches; muck (sapric material), black (10YR 2/1) broken face and rubbed; about 35 percent fiber, 10 percent rubbed; weak coarse subangular blocky structure; nonsticky; few very fine and fine roots; strongly acid (pH 5.5 in water); clear wavy boundary.

Oe—22 to 28 inches; mucky peat (hemic material), dark brown (7.5YR 3/2) broken face and rubbed; about 80 percent fiber, 20 percent rubbed; massive and weak thick platy structure; nonsticky; strongly acid (pH 5.5 in water); clear wavy boundary.

O´a1—28 to 40 inches; muck (sapric material), black (10YR 2/1) broken face and rubbed; about 40 percent fiber, 10 percent rubbed; massive; nonsticky; strongly acid (pH 5.1 in water); clear wavy boundary.

O´a2—40 to 60 inches; muck (sapric material), black (10YR 2/1) broken face and rubbed; about 40 percent fiber, 10 percent rubbed; massive; nonsticky; strongly acid (pH 5.1 in water).

Range in Characteristics

Thickness of the organic material: More than 51 inches

Kind of organic material: Primarily herbaceous

Surface tier:
Hue—7.5YR, 10YR, or neutral
Value—2 or 3
Chroma—0 to 2
Texture—dominantly muck; thin layers of mucky peat or peat

Subsurface and bottom tiers:
Hue—7.5YR, 10YR, or neutral
Value—2 or 3
Chroma—0 to 3
Texture—dominantly muck; thin layers of mucky peat (up to 10 inches total thickness) or peat (up to 5 inches total thickness)

Kalmarville Series

Typical Pedon

The location of a representative pedon of Kalmarville silt loam in Pepin County is NW¼NW¼ sec. 27, T. 23 N., R. 15 W. The typical pedon for the Kalmarville series is 1,000 feet south and 2,200 feet west of the northeast corner of sec. 5, T. 19 N., R. 5 W., Jackson County, Wisconsin:

A1—0 to 6 inches; very dark brown (10YR 2/2) silt loam, grayish brown (10YR 5/2) dry; weak coarse granular structure; friable; many very fine to medium roots; few fine prominent dark red (2.5YR 3/6) masses of iron accumulation; slightly acid; clear smooth boundary.

A2—6 to 37 inches; dark gray (10YR 4/1) very fine sandy loam with common thin strata of grayish

brown (10YR 5/2) and dark grayish brown (10YR 4/2) silt loam and fine sandy loam; massive breaking to medium plates along depositional strata; friable; common very fine to medium roots; few coarse prominent dark red (2.5YR 3/6) masses of iron accumulation; slightly acid; clear smooth boundary.

Cg1—37 to 42 inches; light brownish gray (10YR 6/2) fine sandy loam with a few thin strata of grayish brown (10YR 5/2) very fine sandy loam and silt loam; massive breaking to thick plates along depositional strata; friable; few medium prominent yellowish red (5YR 4/6) masses of iron accumulation; slightly acid; abrupt smooth boundary.

2Cg2—42 to 60 inches; light brownish gray (10YR 6/2) sand; single grain; loose; slightly acid.

Range in Characteristics

Thickness of the loamy alluvium: 40 to 60 inches

A horizon:
- Hue—10YR
- Value—2 or 3
- Chroma—1 or 2
- Texture—typically silt loam or loam in the upper part and stratified silt loam, loam, very fine sandy loam, fine sandy loam, or sandy loam in the lower part
- Content of gravel—0 to 5 percent

Cg or C horizon (if it occurs):
- Hue—7.5YR, 10YR, or 2.5Y
- Value—3 to 6
- Chroma—1 to 6
- Texture—commonly stratified very fine sandy loam, silt loam, loam, fine sandy loam, or sandy loam; thin strata of coarser texture in some pedons
- Content of gravel—0 to 10 percent

2Cg or 2C horizon (if it occurs):
- Hue—7.5YR, 10YR, or 2.5Y
- Value—3 to 6
- Chroma—1 to 6
- Texture—sand, fine sand, or coarse sand
- Content of gravel—0 to 10 percent

Kevilar Series

Typical Pedon

Typical pedon for the Kevilar series, 2,250 feet south and 100 feet west of the northeast corner of sec. 31, T. 25 N., R. 12 W., Pepin County, Wisconsin:

Ap—0 to 9 inches; very dark brown (10YR 2/2) sandy loam, dark grayish brown (10YR 4/2) dry; weak coarse subangular blocky structure; friable; many fine and medium roots; moderately acid; abrupt smooth boundary.

Bt1—9 to 23 inches; dark yellowish brown (10YR 4/4) loam; moderate medium and coarse subangular blocky structure; friable; many fine and medium roots; common faint brown (10YR 4/3) clay films on faces of peds and in pores; neutral; clear smooth boundary.

Bt2—23 to 29 inches; strong brown (7.5YR 4/6) sandy loam; moderate coarse subangular blocky structure; friable; few very fine and fine roots; common faint brown (7.5YR 4/4) clay films on faces of peds and in pores; neutral; clear smooth boundary.

2BC1—29 to 43 inches; yellowish brown (10YR 5/6) sand; single grain; loose; few very fine and fine roots; moderately acid; gradual smooth boundary.

2BC2—43 to 50 inches; yellowish brown (10YR 5/4) sand; single grain; loose; common prominent strong brown (7.5YR 5/8) masses of iron accumulation; neutral; gradual smooth boundary.

3Bt—50 to 80 inches; dark brown (7.5YR 3/4) sandy loam with thin strata of dark yellowish brown (10YR 4/4) loam and yellowish brown (10YR 5/4) sand; weak fine and medium subangular blocky structure; friable; breaks to weak thick plates along depositional strata; common faint brown (7.5YR 4/3) clay films on faces of peds and in pores; many medium prominent strong brown (7.5YR 5/8) masses of iron accumulation and few coarse prominent brown (7.5YR 5/2) masses of iron depletion; neutral.

Range in Characteristics

Thickness of the loamy alluvium: 20 to 40 inches

Other features: Some pedons have an E horizon, and some have a 4C horizon.

Ap or A horizon (if it occurs):
- Hue—7.5YR or 10YR
- Value—2 or 3
- Chroma—1 to 3
- Texture—sandy loam
- Content of channers—0 to 15 percent

Bt horizon:
- Hue—7.5YR or 10YR
- Value—4 or 5
- Chroma—3 to 6
- Texture—sandy loam, loam, or fine sandy loam
- Content of channers—0 to 15 percent

Figure 10.—The ice shelf in this area of Algansee-Kalmarville complex, 0 to 3 percent slopes, indicates a recent high-water mark from spring flooding. These soils are in a forested area on the flood plains.

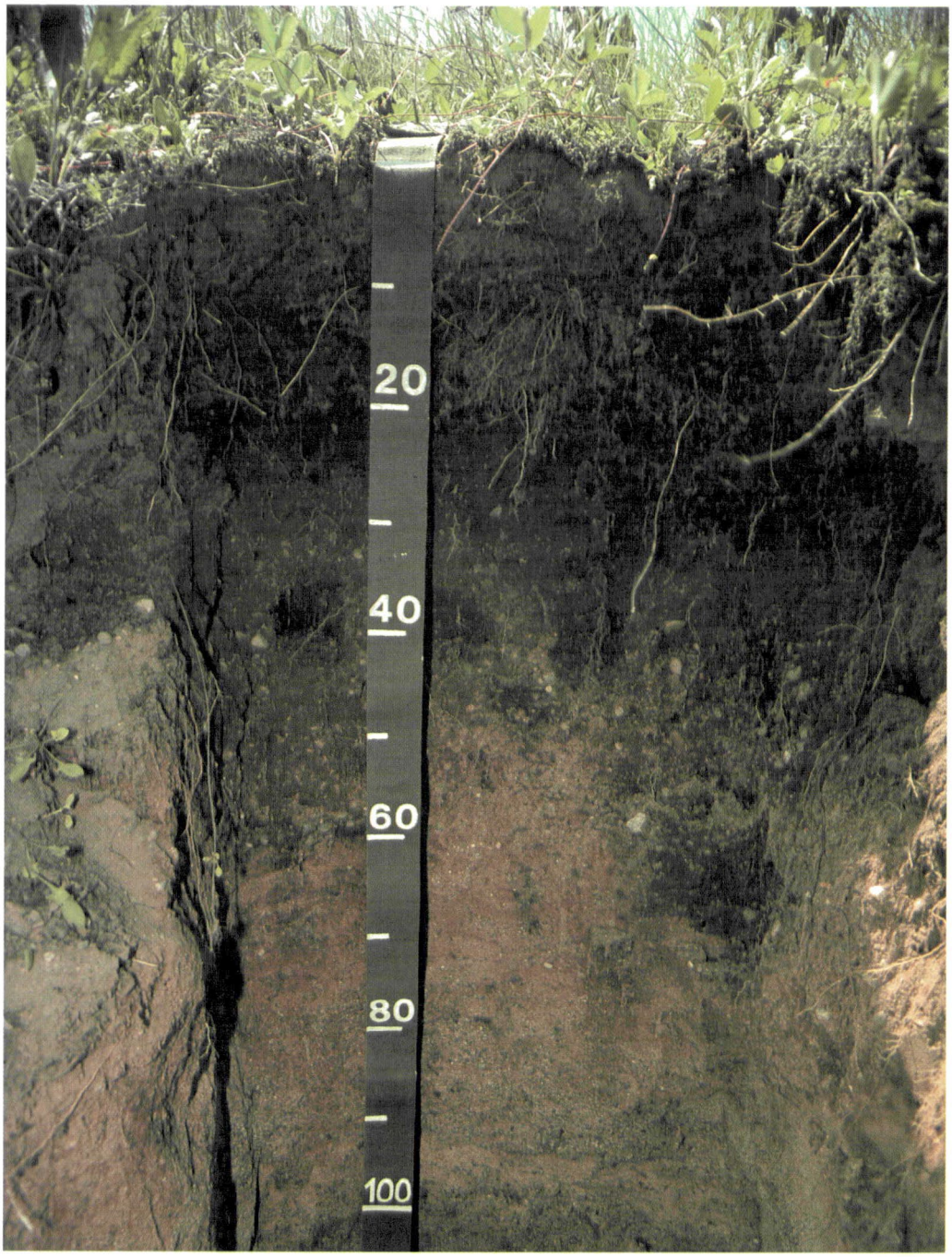


Figure 11.—Profile of a Burkhardt soil. The thick, dark, humus-rich surface layer is a result of the decomposition of deep-rooted prairie grasses. Fires helped to keep these droughty soils from reverting to trees and shrubs. Depth is marked in centimeters.

Figure 12.—Profile of a Dorerton soil. These soils are on very steep, wooded slopes. The lower part of the profile averages more than 35 percent dolostone fragments.

Figure 13.—Drammen soils typically are on footslopes and toeslopes of sand sheets. During past periods of dry climate, sand was blown from the glacial-meltwater deposits near major rivers and filled the many narrow valleys that interfinger into the bedrock-controlled uplands.

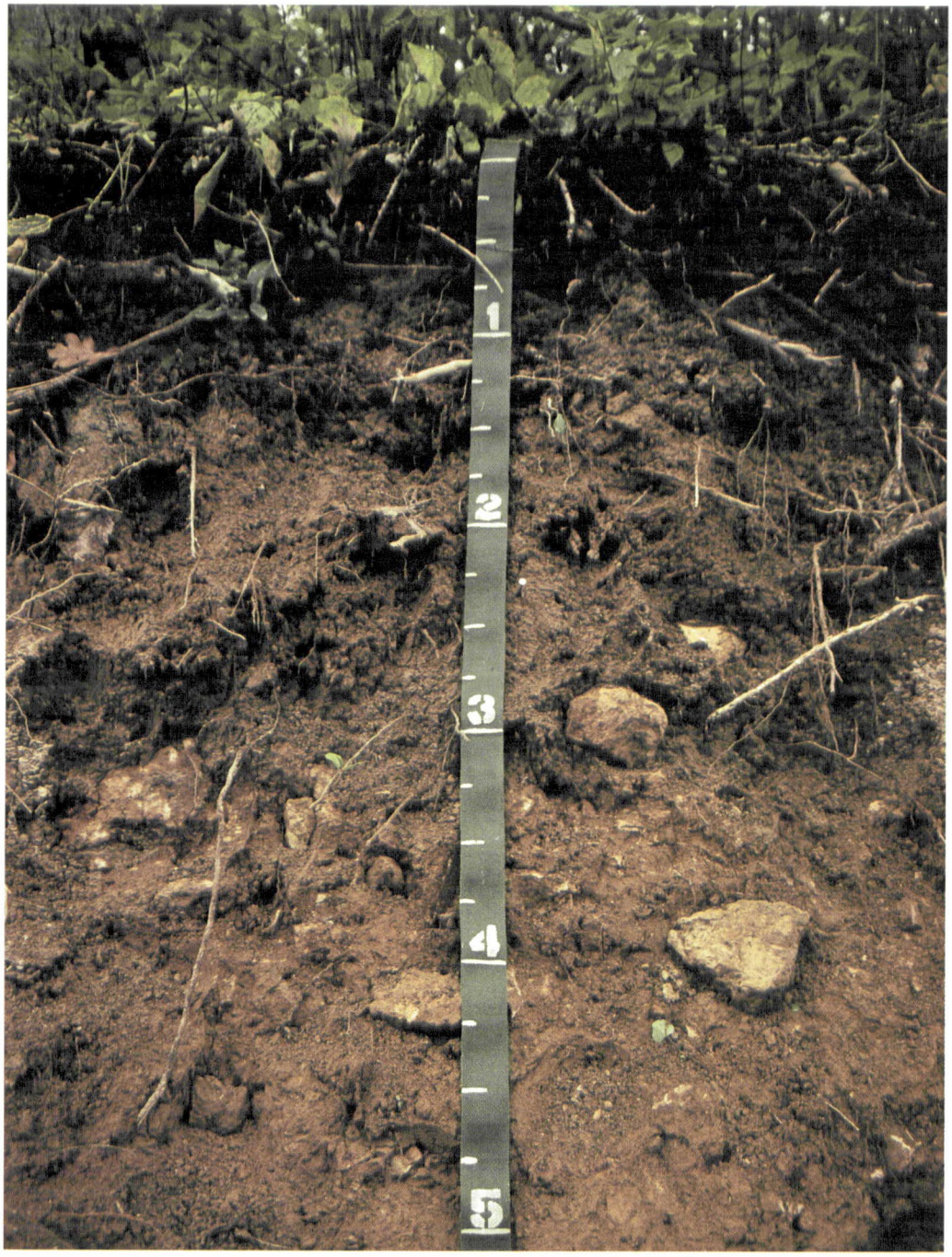


Figure 14.—Profile of an Elbaville soil. These soils are on very steep, wooded slopes. They have a thin, silty surface layer with an accumulation of organic matter underlain by clayey and loamy colluvium mixed with flagstones and channers of dolostone. Depth is marked in feet.

Figure 15.—Spring flooding in a backswamp area of Markey muck, flooded, 0 to 1 percent slopes.

Figure 16.—Profile of a Mt. Carroll soil. These soils formed in thick deposits of loess. They have a clay-enriched subsoil and are leached of carbonates to a depth of 5 feet or more. Depth is marked in feet.

Figure 17.—Oneota dolostone is exposed in this rock quarry.

2BC horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—4 to 6
Texture—sand, loamy sand, fine sand, or loamy fine sand

3Bt horizon:
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—4 to 6
Texture—sandy loam or loam (thin strata of finer or coarser textures are common)

432A—Kevilar sandy loam, 0 to 3 percent slopes

Composition

Kevilar and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Valley trains
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Sandy loam
Depth to bedrock: Greater than 80 inches
Drainage class: Moderately well drained
Dominant parent material: Loamy alluvium over sandy alluvium over stratified loamy and sandy alluvium
Flooding: None
Depth to the water table: 3.5 to 6.0 feet
Kind of water table: Perched
Available water capacity to 60 inches or root-limiting layer: About 7.5 inches (moderate)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Hoopeston and similar soils
- Kevilar soils that are well drained
- Prissel and similar soils
- Soils that have sandstone at a depth of less than 60 inches
- Soils that have slopes of more than 3 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

432B—Kevilar sandy loam, 2 to 6 percent slopes

Composition

Kevilar and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Valley trains
Slope range: 2 to 6 percent

Component Description

Texture of the surface layer: Sandy loam
Depth to bedrock: Greater than 80 inches
Drainage class: Moderately well drained
Dominant parent material: Loamy alluvium over sandy alluvium over stratified loamy and sandy alluvium
Flooding: None
Depth to the water table: 3.5 to 6.0 feet
Kind of water table: Perched
Available water capacity to 60 inches or root-limiting layer: About 7.5 inches (moderate)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Kevilar soils that are well drained
- Prissel and similar soils
- Soils that have sandstone at a depth of less than 60 inches
- Soils that have slopes of more than 6 percent or less than 2 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning

these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

432C2—Kevilar sandy loam, 6 to 12 percent slopes, eroded

Composition

Kevilar and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Valley trains
Slope range: 6 to 12 percent

Component Description

Texture of the surface layer: Sandy loam
Depth to bedrock: Greater than 80 inches
Drainage class: Moderately well drained
Dominant parent material: Loamy alluvium over sandy alluvium over stratified loamy and sandy alluvium
Flooding: None
Depth to the water table: 3.5 to 6.0 feet
Kind of water table: Perched
Available water capacity to 60 inches or root-limiting layer: About 7.5 inches (moderate)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Drammen and similar soils
- Kevilar soils that are well drained
- Soils that have sandstone at a depth of less than 60 inches
- Soils that have slopes of more than 12 percent or less than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Komro Series

Mean annual precipitation is sufficient to grow trees on these droughty soils. Natural fires were common and helped to maintain grass vegetation, which contributed to the thick, dark, humus-rich upper horizons. The Native Americans who lived in the area and used these soils also used fire to maintain the grass vegetation for ease of cultivation and for attracting game animals.

Typical Pedon

Typical pedon for the Komro series, 1,500 feet south and 100 feet west of the northeast corner of sec. 7, T. 25 N., R. 12 W., Pepin County, Wisconsin:

Ap—0 to 10 inches; very dark brown (10YR 2/2) loamy sand, very dark grayish brown (10YR 3/2) dry; weak fine subangular blocky structure; very friable; few very fine and fine roots; neutral; abrupt smooth boundary.

A—10 to 14 inches; very dark grayish brown (10YR 3/2) loamy sand, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; very friable; few very fine and fine roots; neutral; clear smooth boundary.

AB—14 to 18 inches; dark brown (10YR 3/3) sand, brown (10YR 4/3) dry; weak fine subangular blocky structure; very friable; few very fine and fine roots; neutral; clear smooth boundary.

Bw1—18 to 32 inches; dark yellowish brown (10YR 4/4) sand; weak medium subangular blocky structure; very friable; few very fine and fine roots; slightly acid; gradual smooth boundary.

Bw2—32 to 38 inches; dark yellowish brown (10YR 4/4) sand; single grain; loose; few very fine and fine roots; few medium prominent strong brown (7.5YR 5/6) masses of iron accumulation; 2 percent gravel; slightly acid; gradual wavy boundary.

C—38 to 72 inches; yellowish brown (10YR 5/4) sand; single grain; loose; common medium prominent strong brown (7.5YR 4/6) masses of iron accumulation; 2 percent gravel; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 24 inches

Ap and A horizons:
Hue—7.5YR or 10YR
Value—2 or 3
Chroma—1 or 2
Texture—loamy sand
Content of gravel—0 to 15 percent

AB horizon:
Hue—7.5YR or 10YR
Value—3
Chroma—2 or 3
Texture—sand, coarse sand, loamy coarse sand, or loamy sand
Content of gravel—0 to 15 percent

Bw horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—4 to 6
Texture—sand, coarse sand, loamy sand, loamy coarse sand, or, in some subhorizons, the gravelly analogs of these textures
Content of gravel—0 to 35 percent
Content of cobbles—0 to 5 percent

C horizon:
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—3 to 6 or multicolored
Texture—sand, coarse sand, or the gravelly analogs of these textures
Content of gravel—0 to 35 percent
Content of cobbles—0 to 5 percent

506A—Komro loamy sand, 0 to 3 percent slopes

Composition

Komro and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Valley trains
Position on the landform: Treads
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Loamy sand
Depth to bedrock: Greater than 60 inches
Drainage class: Moderately well drained
Dominant parent material: Outwash
Flooding: None
Depth to the water table: 3.5 to 6.0 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 4.0 inches (low)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Finchford and similar soils
- Farrington and similar soils
- Komro soils that have a loamy substratum
- Soils that have sandstone at a depth of less than 60 inches

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

2050—Landfill

Composition

Landfill: 100 percent

Component Description

- This map unit consists of areas where accumulated waste products of human habitation have been deposited. The areas can be above or below the ground.

Lows Series

Typical Pedon

The location of a representative pedon of Lows loam in Pepin County is NE¼SE¼ sec. 7, T. 25 N., R. 12 W. The typical pedon for the Lows series is 800 feet north and 2,240 feet west of the southeast corner of sec. 32, T. 27 N., R. 12 W., Dunn County, Wisconsin:

A—0 to 6 inches; very dark gray (10YR 3/1) loam, gray (10YR 5/1) dry; weak fine subangular blocky structure; friable; many fine fibrous roots; many medium fine and very fine and few continuous, mostly exped dendritic pores; moderately acid; abrupt smooth boundary.
Eg—6 to 13 inches; gray (10YR 5/1) loam, light gray (10YR 7/1) dry; common fine distinct dark brown (7.5YR 4/3) mottles; weak medium platy structure; friable; common fine fibrous roots; common fine

and very fine and few medium and coarse, continuous, inped and exped dendritic pores; strongly acid; clear smooth boundary.

Bg1—13 to 16 inches; gray (10YR 5/1) loam; many coarse and medium prominent yellowish red (5YR 4/6) mottles; weak very fine subangular blocky structure; firm; few fine fibrous roots; common fine and very fine and few medium and coarse, continuous, inped and exped dendritic pores; strongly acid; clear smooth boundary.

Bg2—16 to 23 inches; gray (10YR 5/1) loam; many fine prominent yellowish red (5YR 4/6) mottles; moderate medium subangular blocky structure; firm; few fine fibrous roots; common medium, fine, and very fine, continuous, obliquely oriented, mostly exped pores; strongly acid; clear smooth boundary.

Bg3—23 to 26 inches; gray (10YR 5/1) silt loam with a relatively high percentage of fine sand; many fine prominent yellowish red (5YR 4/6) mottles; weak medium and coarse subangular blocky structure; friable; common fine and very fine and few medium, continuous, obliquely oriented, inped and exped pores; slightly acid; clear smooth boundary.

Bg4—26 to 28 inches; gray (10YR 5/1) loam; many medium prominent yellowish red (5YR 4/6) mottles; weak medium subangular blocky structure; friable; common fine and very fine, continuous, vertically oriented, inped and exped pores; slightly acid; abrupt smooth boundary.

2Cg—28 to 60 inches; gray (10YR 6/1) sand with few thin (1/2 inch to 2 inches thick) bands of finer textured sediments at widely spaced (12- to 14-inch) intervals; single grain; loose; slightly acid.

Range in Characteristics

Depth to sandy alluvium: 20 to 40 inches

Ap or A horizon (if it occurs):
Hue—7.5YR or 10YR
Value—2 or 3
Chroma—1 or 2
Texture—loam
Content of gravel—0 to 5 percent

Eg horizon:
Hue—10YR or 2.5Y
Value—5 to 7
Chroma—1 or 2
Texture—loam, silt loam, or sandy loam
Content of gravel—0 to 5 percent

Bg horizon and BCg horizon (if it occurs):
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—1 or 2
Texture—loam, silt loam, sandy loam, or sandy clay loam
Content of gravel—0 to 5 percent

2Cg horizon:
Hue—10YR or 2.5Y
Value—5 to 8
Chroma—1 to 4
Texture—sand, loamy sand, fine sand, or coarse sand (commonly stratified at widely spaced intervals with finer textured material)
Content of gravel—0 to 15 percent

429A—Lows loam, 0 to 2 percent slopes

Composition

Lows and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Drainageways on valley trains
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Loam
Depth to bedrock: Greater than 60 inches
Drainage class: Poorly drained
Dominant parent material: Loamy alluvium over sandy alluvium
Frequency of flooding: Occasional
Water table depth: 1 foot above to 1 foot below the surface
Kind of water table: Apparent
Ponding duration: Long
Available water capacity to 60 inches or root-limiting layer: About 7.1 inches (moderate)
Content of organic matter in the surface layer: About 4 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Hoopeston and similar soils
- Lows soils that have a loamy substratum
- Markey and similar soils
- Soils that have sandstone at a depth of less than 60 inches

Major Uses of the Unit

- Cropland
- Hayland

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Markey Series

Typical Pedon

The location of a representative pedon of Markey muck in Pepin County is NW¼SE¼ sec. 7, T. 25 N., R. 12 W. The typical pedon for the Markey series is 650 feet north and 2,050 feet west of the southeast corner of sec. 13, T. 23 N., R. 3 W., Clark County, Wisconsin:

Oa1—0 to 2 inches; muck (sapric material), black (10YR 2/1) broken face, black (N 2/0) rubbed; about 40 percent fiber, 5 percent rubbed; weak thin platy structure; nonsticky; common very fine and fine roots; primarily herbaceous fibers; strongly acid (pH 5.3 in water 1:1); abrupt wavy boundary.

Oa2—2 to 18 inches; muck (sapric material), black (N 2/0) broken face and rubbed; about 5 percent fiber, trace rubbed; weak medium platy structure; nonsticky; few very fine and fine roots; primarily herbaceous fibers; strongly acid (pH 5.3 in water 1:1); gradual wavy boundary.

Oa3—18 to 27 inches; muck (sapric material), black (N 2/0) broken face and rubbed; about 1 percent fiber, trace rubbed; weak coarse subangular blocky structure; primarily herbaceous fibers; about 30 percent mineral material; moderately acid (pH 5.8 in water 1:1); abrupt wavy boundary.

Cg—27 to 60 inches; dark gray (10YR 4/1), stratified coarse sand and gravelly coarse sand; single grain; loose; about 10 percent gravel as an average; slightly acid.

Range in Characteristics

Thickness of the organic material: 16 to 51 inches
Kind of organic material: Primarily herbaceous

Surface tier:
Hue—5YR, 7.5YR, 10YR, or neutral
Value—2 to 4
Chroma—0 to 3
Texture—dominantly muck with thin layers of mucky peat

Subsurface and bottom tiers:
Hue—5YR, 7.5YR, 10YR, or neutral
Value—2 to 4
Chroma—0 to 3
Texture—dominantly muck with thin layers of mucky peat (up to 10 inches total thickness) or peat (up to 5 inches total thickness)

Cg or C horizon (if it occurs):
Hue—7.5YR, 10YR, 2.5Y, 5Y, or neutral
Value—4 to 6
Chroma—0 to 4
Texture—stratified loamy sand, fine sand, sand, coarse sand, or the gravelly analogs of these textures
Content of gravel—0 to 35 percent

11A—Markey muck, flooded, 0 to 1 percent slopes

Composition

Markey and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Backswamps on flood plains (fig. 15)
Slope range: 0 to 1 percent

Component Description

Texture of the surface layer: Muck
Depth to bedrock: Greater than 60 inches
Drainage class: Very poorly drained
Dominant parent material: Organic materials over sandy alluvium
Frequency of flooding: Frequent
Water table depth: 1 foot above to 1 foot below the surface
Kind of water table: Apparent
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 12.7 inches (high)
Content of organic matter in the surface layer: About 79.5 percent (very high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Algansee and similar soils
- Kalmarville and similar soils
- Markey soils that have a loamy substratum

Major Uses of the Unit

- Wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

- "Wildlife Habitat" section

40A—Markey and Seelyeville mucks, 0 to 1 percent slopes

Composition

Markey: 0 to 90 percent
Seelyeville: 0 to 90 percent
Inclusions: About 10 percent

Setting

Landform: Depressions on valley trains
Slope range: 0 to 1 percent

Component Description

Markey

Texture of the surface layer: Muck
Depth to bedrock: Greater than 60 inches
Drainage class: Very poorly drained
Dominant parent material: Organic materials over sandy and gravelly outwash
Flooding: None
Water table depth: 1 foot above to 1 foot below the surface
Kind of water table: Apparent
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 12.6 inches (high)
Content of organic matter in the surface layer: About 79.5 percent (very high)

Seelyeville

Texture of the surface layer: Muck
Depth to bedrock: Greater than 60 inches
Drainage class: Very poorly drained
Dominant parent material: Organic materials
Flooding: None
Water table depth: 2.0 feet above to 0.5 foot below the surface
Kind of water table: Apparent
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 24.0 inches (high)
Content of organic matter in the surface layer: About 79.5 percent (very high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Lows and similar soils
- Markey soils that have a loamy substratum
- Newson and similar soils
- Water

Major Uses of the Unit

- Wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

- "Wildlife Habitat" section

Medary Series

Typical Pedon

The location of a representative pedon of Medary silt loam in Pepin County is NE¼NE¼ sec. 19, T. 23 N., R. 14 W. The typical pedon for the Medary series is 2,640 feet west and 400 feet north of the southeast corner of sec. 31, T. 9 N., R. 2 W., Richland County, Wisconsin:

Ap—0 to 7 inches; grayish brown (10YR 5/2) silt loam, pale brown (10YR 6/3) dry; weak very fine subangular blocky structure; friable; many fine fibrous roots; slightly acid; clear smooth boundary.

BE—7 to 14 inches; reddish brown (7.5YR 5/3) silt loam; moderate medium platy structure parting to moderate fine subangular blocky; friable; many wormcasts; common fine fibrous roots; moderately acid; clear smooth boundary.

2Bt1—14 to 20 inches; reddish brown (5YR 4/4) silty clay loam; strong medium angular blocky structure; firm; few fine fibrous roots; many faint reddish brown (5YR 4/3) clay films on faces of peds; strongly acid; clear smooth boundary.

2Bt2—20 to 30 inches; reddish brown (2.5YR 4/4) silty clay; strong medium angular blocky structure; very firm; few fine fibrous roots; many faint reddish brown (2.5YR 4/3) clay films on faces of peds; strongly acid; clear smooth boundary.

2C1—30 to 36 inches; red (2.5YR 4/6) clay; common fine and medium distinct yellowish red (5YR 5/6) masses of iron accumulation; few small spots of iron-manganese stains; very weak medium subangular blocky structure; very firm; strongly acid; clear smooth boundary.

2C2—36 to 60 inches; variegated yellowish red (5YR 4/8), reddish brown (5YR 5/4), and pinkish gray (5YR 6/2) clay that grades to clay stratified with thin seams of very fine sand and silt at a depth of 50 inches; few small streaks of iron-manganese

stains; massive; slightly acid in the upper part, near neutral at a depth of 60 inches.

Range in Characteristics

Depth to slackwater deposits: 7 to 20 inches
Depth to carbonates: 40 to more than 60 inches

Ap or A horizon (if it occurs):
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—2 to 4
Texture—silt loam

BE horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—2 or 3
Texture—silt loam or silty clay loam

2Bt horizon:
Hue—7.5YR, 5YR, or 2.5YR
Value—4 or 5
Chroma—4 to 6
Texture—stratified clay to silty clay loam (very thin strata of coarser textures are common)

2C horizon:
Hue—2.5YR, 5YR, or 7.5YR
Value—4 or 5
Chroma—4 to 8
Texture—stratified clay to silt loam (very thin strata of coarser textures are common)

326B2—Medary silt loam, 1 to 6 percent slopes, eroded

Composition

Medary and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Stream terraces
Position on the landform: Treads
Slope range: 1 to 6 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Moderately well drained
Dominant parent material: Silty alluvium over silty to clayey slackwater deposits
Flooding: None
Depth to the water table: 2.5 to 3.5 feet
Kind of water table: Perched
Available water capacity to 60 inches or root-limiting layer: About 9.8 inches (high)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Ella and similar soils
- Soils that have slopes of more than 6 percent or less than 1 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Meridian Series

Typical Pedon

Typical pedon for the Meridian series, 150 feet north and 2,300 feet east of the southwest corner of sec. 6, T. 25 N., R. 13 W., Pepin County, Wisconsin:

Ap—0 to 9 inches; very dark brown (10YR 2/2) silt loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; friable; few very fine and fine roots throughout; 1 percent gravel and 1 percent cobbles; slightly acid; abrupt smooth boundary.

Bt1—9 to 15 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; friable; few very fine and fine roots throughout; few faint brown (10YR 4/3) clay films between sand grains; 1 percent gravel and 1 percent cobbles; moderately acid; clear smooth boundary.

Bt2—15 to 22 inches; dark yellowish brown (10YR 4/4) loam; moderate medium subangular blocky structure; friable; few very fine and fine roots throughout; common faint brown (10YR 4/3) clay films on faces of peds and in pores; 1 percent gravel and 1 percent cobbles; very strongly acid; clear smooth boundary.

Bt3—22 to 28 inches; brown (7.5YR 4/4) loam; moderate coarse subangular blocky structure; friable; few very fine and fine roots throughout; many faint brown (10YR 4/3) clay films on faces of peds and in pores; 1 percent gravel and 1 percent cobbles; very strongly acid; gradual smooth boundary.
Bt4—28 to 32 inches; strong brown (7.5YR 4/6) sandy loam; moderate medium and coarse subangular blocky structure; friable; many distinct brown (10YR 4/3) clay films on faces of peds and in pores; 3 percent gravel and 1 percent cobbles; very strongly acid; clear smooth boundary.
2BC—32 to 41 inches; brown (7.5YR 4/4) loamy coarse sand; single grain; loose; 3 percent gravel and 1 percent cobbles; strongly acid; gradual smooth boundary.
2C1—41 to 50 inches; strong brown (7.5YR 5/6) sand; single grain; loose; moderately acid; gradual smooth boundary.
2C2—50 to 72 inches; multicolored coarse sand; single grain; loose; 3 percent gravel and 1 percent cobbles; slightly acid.

Range in Characteristics

Depth to outwash: 20 to 40 inches
Other features: Some pedons have an E horizon.

Ap or A horizon (if it occurs):
Hue—7.5YR or 10YR
Value—2 or 3
Chroma—1 to 3
Texture—silt loam

Bt horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—4 to 6
Texture—loam, silt loam, silty clay loam, sandy clay loam, or sandy loam
Content of gravel—0 to 5 percent

2BC horizon and 2Bt horizon (if it occurs):
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—3 or 4
Texture—loamy coarse sand, coarse sand, sand, loamy sand, or the gravelly analogs of these textures
Content of gravel—0 to 35 percent
Content of cobbles—0 to 5 percent

2C horizon:
Hue—7.5YR or 10YR
Value—6 or 7
Chroma—3 to 6 or multicolored
Texture—sand, coarse sand, or the gravelly analogs of these textures
Content of gravel—0 to 35 percent
Content of cobbles—0 to 5 percent

423A—Meridian silt loam, 0 to 3 percent slopes

Composition

Meridian and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Valley trains
Position on the landform: Treads
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Silty alluvium over sandy and gravelly outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 7.9 inches (moderate)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Forkhorn and similar soils
- Kevilar and similar soils
- Soils that have sandstone at a depth of less than 60 inches

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

423B2—Meridian silt loam, 2 to 6 percent slopes, eroded

Composition

Meridian and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Valley trains
Position on the landform: Treads
Slope range: 2 to 6 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Silty alluvium over sandy and gravelly outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 7.9 inches (moderate)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Forkhorn and similar soils
- Kevilar and similar soils
- Soils that have sandstone at a depth of less than 60 inches
- Soils that have slopes of more than 6 percent or less than 2 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Mt. Carroll Series

Typical Pedon

The location of a representative pedon of Mt. Carroll silt loam (fig. 16) in Pepin County is SW¼NW¼ sec. 6, T. 23 N., R. 15 W. The typical pedon for the Mt. Carroll series is 1,020 feet south and 2,530 feet east of the northwest corner of sec. 17, T. 15 N., R. 5 W., La Crosse County, Wisconsin:

Ap—0 to 9 inches; very dark brown (10YR 2/2) silt loam, grayish brown (10YR 5/2) dry; some mixing of brown (10YR 5/3) silt loam (E) caused by erosion; moderate fine granular structure parting to moderate medium subangular blocky; friable; common very fine, fine, and medium roots between peds; common medium rounded black (10YR 2/1) wormcasts; neutral; abrupt wavy boundary.

E—9 to 12 inches; brown (10YR 5/3, exterior) silt loam; moderate thin platy structure; friable; common very fine, fine, and medium roots between peds; neutral; abrupt wavy boundary.

Bt1—12 to 19 inches; dark yellowish brown (10YR 4/4) silt loam; moderate fine subangular blocky structure; friable; common very fine, fine, and medium roots between peds; few distinct yellowish brown (10YR 5/4) silt coatings on faces of peds; many faint brown (10YR 4/3) clay films on faces of peds and in pores; slightly acid; clear wavy boundary.

Bt2—19 to 27 inches; brown (10YR 4/3) silt loam; moderate medium subangular blocky structure; friable; common very fine and fine roots between peds; many distinct dark brown (10YR 3/3) clay films on faces of peds and in pores; moderately acid; clear wavy boundary.

Bt3—27 to 37 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; friable; common very fine and fine roots between peds; many faint brown (10YR 4/3) clay films on faces of peds and in pores; slightly acid; clear wavy boundary.

Bt4—37 to 46 inches; yellowish brown (10YR 5/4) silt loam; weak coarse subangular blocky structure; friable; common very fine and fine roots between peds; common distinct brownish yellow (10YR 6/6) masses of iron accumulation and few distinct pale brown (10YR 6/3) masses of iron depletion in pores and root channels; common faint dark yellowish brown (10YR 4/4) clay films on faces of peds and in pores; slightly acid; gradual wavy boundary.

BC—46 to 61 inches; yellowish brown (10YR 5/4) silt loam; weak coarse subangular blocky structure; very friable; common very fine and fine roots between peds; common distinct strong brown (7.5YR 5/6) masses of iron accumulation and common distinct pale brown (10YR 6/3) masses of

iron depletion in pores and root channels; very few faint dark yellowish brown (10YR 4/4) clay films in root channels and/or pores; slightly acid; diffuse wavy boundary.

C—61 to 80 inches; yellowish brown (10YR 5/4) silt loam; massive; very friable; few very fine and fine roots; common distinct pale brown (10YR 6/3) masses of iron depletion and common prominent strong brown (7.5YR 5/6) masses of iron accumulation in pores and root channels; slightly acid.

Range in Characteristics

Depth to carbonates: More than 60 inches

Ap or A horizon (if it occurs):
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—silt loam

E horizon:
Hue—10YR
Value—4 to 6
Chroma—2 to 4
Texture—silt loam

Bt horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—3 to 6
Texture—silt loam

C horizon:
Hue—7.5YR, 10YR, or 2.5Y
Value—4 to 6
Chroma—1 to 8
Texture—silt loam or silt

114B2—Mt. Carroll silt loam, 2 to 6 percent slopes, eroded

Composition

Mt. Carroll and similar soils: 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on the landform: Summits
Slope range: 2 to 6 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.8 inches (high)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have slopes of more than 6 percent or less than 2 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

114C2—Mt. Carroll silt loam, 6 to 12 percent slopes, eroded

Composition

Mt. Carroll and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on the landform: Shoulders and backslopes
Slope range: 6 to 12 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.8 inches (high)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in

characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have slopes of more than 12 percent or less than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

M-W—Miscellaneous water

Composition

Miscellaneous water: 100 percent

Component Description

- Small manmade areas that are used for industrial, sanitary, or mining applications and that contain water most of the year

NewGlarus Series

Typical Pedon

The location of a representative pedon of NewGlarus silt loam in Pepin County is NE¼NW¼ sec. 10, T. 24 N., R. 14 W. The typical pedon for the NewGlarus series is 990 feet north and 1,925 feet east of the southwest corner of sec. 2, T. 2 N., R. 6 E., Green County, Wisconsin:

A—0 to 4 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; moderate very fine subangular blocky structure; friable; many fine roots; neutral; abrupt smooth boundary.

E—4 to 8 inches; brown (10YR 5/3) silt loam; moderate thin platy structure; friable; many fine roots; neutral; abrupt smooth boundary.

BE—8 to 13 inches; yellowish brown (10YR 5/4) silt loam; moderate fine subangular blocky structure; friable; common fine roots; slightly acid; clear smooth boundary.

Bt1—13 to 23 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine angular and subangular blocky structure; very firm; few fine roots; faint continuous clay films on all faces of peds; slightly acid; clear smooth boundary.

2Bt2—23 to 35 inches; dark reddish brown (2.5YR 3/4) clay; moderate fine angular and subangular blocky structure; very firm; few fine roots; faint continuous clay films on all faces of peds; slightly acid; abrupt smooth boundary.

3R—35 inches; partially weathered dolostone that is shattered in the upper part and has clay in the narrow and widely spaced joints.

Range in Characteristics

Thickness of the loess: 12 to 30 inches
Depth to dolostone: 20 to 40 inches

A or Ap horizon (if it occurs):
Hue—10YR
Value—3 or 4
Chroma—2 or 3
Texture—silt loam

E and BE horizons:
Hue—10YR
Value—3 to 6
Chroma—2 or 3
Texture—silt loam

Bt horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—4 to 6
Texture—silt loam or silty clay loam

2Bt horizon:
Hue—2.5YR, 5YR, or 7.5YR
Value—3 to 6
Chroma—4 to 6
Texture—clay, clay loam, silty clay, silty clay loam, or the rock fragment analogs of these textures
Content of channers—0 to 30 percent
Content of flagstones—0 to 20 percent

3Bt horizon (if it occurs):
Hue—7.5YR or 10YR
Value—3 or 4
Chroma—1 to 4
Texture—clay loam, loam, sandy loam, or the rock fragment analogs of these textures
Content of channers—5 to 40 percent
Content of flagstones—1 to 20 percent

144B2—NewGlarus silt loam, 2 to 6 percent slopes, eroded

Composition

NewGlarus and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on the landform: Summits
Slope range: 2 to 6 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: 20 to 40 inches
Drainage class: Well drained
Dominant parent material: Loess over clayey pedisediment over loamy residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.2 inches (moderate)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Pepin and similar soils
- Soils that are less than 20 inches deep over dolostone
- Soils that have slopes of more than 6 percent or less than 2 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

144C2—NewGlarus silt loam, 6 to 12 percent slopes, eroded

Composition

NewGlarus and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on the landform: Shoulders and backslopes
Slope range: 6 to 12 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: 20 to 40 inches
Drainage class: Well drained
Dominant parent material: Loess over clayey pedisediment over loamy residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.2 inches (moderate)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Pepin and similar soils
- Soils that are less than 20 inches deep over dolostone
- Soils that have slopes of more than 12 percent or less than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

144D2—NewGlarus silt loam, 12 to 20 percent slopes, eroded

Composition

NewGlarus and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on the landform: Shoulders and backslopes

Slope range: 12 to 20 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: 20 to 40 inches
Drainage class: Well drained
Dominant parent material: Loess over clayey pedisediment over loamy residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.2 inches (moderate)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Pepin and similar soils
- Soils that are less than 20 inches deep over dolostone
- Soils that have slopes of more than 20 percent or less than 12 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

144E—NewGlarus silt loam, 20 to 30 percent slopes

Composition

NewGlarus and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on the landform: Shoulders and backslopes
Slope range: 20 to 30 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: 20 to 40 inches
Drainage class: Well drained
Dominant parent material: Loess over clayey pedisediment over loamy residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.2 inches (moderate)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Elbaville and similar soils
- Pepin and similar soils
- Soils that are less than 20 inches deep over dolostone
- Soils that have slopes of more than 30 percent or less than 20 percent

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Newson Series

Typical Pedon

The location of a representative pedon of Newson mucky loamy sand in Pepin County is SW¼SW¼ sec. 7, T. 25 N., R. 12 W. The typical pedon for the Newson series is 1,050 feet south and 700 feet east of the northwest corner of sec. 5, T. 20 N., R. 5 E., Juneau County, Wisconsin:

A1—0 to 3 inches; black (10YR 2/1) mucky loamy sand, very dark gray (10YR 3/1) dry; weak very fine and fine subangular blocky structure; very friable; common very fine to coarse roots; very strongly acid; clear smooth boundary.
A2—3 to 8 inches; black (10YR 2/1) loamy sand, very dark gray (10YR 3/1) dry; weak medium subangular blocky structure; very friable; many very fine to coarse roots; extremely acid; abrupt irregular boundary.

Bg—8 to 16 inches; dark grayish brown (10YR 4/2) sand; weak medium subangular blocky structure; very friable; few very fine and fine roots; few fine prominent strong brown (7.5YR 5/6) masses of iron accumulation; black (10YR 2/1) soil in some root channels; extremely acid; gradual smooth boundary.

BCg—16 to 22 inches; grayish brown (10YR 5/2) sand; single grain; loose; few fine roots; few fine prominent strong brown (7.5YR 5/6) masses of iron accumulation; few medium faint dark grayish brown (10YR 4/2) masses of iron depletion; extremely acid; gradual smooth boundary.

C—22 to 60 inches; yellowish brown (10YR 5/4) sand; single grain; loose; many medium prominent strong brown (7.5YR 5/6) masses of iron accumulation; very strongly acid.

Range in Characteristics

A or Ap horizon (if it occurs):
- Hue—7.5YR, 10YR, 2.5Y, or 5Y
- Value—2 or 3
- Chroma—1 to 3
- Texture—mucky loamy sand, loamy sand, or loamy fine sand (mucky loamy sand in the A1 horizon)
- Content of gravel—0 to 15 percent

Bg horizon:
- Hue—7.5YR, 10YR, 2.5Y, or 5Y
- Value—4 to 7
- Chroma—1 or 2
- Texture—sand, coarse sand, loamy sand, or loamy coarse sand
- Content of gravel—0 to 15 percent

BCg horizon:
- Hue—7.5YR, 10YR, 2.5Y, or 5Y
- Value—5 or 6
- Chroma—1 or 2
- Texture—sand, loamy sand, loamy coarse sand, or coarse sand
- Content of gravel—0 to 15 percent

C or Cg horizon (if it occurs):
- Hue—7.5YR, 10YR, or 2.5Y
- Value—4 to 8
- Chroma—1 to 6 (3 to 6 in the C horizon, 1 or 2 in the Cg horizon)
- Texture—sand, loamy sand, loamy coarse sand, coarse sand, or the gravelly analogs of these textures
- Content of gravel—0 to 35 percent

589A—Newson mucky loamy sand, 0 to 2 percent slopes

Composition

Newson and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Depressions and drainageways on valley trains
Slope range: 0 to 2 percent

Component Description

Texture of the surface layer: Mucky loamy sand
Depth to bedrock: Greater than 60 inches
Drainage class: Poorly drained
Dominant parent material: Sandy alluvium and/or sandy and gravelly outwash
Flooding: None
Water table depth: 1 foot above to 1 foot below the surface
Kind of water table: Apparent
Ponding duration: Long
Available water capacity to 60 inches or root-limiting layer: About 4.2 inches (low)
Content of organic matter in the surface layer: About 15 percent (very high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Farrington and similar soils
- Markey and similar soils
- Newson soils that have a loamy substratum

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Norden Series

Typical Pedon

The location of a representative pedon of Norden silt

loam in Pepin County is NE1/4SW1/4 sec. 15, T. 25 N., R. 14 W. The typical pedon for the Norden series is 1,150 feet south and 350 feet west of the northeast corner of sec. 32, T. 18 N., R. 5 W., La Crosse County, Wisconsin:

Ap—0 to 8 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; moderate medium subangular blocky structure; friable; many fine and medium roots; some mixing of dark yellowish brown (10YR 4/4) silt loam as a result of plowing; slightly acid; abrupt smooth boundary.

Bt1—8 to 11 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; friable; many fine and medium roots; common faint brown (10YR 4/3) clay films on faces of peds; slightly acid; gradual wavy boundary.

Bt2—11 to 20 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; friable; many very fine and fine roots; common faint dark yellowish brown (10YR 4/4) clay films on faces of peds; 2 percent channers; moderately acid; gradual wavy boundary.

2Bt3—20 to 25 inches; olive (5Y 5/3) loam; moderate medium subangular blocky structure; friable; common very fine and fine roots; common faint olive gray (5Y 5/2) clay films on faces of peds; 3 percent channers; strongly acid; gradual wavy boundary.

2Bt4—25 to 33 inches; 50 percent brownish yellow (10YR 6/8) and 50 percent dark greenish gray (5G 4/1) fine sandy loam; moderate medium and coarse subangular blocky structure; friable; common very fine and fine roots; common prominent brown (10YR 4/3) clay films on faces of peds; 10 percent channers; strongly acid; gradual wavy boundary.

2Bt5—33 to 37 inches; 50 percent brownish yellow (10YR 6/6) and 50 percent dark greenish gray (5GY 4/1) fine sandy loam; moderate coarse subangular blocky structure; friable; common very fine and fine roots; very few prominent yellowish brown (10YR 5/4) clay films on faces of peds; 10 percent channers; strongly acid; abrupt wavy boundary.

2Cr—37 inches; 90 percent dark greenish gray (5G 4/1) and 10 percent brownish yellow (10YR 6/6), weathered bedrock.

Range in Characteristics

Thickness of the loess: 8 to 25 inches
Depth to sandstone: 20 to 40 inches
Other features: Some pedons have an E horizon.

Ap or A horizon (if it occurs):
Hue—10YR
Value—2 or 3 in the A horizon; 3 to 5 in the Ap
Chroma—2 or 3
Texture—silt loam

Bt horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—3 or 4
Texture—silt loam, loam, or silt clay loam

2Bt horizon:
Hue—7.5YR, 10YR, 2.5Y, 5Y, 5GY, 10GY, or 5G
Value—4 or 5
Chroma—1 to 6
Texture—fine sandy loam, sandy clay loam, sandy loam, very fine sandy loam, clay loam, loam, or the channery analogs of these textures
Content of channers—0 to 35 percent

254B2—Norden silt loam, 2 to 6 percent slopes, eroded

Composition

Norden and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on the landform: Summits
Slope range: 2 to 6 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: 20 to 40 inches
Drainage class: Well drained
Dominant parent material: Loess over loamy residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.6 inches (moderate)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Urne and similar soils
- Soils that have sandstone at a depth of more than 40 inches

- Soils that have slopes of more than 6 percent or less than 2 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

254C2—Norden silt loam, 6 to 12 percent slopes, eroded

Composition

Norden and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on the landform: Shoulders and backslopes
Slope range: 6 to 12 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: 20 to 40 inches
Drainage class: Well drained
Dominant parent material: Loess over loamy residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.6 inches (moderate)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Urne and similar soils
- Soils that have sandstone at a depth of more than 40 inches
- Soils that have slopes of more than 12 percent or less than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

254D2—Norden silt loam, 12 to 20 percent slopes, eroded

Composition

Norden and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on the landform: Shoulders and backslopes
Slope range: 12 to 20 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: 20 to 40 inches
Drainage class: Well drained
Dominant parent material: Loess over loamy residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.6 inches (moderate)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Urne and similar soils
- Soils that have sandstone at a depth of more than 40 inches
- Soils that have slopes of more than 20 percent or less than 12 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning

these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

254E2—Norden silt loam, 20 to 30 percent slopes, eroded

Composition

Norden and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on the landform: Shoulders and backslopes
Slope range: 20 to 30 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: 20 to 40 inches
Drainage class: Well drained
Dominant parent material: Loess over loamy residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.6 inches (moderate)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Churchtown and similar soils
- Urne and similar soils
- Soils that have sandstone at a depth of more than 40 inches
- Soils that have slopes of more than 30 percent or less than 20 percent

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

254F—Norden silt loam, 30 to 45 percent slopes

Composition

Norden and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Hills
Position on the landform: Shoulders and backslopes
Slope range: 30 to 45 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: 20 to 40 inches
Drainage class: Well drained
Dominant parent material: Loess over loamy residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.6 inches (moderate)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Urne and similar soils
- Churchtown and similar soils
- Norden soils that have a surface layer of very stony silt loam
- Soils that have slopes of less than 30 percent

Major Uses of the Unit

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Northbend Series

Typical Pedon

The location of a representative pedon of Northbend silt loam in Pepin County is NW1/4NE1/4 sec. 30, T. 25 N., R. 13 W. The typical pedon for the Northbend

series is 900 feet north and 1,000 feet west of the southeast corner of sec. 31, T. 19 N., R. 6 W., Jackson County, Wisconsin:

A—0 to 7 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; weak medium granular structure; friable; many very fine, fine, and medium roots; extremely acid; abrupt irregular boundary.

Bw1—7 to 19 inches; dark brown (7.5YR 4/4) silt loam; weak medium subangular blocky structure; friable; common very fine and fine and few medium roots; few medium prominent yellowish red (5YR 5/6) masses of iron accumulation; extremely acid; clear wavy boundary.

Bw2—19 to 34 inches; dark brown (7.5YR 4/4) loam; weak medium subangular blocky structure; friable; few very fine and fine roots; few fine prominent yellowish red (5YR 5/6) masses of iron accumulation; common fine prominent light brownish gray (10YR 6/2) masses of iron depletion; few thin (less than 1/8 inch thick) discontinuous very dark grayish brown (10YR 3/2) strata of silt loam; extremely acid; clear wavy boundary.

2BC—34 to 36 inches; dark brown (7.5YR 4/4) loamy fine sand; weak coarse subangular blocky structure; very friable; few very fine and fine roots; common medium prominent yellowish red (5YR 5/6) masses of iron accumulation and light brownish gray (10YR 6/2) masses of iron depletion; very strongly acid; clear wavy boundary.

2C1—36 to 44 inches; brown (10YR 5/3) sand; single grain; loose; common medium prominent yellowish red (5YR 5/6) masses of iron accumulation; very strongly acid; clear wavy boundary.

2C2—44 to 60 inches; very pale brown (10YR 7/4) sand; single grain; loose; common medium prominent yellowish red (5YR 5/6) masses of iron accumulation; few thin (less than 1/2 inch thick) discontinuous dark brown (7.5YR 6/3) strata of loamy sand; very strongly acid.

Range in Characteristics

Depth to sandy alluvium: 20 to 40 inches

A horizon:
- Hue—7.5YR or 10YR
- Value—2 or 3
- Chroma—2 or 3
- Texture—silt loam
- Content of gravel—0 to 5 percent

Bw horizon:
- Hue—5YR, 7.5YR, or 10YR
- Value—3 or 4
- Chroma—3 or 4
- Texture—silt loam, loam, sandy loam, fine sandy loam, or very fine sandy loam (thin strata of finer or coarser textures are common)
- Content of gravel—0 to 5 percent

2BC horizon:
- Hue—5YR, 7.5YR, or 10YR
- Value—4 to 8
- Chroma—1 to 8
- Texture—loamy fine sand or loamy sand
- Content of gravel—0 to 5 percent

2C horizon:
- Hue—5YR, 7.5YR, or 10YR
- Value—4 to 8
- Chroma—1 to 8
- Texture—typically sand or fine sand (thin strata of finer textures are common)
- Content of gravel—0 to 5 percent

1648A—Northbend-Ettrick silt loams, 0 to 3 percent slopes

Composition

Northbend and similar soils: About 60 percent
Ettrick and similar soils: About 30 percent
Inclusions: About 10 percent

Setting

Landform: Northbend—low flats on flood plains; Ettrick—depressions and drainageways on flood plains
Slope range: Northbend—0 to 3 percent; Ettrick—0 to 2 percent

Component Description

Northbend

Texture of the surface layer: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Silty and loamy alluvium over sandy alluvium
Frequency of flooding: Frequent
Depth to the water table: 1 to 2 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 8.0 inches (moderate)
Content of organic matter in the surface layer: About 3 percent (moderate)

Ettrick

Texture of the surface layer: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Poorly drained

Dominant parent material: Silty alluvium
Frequency of flooding: Frequent
Water table depth: 1 foot above to 1 foot below the surface
Kind of water table: Apparent
Ponding duration: Long
Available water capacity to 60 inches or root-limiting layer: About 14.2 inches (high)
Content of organic matter in the surface layer: About 8 percent (very high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Palms soils that are subject to flooding
- Dunnbot and similar soils
- Water

Major Uses of the Unit

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Orion Series

Typical Pedon

The location of a representative pedon of Orion silt loam in Pepin County is NW¼NW¼ sec. 3, T. 25 N., R. 14 W. The typical pedon for the Orion series is 1,040 feet south and 2,340 feet east of the northwest corner of sec. 8, T. 19 N., R. 6 E., Jackson County, Wisconsin:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak coarse subangular blocky structure; friable; common very fine to coarse roots; slightly acid; abrupt smooth boundary.
C—8 to 32 inches; stratified brown (10YR 4/3) and dark grayish brown (10YR 4/2) silt loam with thin strata of light brownish gray (10YR 6/2) very fine sand; massive breaking to thick plates along depositional strata; friable; common very fine and fine roots; few medium prominent dark reddish brown (5YR 3/4) masses of iron accumulation and few medium faint light brownish gray (10YR 6/2) masses of iron depletion; neutral; abrupt smooth boundary.
Ab—32 to 40 inches; black (10YR 2/1) silt loam; weak medium subangular blocky structure breaking to very thick plates along depositional strata; friable; common medium distinct grayish brown (10YR 5/2) masses of iron depletion; slightly acid; clear smooth boundary.
Cg—40 to 60 inches; light brownish gray (10YR 6/2) silt loam; massive; friable; common coarse prominent yellowish red (5YR 5/6) masses of iron accumulation; slightly acid.

Range in Characteristics

Depth to a buried A horizon: 20 to 60 inches
Other features: Some pedons have a Bgb horizon.

Ap or A horizon (if it occurs):
Hue—10YR
Value—3 to 6 (value of 3 moist is 6 or more dry; thin strata of darker colors are common)
Chroma—2 or 3
Texture—silt loam (thin strata of coarser textures are common)

C horizon:
Hue—10YR
Value—3 to 5
Chroma—2 or 3 (thin strata of lighter or darker colors are common)
Texture—dominantly silt loam (thin strata of coarser textures are common)

Ab horizon:
Hue—10YR or 2.5Y
Value—2 or 3
Chroma—1 or 2
Texture—dominantly silt loam or silty clay loam (thin strata of coarser textures are in some pedons)

Cg horizon:
Hue—10YR, 2.5Y, 5Y, 5GY, 5G, 5BG, 5B, or neutral
Value—4 to 6
Chroma—0 to 2
Texture—typically silt loam (thin strata of coarser textures are common)
Content of channers—0 to 15 percent

628A—Orion silt loam, 0 to 3 percent slopes

Composition

Orion and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Drainageways on stream terraces
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Silty alluvium
Frequency of flooding: Occasional
Depth to the water table: 1.0 to 2.5 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 12.5 inches (high)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Arenzville and similar soils
- Ettrick and similar soils
- Orion soils that have a sandy substratum
- Soils that are not subject to flooding

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Palms Series

Typical Pedon

The location of a representative pedon of Palms muck in Pepin County is SE1/4 sec. 24, T. 25 N., R. 11 W. The typical pedon for the Palms series is 300 feet south and 2,350 feet east of the northwest corner of sec. 22, T. 22 N., R. 6 W., Jackson County, Wisconsin:

Oa1—0 to 4 inches; muck (sapric material), black (N 2/0) broken face and rubbed; about 70 percent fiber, about 12 percent rubbed; weak fine subangular blocky structure; nonsticky; primarily herbaceous fibers; many fine to coarse roots; strongly acid (pH 5.5 in water); clear smooth boundary.

Oa2—4 to 22 inches; muck (sapric material), black (N 2/0) broken face and rubbed; about 35 percent fiber, about 5 percent rubbed; weak medium subangular blocky structure; nonsticky; primarily herbaceous fibers; many fine to coarse roots; moderately acid (pH 5.8 in water); clear wavy boundary.

Oa3—22 to 32 inches; muck (sapric material), black (10YR 2/1) broken face and rubbed; about 75 percent fiber, about 7 percent rubbed; weak thick platy structure; nonsticky; primarily herbaceous fibers; moderately acid (pH 5.8 in water); clear smooth boundary.

Oa4—32 to 40 inches; muck (sapric material), black (10YR 2/1) broken face and rubbed; about 20 percent fiber, about 3 percent rubbed; weak coarse subangular blocky structure; nonsticky; primarily herbaceous fibers; 10 to 15 percent mineral material; moderately acid (pH 5.8 in water); abrupt smooth boundary.

Cg—40 to 60 inches; dark gray (5Y 4/1) silt loam; massive; friable; neutral.

Range in Characteristics

Thickness of the organic material: 16 to 51 inches
Kind of organic material: Primarily herbaceous

Surface tier:
Hue—7.5YR, 10YR, or neutral
Value—2 or 3
Chroma—0 to 2
Texture—dominantly muck with thin layers of mucky peat

Subsurface and bottom tiers:
Hue—7.5YR, 10YR, or neutral
Value—2 to 4
Chroma—0 to 3
Texture—dominantly muck with thin layers of mucky peat (up to 10 inches total thickness) or peat (up to 5 inches total thickness)

Cg or C horizon (if it occurs):
Hue—10YR, 2.5Y, 5Y, 5GY, or neutral
Value—3 to 7
Chroma—0 to 4
Texture—silt loam, silty clay loam, sandy loam, fine sandy loam, loam, or very fine sandy loam
Content of channers—0 to 15 percent

20A—Palms and Houghton mucks, 0 to 1 percent slopes

Composition

Palms: 0 to 90 percent
Houghton: 0 to 90 percent
Inclusions: About 10 percent

Setting

Landform: Depressions on stream terraces
Slope range: 0 to 1 percent

Component Description

Palms

Texture of the surface layer: Muck
Depth to bedrock: Greater than 60 inches
Drainage class: Very poorly drained
Dominant parent material: Organic material over loamy alluvium
Flooding: None
Water table depth: 1 foot above to 1 foot below the surface
Kind of water table: Apparent
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 19.4 inches (high)
Content of organic matter in the surface layer: About 79.5 percent (very high)

Houghton

Texture of the surface layer: Muck
Depth to bedrock: Greater than 60 inches
Drainage class: Very poorly drained
Dominant parent material: Organic material
Flooding: None
Water table depth: 2.0 feet above to 0.5 foot below the surface
Kind of water table: Apparent
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 24.0 inches (high)
Content of organic matter in the surface layer: About 79.5 percent (very high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Ettrick and similar soils
- Water

Major Uses of the Unit

- Wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

- "Wildlife Habitat" section

21A—Palms muck, flooded, 0 to 1 percent slopes

Composition

Palms and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Backswamps on flood plains
Slope range: 0 to 1 percent

Component Description

Texture of the surface layer: Muck
Depth to bedrock: Greater than 60 inches
Drainage class: Very poorly drained
Dominant parent material: Organic material over loamy alluvium
Frequency of flooding: Frequent
Water table depth: 1 foot above to 1 foot below the surface
Kind of water table: Apparent
Ponding duration: Very long
Available water capacity to 60 inches or root-limiting layer: About 19.4 inches (high)
Content of organic matter in the surface layer: About 79.5 percent (very high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Ettrick and similar soils
- Kalmarville and similar soils
- Water

Major Uses of the Unit

- Wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

- "Wildlife Habitat" section

Pepin Series

Typical Pedon

Typical pedon for the Pepin series, 750 feet north and 400 feet west of the southeast corner of sec. 32, T. 24 N., R. 14 W., Pepin County, Wisconsin:

Ap—0 to 9 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; weak coarse subangular blocky structure; friable; many fine and medium roots; neutral; abrupt smooth boundary.

Bt1—9 to 14 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure; friable; many fine and medium roots; few faint brown (10YR 4/3) clay films on faces of peds and in pores; common distinct pale brown (10YR 6/3) silt coatings on vertical faces of some peds; slightly acid; clear smooth boundary.

Bt2—14 to 30 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; friable; common fine and medium roots; common faint brown (10YR 4/3) clay films on faces of peds and in pores; few distinct pale brown (10YR 6/3) silt coatings on vertical faces of some peds; slightly acid; clear smooth boundary.

Bt3—30 to 41 inches; dark yellowish brown (10YR 4/4) silt loam; moderate coarse subangular blocky structure; friable; few very fine roots; common faint brown (10YR 4/3) clay films on faces of peds and in pores; few distinct pale brown (10YR 6/3) silt coatings on vertical faces of some peds; slightly acid; gradual smooth boundary.

Bt4—41 to 48 inches; yellowish brown (10YR 5/4) silt loam; weak medium and coarse subangular blocky structure; friable; few very fine roots; few faint dark yellowish brown (10YR 4/4) clay films on faces of peds; moderately acid; gradual wavy boundary.

2Bt5—48 to 58 inches; dark reddish brown (5YR 3/4) clay; strong coarse subangular blocky structure; firm; many faint dark reddish brown (5YR 3/3) clay films on faces of peds and in pores; about 5 percent chert channers; about 3 percent dolostone and chert flagstones; strongly acid; clear wavy boundary.

3Bt6—58 to 66 inches; dark yellowish brown (10YR 4/4) very flaggy loam; moderate medium subangular blocky structure; friable; common faint brown (10YR 4/3) clay films on faces of peds and in pores; thin (less than 1/4 inch thick) residual layer of very dark grayish brown (10YR 3/2) clay surrounding dolostone fragments; thin (less than 1 inch thick) layer of very dark grayish brown (10YR 3/2) clay near the bedrock contact; about 30 percent dolostone channers; about 10 percent dolostone flagstones; neutral; abrupt irregular boundary.

3R—66 inches; brownish yellow (10YR 6/6) dolostone bedrock with fractures more than 4 inches apart.

Range in Characteristics

Depth to dolostone: 45 to 60 inches
Other features: Some pedons have an E horizon.

Ap or A horizon (if it occurs):
Hue—10YR
Value—2 to 4
Chroma—1 to 3
Texture—silt loam

Bt horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—4 to 6
Texture—silt loam or silty clay loam

2Bt horizon:
Hue—2.5YR, 5YR, or 7.5YR
Value—3 to 5
Chroma—4 to 6
Texture—clay loam, clay, silty clay, or the rock fragment analogs of these textures
Content of channers—5 to 40 percent
Content of flagstones—1 to 20 percent

3Bt horizon:
Hue—7.5YR or 10YR
Value—3 or 4
Chroma—1 to 4
Texture—sandy loam, clay loam, loam, or the rock fragment analogs of these textures
Content of channers—5 to 40 percent
Content of flagstones—1 to 20 percent

125B2—Pepin silt loam, 2 to 6 percent slopes, eroded

Composition

Pepin and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on the landform: Summits
Slope range: 2 to 6 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: 45 to 80 inches
Drainage class: Well drained

Dominant parent material: Loess over clayey pedisediment over loamy residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.7 inches (high)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Hersey and similar soils
- NewGlarus and similar soils
- Seaton and similar soils
- Soils that have slopes of more than 6 percent or less than 2 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

125C2—Pepin silt loam, 6 to 12 percent slopes, eroded

Composition

Pepin and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on the landform: Shoulders and backslopes
Slope range: 6 to 12 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: 45 to 80 inches
Drainage class: Well drained
Dominant parent material: Loess over clayey pedisediment over loamy residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.7 inches (high)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Hersey and similar soils
- NewGlarus and similar soils
- Seaton and similar soils
- Soils that have slopes of more than 12 percent or less than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

125D2—Pepin silt loam, 12 to 20 percent slopes, eroded

Composition

Pepin and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on the landform: Shoulders and backslopes
Slope range: 12 to 20 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: 45 to 80 inches
Drainage class: Well drained
Dominant parent material: Loess over clayey pedisediment over loamy residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.7 inches (high)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- NewGlarus and similar soils
- Seaton and similar soils
- Soils that have slopes of more than 20 percent or less than 12 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

125E2—Pepin silt loam, 20 to 30 percent slopes, eroded

Composition

Pepin and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on the landform: Shoulders and backslopes
Slope range: 20 to 30 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: 45 to 80 inches
Drainage class: Well drained
Dominant parent material: Loess over clayey pedisediment over loamy residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 11.7 inches (high)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- NewGlarus and similar soils
- Seaton and similar soils
- Soils that have slopes of more than 30 percent or less than 20 percent

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

2013—Pits, gravel

Composition

Pits, gravel: 95 percent
Inclusions: About 5 percent

Setting

Landform: Valley trains
Position on the landform: Treads and risers

Component Description

Texture of the surface layer: Sand and gravel
Depth to bedrock: Greater than 60 inches
Dominant parent material: Outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet

Inclusions

- Burkhardt and similar soils
- Finchford and similar soils
- Plainfield and similar soils

2014—Pits, quarry, hard bedrock

Composition

Pits, quarry: 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on the landform: Shoulders and summits

Component Description

Texture of the surface layer: Variable
Drainage class: Well drained

Dominant parent material: Dolostone (fig. 17) and sandstone bedrock
Flooding: None
Depth to the water table: Greater than 6.0 feet

Inclusions

- Boone and Urne soils (below an elevation of 1,000 feet)
- NewGlarus and Pepin soils (above an elevation of 1,000 feet)

Plainfield Series

Typical Pedon

The location of a representative pedon of Plainfield sand in Pepin County is SE¼NE¼ sec. 7, T. 25 N., R. 13 W. The typical pedon for the Plainfield series is 600 feet south and 2,400 feet east of the northwest corner of sec. 5, T. 26 N., R. 11 W., Dunn County, Wisconsin:

A—0 to 4 inches; very dark brown (10YR 2/2) sand, very dark grayish brown (10YR 3/2) dry; weak medium granular structure; very friable; many fine and medium roots; 5 percent gravel; moderately acid; abrupt smooth boundary.
Bw1—4 to 12 inches; brown (10YR 4/3) sand; weak medium and coarse subangular blocky structure; very friable; common fine roots; 5 percent gravel; moderately acid; clear wavy boundary.
Bw2—12 to 32 inches; dark yellowish brown (10YR 4/4) sand; weak coarse subangular blocky structure; very friable; few fine roots; 10 percent gravel; strongly acid; clear wavy boundary.
C—32 to 80 inches; brown (7.5YR 5/4) sand; single grain; loose; 5 percent gravel; strongly acid.

Range in Characteristics

Note: Some pedons have an E horizon.

A or Ap horizon (if it occurs):
Hue—7.5YR or 10YR
Value—2 to 4
Chroma—1 to 3
Texture—sand
Content of gravel—0 to 15 percent

Bw horizon:
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—3 to 6
Texture—sand or loamy sand
Content of gravel—0 to 15 percent

C horizon:
Hue—7.5YR or 10YR
Value—5 to 7
Chroma—3 to 6
Texture—sand, coarse sand, or the gravelly analogs of these textures
Content of gravel—0 to 35 percent
Content of cobbles—0 to 5 percent

511A—Plainfield sand, 0 to 3 percent slopes

Composition

Plainfield and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Valley trains
Position on the landform: Treads
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Sand
Depth to bedrock: Greater than 60 inches
Drainage class: Excessively drained
Dominant parent material: Sandy and gravelly outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.2 inches (low)
Content of organic matter in the surface layer: About 1.25 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Aldo and similar soils
- Soils that have sandstone at a depth of less than 60 inches
- Soils that have slopes of more than 3 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

511B—Plainfield sand, 2 to 6 percent slopes

Composition

Plainfield and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Valley trains
Position on the landform: Treads
Slope range: 2 to 6 percent

Component Description

Texture of the surface layer: Sand
Depth to bedrock: Greater than 60 inches
Drainage class: Excessively drained
Dominant parent material: Sandy and gravelly outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.2 inches (low)
Content of organic matter in the surface layer: About 1.25 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have sandstone at a depth of less than 60 inches
- Soils that have slopes of more than 6 percent or less than 2 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

511C—Plainfield sand, 6 to 15 percent slopes

Composition

Plainfield and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Valley trains
Position on the landform: Risers
Slope range: 6 to 15 percent

Component Description

Texture of the surface layer: Sand
Depth to bedrock: Greater than 60 inches
Drainage class: Excessively drained
Dominant parent material: Sandy and gravelly outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.2 inches (low)
Content of organic matter in the surface layer: About 1.25 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have sandstone at a depth of less than 60 inches
- Soils that have slopes of more than 15 percent or less than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

511F—Plainfield sand, 15 to 60 percent slopes

Composition

Plainfield and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Valley trains
Position on the landform: Risers
Slope range: 15 to 60 percent

Component Description

Texture of the surface layer: Sand
Depth to bedrock: Greater than 60 inches
Drainage class: Excessively drained
Dominant parent material: Sandy and gravelly outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.2 inches (low)
Content of organic matter in the surface layer: About 1.25 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Boplain and similar soils
- Soils with seeps
- Soils that have slopes of less than 15 percent

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Plumcreek Series

Typical Pedon

Typical pedon for the Plumcreek series, 2,275 feet south and 2,250 feet west of the northeast corner of sec. 21, T. 24 N., R. 14 W., Pepin County, Wisconsin:

A—0 to 4 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; moderate medium and coarse granular structure; very friable; common very fine to medium and few coarse roots; neutral; clear smooth boundary.

E—4 to 7 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak medium platy structure; friable; common very fine to medium and few coarse roots; neutral; clear smooth boundary.

Bt1—7 to 17 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure; friable; common very fine to medium roots; few faint brown (10YR 4/3) clay films on faces of peds and in pores; neutral; clear smooth boundary.

Bt2—17 to 28 inches; dark yellowish brown (10YR 4/6) loam; weak coarse subangular blocky structure; friable; common very fine to medium roots; common distinct brown (10YR 4/3) clay films on faces of peds and in pores; slightly acid; abrupt irregular boundary.

2Bt3—28 to 36 inches; brown (7.5YR 4/4) fine sandy loam with many thin strata of dark yellowish brown (10YR 4/4) loamy fine sand and very fine sand; weak coarse subangular blocky structure; friable; breaks to weak thick and thin plates along depositional strata; few very fine and fine roots; few faint brown (10YR 4/3) clay films on faces of peds and in pores; slightly acid; abrupt irregular boundary.

2C1—36 to 55 inches; brown (7.5YR 4/4) fine sand with many thin (less than 2 inches thick) strata of dark yellowish brown (10YR 4/4) fine sandy loam, silt, loamy fine sand, and very fine sand; single grain; loose; massive and friable in the silty and loamy strata; breaks to weak thick and thin plates along depositional strata; few very fine and fine roots; neutral; abrupt irregular boundary.

2C2—55 to 60 inches; brown (7.5YR 4/4) silt loam with common thin strata of silt and very fine sand; massive; friable; breaks to weak thick plates along depositional strata; neutral.

Range in Characteristics

Depth to slackwater deposits: 20 to 40 inches
Depth to carbonates: More than 60 inches

A horizon:
Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—silt loam

E horizon:
Hue—10YR
Value—4 or 5
Chroma—2 or 3
Texture—silt loam or loam

Bt horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—4 to 6
Texture—silt loam, loam, or sandy loam

2Bt horizon:
Hue—5YR, 7.5YR, or 10YR
Value—4 or 5

Chroma—4 to 8
Texture—stratified silty clay loam to sand

2C horizon:
Hue—5YR, 7.5YR, or 10YR
Value—4 to 7
Chroma—3 to 8
Texture—stratified silty clay loam to sand

313D2—Plumcreek silt loam, 12 to 20 percent slopes, eroded

Composition

Plumcreek and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Stream terraces
Position on the landform: Risers
Slope range: 12 to 20 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Silty and loamy slope alluvium over silty to sandy slackwater deposits
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.9 inches (high)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Ella and similar soils
- Plumcreek soils that have a sandy substratum
- Soils that have slopes of more than 20 percent

Major Uses of the Unit

- Cropland
- Hayland
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

313F—Plumcreek silt loam, 20 to 45 percent slopes

Composition

Plumcreek and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Stream terraces
Position on the landform: Risers
Slope range: 20 to 45 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Silty and loamy slope alluvium over silty to sandy slackwater deposits
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.9 inches (high)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Plumcreek soils that have a sandy substratum
- Soils with seeps
- Soils that have slopes of less than 20 percent

Major Uses of the Unit

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Prissel Series

Typical Pedon

Typical pedon for the Prissel series, 1,150 feet north and 1,150 feet west of the southeast corner of sec. 30, T. 25 N., R. 12 W., Pepin County, Wisconsin:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loamy sand, dark grayish brown (10YR 4/2) dry;

weak fine subangular blocky structure; very friable; common very fine to medium roots; neutral; abrupt smooth boundary.

Bw1—9 to 16 inches; dark yellowish brown (10YR 3/4) loamy sand; weak fine subangular blocky structure; very friable; few very fine and fine roots; neutral; clear smooth boundary.

Bw2—16 to 44 inches; dark yellowish brown (10YR 4/4) sand; weak coarse subangular blocky structure; very friable; few very fine and fine roots; moderately acid; gradual smooth boundary.

Bw3—44 to 48 inches; strong brown (7.5YR 4/6) sand; weak coarse subangular blocky structure; loose; few very fine and fine roots; common medium distinct strong brown (7.5YR 5/8) masses of iron accumulation; moderately acid; clear wavy boundary.

2Bt1—48 to 52 inches; brown (7.5YR 4/4) sandy loam with very thin strata of yellowish brown (7.5YR 5/6) fine sand; moderate fine and medium subangular blocky structure; friable; breaks to weak thick plates along depositional strata; few very fine roots; common faint brown (7.5YR 4/3) clay films on faces of peds and in pores; common fine and medium distinct strong brown (7.5YR 5/8) masses of iron accumulation; strongly acid; clear wavy boundary.

2Bt2—52 to 56 inches; yellowish brown (10YR 5/4) loam with very thin strata of yellowish brown (7.5YR 5/6) fine sand; moderate medium subangular blocky structure; friable; breaks to weak thick plates along depositional strata; few faint dark yellowish brown (10YR 4/4) clay films on faces of peds and in pores; many fine and medium prominent strong brown (7.5YR 5/8) masses of iron accumulation and few medium prominent brown (7.5YR 5/2) iron depletions; strongly acid; clear wavy boundary.

3BC—56 to 67 inches; dark yellowish brown (10YR 4/6) sand with very thin strata of yellowish brown (7.5YR 5/6) fine sand; single grain; loose; common fine and medium prominent strong brown (7.5YR 5/8) masses of iron accumulation and few medium prominent brown (7.5YR 5/2) iron depletions; slightly acid; gradual wavy boundary.

3C—67 to 72 inches; yellowish brown (10YR 5/6) sand; single grain; loose; slightly acid.

Range in Characteristics

Depth to stratified loamy alluvium: 40 to 60 inches

Ap or A horizon (if it occurs)
- Hue—7.5YR or 10YR
- Value—2 to 4
- Chroma—1 to 3
- Texture—loamy sand
- Content of channers—0 to 15 percent

E horizon (if it occurs):
- Hue—7.5YR or 10YR
- Value—4 or 5
- Chroma—2 or 3
- Texture—sand or loamy sand
- Content of channers—0 to 15 percent

Bw horizon:
- Hue—7.5YR or 10YR
- Value—3 to 5
- Chroma—3 to 6
- Texture—loamy sand, sand, fine sand, or loamy fine sand
- Content of channers—0 to 15 percent

2Bt horizon:
- Hue—7.5YR or 10YR
- Value—4 to 6
- Chroma—3 to 6
- Texture—stratified silt loam to sand
- Content of channers—0 to 15 percent

3BC and 3C horizons:
- Hue—7.5YR or 10YR
- Value—3 to 7
- Chroma—3 to 8
- Texture—sand or fine sand (widely spaced strata of finer textures are common)
- Content of channers—0 to 15 percent

546A—Prissel loamy sand, 0 to 3 percent slopes

Composition

Prissel and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Valley trains
Position on the landform: Treads
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Loamy sand
Depth to bedrock: Greater than 80 inches
Drainage class: Moderately well drained
Dominant parent material: Sandy alluvium over stratified silty to sandy alluvium
Flooding: None
Depth to the water table: 3.5 to 6.0 feet
Kind of water table: Perched

Available water capacity to 60 inches or root-limiting layer: About 5.8 inches (low)
Content of organic matter in the surface layer: About 1.25 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Hoopeston and similar soils
- Kevilar and similar soils
- Plainfield and similar soils
- Soils that have sandstone at a depth of less than 60 inches

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

546B—Prissel loamy sand, 2 to 6 percent slopes

Composition

Prissel and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Valley trains
Position on the landform: Treads
Slope range: 2 to 6 percent

Component Description

Texture of the surface layer: Loamy sand
Depth to bedrock: Greater than 80 inches
Drainage class: Moderately well drained
Dominant parent material: Sandy alluvium over stratified silty to sandy alluvium
Flooding: None
Depth to the water table: 3.5 to 6.0 feet
Kind of water table: Perched
Available water capacity to 60 inches or root-limiting layer: About 5.8 inches (low)
Content of organic matter in the surface layer: About 1.25 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Kevilar and similar soils
- Plainfield and similar soils
- Soils that have sandstone at a depth of less than 60 inches
- Soils that have slopes of more than 6 percent or less than 2 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

546F—Prissel loamy sand, 15 to 60 percent slopes

Composition

Prissel and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Valley trains
Position on the landform: Risers
Slope range: 15 to 60 percent

Component Description

Texture of the surface layer: Loamy sand
Depth to bedrock: Greater than 80 inches
Drainage class: Moderately well drained
Dominant parent material: Sandy alluvium over stratified silty to sandy alluvium
Flooding: None
Depth to the water table: 3.5 to 6.0 feet
Kind of water table: Perched
Available water capacity to 60 inches or root-limiting layer: About 5.8 inches (low)
Content of organic matter in the surface layer: About 1.25 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this

section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Plainfield and similar soils
- Soils that have sandstone at a depth of less than 60 inches
- Soils with seeps
- Soils that have slopes of less than 15 percent

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Rasset Series

Mean annual precipitation is sufficient to grow trees on these droughty soils. Natural fires were common and helped to maintain the grass vegetation, which contributed to the thick, dark, humus-rich upper horizons. The Native Americans who lived in the area and used these soils also used fire to maintain the grass vegetation for ease of cultivation and for attracting game animals.

Typical Pedon

Typical pedon for the Rasset series, 650 feet south and 200 feet east of the northwest corner of sec. 27, T. 25 N., R. 15 W., Pepin County, Wisconsin:

Ap—0 to 10 inches; very dark brown (10YR 2/2) sandy loam, dark grayish brown (10YR 4/2) dry; moderate fine subangular blocky structure; friable; many very fine and fine and few medium roots; slightly acid; clear smooth boundary.

A—10 to 14 inches; very dark brown (10YR 2/2) sandy loam, dark grayish brown (10YR 4/2) dry; moderate medium subangular blocky structure; friable; common very fine and fine roots; slightly acid; clear wavy boundary.

AB—14 to 18 inches; dark brown (10YR 3/3) sandy loam, brown (10YR 5/3) dry; moderate medium and coarse subangular blocky structure; friable; few very fine and fine roots; slightly acid; clear wavy boundary.

Bt1—18 to 30 inches; dark yellowish brown (10YR 3/4) sandy loam; moderate coarse subangular blocky structure; friable; common faint continuous dark yellowish brown (10YR 3/4) clay films on faces of peds and in pores; slightly acid; clear wavy boundary.

2Bt2—30 to 37 inches; dark yellowish brown (10YR 4/6) loamy sand; moderate coarse subangular blocky structure; friable; few faint discontinuous dark yellowish brown (10YR 4/6) clay films on faces of peds and in pores; slightly acid; gradual wavy boundary.

2Bt3—37 to 42 inches; dark yellowish brown (10YR 4/6) loamy sand; weak coarse subangular blocky structure; very friable; few faint discontinuous dark yellowish brown (10YR 4/6) clay films on faces of peds and in pores; slightly acid; gradual wavy boundary.

2BC—42 to 50 inches; dark yellowish brown (10YR 4/4) sand; weak medium subangular blocky structure; very friable; very few faint patchy dark yellowish brown (10YR 4/4) clay films between sand grains; slightly acid; gradual wavy boundary.

2C—50 to 60 inches; yellowish brown (10YR 5/4) sand; single grain; loose; slightly acid.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 20 inches
Depth to outwash: 20 to 40 inches

Ap and A horizons:
Hue—7.5YR or 10YR
Value—2 or 3
Chroma—1 to 3
Texture—sandy loam
Content of gravel—0 to 15 percent

AB horizon:
Hue—7.5YR or 10YR
Value—3 or 4
Chroma—2 or 3
Texture—sandy loam or loam
Content of gravel—0 to 15 percent

Bt horizon:
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—2 to 6
Texture—sandy loam or loam
Content of gravel—0 to 15 percent

2Bt and 2BC horizons:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—3 to 6
Texture—loamy sand, loamy coarse sand, sand, coarse sand, or the gravelly analogs of these textures

Content of gravel—0 to 35 percent
Content of cobbles—0 to 5 percent

2C horizon:
Hue—7.5YR or 10YR
Value—5 to 7
Chroma—3 to 6
Texture—sand, coarse sand, or the gravelly analogs of these textures
Content of gravel—0 to 35 percent
Content of cobbles—0 to 5 percent

413A—Rasset sandy loam, 0 to 3 percent slopes

Composition

Rasset and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Valley trains
Position on the landform: Treads
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Sandy loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loamy alluvium over sandy and gravelly outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.2 inches (moderate)
Content of organic matter in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Dakota and similar soils
- Finchford and similar soils
- Rasset soils that have a loamy substratum

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

413B—Rasset sandy loam, 2 to 6 percent slopes

Composition

Rasset and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Valley trains
Position on the landform: Treads
Slope range: 2 to 6 percent

Component Description

Texture of the surface layer: Sandy loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loamy alluvium over sandy and gravelly outwash
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 6.2 inches (moderate)
Content of organic matter in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Burkhardt and similar soils
- Finchford and similar soils
- Rasset soils that have a loamy substratum
- Soils that have slopes of less than 2 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

2003A—Riverwash, nearly level

Composition

Riverwash: 95 percent
Inclusions: About 5 percent

Setting

Landform: Flood plains
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Sand and gravel
Depth to bedrock: Greater than 60 inches
Dominant parent material: Alluvium
Frequency of flooding: Frequent
Depth to the water table: 1 to 6 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 0.0 inches (very low)

Inclusions

- Algansee and similar soils
- Kalmarville and similar soils
- Water

Major Uses of the Unit

- Wildlife habitat

For general information concerning these uses, see Part II of this publication:

- "Wildlife Habitat" section

Rockbluff Series

Typical Pedon

Typical pedon for the Rockbluff series, 1,500 feet south and 2,360 feet east of the northwest corner of sec. 32, T. 24 N., R. 14 W., Pepin County, Wisconsin:

Oe—0 to 2 inches; very dark grayish brown (10YR 3/2) mucky peat (hemic material consisting of a mat of partially decomposed forest litter); about 50 percent fiber, 25 percent rubbed; weak thin platy structure; very friable; strongly acid; abrupt smooth boundary.

A—2 to 4 inches; black (10YR 2/1) loamy sand, dark gray (10YR 4/1) dry; moderate fine granular structure; very friable; many fine and medium roots; about 1 percent dolostone channers; about 1 percent dolostone flagstones; moderately acid; abrupt smooth boundary.

E—4 to 9 inches; brown (10YR 4/3) loamy sand, pale brown (10YR 6/3) dry; weak thick platy structure; very friable; many fine and medium roots; about 1 percent dolostone channers and 2 percent sandstone channers; slightly acid; clear smooth boundary.

Bw—9 to 35 inches; brown (7.5YR 4/4) sand; weak coarse subangular blocky structure; very friable; common fine and medium roots; about 3 percent dolostone channers and 3 percent sandstone channers; slightly acid; gradual smooth boundary.

C—35 to 52 inches; yellow (10YR 7/6) sand; single grain; loose; few very fine and fine roots; about 5 percent sandstone channers; neutral; gradual irregular boundary.

Cr—52 to 60 inches; brownish yellow (10YR 6/6), light yellowish brown (10YR 6/4), and yellowish brown (10YR 5/6) sandstone.

Range in Characteristics

Depth to sandstone: 40 to 80 inches

A horizon:
Hue—7.5YR or 10YR
Value—2 to 5
Chroma—1 to 3
Texture—loamy sand
Content of channers—0 to 15 percent
Content of flagstones—0 to 5 percent

E horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—2 or 3
Texture—loamy sand, sand, fine sand, or loamy fine sand
Content of channers—0 to 15 percent
Content of flagstones—0 to 5 percent

Bw horizon:
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—3 to 6
Texture—sand, loamy sand, fine sand, loamy fine sand, or the channery or flaggy analogs of these textures
Content of channers—0 to 35 percent
Content of flagstones—0 to 5 percent

C horizon:
Hue—7.5YR or 10YR
Value—5 to 8
Chroma—2 to 8
Texture—sand, fine sand, or the channery or flaggy analogs of these textures
Content of channers—0 to 35 percent
Content of flagstones—0 to 5 percent

Rusktown Series

Typical Pedon

The location of a representative pedon of Rusktown sandy loam in Pepin County is SW¼NE¼ sec. 34, T. 24 N., R. 14 W. The typical pedon for the Rusktown series is 2,500 feet south and 250 feet east of the northwest corner of sec. 13, T. 28 N., R. 12 W., Dunn County, Wisconsin:

Ap—0 to 9 inches; very dark brown (10YR 2/2) sandy loam, dark grayish brown (10YR 4/2) dry; weak medium subangular blocky structure; friable; common very fine and fine roots throughout; neutral; abrupt smooth boundary.

Bt1—9 to 18 inches; brown (10YR 4/3) loam; weak medium subangular blocky structure; friable; common very fine and fine roots; common faint dark grayish brown (10YR 4/2) clay films on faces of peds and in pores; neutral; clear smooth boundary.

Bt2—18 to 25 inches; brown (7.5YR 4/4) fine sandy loam; weak medium and coarse subangular blocky structure; friable; common very fine and fine roots; common faint brown (7.5YR 4/3) clay films on faces of peds and in pores; neutral; gradual wavy boundary.

2Bt3—25 to 38 inches; brown (7.5YR 4/4) loamy sand; weak coarse subangular blocky structure; very friable; few very fine and fine roots; few faint brown (7.5YR 4/3) bridges between sand grains; strongly acid; gradual wavy boundary.

2BC—38 to 45 inches; strong brown (7.5YR 4/6) coarse sand; single grain; loose; about 1 percent gravel; moderately acid; clear wavy boundary.

2C—45 to 72 inches; strong brown (7.5YR 5/6) coarse sand; single grain; loose; common fine and medium distinct strong brown (7.5YR 5/8) masses of iron accumulation; about 1 percent gravel; moderately acid.

Range in Characteristics

Depth to outwash: 20 to 40 inches
Other features: Some pedons have an E horizon.

Ap or A horizon (if it occurs):
Hue—7.5YR or 10YR
Value—2 or 3
Chroma—1 to 3
Texture—sandy loam
Content of gravel—0 to 15 percent

Bt horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—3 to 6
Texture—loam, fine sandy loam, or sandy loam
Content of gravel—0 to 15 percent

2Bt horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—4 to 6
Texture—loamy sand, coarse sand, sand, loamy coarse sand, or the gravelly analogs of these textures
Content of gravel—0 to 35 percent
Content of cobbles—0 to 5 percent

2BC and 2C horizons:
Hue—7.5YR or 10YR
Value—5 to 7
Chroma—3 to 6 or multicolored
Texture—coarse sand, sand, or the gravelly analogs of these textures
Content of gravel—0 to 35 percent
Content of cobbles—0 to 5 percent

436A—Rusktown sandy loam, 0 to 3 percent slopes

Composition

Rusktown and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Valley trains
Position on the landform: Treads
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Sandy loam
Depth to bedrock: Greater than 80 inches
Drainage class: Moderately well drained
Dominant parent material: Loamy alluvium over sandy and gravelly outwash
Flooding: None
Depth to the water table: 3.5 to 6.0 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 5.4 inches (low)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Forkhorn and similar soils
- Hoopeston and similar soils
- Kevilar and similar soils
- Soils that have sandstone at a depth of less than 60 inches

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Scotah Series

Typical Pedon

The location of a representative pedon of Scotah loamy fine sand in Pepin County is NE¼NE¼ sec. 11, T. 24 N., R. 14 W. The typical pedon for the Scotah series is 1,500 feet west and 650 feet south of the northeast corner of sec. 1, T. 26 N., R. 12 W., Dunn County, Wisconsin:

A—0 to 4 inches; very dark brown (10YR 2/2) loamy fine sand, dark brown (10YR 3/3) dry; weak medium and coarse granular structure; very friable; common very fine to medium roots; neutral; clear smooth boundary.

Bw1—4 to 11 inches; dark yellowish brown (10YR 3/4) fine sand; weak medium subangular blocky structure; very friable; common very fine to medium roots; slightly acid; gradual smooth boundary.

Bw2—11 to 22 inches; dark yellowish brown (10YR 3/6) fine sand; weak coarse subangular blocky structure; very friable; few very fine and fine roots; slightly acid; gradual smooth boundary.

C1—22 to 46 inches; dark yellowish brown (10YR 4/6) sand; single grain; loose; few very fine and fine roots; few thin strata of very dark gray (10YR 3/1) loamy fine sand and fine sand in the upper part; neutral; clear wavy boundary.

C2—46 to 57 inches; dark yellowish brown (10YR 4/4), stratified fine sand, sand, and loamy fine sand; single grain; loose; common medium prominent strong brown (7.5YR 5/6) iron accumulations; slightly acid; clear wavy boundary.

C3—57 to 60 inches; light yellowish brown (10YR 6/4) gravelly coarse sand; loose; few medium prominent strong brown (7.5YR 5/6) iron accumulations; single grain; about 25 percent gravel; slightly acid.

Range in Characteristics

A or Ap horizon (if it occurs):
Hue—10YR
Value—2 to 4
Chroma—1 to 3
Texture—loamy fine sand
Content of gravel—0 to 15 percent

Bw horizon:
Hue—7.5YR or 10YR
Value—3 to 6
Chroma—3 to 6
Texture—fine sand, sand, loamy sand, or loamy fine sand
Content of gravel—0 to 15 percent

C horizon:
Hue—7.5YR or 10YR
Value—4 to 6
Chroma—3 to 6
Texture—strata of coarse sand, sand, gravelly coarse sand, gravelly sand, fine sand, or loamy fine sand
Content of gravel—0 to 35 percent
Content of cobbles—0 to 5 percent

656A—Scotah loamy fine sand, 0 to 3 percent slopes

Composition

Scotah and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: High flats and natural levees on flood plains
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Loamy fine sand
Depth to bedrock: Greater than 60 inches
Drainage class: Moderately well drained
Dominant parent material: Sandy alluvium
Frequency of flooding: Occasional
Depth to the water table: 3.5 to 6.0 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 3.9 inches (low)
Content of organic matter in the surface layer: About 1.75 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Algansee and similar soils
- Kalmarville and similar soils
- Aldo and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Seaton Series

Typical Pedon

Typical pedon for the Seaton series, 1,230 feet north and 500 feet east of the southwest corner of sec. 29, T. 24 N., R. 15 W., Pepin County, Wisconsin:

Ap—0 to 8 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; some mixing of yellowish brown (10YR 5/4) silt loam caused by plowing; weak fine and medium subangular blocky structure; friable; common very fine to medium roots; neutral; abrupt smooth boundary.

BE—8 to 13 inches; yellowish brown (10YR 5/4 dry) silt loam; weak fine and medium subangular blocky structure; friable; few very fine to medium roots; few faint patchy brown (10YR 4/3) clay films on faces of peds and in pores and common faint discontinuous pale brown (10YR 6/3) silt coatings on faces of peds and in pores; neutral; clear smooth boundary.

Bt1—13 to 34 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; friable; few very fine to medium roots; common faint discontinuous brown (10YR 4/3) clay films on faces of peds and in pores and few faint discontinuous pale brown (10YR 6/3) silt coatings on faces of peds and in pores; neutral; clear smooth boundary.

Bt2—34 to 43 inches; dark yellowish brown (10YR 4/4) silt loam; moderate coarse subangular blocky structure; friable; few very fine and fine roots; common faint discontinuous brown (10YR 4/3) clay films on faces of peds and in pores and common faint discontinuous pale brown (10YR 6/3) silt coatings on faces of peds and in pores; strongly acid; gradual smooth boundary.

Bt3—43 to 55 inches; yellowish brown (10YR 5/4) silt loam; weak coarse subangular blocky structure; friable; few very fine and fine roots; few fine and medium prominent strong brown (7.5YR 5/6) iron concentrations; few faint discontinuous brown (10YR 4/3) clay films on faces of peds and in pores, common faint discontinuous pale brown (10YR 6/3) silt coatings on faces of peds and in pores, and very few prominent patchy black (N 2/0) manganese or iron-manganese stains on faces of peds and in pores; strongly acid; gradual smooth boundary.

BC—55 to 80 inches; light olive brown (2.5Y 5/4) silt loam; weak coarse subangular blocky structure; very friable; few very fine roots; very few distinct continuous brown (10YR 4/3) clay films in root channels and/or pores and few distinct continuous pale brown (10YR 6/3) silt coatings in root channels and/or pores; slightly acid.

Range in Characteristics

Depth to carbonates: More than 60 inches

Ap or A horizon (if it occurs):
Hue—10YR
Value—2 to 4
Chroma—2 or 3
Texture—silt loam

BE horizon and E horizon (if it occurs):
Hue—10YR
Value—4 to 6
Chroma—2 to 4
Texture—silt loam

Bt horizon:
Hue—7.5YR or 10YR
Value—4 or 5
Chroma—4 to 6
Texture—silt loam

BC horizon and C horizon (if it occurs):
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 6
Texture—silt loam or silt

115B2—Seaton silt loam, 2 to 6 percent slopes, eroded

Composition

Seaton and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on the landform: Summits
Slope range: 2 to 6 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.9 inches (high)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have slopes of more than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

115C2—Seaton silt loam, 6 to 12 percent slopes, eroded

Composition

Seaton and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on the landform: Shoulders and backslopes
Slope range: 6 to 12 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 12.9 inches (high)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have slopes of more than 12 percent or less than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

115D2—Seaton silt loam, 12 to 20 percent slopes, eroded

Composition

Seaton and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Hills
Position on the landform: Shoulders and backslopes
Slope range: 12 to 20 percent

Component Description

Texture of the surface layer: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: Greater than 6.0 feet

Available water capacity to 60 inches or root-limiting layer: About 12.9 inches (high)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have slopes of more than 20 percent or less than 12 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Seelyeville Series

Typical Pedon

The location of a representative pedon of Seelyeville muck in Pepin County is SW¼NE¼ sec. 7, T. 25 N., R. 12 W. The typical pedon for the Seelyeville series is 1,480 feet north and 1,950 feet west of the southeast corner of sec. 36, T. 26 N., R. 11 W., Dunn County, Wisconsin:

Oa1—0 to 12 inches; muck (sapric material), black (10YR 2/1) broken face and rubbed; about 25 percent fiber, less than 5 percent rubbed; weak coarse subangular blocky structure; very friable; strongly acid; clear smooth boundary.
Oa2—12 to 35 inches; muck (sapric material), black (N 2/0) broken face and rubbed; about 5 percent fiber unrubbed and rubbed; weak medium and coarse subangular blocky structure; very friable; strongly acid; clear smooth boundary.
Oa3—35 to 43 inches; muck (sapric material), very dark gray (10YR 3/1) broken face and rubbed; about 40 percent fiber, about 10 percent rubbed; massive; very friable; strongly acid; gradual smooth boundary.
Oa4—43 to 72 inches; muck (sapric material), black (N 2/0) broken face and rubbed; about 5 percent fiber unrubbed and rubbed; massive; very friable; strongly acid.

Range in Characteristics

Thickness of the organic material: More than 51 inches
Kind of organic material: Primarily herbaceous material

Surface tier:
Hue—7.5YR, 10YR, or neutral
Value—2 or 3
Chroma—0 to 2
Texture—dominantly muck with thin layers of mucky peat

Subsurface and bottom tiers:
Hue—7.5YR, 10YR, or neutral
Value—2 or 3
Chroma—0 to 3
Texture—dominantly muck with thin layers of mucky peat (up to 10 inches total thickness) or peat (up to 5 inches total thickness)

Tarr Series

Typical Pedon

The location of a representative pedon of Tarr sand in Pepin County is NE¼NW¼ sec. 12, T. 25 N., R. 11 W. The typical pedon for the Tarr series is 100 feet north and 2,000 feet east of the southwest corner of sec. 32, T. 19 N., R. 4 W., Monroe County, Wisconsin:

Oe—0 to 2 inches; mucky peat; partially decomposed roots, leaves, and twigs.
A—2 to 6 inches; very dark brown (10YR 2/2) sand, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; many fine and medium roots; strongly acid; abrupt smooth boundary.
Bw1—6 to 13 inches; dark yellowish brown (10YR 3/4) sand; weak fine subangular blocky structure; friable; common fine and medium roots; strongly acid; clear smooth boundary.
Bw2—13 to 34 inches; dark yellowish brown (10YR 4/6) sand; weak fine subangular blocky structure; friable; moderately acid; clear smooth boundary.
C—34 to 62 inches; yellowish brown (10YR 5/8) sand; single grain; loose; moderately acid.

Range in Characteristics

Note: Some pedons have an E horizon.

A or Ap horizon (if it occurs):
Hue—7.5YR or 10YR

Value—2 to 4
Chroma—1 to 4
Texture—sand
Content of channers—0 to 15 percent

Bw horizon:
Hue—7.5YR or 10YR
Value—3 to 6
Chroma—3 to 8
Texture—sand or fine sand
Content of channers—0 to 15 percent

C horizon:
Hue—7.5YR or 10YR
Value—5 to 8
Chroma—2 to 8
Texture—sand or fine sand
Content of channers—0 to 15 percent

561B—Tarr sand, 1 to 6 percent slopes

Composition

Tarr and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Pediments
Position on the landform: Toeslopes
Slope range: 1 to 6 percent

Component Description

Texture of the surface layer: Sand
Depth to bedrock: Greater than 60 inches
Drainage class: Excessively drained
Dominant parent material: Sandy pedisediment over sandy residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 3.8 inches (low)
Content of organic matter in the surface layer: About 1.25 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Boone and similar soils
- Tint and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

Tint Series

Typical Pedon

The location of a representative pedon of Tint sand in Pepin County is SW¼NE¼ sec. 6, T. 25 N., R. 11 W. The typical pedon for the Tint series is 1,980 feet south and 245 feet east of the northwest corner of sec. 5, T. 21 N., R. 5 W., Jackson County, Wisconsin:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) sand, brown (10YR 5/3) dry; weak coarse subangular blocky structure; very friable; many very fine and fine roots; strongly acid; abrupt wavy boundary.
Bw1—9 to 17 inches; dark yellowish brown (10YR 3/4) sand; weak medium subangular blocky structure; very friable; common very fine and fine roots; moderately acid; clear smooth boundary.
Bw2—17 to 24 inches; dark yellowish brown (10YR 4/4) sand; weak medium subangular blocky structure; very friable; few very fine and fine roots; moderately acid; clear smooth boundary.
BC—24 to 34 inches; yellowish brown (10YR 5/4) sand; single grain; loose; few very fine and fine roots; moderately acid; clear wavy boundary.
C1—34 to 38 inches; very pale brown (10YR 7/4) sand; single grain; loose; few very fine and fine roots; common medium prominent reddish yellow (7.5YR 6/8) masses of iron accumulation; slightly acid; gradual smooth boundary.
C2—38 to 60 inches; brownish yellow (10YR 6/6) sand; single grain; loose; many medium distinct yellow (10YR 7/8) masses of iron accumulation; slightly acid.

Range in Characteristics

Note: Some pedons have an E horizon.

Ap or A horizon (if it occurs):
Hue—7.5YR or 10YR
Value—2 to 4
Chroma—1 to 3
Texture—sand
Content of channers—0 to 15 percent

Bw horizon:
Hue—7.5YR or 10YR
Value—3 to 5
Chroma—4 to 6
Texture—sand or fine sand
Content of channers—0 to 15 percent

C horizon:
Hue—7.5YR or 10YR
Value—5 to 8
Chroma—2 to 8
Texture—sand or fine sand
Content of channers—0 to 15 percent

566A—Tint sand, 0 to 3 percent slopes

Composition

Tint and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Pediments
Position on the landform: Toeslopes
Slope range: 0 to 3 percent

Component Description

Texture of the surface layer: Sand
Depth to bedrock: Greater than 60 inches
Drainage class: Moderately well drained
Dominant parent material: Sandy pedisediment
Flooding: None
Depth to the water table: 3.5 to 6.0 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 3.7 inches (low)
Content of organic matter in the surface layer: About 1.25 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Tarr and similar soils
- Soils that have a water table at a depth of less than 4 feet
- Soils that have sandstone at a depth of less than 60 inches

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

2040—Udipsamments, dredge material

Composition

Udipsamments and similar soils: About 95 percent
Inclusions: About 5 percent

Component Description

- This map unit consists of piles of soil material that has been dredged from the river channels and deposited in areas of adjacent soils.

Inclusions

- Algansee and similar soils
- Kalmarville and similar soils
- Scotah and similar soils

Major Uses of the Unit

- Wildlife habitat

For general information concerning these uses, see Part II of this publication:

- "Wildlife Habitat" section

Urne Series

Typical Pedon

The location of a representative pedon of Urne fine sandy loam in Pepin County is SW¼NE¼ sec. 26, T. 25 N., R. 13 W. The typical pedon for the Urne series is 700 feet south and 2,440 feet east of the northwest corner of sec. 29, T. 22 N., R. 6 W., Jackson County, Wisconsin:

A—0 to 2 inches; black (10YR 2/1) fine sandy loam, very dark gray (10YR 3/1) dry; moderate medium granular structure; very friable; common very fine to coarse roots; very strongly acid; abrupt wavy boundary.

Bw1—2 to 7 inches; olive brown (2.5Y 4/4) fine sandy loam; moderate medium subangular blocky structure; friable; common very fine to medium roots; strongly acid; clear wavy boundary.

Bw2—7 to 28 inches; light olive brown (2.5Y 5/4) fine sandy loam; moderate medium subangular blocky structure; friable; common very fine and fine roots; strongly acid; clear wavy boundary.
Bw3—28 to 36 inches; light olive brown (2.5Y 5/4) fine sandy loam; weak medium subangular blocky structure; friable; strongly acid; clear smooth boundary.
Cr—36 to 60 inches; strata of olive brown (2.5Y 4/4) and light olive brown (2.5Y 5/6), weakly cemented, fine grained glauconitic sandstone; a few thin (1/8 inch thick) yellowish red (5YR 5/6) strata.

Range in Characteristics

Depth to sandstone: 20 to 40 inches
Other features: Some pedons have an E horizon.

A or Ap horizon (if it occurs):
Hue—10YR
Value—2 to 4
Chroma—1 to 3
Texture—fine sandy loam
Content of channers—0 to 15 percent

Bw horizon:
Hue—7.5YR, 10YR, 2.5Y, 5Y, or 5G
Value—4 to 6
Chroma—2 to 6
Texture—fine sandy loam, sandy loam, loam, very fine sandy loam, or the channery analogs of these textures
Content of channers—0 to 35 percent

255B2—Urne fine sandy loam, 2 to 6 percent slopes, eroded

Composition

Urne and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Hills
Position on the landform: Summits
Slope range: 2 to 6 percent

Component Description

Texture of the surface layer: Fine sandy loam
Depth to bedrock: 20 to 40 inches
Drainage class: Well drained
Dominant parent material: Loamy slope alluvium over loamy residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.6 inches (low)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Drammen and similar soils
- Garne and similar soils
- Norden and similar soils
- Soils that are less than 20 inches deep over sandstone
- Soils that have slopes of more than 6 percent or less than 2 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

255C2—Urne fine sandy loam, 6 to 12 percent slopes, eroded

Composition

Urne and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Hills
Position on the landform: Backslopes and shoulders
Slope range: 6 to 12 percent

Component Description

Texture of the surface layer: Fine sandy loam
Depth to bedrock: 20 to 40 inches
Drainage class: Well drained
Dominant parent material: Slope alluvium over sandstone residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.6 inches (low)

Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Drammen and similar soils
- Norden and similar soils
- Soils that are shallower over sandstone
- Soils that have sandy surface textures
- Soils that have slopes of more than 12 percent or less than 6 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

255D2—Urne fine sandy loam, 12 to 20 percent slopes, eroded

Composition

Urne and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Hills
Position on the landform: Backslopes and shoulders
Slope range: 12 to 20 percent

Component Description

Texture of the surface layer: Fine sandy loam
Depth to bedrock: 20 to 40 inches
Drainage class: Well drained
Dominant parent material: Slope alluvium over sandstone residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.6 inches (low)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Drammen and similar soils
- Norden and similar soils
- Soils that are shallower over sandstone
- Soils that have sandy surface textures
- Soils that have slopes of more than 20 percent or less than 12 percent

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

255E—Urne fine sandy loam, 20 to 30 percent slopes

Composition

Urne and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Hills
Position on the landform: Shoulders and nose slopes
Slope range: 20 to 30 percent

Component Description

Texture of the surface layer: Fine sandy loam
Depth to bedrock: 20 to 40 inches
Drainage class: Well drained
Dominant parent material: Slope alluvium over sandstone residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.6 inches (low)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Norden and similar soils
- Soils that are deeper or shallower over sandstone
- Soils that have slopes of more than 30 percent or less than 20 percent

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

255F—Urne fine sandy loam, 30 to 45 percent slopes

Composition

Urne and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Hills
Position on the landform: Shoulders and nose slopes
Slope range: 30 to 45 percent

Component Description

Texture of the surface layer: Fine sandy loam
Depth to bedrock: 20 to 40 inches
Drainage class: Well drained
Dominant parent material: Slope alluvium over sandstone residuum
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 5.6 inches (low)
Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Gaphill and similar soils
- Norden and similar soils
- Rockbluff and similar soils
- Soils that are shallower over sandstone
- Soils that have slopes of less than 30 percent

Major Uses of the Unit

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- "Agronomy" section
- "Forest Land" section

W—Water

Composition

Water: 100 percent

Component Description

- Naturally occurring basins of surface water

References

American Association of State Highway and Transportation Officials (AASHTO). 1998. Standard specifications for transportation materials and methods of sampling and testing. 19th edition, 2 volumes.

American Society for Testing and Materials (ASTM). 1998. Standard classification of soils for engineering purposes. ASTM Standard D 2487.

Anderson, William. 1990. Laura Ingalls Wilder country.

Attig, John W. 1993. Pleistocene geology of Taylor County, Wisconsin. Wisconsin Geological and Natural History Survey Bulletin 90.

Attig, J.W., L. Clayton, and D.M. Mickelson. 1988. Pleistocene stratigraphic units of Wisconsin 1984-1987. Wisconsin Geological and Natural History Survey Information Circular 62.

Austin, G.S. 1972. Summation of the lithic environment during the deposition of Paleozoic seas. *In* Geology of Minnesota: A centennial volume. Minnesota Geological Survey, pages 471 and 472.

Baker, R.W., J.F. Diehl, T.W. Simpson, S. Beske-Diehl, and L.W. Zelazny. 1983. Pre-Wisconsinan glacial stratigraphy, chronology, and paleomagnetics of west-central Wisconsin. Geological Society of America Bulletin 94: 1442-1449.

Baker, R.W., J.C. Knox, R.S. Lively, and B.M. Olson. 1997. Evidence for entrenchment of the upper Mississippi Valley by early Pleistocene time. Minnesota Geological Survey.

Bement, P.J., and K.M. Syverson. 1995. Evidence for a pre-late Wisconsin ice-margin position in the northern "driftless area," Eau Claire County, Wisconsin. Geological Society of America Abstracts with Programs (North-Central Section), volume 27, number 3.

Bettis, E.A. III, R.G. Baker, W.R. Green, M.K. Whelan, and D.W. Benn. 1992. Late Wisconsinan and Holocene alluvial stratigraphy, paleoecology, and archaeological geology of east-central Iowa. Iowa Department of Natural Resources, Guidebook Series 12, pages 33-35.

Borchart, J.R. 1950. The climate of the central North American grassland. Annals of the Association of American Geographers 67(3): 323-342.

Clayton, L., J.W. Attig, D.M. Mickelson, and M.D. Johnson. 1991. Glaciation of Wisconsin. Wisconsin Geological and Natural History Survey, Educational Series 36.

Johnson, M.D. 1986. Pleistocene geology of Barron County, Wisconsin. Wisconsin Geological and Natural History Survey Information Circular 55.

Knox, James C. 1977. Human impacts of Wisconsin stream channels. Annals of the Association of American Geographers 67(3): 323-342.

Kotar, John, and T.L. Burger. 1996. A guide to forest communities and habitat types of central and southern Wisconsin. Department of Forestry, University of Wisconsin-Madison.

Leigh, David S., and James C. Knox. 1994. Loess of the upper Mississippi Valley driftless area. Quaternary Research 42, pages 30-40.

Martin, Lawrence. 1932. The physical geography of Wisconsin. Wisconsin Geological and Natural History Survey Bulletin 36.

Packard, Stephen, and Cornelia F. Mutel. 1997. The tallgrass restoration handbook for prairies, savannas, and woodlands.

Ruhe, Robert V. 1969. Quaternary landscapes in Iowa.

Ruhe, Robert V. 1975. Geomorphology.

Simon, Marvin J. 1965. Pioneers forever.

United States Department of Agriculture. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210.

United States Department of Agriculture. 1964. Soil survey of Pepin County, Wisconsin. Series 1958, number 29.

United States Department of Agriculture. 1993. Soil survey manual. Soil Conservation Service, Soil Survey Division Staff. U.S. Department of Agriculture Handbook 18.

United States Department of Agriculture. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, Soil Survey Staff. U.S. Department of Agriculture Handbook 436.

Wisconsin Department of Natural Resources (WDNR). 1996. Lower Chippewa River basin, water quality management plan.

Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Alpha,alpha-dipyridyl. A dye that when dissolved in 1N ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction indicates a type of redoximorphic feature.

Animal unit month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Aspect. The direction in which a slope faces.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Backslope. The position that forms the steepest and generally linear, middle portion of a hillslope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Blowout. A shallow depression from which all or most of the soil material has been removed by the wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Blowout (map symbol). A small saucer, cup, or trough-shaped hollow or depression formed by wind erosion on a preexisting sand deposit. The areas are typically less than 3 acres in size.

Borrow pit (map symbol). An open excavation from which soil and underlying material have been removed, usually for construction purposes. The areas are typically less than 3 acres in size.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Channery soil material. Soil material that has, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clastic. Pertaining to rock or sediment composed mainly of fragments derived from preexisting rocks or minerals and moved from their place of origin. The term indicates sediment sources that are both within and outside the depositional basin.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions. Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green

manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the "Soil Survey Manual."

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Coulee. A dry or intermittent stream valley or wash, especially a long, steep-walled gorge representing a Pleistocene overflow channel that carried meltwater from an ice sheet.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Culmination of the mean annual increment (CMAI). The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cut and fill (map symbol). An area where the original soil profile has been altered by the addition or removal of more than about a foot of soil material. The area is typically less than 3 acres in size.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Dolomite (mineral). A common rock-forming rhombohedral carbonate mineral—$CaMg(CO_3)_2$.

Dolomite (rock). A carbonate sedimentary rock consisting chiefly (more than 50 percent by weight or by areal percentages under the microscope) of the mineral dolomite. Compare: dolostone.

Dolostone. A term proposed for the sedimentary rock dolomite in order to avoid confusion with the mineral of the same name. Compare: dolomite.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained.* These classes are defined in the "Soil Survey Manual."

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian deposits. Earthy parent material accumulated through wind action; commonly refers to sandy

material in dunes or to loess in blankets on the surface.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Synonym: scarp.

Escarpment, bedrock (map symbol). A relatively continuous and steep slope or cliff produced by erosion or faulting, breaking the general continuity of more gently sloping land surfaces. Exposed material is hard or soft bedrock.

Escarpment, other than bedrock (map symbol). A relatively continuous and steep slope or cliff that is generally produced by erosion but can be produced by faulting, breaking the general continuity of more gently sloping land surfaces. Exposed nonbedrock material is nonsoil or very shallow, poorly developed soil.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, or clay.

Flaggy soil material. Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Flood-plain step. An essentially flat, alluvial surface within a valley that is frequently covered by floodwater from the present stream; any approximately horizontal surface frequently modified by scour and/or deposition. May occur individually or as a series of steps.

Footslope. The position that forms the inner, gently inclined surface at the base of a hillslope. In profile, footslopes are commonly concave. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Geomorphology. The science that treats the general configuration of the earth's surface; specifically the study of the classification, description, nature, origin, and development of landforms and their relationships to underlying structures, and the history of geologic changes as recorded by these surface features. The term is especially applied to the genetic interpretation of landforms.

Glacial outwash. Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till. Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits. Material moved by glaciers and subsequently sorted and deposited by

streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Gravelly spot (map symbol). An area of soil in which the surface layer has more than 35 percent, by volume, rock fragments that are mostly less than 3 inches in diameter. The area is typically less than 3 acres in size.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground moraine. An extensive, fairly even layer of till having an uneven or undulating surface; a deposit of rock and mineral debris dragged along, in, on, or beneath a glacier and emplaced by processes including basal lodgment and release from downwasting stagnant ice by ablation.

Ground water. Water filling all the unblocked pores of the material below the water table.

Gully (map symbol). A very small channel with steep sides cut by running water and through which water ordinarily runs only after a rain or an ice or snow melt. Generally is an obstacle to wheeled vehicles and is too deep to be obliterated by ordinary tillage.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Head slope. A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual." The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those

that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Interfluve. An elevated area between two drainageways that sheds water to those drainageways.

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Iron concentrations. High-chroma zones having a high content of iron and manganese oxide because of chemical oxidation and accumulation, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic concentration.

Iron depletions. Low-chroma zones having a low content of iron and manganese oxide because of chemical reduction and removal, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Island (map symbol). Any island within a body of water and above the normal water level. The island should be a relatively permanent feature. The areas are typically less than 3 acres in size.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Landfill (map symbol). An area of accumulated waste products of human habitation. Can be above or below natural ground level. The area is typically less than 3 acres in size.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Levee (map symbol). An embankment built to confine or control water, especially one built along the banks of a river to prevent overflow onto lowlands.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low-chroma zones. Zones having chroma of 2 or less. Typical color in areas of iron depletions.

Low strength. The soil is not strong enough to support loads.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mine or quarry (map symbol). An open excavation from which soil and underlying material are removed, exposing the bedrock. Also used to denote surface openings to underground mines. The areas are typically less than 3 acres in size.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine. An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Natural levee. A long, broad, low ridge or embankment of sand and coarse silt, built up by a stream on its flood plain and along both sides of its channel. Consists of wedge-shaped deposits of the coarsest suspended-load material and slopes gently away from the stream.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nose slope. A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it generally is low in relief.

Paddock. A fenced area commonly used to confine livestock for grazing.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedisediment. A thin layer of alluvial material that mantles an erosion surface and has been transported to its present position from higher lying areas of the erosion surface.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

Perennial water (map symbol). Small natural or manmade lake, pond, or pit that contains water most of the year. The areas are typically less than 3 acres in size.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as "saturated hydraulic conductivity," which is defined in the "Soil Survey Manual." In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as "permeability." Terms describing permeability, measured in inches per hour, are as follows:

Extremely slow	0.0 to 0.01 inch
Very slow	0.01 to 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prairie. A fire-maintained natural community dominated by grasses and with few or no trees.

Prescribed burning. Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.

Riser. The vertical or steeply sloping surface, commonly one of a series, of natural steplike landforms, as those of a glacial stairway or of successive stream terraces.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rock outcrop (map symbol). An exposure of bedrock at the surface of the earth. Not used where the named soils of the surrounding map unit are shallow over bedrock. The areas are typically less than 3 acres in size.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sand sheet. A large, irregularly shaped, commonly thin surficial mantle of eolian sand that lacks the discernible slip faces that are common on dunes.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sandy spot (map symbol). An area of soil in which the surface layer contains more than 75 percent sand and where the named soils of the surrounding map unit have less than about 25 percent sand. The area is typically less than 3 acres in size.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Savanna. A fire-maintained natural community dominated by grasses or sedges but with scattered fire-tolerant species of trees. Hazelnut is a major shrub.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Short steep slope (map symbol). A narrow area that has slopes at least two slope classes steeper than the slope class of the surrounding map unit. The area is typically less than 3 acres in size.

Shoulder. The position that forms the uppermost inclined surface near the top of a hillslope. It is a transition from backslope to summit. The surface is dominantly convex in profile and erosional in origin.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Shrub-carrs. Plant communities composed of tall, deciduous shrubs growing on saturated or seasonally flooded soils. They are usually dominated by willow and/or redosier dogwood and, in some places, silky dogwood. Shrub-carrs typically retain some of the forbs, grasses, and sedges of the inland fresh meadows. It should be noted that several alien shrub species are invading shrub-carrs, especially where disturbances, such as drainage and grazing, have occurred.

Side slope. A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole (map symbol). A closed depression formed either by solution of the surficial rock or by collapse of underlying caves. Complexes of sinkholes in carbonate-rock terrain are the main components of karst topography. The areas are typically less than 3 acres in size.

Slackwater. A quiet part of a body of water or a still body of water in a stream.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of

the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Spoil area (map symbol). Piles of earthy materials, either smoothed or uneven, resulting from human activity. The areas are typically less than 3 acres in size.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summit. The topographically highest position of a hillslope. It has a nearly level (planar or only slightly convex) surface.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material that is too thin for the specified use.

Till. Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Till plain. An extensive area of nearly level to undulating soils underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope. The position that forms the gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Tread. The flat or gently sloping surface of natural steplike landforms, commonly one of a series, such as successive stream terraces.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley train. A long narrow body of outwash confined

within a valley beyond a glacier; it may or may not emerge from the valley and join an outwash plain.

Very stony spot (map symbol). An area in which more than 3 percent of the surface is covered with rock fragments larger than 10 inches in diameter. The area is typically less than 3 acres in size.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wet spot (map symbol). An area of somewhat poorly drained to very poorly drained soils at least two drainage classes wetter than the named soils in the surrounding map unit. The area is typically less than 3 acres in size.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The uprooting and tipping over of trees by the wind.

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