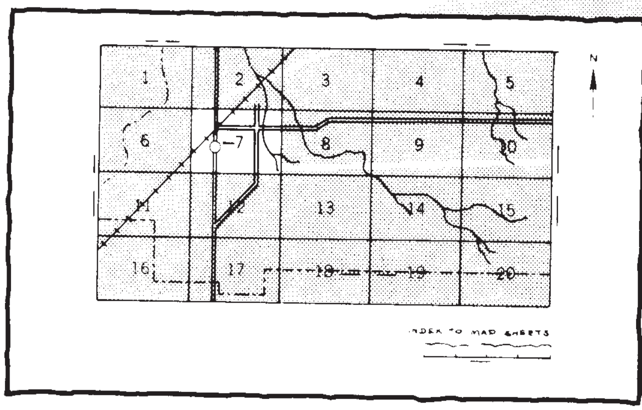
soil survey of

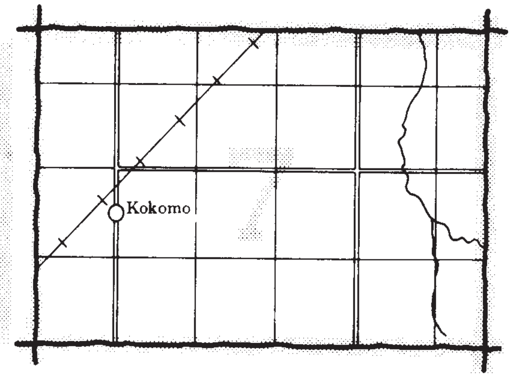
ADAMS COUNTY WISCONSIN

United States Department of Agriculture
Soil Conservation Service
in cooperation with
Research Division of the College of Agricultural
and Life Sciences, University of Wisconsin

HOW TO USE

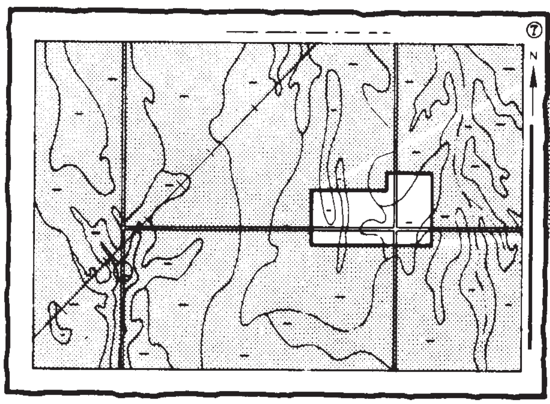
1. Locate your area of interest on the "Index to Map Sheets" (the last page of this publication).

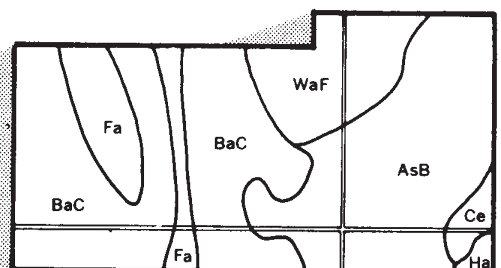




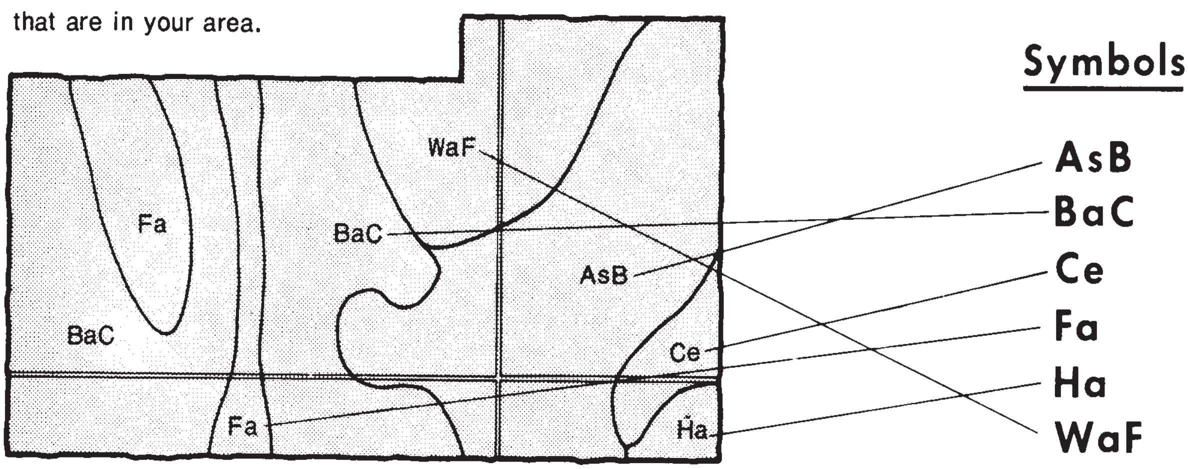
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.



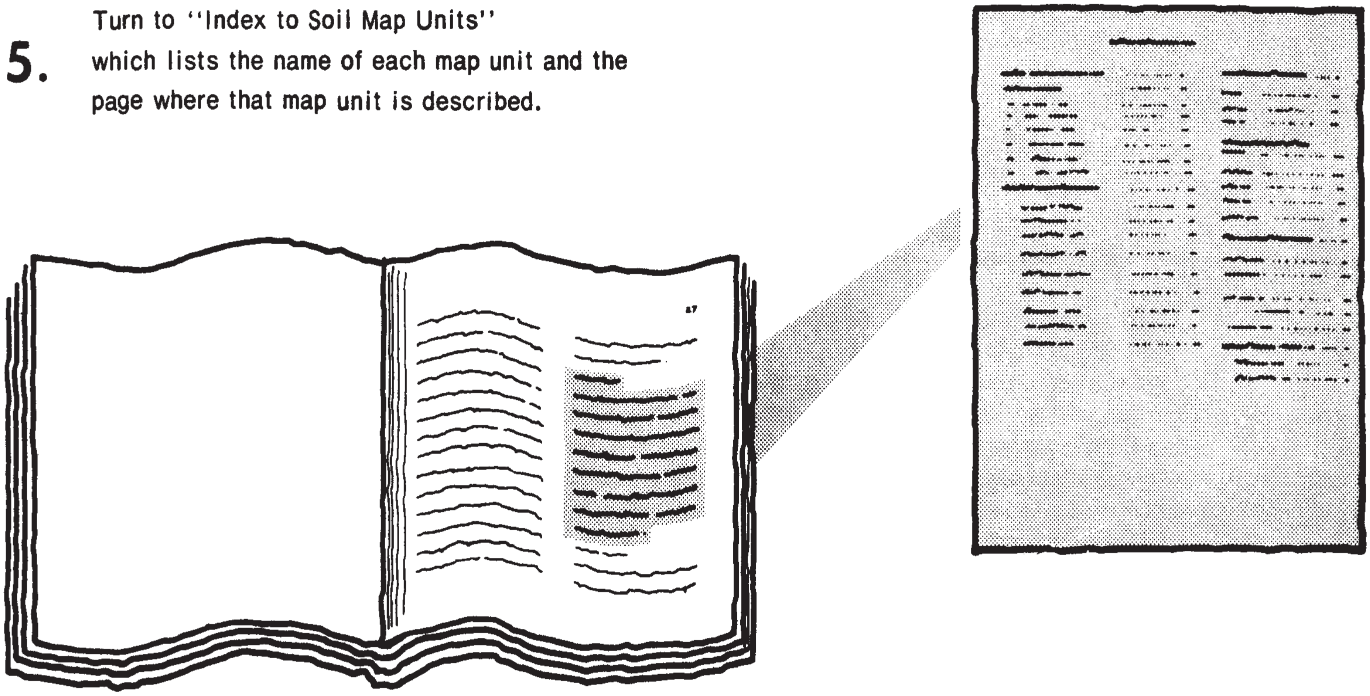


4. List the map unit symbols that are in your area.

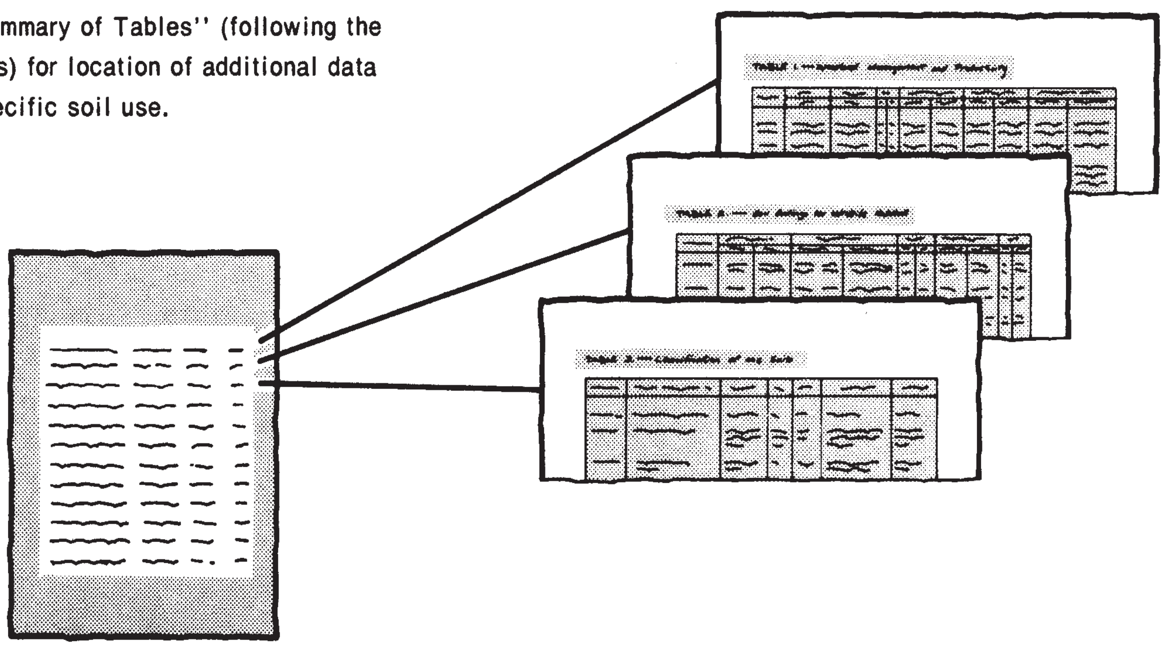


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

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 Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was performed in the period 1973-1977. Soil names and descriptions were approved in February 1978. This survey was made cooperatively by the Soil 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 Adams County Soil and Water Conservation District. The fieldwork was partly financed by the district.

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.

contents

soil series

Issued July 1984

index to soil map units

summary of tables

foreword

This soil survey contains information that can be used in land-planning programs in Adams County, Wisconsin. 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 insure 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.

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 Soil Conservation Service or the Cooperative Extension Service.

J. C. Hytry
State Conservationist
Soil Conservation Service

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soil survey of
Adams County, Wisconsin

By Dale E. Jakel, Soil Conservation Service

Fieldwork by Frank L. Anderson, Dale E. Jakel, David C. Roberts, Keith H. Widdel, and Robert W. Slota, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service
in cooperation with the Research Division of the
College of Agricultural and Life Sciences, University of Wisconsin

ADAMS COUNTY lies a little south of central Wisconsin (fig. 1). It extends about 43 miles north to south and 22 miles east to west. The total land area is about 646 square miles, or 413,568 acres. The population in 1970 was 9,234. The city of Adams is in the center of the county. Friendship, just north of Adams, is the county seat.

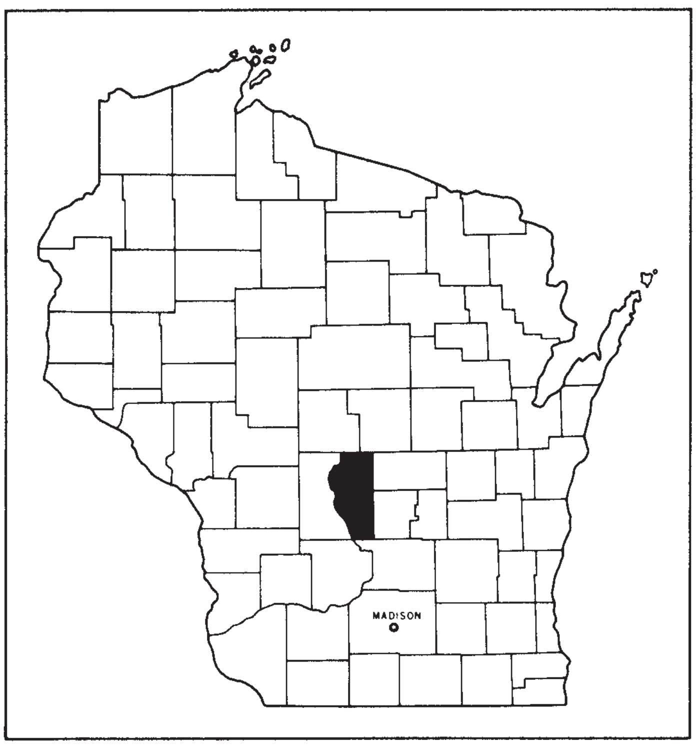

Figure 1.—Location of Adams County in Wisconsin.

Adams is a rural county. Approximately 35 percent of the area is farmland and 60 percent is woodland. Agriculture and related businesses employ a large proportion of the work force, and the economy has been boosted by recent increases in irrigation. Recreational services and facilities are also important. Many small businesses depend on tourism and recreation (*14*).

The county can be divided into two physiographic areas. The hills and kettles in the southeast make up one area. These landforms were caused almost entirely by glacial deposition. The Johnstown moraine forms the western boundary of this area. The other area is larger. It is a broad outwash plain bordered on the west by the Wisconsin River. The outwash deposits are sand over silty and clayey lacustrine deposits laid down in old glacial Lake Wisconsin. In some places there is no sandy mantle, or it is thin. In most areas, however, it is more than 5 feet thick.

general nature of the county

This section gives general information about the county. It describes the climate; physiography, relief, and drainage; water supply; history and development; and transportation and industry.

climate

Adams County has a continental climate that is characterized by long, cold, snowy winters; warm summers; and springs and falls that are often short.

From late in fall through spring the weather changes every few days because of airmasses that are part of the pressure systems moving eastward and northeastward over the northern states. Nearly every year there are one or more periods of Indian summer when the days are abnormally warm and sunny, the nights are cool, and the skies are hazy but unclouded.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Hancock in the period 1930 to 1959. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring.

In winter the average temperature is 18 degrees F, and the average daily minimum temperature is 8 degrees. The lowest temperature on record, which occurred at Hancock in 1951, is -43 degrees. The annual number of days on which the temperature reached 0 degrees or below has varied from 9 in 1931 to 53 in 1950. In summer the average temperature is 69 degrees, and the average daily maximum temperature is 82 degrees. The highest recorded temperature, which occurred in 1936, is 112 degrees. The annual number of days on which the temperature reached 90 degrees or above has varied from 1 in 1951 to 35 in 1933.

The total annual precipitation is 29.27 inches. Of this, 17.7 inches, or 60 percent, usually falls in May through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in May through September is less than 15 inches. The heaviest 1-day rainfall during the period of record was 5.04 inches at Hancock on June 22, 1940. Thunderstorms occur on about 32 days each year. Hail falls on an average of two days a year.

Summer rains fall mostly as showers and tend to be erratic and variable. The likelihood of 1 inch or more of rain falling in a 7-day period is greater during the first, second, and fourth weeks of June than any other time of the summer; the chance is 2 in 5 years. The likelihood of a dry 7-day period, with a trace of precipitation or less, is greater at the end of August than any other time of the summer; the chance is 1 in 4 years.

Average seasonal snowfall is 38.1 inches. The greatest total seasonal snowfall during the period of record was 93 inches.

The average date of the last 32-degree freeze in the spring is May 17, and the first in the fall is September 30. The growing season—defined as the interval between these two dates—averages 135 days. This may vary slightly within the county, depending on nearness of the location to water and whether it is in a depression or on a hilltop or slope.

The sun shines 40 percent of the time possible in summer and 20 percent in winter. The prevailing wind is from the west. Average windspeed is highest, 12 miles per hour, in March, April, and November.

physiography, relief, and drainage

Adams County is in the Wisconsin Central Plain, which is characterized by flat or gently undulating topography. Relief is generally low except for occasional pinnacles and hills of sandstone such as Pilot Knob, Friendship Mound, and Roche-A-Cri Mound (*15*).

Roche-A-Cri Mound rises 300 feet above the surrounding plain to an elevation of 1,185 feet. Elevations along the Wisconsin River range from 850 feet in the southern part of the county to 950 feet in the northern part. The altitude of the outwash plain ranges from 1,000 to 1,100 feet.

The Johnstown moraine in southeastern Adams County divides the drainage between the Wisconsin and Fox Rivers. The principal drainage in Adams County is westward to the Wisconsin River. Little Roche-A-Cri Creek, Big Roche-A-Cri Creek, and Fourteen Mile Creek are the major tributaries. Drainage east of the moraine is to the Fox River via Neenah Creek, Widow Green Creek, and other tributaries.

Streams in Adams County begin in outwash plains, which provide relatively large and constant amounts of ground water. Average regional runoff is about 9 inches per year. The Wisconsin River is regulated by dams and has a relatively constant flow. Flood plains in Adams County are small, and floods occur only during periods of exceptionally heavy rainfall.

water supply

Surface water is abundant, but most of the water used for stock and domestic purposes, irrigation, and municipal and industrial uses is from wells in glacial deposits or Upper Cambrian sandstone (*4*).

Probable yields of wells in the sandy outwash plains is more than 1,000 gallons per minute in the northern part of the county. Toward the south, wells yield less. Glacial till in the Johnstown moraine yields from 50 to 1,000 gallons per minute. Wells in the sandstone bedrock yield 100 to 500 gallons per minute (*3*).

Most of the ground water in Adams County is soft, ranging in hardness from 0 to 60 milligrams of dissolved solids per liter. Areas within the Johnstown moraine have moderately hard water of 61 to 120 milligrams per liter. To the east of the moraine the water is hard, ranging from 121 to 180 milligrams per liter (*6*).

history and development

Before settlement the area was visited by French explorers, missionaries, and fur traders who traveled the Wisconsin River. Lumbermen entered the area shortly after the War of 1812, and permanent settlement soon began.

Adams County was created in 1848. After several boundary changes, the county assumed its present shape in 1857. The county seat was first at the settlement of Quincy, from 1853 to 1858. It was then moved to where it is today, at Friendship, population 641. The city of Adams, population 1,440, is the largest and only incorporated city in the county. Early settlements were also made in the townships now known as New Haven, Jackson, Dell Prairie, and Springville.

About 1890 the agriculture of Adams County began to be diversified. Dairy farming expanded. The acreages of corn, oats, tame hay, and rye were increased considerably. Before 1900 a large acreage was in potatoes. Dairy herds were the largest single source of farm income, but irrigation has produced the fastest gains in the production of vegetables and field crops.

Irrigated land was increased from 943 acres in 1959 to more than 28,000 acres in 1977. Because of extensive reforestation, about 60 percent of the land area is now woodland.

transportation and industry

The principal north-south road in Adams County is State Highway 13. The main east-west roads are State Highways 73, 21, 82, and 23. Rail service also is provided across the county.

The main agricultural enterprises in Adams County are irrigated vegetables and dairy farming. Most of the milk produced is used for cheese, and there is one cheese factory in the county. A small amount of the milk is sold on the grade A fluid milk market.

The trend in the county is toward large irrigated farms. Most of the irrigated land is used for potatoes, snap beans, peas, and sweet corn. These vegetables are processed at plants outside of the county.

Sand and gravel are the only commercial mineral resources. In 1973, according to the U.S. Bureau of Mines, 40,250 short tons of sand and gravel were surface mined. Some quartzite from Hamilton Mound is used for road surfacing by the county highway department.

Adams County's industry includes a cheese factory, a boxboard container manufacturer, a mobile home manufacturer, a metal fabricating plant, a pallet manufacturing plant, several sawmills, and several pulp cutting and hauling operations.

The recreation industry is also important. Recreational facilities include two county parks, one state park, a ski hill, snowmobile trails, and several summer and recreational homesite developments. The county is a popular fishing and hunting area.

how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, woodland managers, engineers, planners, developers and builders, home buyers, and others.

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general soil map units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units 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 can be identified on the map. Likewise, areas where the soils 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 map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

1. Coloma-Wyocena-Okee

Gently sloping to steep, well drained and somewhat excessively drained soils that have a sandy and loamy subsoil underlain by sandy outwash deposits or sandy glacial till

This map unit consists of outwash plains and the rough terminal moraine which has many knolls, hills, and depressions. Slopes are short and irregular and range from 2 to 25 percent.

This map unit covers about 12 percent of the county. It is about 40 percent Coloma soils, 20 percent Wyocena soils, 15 percent Okee soils, and 25 percent minor soils (fig. 2).

Coloma soils are gently sloping to steep and are somewhat excessively drained. They are on outwash plains and moraines. Typically, the surface layer is very dark gray sand about 2 inches thick. The subsurface layer is loose sand about 53 inches thick. It is dark brown and yellowish brown in the upper part and strong brown in the lower part. There are yellowish red, very friable loamy sand subsoil bands 1/8- to 1/4-inch thick in the lower part of the subsurface layer. The substratum, to a depth of about 60 inches, is strong brown sand.

Wyocena soils are gently sloping to steep and are well drained. They are on ground moraines and terminal moraines. Typically, the surface layer is brown loamy sand about 8 inches thick. The subsurface layer is brown sandy loam about 4 inches thick. The subsoil is about 25 inches thick. It is brown, very friable sandy loam in the upper part; reddish brown and yellowish red, very friable sandy loam in the middle; and brown, very friable loamy sand in the lower part. The substratum, to a depth of about 60 inches, is brown loamy sand in the upper part and dark yellowish brown sand in the lower part.

Okee soils are gently sloping to steep and are well drained and somewhat excessively drained. They are on moraines. Typically, the surface layer is very dark grayish brown loamy sand about 8 inches thick. The subsurface layer is very dark grayish brown loamy sand about 8 inches thick. The subsoil is about 23 inches thick. It is yellowish red, firm sandy clay loam in the upper part; yellowish red, friable sandy loam in the middle; and strong brown, friable loamy sand in the lower part. The substratum, to a depth of about 60 inches, is strong brown loamy sand.

Minor in this map unit are the Houghton, Newton, Plainfield, and Richford soils. The Houghton and Newton soils are poorly drained or very poorly drained. The Plainfield soils are excessively drained. Richford soils are well drained and somewhat excessively drained. Houghton and Newton soils are in drainageways and depressions. Plainfield and Richford soils occupy positions in the landscape similar to the major soils.

Most areas of this map unit are used for woodland or pasture. Some areas of gently sloping and sloping soils are used for cultivated crops.

The major soils in this map unit have poor or fair potential for cultivated crops because of droughtiness and the soil blowing and erosion hazard. Slopes are extremely uneven, and most areas are not suitable for stripcropping, terracing, irrigation, or other improved farming methods. These soils have fair potential for trees. The potential for most engineering uses is good in the less sloping areas. Because of moderately rapid or rapid permeability in the substratum, there is a danger of ground water contamination if these soils are used for waste disposal.

2. Kewaunee-Poygan

Nearly level to moderately steep, well drained and poorly drained soils that have a silty and clayey subsoil underlain by clayey glacial till or clayey lacustrine deposits

This map unit consists of flat glacial lake basins and undulating ground moraines with small hills and broad

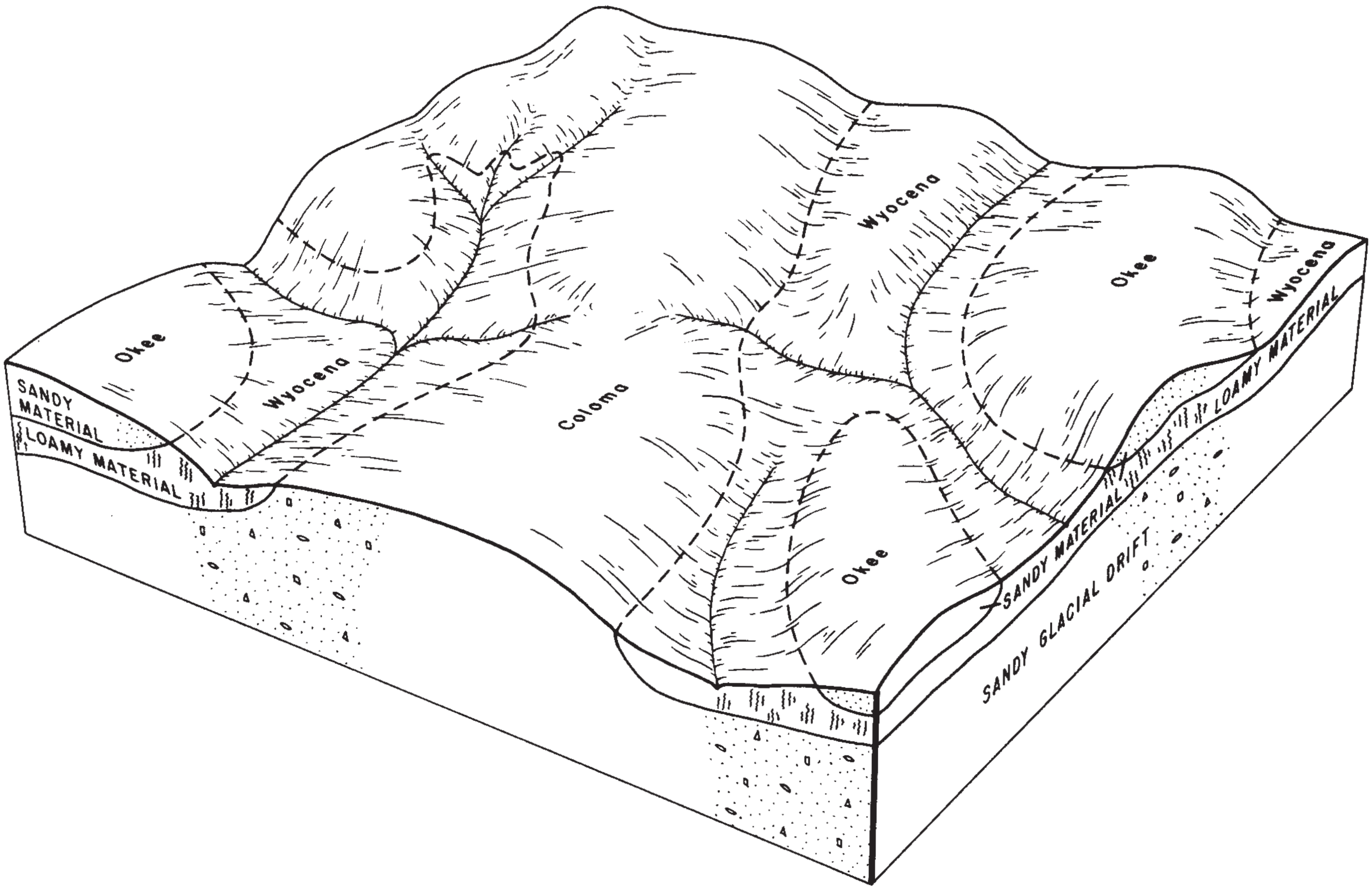

Figure 2.—Typical pattern of soils in the Coloma-Wyocena-Okee unit.

ridges adjacent to the terminal moraine. Slopes are medium in length and irregular. They range from 0 to 20 percent.

This map unit covers about 4 percent of the county. It is about 50 percent Kewaunee soils, 7 percent Poygan soils, and 43 percent minor soils (fig. 3).

Kewaunee soils are gently sloping to moderately steep and are well drained. They are on ground moraines. Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsoil is about 25 inches thick. It is brown, friable silty clay loam in the upper part and reddish brown, firm silty clay in the lower part. The substratum, to a depth of about 60 inches, is reddish brown silty clay.

Poygan soils are nearly level and are poorly drained. They are in drainageways and depressions on till plains and glacial lake basins. Typically, the surface layer is black silty clay loam about 9 inches thick. The subsoil is about 15 inches thick. It is grayish brown, olive gray, and reddish brown, firm silty clay. The substratum, to a depth of about 60 inches, is mixed reddish brown and olive gray, very firm silty clay.

Minor in this map unit are the Briggsville, Grays, Manawa, and Palms soils. The well drained Briggsville and Grays soils are in depressions throughout the ground moraine. The somewhat poorly drained Manawa soils and very poorly drained Palms soils are also in depressions.

Most areas of this map unit are used for cultivated crops and pasture. Some of the steeper areas remain in woods.

The major soils in this map unit have good potential for cultivated crops. The Kewaunee soils need erosion control practices such as terraces, diversions, and grassed waterways. The poorly drained Poygan soils need drainage. The major soils have good potential for trees. The Kewaunee soils have fair or poor potential for most engineering uses because of moderately slow or slow permeability and shrinking and swelling. Poygan soils have poor potential for most engineering uses because of wetness, flooding, and slow permeability.

3. Plainfield-Brems

Nearly level to steep, excessively drained and moderately well drained soils that have a sandy subsoil underlain by sandy outwash deposits

This map unit consists of an undulating outwash plain with small hills and depressions dissected by streams and small drains. Slopes are mostly long and irregular and range from 0 to 25 percent. Except along drainageways, most slopes are less than 6 percent.

This map unit covers about 46 percent of the county. It is about 50 percent Plainfield soils, 25 percent Brems soils, and 25 percent minor soils (fig. 4).

Plainfield soils are nearly level to steep and are excessively drained. Typically, the surface layer is very dark grayish brown sand about 4 inches thick. The subsoil is about 24 inches thick. It is dark yellowish brown, very friable sand in the upper part; strong brown, very friable sand in the middle; and yellowish brown, very friable sand in the lower part. The substratum, to a depth of about 60 inches, is yellowish brown sand.

Brems soils are nearly level and gently sloping and are moderately well drained. Typically, the surface layer is very dark grayish brown loamy sand about 7 inches thick. The subsurface layer is dark yellowish brown sand about 2 inches thick. The subsoil is about 37 inches thick. It is yellowish brown, very friable sand in the upper part and strong brown, mottled, very friable and loose sand in the lower part. The subsoil, to a depth of about 60 inches, is yellowish brown sand.

Minor in this map unit are the Meehan and Newson soils. The somewhat poorly drained Meehan soils and poorly drained and very poorly drained Newson soils are in depressions and drainageways.

Most areas of this map unit remain in woodland. A few areas are used for pasture and a few areas are irrigated and used for vegetables.

The major soils in this map unit have poor or fair potential for cultivated crops; droughtiness and soil blowing are the main hazards. Wind stripcropping, windbreaks, minimum tillage, winter cover crops, and irrigation can reduce soil blowing and the drought hazard. These soils have fair potential for trees. The potential for most engineering uses is good or fair. Because of rapid permeability there is a danger of ground water contamination if these soils are used for waste disposal.

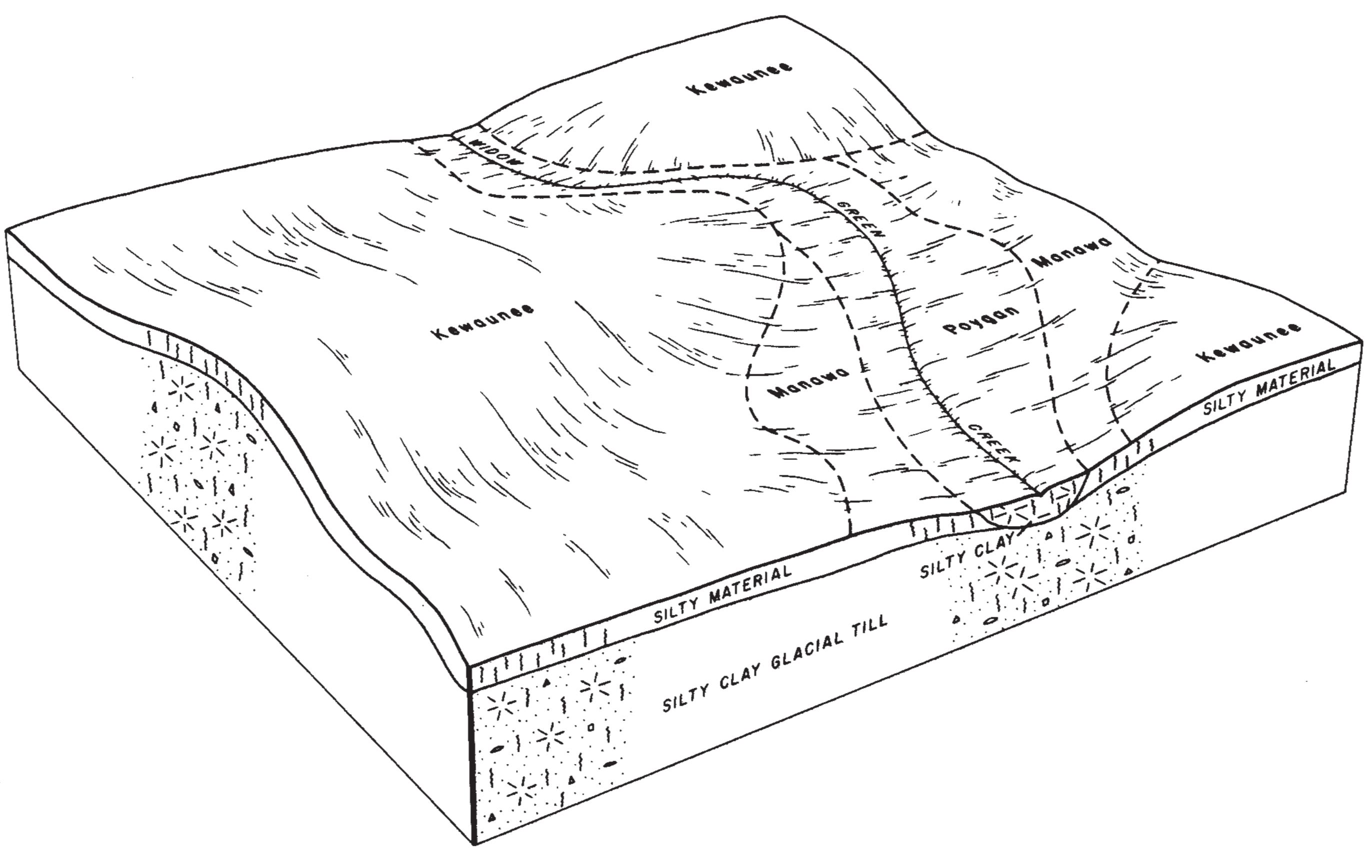

Figure 3.—Typical pattern of soils in the Kewaunee-Poygan unit.

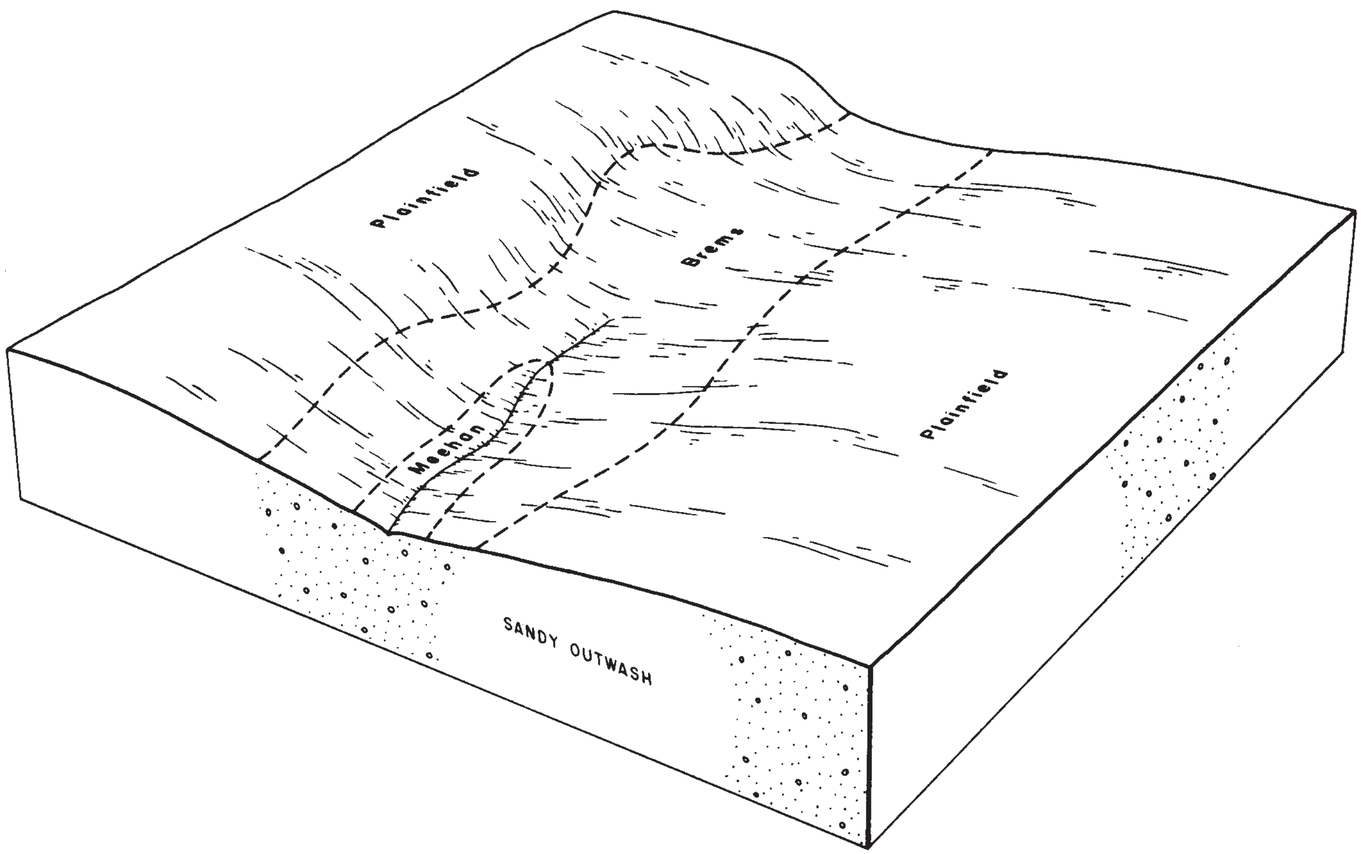

Figure 4.—Typical pattern of soils in the Plainfield-Brems unit.

4. Meehan-Newson-Brems

Nearly level and gently sloping, moderately well drained to very poorly drained soils that have a sandy subsoil underlain by sandy outwash, lacustrine, or alluvial deposits

This map unit consists of a broad, flat outwash and lake plain with numerous depressions and dissected by small streams. Slopes range from 0 to 3 percent.

This map unit covers about 22 percent of the county. It is about 30 percent Meehan soils, 25 percent Newson soils, 20 percent Brems soils, and 25 percent minor soils (fig. 5).

Meehan soils are nearly level and gently sloping and are somewhat poorly drained. They are in depressions and drainageways. Typically, the surface layer is black loamy sand about 8 inches thick. The subsurface layer is brown, mottled sand about 7 inches thick. The subsoil is about 21 inches thick. It is light gray, pale brown, and light brownish gray, mottled, loose sand. The substratum, to a depth of about 60 inches, is light gray sand.

Newson soils are nearly level and are poorly drained and very poorly drained. They are in depressions and drainageways. Typically, the surface layer is black loamy sand about 8 inches thick. The subsoil is about 20 inches thick. It is dark gray, very friable loamy sand in the upper part and dark grayish brown and grayish brown, very friable sand in the lower part. The substratum, to a depth of about 60 inches, is brown sand.

Brems soils are nearly level and gently sloping and are moderately well drained. They are on slightly higher convex slopes between depressions. Typically, the surface layer is very dark grayish brown loamy sand about 7 inches thick. The subsoil is about 37 inches thick. It is yellowish brown, very friable sand in the upper part and strong brown, mottled, very friable and loose sand in the lower part. The substratum, to a depth of about 60 inches, is yellowish brown sand.

Minor in this map unit are the Adrian, Au Gres, and Leola soils. The very poorly drained Adrian soils are in depressions. The somewhat poorly drained Au Gres soils are on convex slopes and the somewhat poorly drained Leola soils are in depressions and drainageways.

Most areas of this map unit remain in woodland or wildlife habitat. A few small areas are used for vegetables.

The major soils in this map unit have fair potential for cultivated crops. The Meehan and Newson soils need drainage for dependable crop production. Wind stripcropping, windbreaks, minimum tillage, and winter cover crops can reduce the soil blowing hazard on the major soils. These soils have fair potential for trees. Meehan and Newson soils have poor potential for most engineering uses because of wetness. Brems soils have good to poor potential for engineering uses. Wetness is a problem for some uses.

5. Delton-Plainfield-Sisson

Nearly level to very steep, well drained and excessively drained soils that have a sandy, loamy, silty, or clayey subsoil underlain by clayey or silty and sandy lacustrine deposits or sandy outwash deposits

This map unit consists of a broad lake basin and outwash plain dissected by a few streams. Slopes range from 0 to 35 percent, but are mostly 0 to 6 percent. The steeper slopes are on the borders of lacustrine basins and along streams.

This map unit covers about 5 percent of the county. It is about 49 percent Delton soils, 20 percent Plainfield soils, 8 percent Sisson soils, and 23 percent minor soils (fig. 6).

Delton soils are nearly level to moderately steep and are somewhat excessively drained. They are on outwash plains and glacial lake basins. Typically, the surface layer is dark brown sand about 10 inches thick. The subsurface layer is dark brown and strong brown sand about 18 inches thick. The subsoil is about 9 inches thick. It is reddish brown, friable sandy loam in the upper part and reddish brown, firm silty clay loam in the lower part. The substratum, to a depth of about 60 inches, is reddish brown silty clay.

Plainfield soils are nearly level to very steep and are excessively drained. They are on outwash plains. Typically, the surface layer is very dark grayish brown sand about 4 inches thick. The subsoil is about 24 inches thick. It is dark yellowish brown, very friable sand in the upper part; strong brown, very friable sand in the middle; and yellowish brown, very friable sand in the lower part. The substratum, to a depth of about 60 inches, is yellowish brown sand.

Sisson soils are gently sloping and are well drained. They are on glacial lake plains. Typically, the surface layer is dark brown fine sandy loam about 8 inches thick.

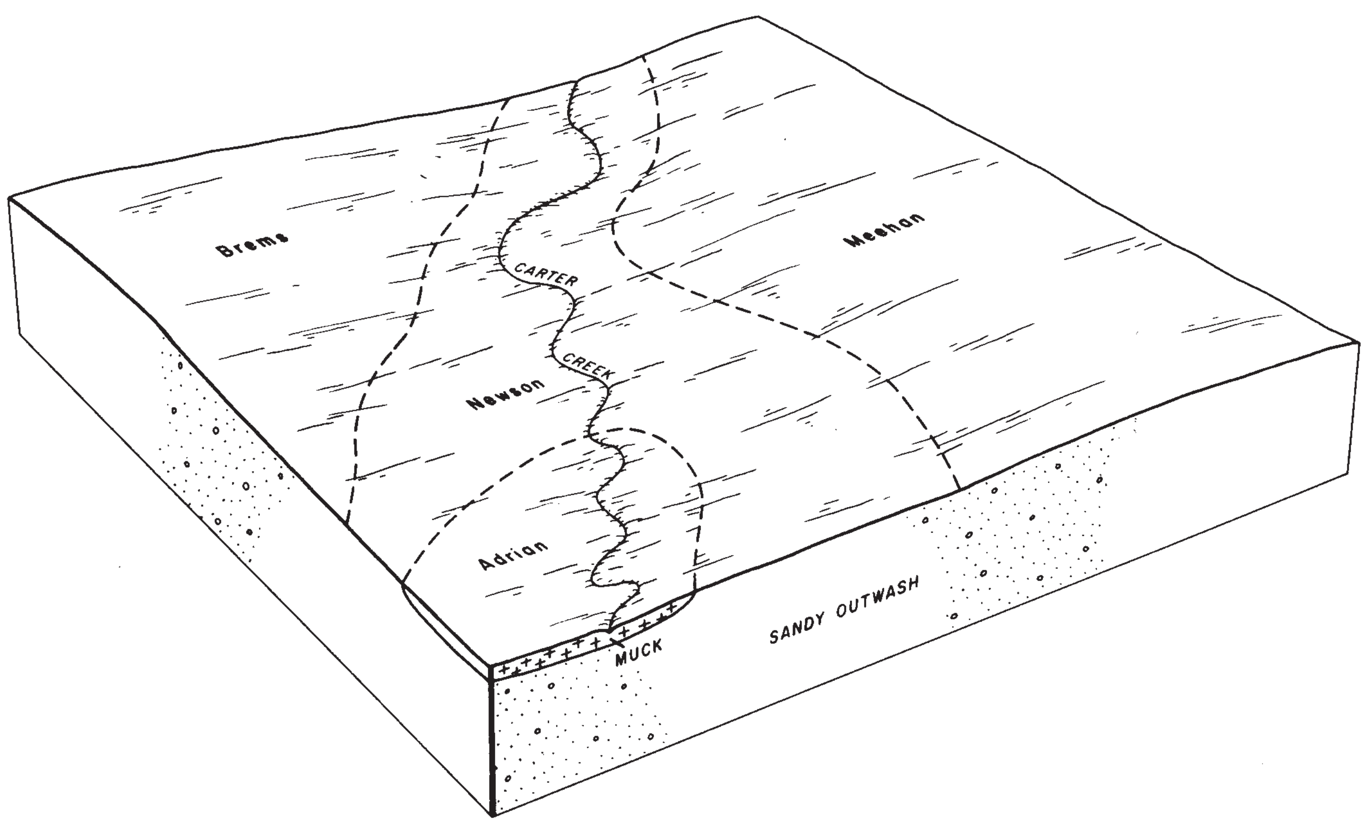

Figure 5.—Typical pattern of soils in the Meehan-Newson-Brems unit.

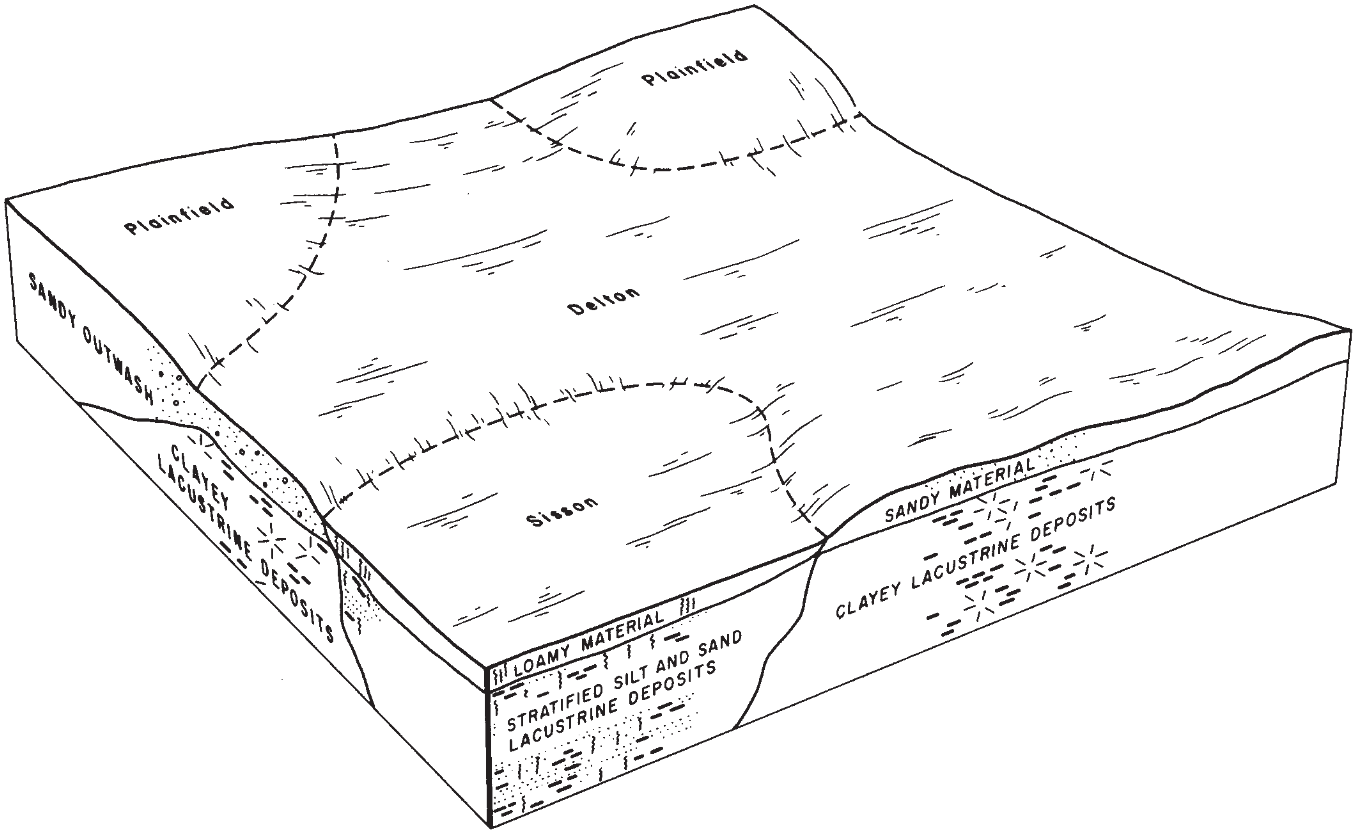

Figure 6.—Typical pattern of soils in the Delton-Plainfield-Sisson unit.

The subsurface layer is brown fine sandy loam about 3 inches thick. The subsoil is about 25 inches thick. It is dark brown, friable fine sandy loam in the upper part; reddish brown, friable loam in the middle; and reddish brown, friable silt loam in the lower part. The substratum, to a depth of about 60 inches, is reddish brown stratified silt and fine sand.

Minor in this map unit are the Brems, Briggsville, and Wyeville soils. The moderately well drained Brems soils are lower in the landscape than Plainfield soils. The well drained Briggsville soils occupy positions in the landscape similar to Delton soils. The somewhat poorly drained Wyeville soils are in depressions and drainageways.

Most areas of this map unit have good or fair potential for cultivated crops, but droughtiness and soil blowing are hazards. Wind stripcropping, windbreaks, minimum tillage, and winter cover crops can reduce soil blowing. These soils have good or fair potential for trees. The potential for most engineering uses is good on the less sloping areas.

6. Plainfield-Richford-Billett

Nearly level to sloping, well drained to excessively drained soils that have a sandy and loamy subsoil underlain by sandy outwash deposits

This map unit consists of a relatively flat outwash plain. Slopes range from 0 to 12 percent, but are mostly 0 to 6 percent.

This map unit covers about 9 percent of the county. It is about 60 percent Plainfield soils, 20 percent Richford soils, 10 percent Billett soils, and 10 percent minor soils.

Plainfield soils are nearly level to sloping and are excessively drained. Typically, the surface layer is very dark grayish brown sand about 4 inches thick. The subsoil is about 24 inches thick. It is dark yellowish brown, very friable sand in the upper part; strong brown, very friable sand in the middle; and yellowish brown, very friable sand in the lower part. The substratum, to a depth of about 60 inches, is yellowish brown sand.

Richford soils are gently sloping and sloping and are well drained and excessively drained. Typically, the surface layer is very dark grayish brown loamy sand about 7 inches thick. The subsurface layer is about 24 inches thick. It is dark brown loamy sand in the upper part; yellowish brown sand in the middle; and strong brown loamy sand in the lower part. The subsoil is about 14 inches thick. It is strong brown, friable sandy loam in the upper part, and dark yellowish brown, very friable loamy sand in the lower part. The substratum, to a depth of about 60 inches, is strong brown sand.

Billett soils are nearly level and gently sloping and are well drained. Typically, the surface layer is very dark brown sandy loam about 8 inches thick. The subsoil is about 30 inches thick. It is dark yellowish brown and dark brown, friable sandy loam in the upper part and dark yellowish brown and dark brown, very friable loamy sand in the lower part. The substratum, to a depth of about 60 inches, is yellowish brown sand.

Minor in this map unit is the moderately well drained Brems soils. Brems soils are on concave slopes in slight depressions.

Most areas of this map unit are irrigated and used for vegetable crops.

The major soils in the map unit have fair potential for cultivated crops. Droughtiness and soil blowing are the main hazard. Wind stripcropping, windbreaks, minimum tillage, and winter cover crops can reduce soil blowing and conserve soil moisture. These soils have fair potential for trees. The potential for most engineering uses is good.

7. Boone-Gale-Billett

Nearly level to very steep, well drained and excessively drained soils that have a sandy, loamy, or silty subsoil underlain by sandy residuum and sandstone or by sandy outwash deposits

This map unit consists of an undulating plain where sandstone is near the surface and a relatively flat outwash plain. Slopes range from 0 to 45 percent. Except along streams and outcrops of sandstone, most slopes are less than 12 percent.

This map unit covers about 2 percent of the county. It is about 50 percent Boone soils, 19 percent Gale soils, 15 percent Billett soils, and 16 percent minor soils.

Boone soils are gently sloping to very steep and are excessively drained. They are on sandstone uplands. Typically, the surface layer is dark brown sand about 3 inches thick. The substratum, to a depth of about 60 inches, is strong brown sand in the upper 13 inches and yellowish red sandstone in the lower part.

Gale soils are gently sloping and sloping and are well drained. They are on sandstone uplands. Typically, the surface layer is brown silt loam about 8 inches thick. The subsoil is about 23 inches thick. It is dark yellowish brown, friable silt loam in the upper part; brown, friable silty clay loam in the middle; and strong brown, friable loam and very friable sandy loam in the lower part. The substratum, to a depth of about 60 inches, is pink, loose sand in the upper 7 inches and reddish yellow sandstone in the lower part.

Billett soils are nearly level and gently sloping and are well drained. They are on outwash plains. Typically, the surface layer is very dark brown sandy loam about 8 inches thick. The subsoil is about 30 inches thick. It is dark yellowish brown and dark brown, friable sandy loam in the upper part and dark yellowish brown and dark brown, very friable loamy sand in the lower part. The substratum, to a depth of about 60 inches, is yellowish brown sand.

Minor in this map unit are the well drained Sisson and Tell soils. Sisson soils formed in lacustrine deposits in depressions near Gale soils. Tell soils are in depressions on outwash plains near Billett soils. Sandstone outcrops are near Boone soils.

Most areas of Gale and Billett soils are used to grow cultivated crops and pasture. Most areas of Boone soils remain in woods.

The major soils in this map unit have good to fair potential for cultivated crops. Droughtiness and erosion are the main hazards. Minimum tillage, winter cover crops, terraces, diversions, and grassed waterways can help to control erosion and conserve soil moisture. These soils have fair or good potential for trees. The potential for most engineering uses is poor on the Boone and Gale soils and good on the Billett soils.

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detailed soil map units

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

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses. Some of the methods described for overcoming hazards and limitations are controlled by local or state ordinances that should be referred to before construction.

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 substratum, 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 substratum. 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, 0 to 2 percent slopes, is one of several phases in the Plainfield series.

Some map units are made up of two or more major soils. These map units are called soil complexes.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Brems-Newson loamy sands, 0 to 3 percent slopes, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 3 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") 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.

soil descriptions

Ad—Adrian muck. This nearly level, very poorly drained soil is in depressions on outwash plains and glacial lake plains. It is subject to frequent flooding. Individual areas of this soil are irregular in shape and range from 5 to 500 acres in size.

Typically, the organic layers are dark reddish brown, black, and very dark brown muck about 45 inches thick. The substratum, to a depth of about 60 inches, is grayish brown sand.

Included with this soil in mapping are small areas of very poorly drained Houghton soils. Houghton soils are organic soils in depressions. They are more than 51 inches thick. Also included are a few small areas of poorly drained and very poorly drained Newson soils. Newson soils formed in sand and generally border the Adrian soil. These included soils make up 5 to 15 percent of the unit.

Water and air move through Adrian muck at a moderately rapid rate. Runoff is ponded. Reaction ranges from very strongly acid to neutral in the organic layers and from slightly acid to moderately alkaline in the substratum. The available water capacity and organic matter content are very high. Natural fertility is low. The surface layer is friable and easily tilled. Subsidence occurs if this soil is drained. Roots of most crops are restricted by the seasonal high water table, which is within a foot of the surface in undrained areas.

Most areas of this soil remain in wetland vegetation. If drained, this soil has fair potential for most cultivated crops, hay, and pasture. The potential is fair for trees and poor for most engineering uses.

If drained with a system of open ditches or tile, this soil is suited to corn, certain vegetables, small grain, and grasses and legumes for hay and pasture. If drained and cultivated, however, there is a soil blowing hazard. This soil is subject to burning if the organic layer dries. Minimum tillage, windbreaks, wind stripcropping, and planting cover crops can help control soil blowing and maintain water infiltration. The use of controlled drainage can reduce the hazard of subsidence and burning. If tile is used, a filter placed over the tile will prevent sand from plugging the tile. Because of cold air drainage there are fewer frost-free days on this soil than on adjacent upland soils.

Using this soil as hayland or pasture also reduces soil blowing. During dry periods undrained areas can be planted to water-tolerant plants and used for pasture. Proper stocking rates, pasture rotation, fertility management, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees. Soil wetness and the high water table during the planting season limit reforestation to natural regeneration. Harvesting with heavy equipment is confined to when the soil is frozen. Harvesting by clear-cut or area-selection methods will reduce windthrow of the remaining trees. Competing vegetation that interferes with natural regeneration following harvest can be controlled by herbicides or mechanical removal.

This soil is poorly suited to building site development and onsite waste disposal because of the high water table, flooding hazard, low strength, or seepage. It is well suited to wetland wildlife habitat.

This soil is in capability subclass IVw drained and VIw undrained. It is in woodland suitability subclass 3w.

AlA—Algansee loamy sand, 0 to 3 percent slopes. This nearly level and gently sloping, somewhat poorly drained soil is on plane slopes of flood plains. It is subject to frequent flooding. Individual areas of this soil are long and narrow in shape and range from 80 to 300 acres in size.

Typically, the surface layer is dark brown loamy sand about 9 inches thick. The substratum, to a depth of about 60 inches, is strong brown, yellowish brown, and grayish brown, mottled sand. In some places the surface layer is sand. Thin layers of loam, sandy loam, fine gravel, or muck occur in some places.

Included with this soil in mapping are small areas of very poorly drained Adrian and poorly drained and very poorly drained Newson soils in depressions. Adrian soils have an organic layer 16 to 51 inches thick underlain by sand. These included areas make up 5 to 10 percent of the unit.

Water and air move through this Algansee soil at a rapid rate. Runoff is slow. Reaction ranges from medium acid to neutral in the surface layer and substratum. The available water capacity is low. Natural fertility is low. The organic matter content of the surface layer is low. Roots of most crops are restricted by the seasonal high water table, which is at a depth of 1 to 2 feet in undrained areas.

Most areas of this soil are in woodland, but some are in pasture. The potential is poor for cultivated crops, hay, and pasture. It is fair for trees and poor for most engineering uses.

This soil is generally unsuited to cultivated crops, hay, or pasture because of wetness and flooding that are difficult to control.

This soil is suited to trees. Seedling survival can be increased by careful planting of vigorous nursery stock. Competing vegetation, which might interfere with natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

This soil is poorly suited to building site development and onsite waste disposal because of the high water table, flooding hazard, or seepage. This soil is suited to wetland wildlife habitat.

This soil is in capability subclass VIw and woodland suitability subclass 3s.

An—Aquents, sandy. These deep, nearly level, poorly drained soils are in depressional areas on flood plains and outwash plains. They are frequently flooded. Individual areas of these soils are oblong in shape and range from 5 to 40 acres in size.

Aquents vary in color, texture, and thickness of the individual layers, but typically consist of a muck surface layer underlain by sandy and loamy deposits with thin strata of muck in some places.

Included with these soils in mapping are small areas of very poorly drained Adrian, Houghton, and Newson soils. Adrian and Houghton soils formed in organic deposits in depressions. Newson soils occupy small knolls. Also included are small areas of open water.

Water and air move through these Aquents at a variable rate. Runoff is slow or ponded. Reaction, available water capacity, and organic matter content of the surface layer are too variable to rate. Natural fertility is low. Unless these soils are drained and protected from flooding, roots of most crops are restricted by the high water table, which ranges from above the soil surface to a depth of about 12 inches.

Most areas of these soils are used for wetland wildlife habitat. The potential is poor for cultivated crops, hay, pasture, trees, and most engineering uses.

These soils are generally unsuited to cultivated crops, hay, or pasture because of wetness and flooding that are difficult to control.

These soils are not suited to woodland because they do not support trees of merchantable size or quality.

These soils are poorly suited to building site development and onsite waste disposal because of wetness and flooding. These soils are in capability subclass VIIIw. They are not assigned to a woodland suitability subclass.

Au—Au Gres loamy sand. This nearly level, somewhat poorly drained soil is on convex slopes on outwash plains. Individual areas of this soil are irregular in shape and range from 4 to 80 acres in size.

Typically, the surface layer is black loamy sand about 3 inches thick. The subsurface layer is brown loamy sand about 3 inches thick. The subsoil is about 24 inches thick. It is dark reddish brown, mottled, very friable sand in the upper part; yellowish red, mottled, loose sand in the middle; and strong brown, mottled, loose sand in the lower part. The substratum, to a depth of about 60 inches, is brown and yellowish brown, mottled sand. In some places the surface layer is sand.

Included with this soil in mapping are small areas of Newson soils in shallow depressions. Newson soils are poorly drained and very poorly drained. These included areas make up about 10 to 15 percent of the unit.

Water and air move through this Au Gres soil at a rapid rate. Runoff is slow. Reaction ranges from strongly acid to neutral in the subsoil. In unlimed areas the reaction of the surface layer is commonly strongly acid. The available water capacity is low. Natural fertility is low. The organic matter content of the surface layer is moderate. The surface layer is very friable and easily tilled over a wide range of moisture content. Roots of most crops are restricted by the seasonal high water table at a depth of 0.5 to 1.5 feet in undrained areas.

Most areas of this soil are in woodland. If drained, the potential is fair for cultivated crops, hay, pasture, and trees. It is poor for most engineering uses.

If drained and irrigated, this soil is suited to cultivated crops. There is a soil blowing hazard. The control of soil blowing and removal of excess water are the main concerns of management. A system of drainage ditches with controlled drainage, cover crops, minimum tillage, and windbreaks may be needed for dependable crop production.

Overgrazing or grazing this soil when it is too wet is a major concern of pasture management. Chief management needs are a system of drainage ditches to lower the water table, proper stocking rates to maintain adapted plant species, rotation of pasture, fertility management, deferment of grazing, and restriction of grazing during wet periods.

This soil is suited to trees. Seedling survival can be increased by careful planting of vigorous nursery stock. Competing vegetation, which might interfere with natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

This soil is poorly suited to building site development and onsite waste disposal because of seepage or the high water table. Building sites should be drained by tile or open ditches. Dwellings should be constructed without basements, but foundation tile can be used to remove excess water from around dwellings with basements.

This soil is in capability subclass IVw and woodland suitability subclass 3s.

BlA—Billett sandy loam, 0 to 3 percent slopes. This nearly level and gently sloping, well drained soil is on convex knolls on outwash plains. Individual areas of this soil are irregular in shape and range from 50 to 500 acres in size.

Typically, the surface layer is very dark brown sandy loam about 8 inches thick. The subsoil is about 30 inches thick. It is dark yellowish brown and dark brown, friable sandy loam in the upper part and dark yellowish brown and dark brown, very friable loamy sand in the lower part. The substratum, to a depth of about 60 inches, is yellowish brown sand. In some places the dark surface layer is more than 10 inches thick. In a few areas the subsoil and substratum is reddish brown or yellowish red.

Included with this soil in mapping are small areas of Plainfield and Richford soils. Plainfield soils occupy slight rises and knolls and are sandy throughout. Richford soils occupy slight rises and have a sandy surface layer between 20 and 35 inches thick. Also included are areas of Billett soils where the surface layer is loamy sand. These included areas make up 5 to 15 percent of the unit.

Air and water move through this Billett soil at a moderately rapid rate in the subsoil and at a rapid rate in the substratum. Runoff from cultivated areas is slow. Reaction ranges from strongly acid to neutral in the subsoil and substratum and varies widely in the surface layer as a result of liming. The available water capacity is moderate. Natural fertility is medium and the organic matter content of the surface layer is moderately low. The surface layer is friable and easily tilled over a wide range in moisture content. Roots of many crops are restricted by the droughty sandy subsoil and substratum.

Most areas of this soil are farmed. The potential is fair for cultivated crops, hay, pasture, and trees. It is good for most engineering uses.

This soil is suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. If cultivated, there is a soil blowing hazard, and the soil is somewhat droughty. Windbreaks (fig. 7) and wind stripcropping can help to control soil blowing. Other practices, such as minimum tillage, return of crop residues, and application of manure can help to conserve moisture and increase the organic matter content. If irrigated, this soil is suited to growing vegetable crops such as snap beans, peas, potatoes, and sweet corn.

Using this soil as pasture or hayland also reduces soil blowing. Proper stocking rates, fertility management, pasture rotation, and timely deferment of grazing help to keep the pasture and soil in good condition.

This soil is suited to trees. The only soil-related forest management problem is competition from brushy vegetation, which interferes with natural regeneration following harvest. This can be controlled by herbicides or mechanical removal of the brush.

This soil is suitable for building site development. Because of seepage it is poorly suited to most onsite waste disposal. It is suitable for septic tank absorption

Figure 7.—Red pine windbreak on Billett sandy loam, 0 to 3 percent slopes. Soil blowing is a hazard on many soils in Adams County.

fields, but there is a danger of polluting the ground water because of the rapid permeability in the substratum.

This soil is in capability subclass IIIs and woodland suitability subclass 3o.

BnB—Boone sand, 2 to 6 percent slopes. This moderately deep, gently sloping, excessively drained soil is on uneven convex side slopes of sandstone uplands. Individual areas of this soil are irregular in shape and range from 20 to 120 acres in size.

Typically, the surface layer is dark brown sand about 3 inches thick. The subsoil is about 15 inches thick. It is brown, very friable sand. The substratum, to a depth of about 60 inches, is very pale brown and white sand in the upper 17 inches and pink sandstone in the lower part. In some places the underlying bedrock is quartzite.

Included with this soil in mapping are small areas of well drained Gale soils which formed in silty and loamy deposits over sandstone. They occupy shallow depressions. Also included are soils similar to Boone but which are underlain by sand. These included areas make up 2 to 5 percent of the unit.

Water and air move through this Boone soil at a rapid rate. Runoff from cultivated areas is slow. Reaction is strongly acid to neutral in the subsoil and substratum and varies widely in the surface layer as a result of liming. The available water capacity and natural fertility are low. The organic matter content of the surface layer is very low or low. The surface layer is very friable and easily tilled over a wide range of moisture content. Roots of most crops are restricted by droughty sand or by sandstone bedrock.

Most areas of this soil are in woodland. The potential is fair for cultivated crops, hay, and pasture. It is poor for trees and most engineering uses.

This soil is suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. If this soil is cultivated, there is a drought hazard and a severe soil blowing hazard. Windbreaks, wind stripcropping, minimum tillage, and cover crops can help to control soil blowing. Returning crop residue and applying manure will increase the organic matter content and fertility.

Using this soil as pasture reduces soil blowing. Proper stocking rates, fertility management, pasture rotation, and timely deferment of grazing help to keep the pasture and soil in good condition.

This soil is poorly suited to trees because growth is slow, and trees tend to be poorly formed. Poor seedling survival in dry years can be partially offset by careful planting of vigorous nursery stock. Production of wood on this soil may be marginally profitable, but trees can reduce soil blowing.

This soil is suitable for building site development. It is poorly suited to most onsite waste disposal because of the shallow depth to sandstone and seepage. Dwellings can be constructed without basements or with partially exposed basements to avoid having to excavate the underlying sandstone. The sandstone is rippable, however, and excavation for basements is not difficult if suitable equipment is used. To avoid the problem of seepage from septic tank absorption fields it may also be possible to locate the filter field in an included soil that has no underlying sandstone.

This soil is in capability subclass IVs and woodland suitability subclass 4s.

BnC—Boone sand, 6 to 12 percent slopes. This moderately deep, sloping, excessively drained soil is on uneven convex side slopes on sandstone uplands. Individual areas of this soil are irregular in shape and range from 20 to 80 acres in size.

Typically, the surface layer is dark brown sand about 3 inches thick. The subsoil is about 22 inches thick. It is brown and strong brown, very friable sand. The substratum, to a depth of about 60 inches, is strong brown sand in the upper 13 inches and yellowish red sandstone in the lower part. In places the subsoil is thinner. In some areas the sandstone is weakly cemented.

Included with this soil in mapping are small areas of well drained Gale soils which formed in silty and loamy deposits over sandstone. They occupy shallow depressions. Also included are soils similar to Boone but which are underlain by sand. These included areas make up 2 to 5 percent of the unit.

Water and air move through this Boone soil at a rapid rate. Runoff from cultivated areas is slow. Reaction in the subsoil and substratum is strongly acid to neutral. The available water capacity and natural fertility are low. The organic matter content of the surface layer is very low or low. The surface layer is very friable and easily tilled over a wide range of moisture content. Roots of most crops are restricted by droughty sand or the sandstone bedrock.

Most areas of this soil are in woodland. The potential is poor for cultivated crops, hay, and trees. It is fair for pasture and poor for most engineering uses.

This soil is generally unsuited to cultivated crops unless it is irrigated. It is droughty and, if cultivated, there is an erosion and soil blowing hazard. Irrigation water is difficult to apply uniformly on this soil, and runoff and erosion are problems.

Using this soil as pasture reduces soil blowing and erosion. Proper stocking rates, fertility management, pasture rotation, and timely deferment of grazing help to keep the pasture and soil in good condition.

This soil is poorly suited to trees because growth is slow, and trees tend to be poorly formed. Poor seedling survival in dry years can be partially offset by careful planting of vigorous nursery stock. Production of wood on this soil may be marginally profitable, but trees can reduce soil blowing.

This soil is suitable for building site development. It is poorly suited to onsite waste disposal because of the shallow depth to sandstone, seepage, and slope. Dwellings can be constructed without basements or with partially exposed basements to avoid having to excavate the underlying sandstone. The sandstone is rippable, however, and excavation for basements is not difficult if suitable equipment is used. To avoid the problem of seepage from septic tank absorption fields it may also be possible to locate the absorption field in an included soil that has no underlying sandstone.

This soil is in capability subclass VIs and woodland suitability subclass 4s.

BnD—Boone sand, 12 to 25 percent slopes. This moderately deep, moderately steep and steep, excessively drained soil is on uneven convex side slopes of sandstone uplands. Individual areas of this soil are irregular in shape and range from 20 to 100 acres in size.

Typically, the surface layer is very dark grayish brown sand about 3 inches thick. The subsoil is about 12 inches thick. It is brown and strong brown, very friable sand. The substratum, to a depth of about 60 inches, is strong brown sand in the upper 23 inches, and pink sand and weakly cemented sandstone in the lower part.

Included with this soil in mapping are small areas of well drained Gale soils which formed in silty and loamy deposits over sandstone. They occupy small depressions. Also included are soils similar to Boone but which are underlain by sand. There are a few small areas of rock outcrops. The inclusions make up 2 to 5 percent of the unit.

Water and air move through this Boone soil at a rapid rate. Runoff from cultivated areas is medium. Reaction is strongly acid to neutral in the subsoil and substratum. The available water capacity and natural fertility are low. The organic matter content of the surface layer is low or very low. The surface layer is very friable and easily tilled over a wide range of moisture content. Roots are restricted by droughty sand or by sandstone bedrock.

Most areas of this soil are in woodland. The potential is poor for cultivated crops, hay, pasture, and trees. It is poor for most engineering uses.

This soil is unsuited to cultivated crops. It is droughty, and, if it is cultivated, there is an erosion and soil blowing hazard.

This soil is poorly suited to pasture because of its droughty nature. Using it for pasture will, however, reduce erosion and soil blowing.

This soil is poorly suited to trees because growth is slow and trees tend to be of poor form. Erosion can be controlled by planting trees on the contour and by careful location of skid roads. Poor survival of planted trees during dry seasons can be offset by careful planting of vigorous nursery stock. Production of merchantable wood on this soil may not prove profitable, but trees can reduce soil blowing and erosion.

This soil is poorly suited to building site development because of slope. It is poorly suited to onsite waste disposal because of the slope, seepage, and shallow depth to sandstone. These problems are more difficult to overcome on this Boone soil than on a Boone soil that is not as steep. Building sites should probably be selected on another soil.

This soil is in capability subclass VIIs and woodland suitability subclass 4s.

BpF—Boone-Rock outcrop complex, 25 to 45 percent slopes. This map unit consists of moderately deep, steep and very steep, excessively drained Boone soils and sandstone outcrops on sandstone uplands. Individual areas of this unit are round or oblong in shape and range from 5 to 200 acres in size. They are 45 to 60 percent Boone soils and 30 to 50 percent sandstone outcrops. Areas of the Boone soils and sandstone outcrops are so intricately mixed, or so small in size, that it was not practical to separate them in mapping.

Typically, the Boone soil has a surface layer of dark brown sand about 3 inches thick. The subsoil is about 21 inches thick. It is brown and strong brown, very friable sand. The substratum, to a depth of about 60 inches, is strong brown sand in the upper 16 inches and yellowish red sandstone in the lower part. In places the subsoil is thinner. In some areas the surface layer is loamy sand. The rock outcrops are strongly cemented sandstone bedrock.

Included with this unit in mapping are small areas of Gale soils that formed in silty and loamy deposits over sandstone. Gale soils are on concave slopes of ridgetops. These included areas make up 2 to 5 percent of the unit.

Water and air move through the Boone soil at a rapid rate, and runoff is rapid. The available water capacity and natural fertility are low. The organic matter content of the surface layer is very low or low. Reaction is strongly acid or neutral in the surface layer, subsoil, and substratum. Roots are restricted by droughty sand or the sandstone bedrock. Rock outcrop is not rated for soil properties.

Most areas of this unit are in woodland. The Boone soil has poor potential for cultivated crops, hay, pasture, and trees. It has poor potential for most engineering uses.

The Boone soil is unsuited to cultivated crops. It is droughty and, if cultivated, there is an erosion and soil blowing hazard. It is too steep for irrigation.

The Boone soil is poorly suited to pasture because of its slope and droughtiness.

The Boone soil is poorly suited to trees because growth is slow and trees tend to be of poor form. Erosion can be reduced by planting on the contour and by careful location of skid roads. Poor survival of planted trees during dry seasons can be offset by careful planting of vigorous nursery stock. Production of merchantable wood on this soil may not prove profitable, but trees can very effectively control soil blowing and erosion.

The Boone soil is poorly suited to building site development and onsite waste disposal because of the slope, depth to sandstone, or seepage. These problems are difficult to overcome, and building sites should be selected on another soil.

This map unit is in capability subclass VIIs. The Boone soil is in woodland suitability subclass 4s; Rock outcrop is not assigned to a woodland suitability subclass.

BrA—Brems loamy sand, 0 to 3 percent slopes. This nearly level and gently sloping, moderately well drained soil is on concave side slopes on outwash plains. Individual areas of this soil are mostly oblong in shape and range from 5 to 700 acres in size.

Typically, the surface layer is very dark grayish brown loamy sand about 7 inches thick. The subsurface layer is dark yellowish brown sand about 2 inches thick. The subsoil is about 37 inches thick. It is yellowish brown, very friable sand in the upper part and strong brown, mottled, very friable and loose sand in the lower part. The substratum, to a depth of about 60 inches, is yellowish brown sand. In some places the surface layer is sand. In areas that have been plowed and not protected from blowing, the surface layer is lighter colored and thinner than is typical.

Included with this soil in mapping are small areas of somewhat poorly drained Meehan soils and excessively drained Plainfield soils. Meehan soils occupy depressions and drainageways. Plainfield soils occupy convex and concave slopes above Brems soils. These included areas make up 8 to 15 percent of the unit.

Water and air move through this Brems soil at a rapid rate, and runoff is slow. Reaction is medium acid or strongly acid in the subsoil and substratum and varies widely in the surface layer as a result of liming. The available water capacity, natural fertility, and organic matter content of the surface layer are low. The surface layer is very friable and easily tilled over a wide range of moisture content. Roots of most plants are restricted during dry seasons by droughty sand.

Most areas of this soil remain in woodland. The potential is fair for cultivated crops, hay, pasture, and trees. It is good to poor for most engineering uses.

This soil is suited to corn, soybeans, and small grains. If irrigated, this soil is suited to vegetable crops such as potatoes, snap beans, sweet corn, and peas. If cultivated, there is a hazard of soil blowing. Minimum tillage, windbreaks, wind stripcropping, and winter cover crops help prevent excessive soil loss. Returning crop residue and the regular addition of manure help to improve organic matter content and fertility.

Using this soil as pasture or hayland also reduces soil blowing. Proper stocking rates, pasture rotation, fertility management, and timely deferment of grazing, help to keep the pasture and soil in good condition.

This soil is suited to trees. Seedling survival can be increased by careful planting of vigorous nursery stock.

Competing vegetation that interferes with natural regeneration following harvest can be controlled by herbicides or mechanical removal.

This soil is generally suitable for building site development. It is poorly suited to onsite waste disposal because of seepage and wetness. Dwellings should be constructed without basements, but foundation tile can be used to remove excess water from around dwellings with basements. Tile or open ditches can be used to lower the seasonal water table near septic tank absorption fields and from around dwellings.

This soil is in capability subclass IVs and woodland suitability subclass 3s.

BsA—Brems-Newson loamy sands, 0 to 3 percent slopes. This map unit consists of moderately well drained and poorly drained or very poorly drained soils. These are nearly level and gently sloping soils on outwash plains. Individual areas of this unit range from 50 to 300 acres in size. The moderately well drained Brems soils are on broad convex slopes and make up 40 to 50 percent of the unit. The poorly drained and very poorly drained Newson soils are in depressions and drainageways and make up 30 to 40 percent of the unit. Areas of these soils are so intricately mixed, or so small in size, that it was not practical to separate them in mapping.

Typically, the Brems soil has a very dark grayish brown loamy sand surface layer about 7 inches thick. The subsurface layer is dark yellowish brown sand about 2 inches thick. The subsoil is about 37 inches thick. It is yellowish brown, mottled, very friable sand in the upper part and strong brown, mottled, very friable and loose sand in the lower part. The substratum, to a depth of about 60 inches, is yellowish brown, mottled, loose sand.

Typically, the Newson soil has a black loamy sand surface layer about 8 inches thick. The subsoil is about 20 inches thick. The upper part is dark gray, very friable loamy sand and the lower part is dark grayish brown and very grayish brown, very friable and loose sand. The substratum, to a depth of about 60 inches, is brown sand.

Included with these soils in mapping are small areas of Adrian, Au Gres, Meehan, and Plainfield soils. The Adrian soils are very poorly drained and formed in an organic deposit 16 to 51 inches thick underlain by sand. They are in depressions. Au Gres soils are somewhat poorly drained and are on convex side slopes. Meehan soils are somewhat poorly drained and are in depressions and drainageways. Plainfield soils are excessively drained and occupy convex and concave slopes on ridges and knolls.

Water and air move through the Brems soil at a rapid rate and runoff is slow. Reaction is medium acid or strongly acid in the subsoil and varies widely in the surface layer as a result of liming. The available water capacity, fertility, and organic matter content of the surface layer are low. The surface layer is very friable and easily tilled over a wide range of moisture content. If this soil is cultivated, there is a soil blowing hazard. Roots of most crops are restricted in Brems soils by droughty sand during dry periods.

Water and air move through the Newson soil at a rapid rate and runoff is very slow or ponded. Reaction is medium acid or slightly acid in the subsoil and varies widely in the surface layer as a result of liming. The available water capacity and natural fertility are low. The organic matter content of the surface layer is high. The surface layer is very friable and easily tilled over a wide range of moisture content. Roots of most crops are restricted by the seasonal high water table, which is within a foot of the surface in undrained areas.

Most areas of these soils remain in woodland, but some small areas are drained and cultivated. These soils have fair potential for cultivated crops, hay, pasture, and trees. They have fair to poor potential for most engineering uses.

These soils are suited to cultivated crops if the Newson soils are adequately drained. Open ditch or surface drains are suitable methods of drainage. If these soils are drained and cultivated, there is a soil blowing hazard and a drought hazard. Minimum tillage, cover crops, and windbreaks can help to control soil blowing and conserve moisture. These soils are also suitable for irrigation.

These soils are suitable for pasture if the Newson soils are adequately drained. Overgrazing or grazing when the soil is too wet will cause surface compaction and poor tilth. Proper stocking rates, pasture rotation, fertility management, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

The Brems soils are suited to trees. Seedling survival can be increased by careful planting of vigorous nursery stock. Competing vegetation, which might interfere with natural regeneration following harvest, can be controlled by herbicides or mechanical removal. The Newson soils are poorly suited to woodland. Growth is slow and form so poor that trees are barely merchantable at best. If natural regeneration is unreliable, soil wetness generally makes it necessary to prepare ridges and plant seedlings by hand or machine. Large, vigorous nursery stock is essential. Harvest is frequently limited to when the soil is frozen. Harvest by clear-cut or area-selection methods will reduce windthrow of the remaining trees. Competing vegetation that interferes with natural regeneration following harvest can be controlled by herbicides or mechanical removal.

Newson soils are poorly suited to building site development and onsite waste disposal because of wetness and seepage. Brems soils are generally suitable for building site development and poorly suited to onsite waste disposal because of wetness and seepage. Construction in this unit should be on the Brems soil. Dwellings should be constructed without basements, but foundation tile can be used to remove excess water from around dwellings with basements. The wetness problem for septic tank absorption fields and dwellings can be overcome by tile or open ditch drainage.

These soils are in capability subclass IVw drained and VIw undrained. The Brems soil is in woodland suitability subclass 3s and the Newson soil is in 4w.

BtB—Briggsville silt loam, 2 to 6 percent slopes. This gently sloping, well drained soil is on short uneven side slopes on glacial lake plains. Individual areas of this soil are irregular in shape and range from 5 to 35 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsurface layer is brown silt loam about 3 inches thick. The subsoil is about 24 inches thick. The upper part is reddish brown, friable silt loam; the middle part is reddish brown, firm silty clay loam. The substratum, to a depth of about 60 inches, is yellowish red silty clay loam. In some places the surface layer is sandy loam or loam. Other areas have a substratum of stratified silt loam and fine sandy loam.

Included with this soil in mapping are small areas of somewhat poorly drained Kibbie and well drained Grays soils. Kibbie soils contain less clay than Briggsville soils and are in depressions and drainageways. Grays soils are underlain by silt loam and stratified silt and fine sand and are on similar landscape positions as Briggsville soils. Also included are small areas of Briggsville soil where the seasonal high water table is at a depth of 3 to 5 feet and other areas where the surface layer is loamy sand. These included soils make up 5 to 8 percent of the unit.

Water and air move through this Briggsville soil at a moderately slow rate and runoff from cultivated areas is medium. Reaction ranges from strongly acid to neutral in the subsoil and varies widely in the surface layer as a result of liming. The available water capacity is high. Natural fertility is medium and organic matter content of the surface layer is moderately low. The surface layer is friable and easily tilled over a fairly wide range of moisture content but it has a tendency to crust or puddle after heavy rains or if tilled when too wet.

Most areas of this soil are farmed. The potential is good for cultivated crops, hay, pasture, and trees. It is fair or poor for most engineering uses.

This soil is suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. If this soil is cultivated there is a slight or moderate erosion hazard. Minimum tillage, winter cover crops, contour farming, terraces, diversions, and grassed waterways help prevent excessive soil loss. Returning crop residue or the regular addition of manure helps to improve fertility, reduce crusting, and increase water infiltration.

Using this soil as pasture or hayland also reduces erosion. Overgrazing or grazing when the soil is too wet, however, will cause surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the soil and pasture in good condition.

This soil is suited to trees. Seedling survival can be increased by careful planting of vigorous nursery stock. Competing vegetation that interferes with natural regeneration following harvest can be controlled by herbicides or mechanical removal.

This soil is generally unsuited to building site development and onsite waste disposal. This soil lacks sufficient strength to support buildings. This problem can be corrected by placing a layer of coarse material such as sand and gravel under the foundation of dwellings. Septic tank absorption fields do not function well because of the moderately slow permeability. This problem can perhaps be overcome by enlarging the absorption field.

This soil is in capability subclass IIe and woodland suitability subclass 2c.

CoB—Coloma sand, 2 to 6 percent slopes. This gently sloping, somewhat excessively drained soil is on convex and concave slopes on outwash plains and moraines. Individual areas of this soil are irregular in shape and range from 5 to 30 acres in size.

Typically, the surface layer is dark yellowish brown sand about 8 inches thick. The subsurface layer is yellowish brown fine sand about 47 inches thick. There are yellowish red, very friable loamy sand subsoil bands 1/8 to 1/4 inch thick in the lower part of the subsurface layer. The substratum, to a depth of about 60 inches, is brownish yellow sand. In places the surface layer is loamy sand. In some areas of this soil there are loamy sand bands.

Included with this soil in mapping are small areas of well drained and somewhat excessively drained Okee soils and well drained Wyocena soils. Both of these soils have a sandy loam subsoil. They occupy knolls and side slopes and make up 5 to 15 percent of the unit.

Water and air move through this Coloma soil at a rapid rate and runoff is slow. Reaction ranges from strongly acid to neutral in the subsoil and varies widely in the surface layer as a result of liming. The available water capacity and natural fertility are low. The organic matter content of the surface layer is low or very low. The surface layer is very friable and easily tilled over a wide range of moisture content. Roots of many crops are restricted by droughty sand.

Most areas of this soil are in pasture or woodland. The potential is fair for cultivated crops, hay, pasture, and trees. It is good for most engineering uses.

This soil is suited to corn, soybeans, small grain, and grasses and legumes for hay and pasture. If the soil is cultivated, however, there is a severe soil blowing hazard and a drought hazard. Windbreaks, wind stripcropping, minimum tillage, mulching crop residues, and planting cover crops will help to control the soil blowing and maintain the organic matter content and conserve soil moisture. If irrigated, this soil is suited to such crops as snap beans, peas, potatoes, and sweet corn. If this soil is irrigated, the rate of application must be closely regulated to prevent erosion. The infiltration rate tends to slow when this soil is irrigated and the erosion hazard becomes greater with each successive irrigation. Even distribution of water, fertilizers, and herbicides through the irrigation system is difficult because of the slope.

Using this soil as pasture or hayland also reduces soil blowing. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during dry periods help to keep the pasture and soil in good condition.

This soil is suited to trees. Seedling survival can be increased by careful planting of vigorous nursery stock. Competing vegetation that interferes with natural regeneration following harvest can be controlled by herbicides or mechanical removal.

This soil is suitable for building site development. It is poorly suited to most onsite waste disposal because of seepage. It is suited to septic tank absorption fields, but there is danger of ground water pollution because of the rapid permeability.

This soil is in capability subclass IVs and woodland suitability subclass 3s.

CoC—Coloma sand, 6 to 12 percent slopes. This sloping, somewhat excessively drained soil is on convex ridgetops and side slopes on outwash plains and moraines. Individual areas of this soil are irregular in shape and range from 5 to 50 acres in size.

Typically, the surface layer is very dark gray sand about 2 inches thick. The subsurface layer is loose sand 53 inches thick. It is dark brown and yellowish brown in the upper part and strong brown in the lower part. There are yellowish red, very friable loamy sand subsoil bands 1/8- to 1/4-inch thick in the lower part of the subsurface layer. The substratum, to a depth of about 60 inches, is strong brown sand. In places the surface layer is loamy sand. In some areas the subsoil consists of a loamy sand band about 4 inches thick.

Included with this soil in mapping are small areas of well drained and somewhat excessively drained Okee soils, and well drained Wyocena soils. Both of these soils have a sandy loam subsoil. They are higher than Coloma soils in the landscape and make up 10 to 15 percent of the unit.

Water and air move through this Coloma soil at a rapid rate and runoff from cultivated areas is slow. Reaction ranges from strongly acid to neutral in the subsoil and varies widely in the subsurface layer as a result of liming. The available water capacity and natural fertility are low. The organic matter content of the surface layer is low or very low. The surface layer is very friable and easily tilled over a fairly wide range in moisture content. Roots of many crops are restricted by droughty sand.

Most areas of this soil are in pasture or woodland. The potential is fair for cultivated crops, hay, pasture, and trees. It is fair for most engineering uses.

This soil is suited to corn, soybeans, small grain, and grasses and legumes for hay and pasture. This soil has a severe soil blowing hazard and drought hazard and moderate erosion hazard. Planting windbreaks, wind stripcropping, minimum tillage, mulching crop residues, and cover crops will help to control soil blowing and erosion. These practices will also maintain the organic matter content and conserve soil moisture. This soil is poorly suited to irrigation because of slopes.

Using this soil as pasture or hayland also reduces soil blowing and erosion. Proper stocking rates, pasture rotation, fertility management, timely deferment of grazing, and restricted use during dry periods help to keep the pasture and soil in good condition.

This soil is suited to trees. Seedling survival can be increased by careful planting of vigorous nursery stock. Competing vegetation that interferes with natural regeneration following harvest can be controlled by use of suitable herbicides or mechanical removal.

This soil is suitable for building site development. It is poorly suited to most onsite waste disposal because of seepage and slopes. It is suited to septic tank absorption fields, but there is a danger of polluting ground water because of the rapid permeability. Septic tank absorption fields and dwelling sites can be improved by land leveling.

This soil is in capability subclass IVs and woodland suitability subclass 3s.

CoD—Coloma sand, 12 to 25 percent slopes. This moderately steep and steep, excessively drained soil is on convex ridgetops and knolls on moraines. Individual areas of this soil are oblong in shape and range from 10 to 200 acres in size.

Typically, the surface layer is very dark grayish brown sand about 3 inches thick. The subsurface layer is sand about 38 inches thick. It is brown in the upper part and yellowish brown in the lower part. There are bands of strong brown, very friable loamy sand subsoil 1/8- to 1/4-inch thick in the lower part of the subsurface layer. The substratum, to a depth of about 60 inches, is strong brown sand. In some areas the surface layer is loamy sand. Some small areas of this soil have a loamy sand subsoil up to 4 inches thick. In other areas the subsoil bands are at depths shallower than 40 inches.

Included with this soil in mapping are small areas of well drained and somewhat excessively drained Okee and excessively drained Plainfield soils. The Okee soils have a sandy loam subsoil and occupy similar positions in the landscape. Plainfield soils are sandy throughout and are on foot slopes of ridges and knolls. Also included are small areas of Coloma soils where the slope is less than 12 percent. These included areas make up 5 to 10 percent of the unit.

Water and air move through this Coloma soil at a rapid rate and runoff from cultivated areas is medium or rapid. Reaction ranges from strongly acid to neutral in the subsoil and varies widely in the surface layer as a result of liming. The available water capacity and natural fertility are low. The organic matter content of the surface layer is low or very low. Roots of many crops are restricted by droughty sand.

Most areas of this soil are in pasture or woodland. The potential is fair for hay, pasture, and trees. It is poor for cultivated crops and most engineering uses.

This soil is generally unsuited to cultivated crops. It is droughty and, if cultivated, there is an erosion and soil blowing hazard. This soil is too steep for irrigation.

Using this soil as pasture or hayland reduces erosion and soil blowing. Proper stocking rates, pasture rotation, fertility management, timely deferment of grazing, and restricted use during dry periods help to keep the pasture and soil in good condition.

This soil is suited to trees. Erosion can be controlled by planting trees on the contour and by careful location of skid roads during harvest. Survival of planted trees can be increased by careful planting of vigorous nursery stock. Vegetation that competes with natural regeneration following harvest can be controlled by herbicides or mechanical removal.

This soil is poorly suited to building site development and onsite waste disposal because of the slope. Dwelling sites and septic tank absorption fields can be improved by land leveling or, where possible, by using included areas that are not as steep.

This soil is in capability subclass VIe and woodland suitability subclass 3s.

DeA—Delton sand, 0 to 2 percent slopes. This nearly level, well drained soil is on plane and concave slopes on glacial lake plains. Individual areas of this soil are irregular in shape and range from 5 to 60 acres in size.

Typically, the surface layer is dark brown sand about 9 inches thick. The subsurface layer is strong brown very friable sand about 23 inches thick. The subsoil is about 10 inches thick. It is reddish brown, friable loam in the upper part and reddish brown, firm silty clay loam in the lower part. The substratum, to a depth of about 60 inches, is reddish brown silty clay. In some places the surface layer is loamy sand. In some areas there is no loam subsoil. In a few areas the sandy sediment is more than 40 inches thick.

Included with this soil in mapping are small areas of well drained Briggsville soils, excessively drained Plainfield soils, and the somewhat poorly drained Wyeville soils. The Briggsville soils occupy knolls and have a silty mantle. The Plainfield soils occupy ridges and are sandy throughout. The Wyeville soils formed in similar materials but are in depressions. Also included are small areas of Delton soil where the seasonal high water table is at a depth of 3 to 5 feet. These included areas make up 2 to 10 percent of the unit.

Water and air move through this Delton soil at a moderately rapid rate in the upper part and at a slow or very slow rate in the lower part. Runoff is slow. Reaction ranges from strongly acid to medium acid in the subsoil. It varies widely in the surface layer as a result of liming. The available water capacity is moderate. Natural fertility is low. The organic matter content of the surface layer is low or very low. The surface layer is very friable and easily tilled over a wide range of moisture content. Roots of many crops are restricted by the compact silty clay substratum.

Most areas of this soil are farmed. The potential is good for cultivated crops, hay, pasture, and trees. It is fair or poor for most engineering uses.

This soil is suited to corn, soybeans, small grain, and grasses and legumes for pasture and hay. There is a soil blowing hazard and a moderate drought hazard. Wind stripcropping, planting windbreaks, minimum tillage, returning crop residues, winter cover crops, and applying manure help control soil blowing, conserve soil moisture, and maintain organic matter content. If irrigated, this soil is suited to vegetable crops such as snap beans, peas, potatoes, and sweet corn.

Using this soil as pasture or hayland also reduces soil blowing. Proper stocking rates, pasture rotation, fertility management, timely deferment of grazing, and restricted use during dry periods help to keep the pasture and soil in good condition.

This soil is suited to trees. Seedling survival can be increased by careful planting of vigorous nursery stock. Competing vegetation that interferes with natural regeneration following harvest can be controlled by herbicides or mechanical removal.

This soil is suitable for most building site development but is poorly suited to onsite waste disposal because of the slow or very slow permeability. Dwellings should be constructed without basements. Dwellings with basements should be designed so that the foundations and footings will not be damaged by the shrinking and swelling of the soil. This may include placing a layer of coarse material such as sand and gravel around the foundation and having foundation tile to remove excess water. Where the water table is at a depth of 3 to 5 feet, foundation tile can prevent wet basements. The included Plainfield soils are better suited to septic tank absorption fields. If no Plainfield soils are available, however, the problem of moderately slow or slow permeability for absorption fields can perhaps be overcome by increasing the size of the field.

This soil is in capability subclass IIIs and woodland suitability subclass 2s.

DeB—Delton sand, 2 to 6 percent slopes. This gently sloping, well drained soil is on convex side slopes on outwash plains and glacial lake plains. Individual areas of this soil are irregular in shape and range from 10 to 150 acres in size.

Typically, the surface layer is dark brown sand about 10 inches thick. The subsurface layer is dark brown and strong brown sand about 18 inches thick. The subsoil is about 9 inches thick. It is reddish brown, friable sandy loam in the upper part and reddish brown, firm silty clay loam in the lower part. The substratum, to a depth of about 60 inches, is reddish brown silty clay. In some areas the surface layer is loamy sand. In some places the sandy sediment is more than 40 inches thick; in a few small areas it is less than 20 inches thick. In other areas there is no loamy subsoil.

Included with this soil in mapping are a few small areas of excessively drained Plainfield soils, well drained Sisson soils, and somewhat poorly drained Wyeville soils. The Plainfield soils occupy knolls and ridges and are sandy throughout. Sissons soils are loamy throughout and occupy convex slopes on landscape positions similar to the Delton soil. Wyeville soils occupy drainageways and depressions. These included areas make up 5 to 8 percent of the unit.

Water and air move through this Delton soil at a moderately rapid rate in the upper part and at a slow or very slow rate in the lower part. Runoff from cultivated areas is slow. Reaction ranges from strongly acid to medium acid in the subsoil. It varies widely in the surface layer as a result of liming. The available water capacity is moderate. Natural fertility is low. The organic matter content of the surface layer is low or very low. The surface layer is very friable and easily tilled over a wide range of moisture content. Roots of many crops are restricted by the compact silty clay substratum.

Most areas of this soil are farmed. The potential is good for cultivated crops, hay, and pasture. It is fair for trees. It is fair or poor for most engineering uses.

This soil is suited to corn, soybeans, small grains, and grasses and legumes for pasture and hay. There is a soil blowing hazard, a slight water erosion hazard, and a moderate drought hazard. Wind stripcropping, planting windbreaks, minimum tillage, returning crop residues, winter cover crops, and applying manure will help control soil blowing and water erosion, conserve soil moisture, and maintain organic matter content. If irrigated, this soil is suited to vegetable crops such as snap beans, peas, potatoes, and sweet corn. If this soil is irrigated, the rate of application must be closely regulated to prevent erosion. The infiltration rate tends to slow when this soil is irrigated, and the erosion hazard becomes greater with each successive irrigation. Even distribution of water, fertilizers, and herbicides through the irrigation system is difficult because of the slope.

Using this soil as pasture or hayland also reduces soil blowing and water erosion. Proper stocking rates, pasture rotation, fertility management, timely deferment of grazing, and restricted use during dry periods help to keep the pasture and soil in good condition.

This soil is suited to trees. Seedling survival can be increased by careful planting of vigorous nursery stock. Competing vegetation that interferes with natural regeneration following harvest can be controlled by herbicides or mechanical removal.

This soil is suitable for most building site development but is poorly suited to most onsite waste disposal because of the slow or very slow permeability. Included areas of Plainfield or Sisson soils are better suited to septic tank absorption fields. If these included areas are not available, the permeability problem for absorption fields can perhaps be overcome by increasing the size of the field. Dwellings should be contructed without basements. Dwellings with basements should be designed so that the foundations and footings will not be damaged by the shrinking and swelling of the soil. This may include placing a layer of coarse material such as sand and gravel around the foundation and having foundation tile to remove excess water.

This soil is in capability subclass IIIe and woodland suitability subclass 2s.

DeC—Delton sand, 6 to 15 percent slopes. This sloping and moderately steep, well drained soil is on convex ridgetops and side slopes on outwash plains and glacial lake plains. Individual areas of this soil are oblong in shape and range from 8 to 20 acres in size.

Typically, the surface layer is very dark grayish brown sand about 2 inches thick. The subsurface layer is dark yellowish brown sand about 23 inches thick. The subsoil is about 10 inches thick. It is yellowish red, friable sandy loam in the upper part and yellowish red, firm silty clay in the lower part. The substratum, to a depth of about 60 inches, is yellowish red silty clay. In some places the surface layer is loamy sand. In some places the sandy sediment is less than 20 inches thick. In a few small areas there is no loamy subsoil.

Included with this soil in mapping are small areas of excessively drained Plainfield soils that are sandy throughout and occupy foot slopes and knolls. These included areas make up 5 to 10 percent of the unit.

Water and air move through this Delton soil at a moderately rapid rate in the upper part and at a slow or very slow rate in the lower part. Runoff from cultivated areas is medium. Reaction ranges from strongly acid to medium acid in the subsoil. It varies widely in the surface layer as a result of liming. The available water capacity is moderate. Natural fertility is low. The organic matter content of the surface layer is low or very low. The surface layer is very friable and easily tilled through a wide range of moisture content. Roots of many crops are restricted by the compact silty clay substratum.

Most areas of this soil are in woodland or pasture. The potential is fair for cultivated crops and good for hay, pasture, and trees. It is fair or poor for most engineering uses.

This soil is suited to corn, soybeans, small grain, and grasses and legumes for pasture and hay. There is a soil blowing hazard, a moderate water erosion hazard, and a moderate drought hazard. Wind stripcropping, planting windbreaks, minimum tillage, returning crop residues, winter cover crops, and applying manure are practices that will help control soil blowing and erosion, conserve soil moisture, and maintain organic matter content.

Using this soil as pasture or hayland also reduces soil blowing and erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during dry periods help to keep the pasture and soil in good condition.

This soil is suited to trees. Seedling survival can be increased by careful planting of vigorous nursery stock. Competing vegetation that interferes with natural regeneration following harvest can be controlled by herbicides or mechanical removal.

This soil is suitable for building site development but is poorly suited to onsite waste disposal because of the slow or very slow permeability. Dwellings should be constructed without basements. Dwellings with basements should be designed so that the foundations and footings will not be damaged by the shrinking and swelling of the soil. This may include placing a layer of coarse material such as sand and gravel around the foundation and having foundation tile to remove excess water. The slope can be overcome by land leveling. The included Plainfield soils are better suited to septic tank absorption fields. If no Plainfield soils are available the permeability problem can be overcome by increasing the size of the absorption field.

This soil is in capability subclass IVe and woodland suitability subclass 2s.

DsA—Delton sand, sandy substratum, 0 to 3 percent slopes. This nearly level and gently sloping, well drained soil is on concave side slopes on outwash plains and glacial lake plains. Individual areas of this soil are mostly elongated in shape and range from 10 to 120 acres in size.

Typically, the surface layer is very dark grayish brown sand about 10 inches thick. The subsurface layer is dark brown and strong brown very friable sand about 16 inches thick. The subsoil is about 10 inches thick. It is reddish brown, friable loam in the upper part and yellowish red, firm silty clay in the lower part. The substratum, to a depth of about 60 inches, is yellowish red silty clay in the upper 6 inches and yellowish brown sand in the lower part. In some places the surface layer is loamy sand. In a few places the sandy mantle is less than 20 inches thick.

Included with this soil in mapping are small areas of excessively drained Plainfield soils and somewhat poorly drained Wyeville soils. Plainfield soils are sandy throughout and occupy small knolls. Wyeville soils occupy depressions and drainageways. Also included are small areas of Delton soil where the seasonal high water table is at a depth of 3 to 5 feet. These included areas make up 3 to 8 percent of the unit.

Water and air move through this Delton soil at a moderately rapid rate in the sandy mantle, at a slow rate in the silty clay horizon, and at a rapid rate in the lower sand horizon. Runoff is slow. Reaction is strongly acid or medium acid throughout. The available water capacity is moderate. Natural fertility is low. The organic matter content of the surface layer is low or very low. The surface layer is very friable and easily tilled over a wide range of moisture content. Roots of many crops are restricted by the compact silty clay substratum.

Most areas of this soil are farmed. The potential is good for cultivated crops, hay, pasture, and trees. It is fair for most engineering uses.

This soil is suited to corn, soybeans, small grains, and grasses and legumes for pasture and hay. There is a soil blowing hazard and a moderate drought hazard. Wind stripcropping, planting windbreaks, minimum tillage, returning crop residues, winter cover crops, and applying manure will help control soil blowing, conserve moisture, and maintain organic matter content. If irrigated, this soil is suited to vegetable crops such as snap beans, peas, potatoes, and sweet corn.

Using this soil as pasture or hayland also reduces soil blowing. Proper stocking rates, pasture rotation, fertility management, timely deferment of grazing, and restricted use during dry periods help to keep the pasture and soil in good condition.

This soil is suited to trees. Seedling survival can be increased by careful planting of vigorous nursery stock. Competing vegetation that interferes with natural regeneration following harvest can be controlled by herbicides or mechanical removal.

This soil is suitable for building site development, but is poorly suited to onsite waste disposal. Dwellings should be designed so that the foundations and footings will not be damaged by the shrinking and swelling of the soil. This may include placing a layer of coarse material such as sand and gravel around the foundation and having foundation tile to remove excess water. This soil is poorly suited to septic tank absorption fields because of slow permeability. Septic tank absorption fields installed in the lower sandy substratum will function properly, but there is danger of polluting ground water.

This soil is in capability subclass IIIs and woodland suitability subclass 2s.

EvB—Elkmound loamy sand, 2 to 6 percent slopes. This shallow, gently sloping, well drained soil is on convex side slopes on sandstone uplands. Individual areas of this soil are irregular in shape and range from 5 to 100 acres in size.

Typically, the surface layer is very dark grayish brown loamy sand about 9 inches thick. The subsoil is about 10 inches thick. It is yellowish red, very friable sandy loam in the upper part and yellowish red, very friable channery sandy loam in the lower part. The substratum, to a depth of about 60 inches, is multicolored partially weathered sandstone. In some places the depth to sandstone is more than 20 inches.

Included with this soil in mapping are small areas of excessively drained Boone soils. Boone soils formed in sand underlain by sandstone. They occupy shallow depressions. Also included are small areas where the seasonal high water table is within a foot of the surface. These included areas make up 5 to 15 percent of the unit.

Water and air move through this Elkmound soil at a moderate or moderately rapid rate. Runoff from cultivated areas is slow or medium. Reaction is strongly acid or medium acid in the subsoil. It varies widely in the surface layer as a result of liming. The available water capacity is low. Natural fertility and organic matter content of the surface layer are low. The surface layer is very friable and easily tilled over a wide range of moisture content. Roots are restricted below a depth of about 20 inches by the sandstone bedrock.

Most areas of this soil are farmed. The potential is fair for cultivated crops, hay, and pasture. It is poor for trees and most engineering uses.

This soil is suited to corn, soybeans, small grains, and grasses and legumes for hay or pasture. If this soil is cultivated, there is a slight or moderate erosion hazard. There is also a soil blowing hazard and a drought hazard. Wind stripcropping, planting windbreaks, minimum tillage, returning crop residues, winter cover crops, and applying manure will help control erosion and soil blowing, conserve soil moisture, and maintain organic matter content.

Using this soil as pasture or hayland also reduces erosion and soil blowing. Proper stocking rates, pasture rotation, fertility management, timely deferment of grazing, and restricted use during dry periods help to keep the pasture and soil in good condition.

This soil is poorly suited to trees. The slow growth and poor shape of the trees limit potential for production. The use of equipment can be limited to harvest operations because the soil is too shallow for machine planting. Mortality rate of planted trees can be reduced by careful planting of vigorous nursery stock. Harvest by clear-cut or area-selection methods will reduce windthrow of the remaining trees.

This soil is poorly suited to building site development and onsite waste disposal because of the shallow depth to sandstone. Dwellings can be constructed without basements or with partially exposed basements to avoid having to excavate the underlying sandstone. The sandstone is rippable, however, and excavation for basements is not difficult if suitable equipment is used.

This soil is in capability subclass IIIe and woodland suitability subclass 4d.

Fv—Fisk loamy sand. This nearly level, somewhat poorly drained soil is in depressions and drainageways on glacial lake plains and beaches. Individual areas of this soil are irregular in shape and range from 5 to 200 acres in size.

Typically, the surface layer is very dark grayish brown loamy sand about 9 inches thick. The subsoil is about 33 inches thick. It is pale brown and brown, mottled, very friable loamy fine sand and sandy loam in the upper part; multicolored, very friable fine sand in the middle; and pinkish gray and strong brown mottled, friable silt loam in the lower part. The substratum, to a depth of about 60 inches, is reddish brown, mottled silt loam. In some places the substratum is sand, loamy sand, or fine sandy loam.

Included with this soil in mapping are small areas of Brems, Meehan, and Wyeville soils. The moderately well drained Brems and somewhat poorly drained Meehan soils are sandy throughout and are higher in the landscape than Fisk soils. Wyeville soils contain more clay in the lower part of the subsoil and substratum and are lower than Fisk soils. These included areas make up 10 to 15 percent of the unit.

Water and air move through this Fisk soil at a rapid rate in the upper part and at a moderate rate in the lower part. Runoff is slow. Reaction ranges from very strongly acid to neutral in the subsoil. The available water capacity is moderate. Natural fertility is low. The organic matter content of the surface layer is moderately low or low. The surface layer is very friable and easily tilled. Roots of most crops are restricted by the seasonal water table, which is at a depth of 1 to 3 feet in undrained areas.

Most areas of this soil are farmed. If drained, this soil has fair potential for cultivated crops, hay, and pasture. It has fair potential for trees and poor potential for most engineering uses.

This soil is suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. If this soil is cultivated, a system of open ditches can be used to remove excess water. If this soil is drained, there is a soil blowing hazard. Minimum tillage, windbreaks, wind stripcropping, and winter cover crops help prevent soil blowing. Returning crop residue or the addition of manure helps to improve fertility and maintain organic matter content.

Using this soil as pasture or hayland also reduces soil blowing. Proper stocking rates, pasture rotation, fertility management, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees. The only soil-related forest management problem is competition from brushy vegetation that may interfere with natural regeneration following harvest. This vegetation can be controlled by herbicides or mechanical removal.

This soil is generally unsuitable for building site development because of wetness. It is poorly suited to onsite waste disposal because of seepage and wetness. Building sites should be drained by tile or open ditches. Dwellings should be constructed without basements, but foundation tile can be used to remove excess water from around dwellings with basements. If possible, the included moderately well drained Brems soils should be selected for building site development. The wetness problem for septic tank filter fields can be overcome by installing tile or open ditch drainage to remove excess water.

This soil is in capability subclass IIIw and woodland suitability subclass 3o.

GaB—Gale silt loam, 2 to 6 percent slopes. This moderately deep, gently sloping, well drained soil is on concave and convex slopes on broad ridgetops on sandstone uplands. Individual areas of this soil are irregular in shape and range from 20 to 40 acres in size.

Typically, the surface layer is brown silt loam about 8 inches thick. The subsoil is about 23 inches thick. It is dark yellowish brown, friable silt loam in the upper part; brown, friable silty clay loam in the middle; and strong brown, friable loam and very friable sandy loam in the lower part. The substratum, to a depth of about 60 inches, is pink sand in the upper 7 inches and reddish yellow sandstone in the lower part. In some places the surface layer is loam or fine sandy loam. In other places the sandstone is at a depth of less than 20 inches or as much as 60 inches. Other small areas, mostly in depressions, have a darker surface layer.

Included with this soil in mapping are small areas of Boone soils. They have a sandy surface layer and subsoil over sandstone and are on similar positions in the landscape as Gale soils. These included areas make up 4 to 8 percent of the unit.

Water and air move through this Gale soil at a moderate rate in the subsoil and at a moderately rapid or rapid rate in the substratum. Runoff from cultivated areas is slow or medium. Reaction is strongly acid to slightly acid in the subsoil. It varies widely in the surface layer as a result of liming. The available water capacity is moderate. Natural fertility is medium and the organic matter content of the surface layer is moderate. The surface layer is friable and easily tilled. It does, however, have a tendency to puddle if tilled when too wet and to crust after heavy rains. Roots are restricted by the sandstone bedrock.

Most areas of this soil are farmed, but a few remain in native hardwoods or pine plantations. The potential is good for cultivated crops, hay, pasture, and trees. It is fair or poor for most engineering uses.

This soil is suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. If this soil is cultivated, there is a moderate erosion hazard. Minimum tillage, contour stripcropping, winter cover crops, and grassed waterways help prevent excessive soil loss. Some areas have slopes that are long enough and smooth enough to be terraced and farmed on the contour. Returning crop residue and the regular addition of manure help to improve fertility, reduce crusting, and increase water infiltration.

Using this soil as pasture or hayland also reduces erosion. Overgrazing or grazing when the soil is too wet will cause surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, fertility management, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees. The only soil-related forest management problem is competing vegetation that interferes with natural regeneration following harvest. This vegetation can be controlled by herbicides or mechanical removal.

This soil is suitable for building site development, but is generally unsuitable for onsite waste disposal because of sandstone and seepage. Dwellings should be constructed without basements or with partially exposed basements to avoid having to excavate the underlying sandstone. The sandstone is rippable, however, and excavation for basements is not difficult if suitable equipment is used. The shrinking and swelling of the subsoil can be a problem for dwellings without basements, but this can be overcome by placing a layer of coarse material such as sand and gravel around the foundation and having foundation tile to remove excess water. Septic tank absorption fields can be improved by selecting a site of included soil where the depth to sandstone is more than 60 inches.

This soil is in capability subclass IIe and woodland suitability subclass 1o.

GaC2—Gale silt loam, 6 to 12 percent slopes, eroded. This moderately deep, sloping, well drained soil is on convex ridgetops and short, uneven side slopes on sandstone uplands. Individual areas of this soil are irregular in shape and range from 5 to 90 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 3 inches thick. The subsoil is about 24 inches thick. It is dark yellowish brown, friable silt loam in the upper part; dark brown, friable silt loam and silty clay loam in the middle; and brown, friable loam in the lower part. The substratum, to a depth of about 60 inches, is strong brown sand in the upper 6 inches and strong brown sandstone in the lower part. Some small areas of this soil have a loam surface layer and other more sloping areas are less than 20 inches thick over sandstone.

Included with this soil in mapping are small areas of sandy Boone soils underlain by sandstone on ridges. These included areas make up 5 to 8 percent of the unit.

Water and air move through the subsoil of this Gale soil at a moderate rate and through the substratum at a moderately rapid or rapid rate. Runoff from cultivated areas is medium or rapid. Reaction is strongly acid to slightly acid in the subsoil. It varies widely in the surface layer as a result of liming. The available water capacity is moderate. Natural fertility is medium and organic matter content of the surface layer is moderate. The surface layer is friable and easily tilled under suitable moisture conditions. It has a tendency to puddle if tilled when too wet and to crust after heavy rains. Roots are restricted by the sandstone bedrock.

Most areas of this soil are farmed, but a few areas remain in native hardwoods or pine plantations. The potential is good for cultivated crops, hay, pasture, and trees. It is fair or poor for most engineering uses.

This soil is suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. If this soil is cultivated, there is a moderate erosion hazard. Minimum tillage, winter cover crops, grassed waterways, diversions, contour farming, and contour stripcropping help prevent excessive soil loss. Returning crop residue or the regular addition of manure help to improve fertility, reduce crusting, and increase water infiltration.

Using this soil as pasture or hayland also reduces erosion. Overgrazing or grazing when the soil is too wet, however, will cause surface compaction, excessive runoff, and poor tilth. Proper stocking rates, fertility management, pasture rotation, and timely deferment of grazing will help keep the pasture and soil in good condition.

This soil is suited to trees. The only soil-related forest management problem is competing vegetation that interferes with natural regeneration following harvest. This vegetation can be controlled by herbicides or mechanical removal.

This soil is suitable for building site development. It is generally unsuited to onsite waste disposal because of the shallow depth to sandstone and seepage. Dwellings should be constructed without basements or with partially exposed basements to avoid having to excavate the underlying sandstone. The sandstone is rippable, however, and excavation for basements is not difficult if suitable equipment is used. The shrinking and swelling of the subsoil may be a problem for dwellings without basements, but this can be overcome by placing a layer of coarse material such as sand and gravel around the foundation and having foundation tile to remove excess water. The slope can be overcome by land leveling, but this may expose sandstone and prove undesirable.

This soil is in capability subclass IIIe and woodland suitability subclass 1o.

GrB—Grays silt loam, 2 to 6 percent slopes. This gently sloping, well drained soil is on concave side slopes on glacial lake plains. Individual areas of this soil are irregular in shape and range from 5 to 200 acres in size.

Typically, the surface layer is very dark brown silt loam about 9 inches thick. The subsurface layer is yellowish brown very fine sandy loam about 6 inches thick. The subsoil is about 24 inches thick. It is dark brown, friable silt loam in the upper part; reddish brown, friable silty clay loam in the middle; and reddish brown and strong brown, friable silt loam in the lower part. The substratum, to a depth of about 60 inches, is reddish brown silt loam in the upper part and brownish yellow, stratified silt and fine sand in the lower part. In some places the surface layer is fine sandy loam.

Included with this soil in mapping are small areas of Kibbie and Plainfield soils. Kibbie soils are somewhat poorly drained and are in drainageways and depressions. Plainfield soils are excessively drained and sandy throughout. They occupy knolls. These included areas make up 4 to 8 percent of the unit.

Water and air move through this Grays soil at a moderate rate, and runoff from cultivated areas is slow or medium. Reaction is slightly acid to moderately alkaline in the subsoil. It varies widely in the surface layer because of liming. The available water capacity is high. Natural fertility is medium, and organic matter content of the surface layer is moderate. The surface layer is friable and easily tilled over a wide range of moisture content. It does, however, have a tendency to crust after heavy rains and to puddle if tilled when too wet.

Most areas of this soil are farmed. The potential is good for cultivated crops, pasture, and trees. It is fair or good for most engineering uses.

This soil is suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. If this soil is cultivated, there is a moderate erosion hazard. Minimum tillage, grassed waterways, diversions, terraces, and contour stripcropping will help prevent excessive soil loss. Returning crop residues or the regular addition of manure helps to improve fertility, reduce crusting, and increase water infiltration.

Using this soil as pasture or hayland also reduces erosion. Overgrazing or grazing when the soil is too wet, however, will cause surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, fertility management, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees. The only soil-related forest management problem is competing vegetation that interferes with natural regeneration. This vegetation can be controlled by herbicides or mechanical removal.

This soil is suitable for building site development and onsite waste disposal. Dwellings constructed on this soil may be damaged by the shrinking and swelling of the subsoil. This problem can be overcome by placing a layer of coarse material such as sand and gravel around the foundation and having foundation tile to remove excess water.

This soil is in capability subclass IIe and woodland suitability subclass 1o.

GrC—Grays silt loam, 6 to 12 percent slopes. This sloping, well drained soil is on convex ridges and side slopes on glacial lake plains. Individual areas of this soil are irregular in shape and range from 5 to 20 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsoil is about 18 inches thick. It is dark brown, friable silt loam in the upper part; yellowish red, friable silty clay loam in the middle; and yellowish red, friable silt loam in the lower part. The substratum, to a depth of about 60 inches, is multicolored, stratified silt and fine sand. In a few places the surface layer is fine sandy loam.

Included with this soil in mapping are small areas of Briggsville soils. These soils have more clay in the subsoil and substratum than the Grays soil and occupy the lower part of slopes. These included areas make up 2 to 5 percent of the unit.

Water and air move through this Grays soil at a moderate rate, and runoff from cultivated areas is medium or rapid. Reaction is slightly acid or neutral in the subsoil. It varies widely in the surface layer as a result of liming. The available water capacity is high. Natural fertility is medium, and the organic matter content of the surface layer is moderate. The surface layer is friable and easily tilled over a fairly wide range of moisture content. It has a tendency to crust or puddle after hard rains.

Most areas of this soil are farmed. The potential is fair for cultivated crops and good for hay, pasture, and trees. It is fair for most engineering uses.

This soil is suited to corn, soybeans, small grains, hay, pasture, and trees. If this soil is cultivated, there is a moderate erosion hazard. Minimum tillage, contour stripcropping, grassed waterways, and diversions help prevent excessive soil loss. Returning crop residues or the regular addition of manure helps to improve fertility, reduce crusting, and increase water infiltration.

Using this soil as pasture or hayland also reduces erosion. Overgrazing or grazing when the soil is too wet, however, will cause surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, fertility management, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees. The only soil-related forest management problem is competing vegetation that interferes with natural regeneration following harvest. This vegetation can be controlled by herbicides or mechanical removal.

This soil is suitable for building site development and onsite waste disposal. The shrinking and swelling of the subsoil is a problem for dwellings. It can be overcome by placing a layer of coarse material such as sand and gravel around the foundation and installing foundation tile to remove excess water. The slope is a problem for dwellings and septic tank absorption fields, but it can be overcome by land leveling.

This soil is in capability subclass IIIe and woodland suitability subclass 1o.

Hm—Houghton muck. This nearly level, very poorly drained soil is in depressions on slopes of glacial lake plains, outwash plains, and moraines. It is subject to frequent flooding. Individual areas of this soil are circular or oblong in shape and range from 10 to 200 acres in size.

Typically, the organic layers are black and very dark brown muck to a depth of about 60 inches. Most areas of this soil contain some woody fragments.

Included with this soil in mapping are small areas of very poorly drained Adrian and Palms soils. Adrian soils have 16 to 51 inches of muck over sand. Palms soils have 16 to 51 inches of muck over loamy material. These included areas make up 5 to 15 percent of the unit.

Water and air move through this Houghton soil at a moderately rapid rate. Runoff is ponded. Natural fertility is low. The available water capacity and organic matter content are very high. Reaction is medium acid or slightly acid throughout. The surface layer is friable and easily tilled. Subsidence occurs if this soil is drained. Roots of most crops are restricted by the seasonal water table which is within a foot of the surface in undrained areas.

Most areas of this soil remain in wetland vegetation. If drained, it has fair potential for most cultivated crops, hay, and pasture. It has fair potential for trees and poor potential for most engineering uses.

If drained with a system of open ditches or tile, this soil is suited to corn, certain vegetables, small grains, and grasses and legumes for hay and pasture. If this soil is drained and cultivated, there is a soil blowing hazard. The soil is subject to burning if it drys. Minimum tillage, windbreaks, wind stripcropping, and winter cover crops will help control soil blowing. Controlled drainage can reduce the hazard of subsidence and burning. Because of cold air drainage, there are fewer frost-free days per growing season on this soil than on adjacent upland soils.

Using this soil as hayland or pasture also reduces soil blowing. During dry periods undrained areas can be planted in water-tolerant plants and used for limited pasture. Drained areas must be managed properly to prevent overgrazing that causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, fertility management, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees. Soil wetness and the high water table during the tree planting season limits reforestation to natural regeneration. Harvest with heavy equipment is limited to when the soil is frozen. Harvest by clear-cut or area-selection methods will reduce windthrow of the remaining trees. Control of competing vegetation to permit natural regeneration following harvest can be accomplished by herbicides or mechanical removal.

This soil is poorly suited to building site development and onsite waste disposal because of the high water table, flooding, and low strength.

This soil is in capability subclass IIIw drained and VIw undrained. It is in woodland suitability subclass 3w.

KnB—Kewaunee silt loam, 2 to 6 percent slopes. This gently sloping, well drained soil is on knolls and side slopes on ground moraines. Individual areas of this soil are irregular in shape and range from 10 to 500 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsoil is about 25 inches thick. It is brown, friable silty clay loam in the upper part and reddish brown, firm silty clay in the lower part. The substratum, to a depth of about 60 inches, is reddish brown silty clay. In some places the surface layer is loam or sandy loam.

Included with this soil in mapping are small areas of somewhat poorly drained Manawa and poorly drained Poygan soils in drainageways and depressions. Also included are areas of Kewaunee soils where the seasonal high water table is at a depth of 4 to 6 feet and other areas where the surface layer is loamy fine sand. These included areas make up 5 to 10 percent of the unit.

Water and air move through this Kewaunee soil at a moderately slow or slow rate and runoff from cultivated areas is slow or medium. Reaction is medium acid to neutral in the subsoil. It varies widely in the surface layer as a result of liming. The available water capacity is moderate. Natural fertility is medium and the organic matter content of the surface layer is moderate. The surface layer is friable and easily tilled but has a tendency to crust or puddle after heavy rains or if tilled when too wet. Roots of many crops are restricted by the compact silty clay substratum.

Most areas of this soil are farmed. The potential is good for cultivated crops, hay, pasture, and trees. It is fair or poor for most engineering uses.

This soil is suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. If this soil is cultivated, there is a moderate erosion hazard. Minimum tillage, terraces, grassed waterways, and contour stripcropping help prevent excessive soil loss. Returning crop residue or the regular addition of manure helps to improve fertility, reduce crusting, and increase water infiltration.

Using this soil as pasture or hayland also reduces erosion. Overgrazing or grazing when the soil is too wet, however, will cause surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, fertility management, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees. Seedling survival can be increased by careful planting of vigorous nursery stock. Competing vegetation that interferes with natural regeneration following harvest can be controlled by herbicides or mechanical removal.

This soil is generally unsuitable for building site development and onsite waste disposal. The shrinking and swelling of the subsoil and substratum may cause damage to dwellings. This problem can be overcome by placing a layer of coarse material such as sand and gravel around the foundation and installing foundation tile to remove excess water. This soil is poorly suited to septic tank absorption fields because of moderately slow or slow permeability. This can be overcome by building a filtering mound of suitable material or possibliy by enlarging the absorption field.

This soil is in capability subclass IIe and woodland suitability subclass 2c.

KnC—Kewaunee silt loam, 6 to 12 percent slopes. This sloping, well drained soil is on convex ridgetops and smooth side slopes on the ground moraines. Individual areas of this soil are oblong in shape and range from 6 to 40 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil is about 26 inches thick. It is brown, friable silt loam in the upper part and yellowish red, firm silty clay in the lower part. The substratum, to a depth of about 60 inches, is yellowish red silty clay. In some places the surface layer is loam or sandy loam.

Included with this soil in mapping are small areas of Okee and Wyocena soils. These soils have less clay and more sand and generally are higher in the landscape than Kewaunee soils. Also included are areas of Kewaunee soils where the slope is less than 6 percent or more than 12 percent. Other inclusions are areas of Kewaunee soils where the surface layer is loamy fine sand. These included areas make up 5 to 8 percent of the unit.

Water and air move through this Kewaunee soil at a moderately slow or slow rate. Runoff from cultivated areas is medium or rapid. Reaction ranges from medium acid to neutral in the subsoil. It varies widely in the surface layer as a result of liming. The available water capacity is moderate. Natural fertility is medium and the organic matter content of the surface layer is moderate. The surface layer is friable and easily tilled but has a tendency to crust after hard rains or to puddle if tilled when too wet. Roots of many crops are restricted by the compact silty clay substratum.

Most areas of this soil are farmed. The potential is fair for cultivated crops and good for hay, pasture, and trees. It is fair or poor for most engineering uses.

This soil is suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. If this soil is cultivated, there is a moderate erosion hazard. Minimum tillage, grassed waterways, contour stripcropping, and diversions help prevent excessive soil loss. Returning crop residues or the regular addition of manure helps to improve fertility, reduce crusting, and increase water infiltration.

Using this soil as pasture or hayland also reduces erosion. Overgrazing or grazing when the soil is too wet, however, will cause surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, fertility management, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees. Seedling survival can be improved by careful planting of vigorous nursery stock. Competing vegetation that interferes with natural regeneration following harvest can be controlled by herbicides or mechanical removal.

This soil is generally unsuitable for building site development and onsite waste disposal. The shrinking and swelling of the subsoil and substratum may cause damage to dwellings. This can be overcome by placing a layer of coarse material such as sand or gravel around the foundation and installing foundation tile to remove excess water. This soil is poorly suited to septic tank absorption fields because of the moderately slow or slow permeability, but this can perhaps be overcome by enlarging the absorption field. The small included areas of Okee and Wyocena soils are better suited to building site development.

This soil is in capability subclass IIIe and woodland suitability subclass 2c.

KnD2—Kewaunee silt loam, 12 to 20 percent slopes, eroded. This moderately steep, well drained soil is on convex side slopes on ground moraines. Individual areas of this soil are irregular in shape and range from 4 to 30 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 4 inches thick. The subsoil is about 28 inches thick. It is yellowish red, firm silty clay loam in the upper part and dark reddish brown, firm silty clay in the lower part. The substratum, to a depth of about 60 inches, is yellowish red silty clay. In some places the surface layer is loam or sandy loam. The surface layer is silty clay loam in a few severely eroded areas.

Included with this soil in mapping are small areas of Coloma, Okee, and Wyocena soils that occupy similar positions in the landscape. These soils have less clay and more sand than Kewaunee soils and, in uncultivated areas, there are cobbles and stones throughout. Also included are areas of Kewaunee soils where the surface layer is loamy fine sand. These included areas make up 5 to 10 percent of the unit.

Water and air move through this Kewaunee soil at a moderately slow or slow rate. Runoff from cultivated areas is rapid or very rapid. Reaction ranges from medium acid to neutral in the subsoil. It varies widely in the surface layer as a result of liming. The available water capacity is moderate. Natural fertility is medium and the organic matter content of the surface layer is moderate. The surface layer is friable and easily tilled but has a tendency to crust after heavy rains and to puddle if tilled when too wet. Roots of many crops are restricted by the compact silty clay substratum.

Most areas of this soil are in pasture. The potential is poor for cultivated crops and good for hay, pasture, and trees. It is poor for most engineering uses.

This soil is suited to cultivated crops in rotation if extensive erosion control practices are used. If this soil is cultivated, there is a severe erosion hazard. Minimum tillage, grassed waterways, contour stripcropping, and diversions help prevent excessive soil loss. Returning crop residue or the regular addition of manure helps to improve fertility, reduce crusting, and increase water infiltration.

Using this soil as pasture or hayland also reduces erosion. Overgrazing or grazing when the soil is too wet, however, will cause surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, fertility management, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees. Seedling survival can be increased by careful planting of vigorous nursery stock. Competing vegetation that might interfere with natural regeneration following harvest can be controlled by herbicides or mechanical removal.

This soil is poorly suited to building site development. It is poorly suited to septic tank absorption fields because of the moderately slow or slow permeability and slope. The steepness of slope and the shrinking and swelling of the subsoil and substratum creates problems for building site development. Where possible, the included areas of Okee and Wyocena soils should be selected for building sites.

This soil is in capability subclass IVe and woodland suitability subclass 2c.

KsA—Kibbie silt loam, 0 to 3 percent slopes. This nearly level and gently sloping, somewhat poorly drained soil is in depressions and drainageways on glacial lake plains and outwash plains. Individual areas of this soil are mostly oblong in shape and range from 10 to 40 acres in size.

Typically, the surface layer is very dark gray silt loam about 9 inches thick. The subsurface layer is grayish brown silt loam about 3 inches thick. The subsoil is about 23 inches thick. It is dark brown, mottled silt loam in the upper part and multicolored, firm silty clay loam in the lower part. The substratum, to a depth of about 60 inches, is light reddish brown silty clay loam. In some places the surface layer is fine sandy loam. In some places the subsoil and substratum are stratified silt and fine sand. In a few small areas there are no gray mottles in the subsoil.

Included with this soil in mapping are small areas of Grays and Sisson soils. These soils are well drained and occupy higher positions in the landscape than Kibbie soils. Also included are areas of Kibbie soils where the surface layer is sand or loamy sand. These included areas make up 5 to 10 percent of the unit.

Water and air move through this Kibbie soil at a moderate rate. Runoff is slow. Reaction is slightly acid to neutral in the subsoil. It varies widely in the surface layer as a result of liming. The available water capacity is high. Natural fertility is medium. The organic matter of the content of the surface layer is moderately low or moderate. The surface layer is friable and easily tilled. It does, however, have a tendency to crust or puddle if tilled when too wet. Roots of most plants are restricted by the seasonal high water table, which is at a depth of 1 to 2 feet in undrained soils.

Most areas of this soil are farmed. If drained, this soil has good potential for cultivated crops, hay, and pasture. The potential is good for trees and poor for most engineering uses.

If drained, this soil is suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. Excess water can be removed by tile or open ditches. Minimum tillage, diversions, and grassed waterways can also help crop production. Returning crop residues or the addition of manure helps to maintain organic matter content and reduce crusting.

Overgrazing or grazing this soil when it is too wet is a major concern of pasture management. Chief management needs are a system of drainage ditches to lower the water table, planting adapted forage species, proper stocking rates to maintain the adapted forage species, rotation of pasture, fertility management, and deferment of grazing during wet periods.

This soil is suited to trees. The only soil-related forest management problem is competing vegetation that interferes with natural regeneration. This vegetation can be controlled by herbicides or mechanical removal.

This soil is generally unsuitable for building site development and onsite waste disposal because of wetness. Dwellings should be constructed without basements, but foundation tile can be used to remove excess water from around dwellings with basements. The wetness problem for septic tank absorption fields can be overcome by lowering the seasonal high water table by tile or open ditch drainage. Where possible, the included Grays and Sisson soils should be used for building site development and onsite waste disposal.

This soil is in capability subclass IIw and woodland suitability subclass 2o.

Le—Leola loamy sand. This nearly level, somewhat poorly drained soil is on plane slopes in depressions and drainageways on outwash plains. Individual areas of this soil are oblong in shape and range from 10 to 80 acres in size.

Typically, the surface layer is very dark gray loamy sand about 9 inches thick. The subsurface layer is brown sand 12 inches thick. The subsoil is about 13 inches thick. It is brown, mottled, very friable sand in the upper part; brown, mottled, friable sandy loam in the middle; and brown, mottled, very friable loamy sand in the lower part. The substratum, to a depth of about 60 inches, is dark grayish brown and grayish brown, mottled sand. In some places the surface layer is sand or sandy loam or the subsoil is loam or sandy clay loam. In a few areas this soil is up to 5 percent pebbles throughout.

Included with this soil in mapping are small areas of Brems and Meehan soils. The moderately well drained Brems soils are sandy throughout and are higher in the landscape than Leola soils. The somewhat poorly drained Meehan soils are sandy throughout and occupy positions in the landscape similar to Leola soils. These included areas make up 10 to 15 percent of the unit.

Water and air move through this Leola soil at a moderately rapid rate in the upper part and at a rapid rate in the lower part. Runoff is slow. Reaction ranges from strongly acid to slightly acid in the subsoil. It varies widely in the surface layer as a result of liming. The available water capacity and natural fertility are low. The organic matter content of the surface layer is low or moderately low. The surface layer is very friable and easily tilled over a wide range of moisture content. Roots of most plants are restricted by the seasonal high water table, which is at a depth of 1.5 to 3 feet in undrained soils.

Most areas of this soil are farmed. If drained, this soil has fair potential for cultivated crops and good potential for hay and pasture. The potential is fair for trees. It is poor for most engineering uses.

If drained, this soil is suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. Excess water can be removed by open ditches. If this soil is drained, there is a soil blowing hazard. Wind stripcropping, windbreaks, and minimum tillage help prevent excessive soil loss. Returning crop residues or the addition of manure helps to improve fertility and increase organic matter content. Some areas of this soil are irrigated and used to grow vegetables or general farm crops.

Overgrazing or grazing this soil when it is too wet is a major concern of pasture management. Chief management needs are a system of drainage ditches to lower the water table, proper stocking rates to maintain adapted plant species, rotation of pasture, fertility management, deferment of grazing, and restriction of grazing during wet periods.

This soil is suited to trees. Seedling survival can be increased by careful planning of vigorous nursery stock. Competing vegetation that interferes with natural regeneration following harvest can be controlled by herbicides or mechanical removal.

This soil is generally unsuitable for building site development and for onsite waste disposal because of wetness. Dwellings should be constructed without basements, but foundation tile can be used to remove excess water from around dwellings with basements. The wetness problem for septic tank absorption fields can be overcome by lowering the water table by tile or open ditch drainage.

This soil is in capability subclass IIIw and woodland suitability subclass 3s.

MbA—Manawa silt loam, 0 to 3 percent slopes. This nearly level and gently sloping, somewhat poorly drained soil is on foot slopes and in depressions on ground moraines. It is subject to occasional flooding. Individual areas of this soil are oblong in shape and range from 5 to 60 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsurface layer is brown silt loam about 4 inches thick. The subsoil is about 17 inches thick. It is reddish brown, mottled, firm silty clay loam in the upper part and reddish brown, mottled, firm silty clay in the lower part. The substratum, to a depth of about 60 inches, is reddish brown, mottled, silty clay. In some places the surface layer is sandy loam or loam.

Included with this soil in mapping are small areas of well drained Kewaunee soils which are above Manawa soils, and poorly drained Poygan soils which are in drainageways and depressions. Also included are areas of Manawa soils where the surface layer is loamy sand. These included areas make up 2 to 10 percent of the unit.

Water and air move through this Manawa soil at a slow rate. Runoff is slow. Reaction is slightly acid or neutral in the subsoil. It varies widely in the surface layer as a result of liming. The available water capacity is moderate. Natural fertility is medium. The organic matter content of the surface layer is moderate. The surface layer is friable and easily tilled, but wetness delays tillage in the spring. It has a tendency to crust or puddle after heavy rains or if tilled when too wet. Roots of most crops are restricted by the seasonal high water table, which is at a depth of 1 to 3 feet in undrained areas. The compact silty clay substratum also restricts root development.

Most areas of this soil are farmed. If drained, this soil has good potential for cultivated crops, hay, and pasture. The potential is good for trees and poor for most engineering uses.

If drained, this soil is suited to corn, small grains, and grasses and legumes for hay and pasture. Excess water can be removed by tile or open ditches. Diversions, terraces, and grassed waterways can be used to remove excess surface water. Minimum tillage, returning crop residue, or the addition of manure helps to improve fertility and reduce crusting.

Overgrazing or grazing this soil when it is too wet is a major concern of pasture management. Chief management needs are a system of drainage ditches to lower the water table, proper stocking rates to maintain adapted plant species, rotation of pasture, fertility management, deferment of grazing, and restriction of grazing during wet periods.

This soil is suited to trees. Seedling survival can be increased by careful planting of vigorous nursery stock. Competing vegetation that interferes with natural regeneration following harvest can be controlled by herbicides or mechanical removal.

This soil is poorly suited to building site development and onsite waste disposal because of wetness and flooding. Dwelling sites can be improved by tile or open ditch drainage and by protection from flooding. The wetness problem for septic tank absorption fields can be overcome by tile or open ditch drainage and protection from flooding.

This soil is in capability subclass IIw and woodland suitability subclass 2c.

MoA—Meehan loamy sand, 0 to 3 percent slopes. This nearly level and gently sloping, somewhat poorly drained soil is in depressions and drainageways on outwash plains. Individual areas of this soil are irregular in shape and range from 5 to 200 acres in size.

Typically, the surface layer is black loamy sand about 8 inches thick. The subsurface layer is brown, mottled sand about 7 inches thick. The subsoil is about 21 inches thick. It is light gray, pale brown, and light brownish gray, mottled, loose sand. The substratum, to a depth of about 60 inches, is light gray sand. In some places the surface layer is sand.

Included with this soil in mapping are small areas of Leola and Newson soils. Leola soils are somewhat poorly drained and have a sandy loam subsoil. They occupy similar positions in the landscape as Meehan soils. Newson soils are poorly drained and very poorly drained and occupy drainageways and depressional areas that are lower in the landscape than Meehan soils. These included areas make up 5 to 15 percent of the unit.

Water and air move through this Meehan soil at a rapid rate. Runoff is slow. Reaction ranges from strongly acid to slightly acid in the subsoil. The available water capacity and natural fertility are low. The organic matter content of the surface layer is low or moderately low. The surface layer is very friable and easily tilled. Roots of most crops are restricted by the seasonal high water table, which is at a depth of 1.5 to 3 feet in undrained areas.

Most areas of this soil are in woodland. If drained, this soil has fair potential for cultivated crops, hay, and pasture. The potential is fair for trees and poor for most engineering uses.

This soil is suited to cultivated crops if drained and irrigated. A system of open ditches can be used to remove excess water. If this soil is drained, however, there is a soil blowing hazard. Minimum tillage, winter cover crops, windbreaks, and wind stripcropping help prevent excessive soil blowing. Returning crop residue or the addition of manure helps to maintain organic matter content and improve fertility.

Overgrazing and grazing this soil when it is too wet are major concerns of pasture management. Chief management needs are a system of drainage ditches to lower the water table, proper stocking rates to maintain adapted plant species, rotation of pasture, fertility management, deferment of grazing, and restriction of grazing during wet periods.

This soil is suited to trees. Seedling survival can be increased by careful planting of vigorous nursery stock. Competing vegetation that interferes with natural regeneration following harvest can be controlled by herbicides or mechanical removal.

The soil is poorly suited to building site development and onsite waste disposal because of the high water table or seepage. Dwellings should be constructed without basements, or else the building site should be drained by tile or open ditches and foundation tile used to remove excess water from around foundations. The wetness problem for septic tank absorption fields can be overcome by tile or open ditch drainage to lower the water table.

This soil is in capability subclass IVw and woodland suitability subclass 3s.

Ne—Newson loamy sand. This nearly level, poorly drained and very poorly drained soil is in depressions and drainageways on outwash plains, glacial lake plains, and stream terraces. Individual areas of this soil are oblong in shape and range from 5 to 500 acres in size.

Typically, the surface layer is black loamy sand about 8 inches thick. The subsoil is about 20 inches thick. It is dark gray, very friable loamy sand in the upper part and dark grayish brown and grayish brown, very friable loose sand in the lower part. The substratum, to a depth of about 60 inches, is brown sand. In some places the surface layer is mucky loamy sand or sand. In some places there are silty or loamy bands up to 2 inches thick at depths of more than 40 inches.

Included with this soil in mapping are small areas of Adrian and Meehan soils. Adrian soils are poorly drained and formed in organic deposits 16 to 51 inches thick over sand. They are in depressions lower in the landscape than Newson soils. Meehan soils are somewhat poorly drained, sandy soils on convex slopes higher in the landscape than Newson soils. These included areas make up 5 to 12 percent of the unit.

Water and air move through this Newson soil at a rapid rate. Runoff is very slow or ponded. Reaction is medium acid or slightly acid in the subsoil. The available water capacity and natural fertility are low. The organic matter content of the surface layer is high. The surface layer is very friable and easily tilled. Roots of most crops are restricted by the seasonal high water table, which is within a foot of the surface in undrained areas.

Most areas of this soil are in woodland. If drained, this soil has fair potential for most cultivated crops, hay, and pasture. It has fair potential for trees and poor potential for most engineering uses.

This soil is suited to cultivated crops if adequate drainage is provided. Open ditch or surface drainage can be used. If this soil is drained, there is a soil blowing hazard. Planting windbreaks, cover crops, residue mulching, and minimum tillage help control soil blowing and maintain organic matter content. If drained, this soil is suited for irrigation.

Using this soil as pasture or hayland also reduces soil blowing. Drainage, fertilization, and controlled grazing are major concerns of pasture management. Proper stocking rates, pasture rotation, fertility management, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is poorly suited to trees. Growth is slow and form so poor that trees are barely merchantable at best. When natural regeneration is unreliable, soil wetness generally makes it necessary to prepare ridges and plant seedlings by hand or machine. Large, vigorous nursery stock is essential. Harvest is frequently limited to when the soil is frozen. Harvest by clear-cut or area-selection methods will reduce the danger of windthrow to trees left standing. Competing vegetation can be controlled by herbicides or mechanical removal to permit natural regeneration.

This soil is poorly suited to building site development and onsite waste disposal because of the high water table or seepage. It is well suited to wetland wildlife habitat.

This soil is in capability subclass IVw drained and VIw undrained. It is in woodland suitability subclass 4w.

OkB—Okee loamy sand, 2 to 6 percent slopes. This gently sloping, well drained and somewhat excessively drained soil is on knolls and short side slopes of moraines. Individual areas of this soil are irregular in shape and range from 10 to 30 acres in size.

Typically, the surface layer is very dark grayish brown loamy sand about 8 inches thick. The subsurface layer is yellowish brown sand 18 inches thick. The subsoil is about 23 inches thick. It is red, firm sandy clay loam in the upper part; yellowish red, friable sandy loam in the middle; and strong brown, friable loamy sand in the lower part. The substratum, to a depth of about 60 inches, is strong brown loamy sand. In some places the sandy mantle is more than 40 inches thick.

Included with this soil in mapping are small areas of Coloma and Wyocena soils. Coloma soils are somewhat excessively drained and are sandy throughout. They are lower in the landscape than Okee soils. Wyocena soils are well drained and have a sandy mantle less than 20 inches thick. They are higher in the landscape than Okee soils. These included areas make up 10 to 15 percent of the unit.

Water and air move through the sandy mantle of this Okee soil at a moderately rapid rate and through the upper part of the subsoil at a moderate rate. Runoff from cultivated areas is slow. Reaction ranges from slightly acid to neutral in the subsoil. It varies widely in the surface layer as a result of liming. The available water capacity is moderate. Natural fertility is low. The organic matter content of the surface layer is moderately low. The surface layer is very friable and easily tilled.

Most areas of this soil are farmed. The potential is fair for cultivated crops, good for hay and pasture, fair for trees, and good for most engineering uses.

This soil is suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. If this soil is cultivated, there is a slight erosion hazard and a soil blowing hazard. Minimum tillage, wind stripcropping, windbreaks, contour farming, and winter cover crops help control erosion and soil blowing. Returning crop residue or the regular addition of manure helps to improve fertility and maintain the organic matter content.

Using this soil as pasture or hayland also reduces erosion and soil blowing. Proper stocking rates, pasture rotation, fertility management, and timely deferment of grazing help to keep the pasture and soil in good condition.

This soil is suited to trees. Seedling survival can be increased by careful planting of vigorous nursery stock. Competing vegetation that interferes with natural regeneration following harvest can be controlled by herbicides or mechanical removal.

This soil is suitable for most building site development. It is poorly suited to most onsite waste disposal because of seepage. It is suitable for septic tank absorption fields, but there is a danger of polluting ground water because of the moderately or moderately rapidly permeable substratum.

This soil is in capability subclass IIIs and woodland suitability subclass 4s.

OkC—Okee loamy sand, 6 to 12 percent slopes. This sloping, well drained and somewhat excessively drained soil is on convex ridgetops and side slopes of moraines. Individual areas of this soil are irregular in shape and range from 10 to 100 acres in size.

Typically, the surface layer is very dark grayish brown loamy sand about 4 inches thick. The subsurface layer is brown loamy sand about 24 inches thick. The subsoil is yellowish red, friable sandy loam about 6 inches thick. The substratum, to a depth of about 60 inches, is strong brown gravelly loamy sand. In some places the subsoil is sandy clay loam. In a few places the sandy mantle is less than 20 inches thick; in others it is more than 40 inches thick.

Included with this soil in mapping are small areas of Coloma and Wyocena soils. Coloma soils are somewhat excessively drained and are sandy throughout. They are lower in the landscape than Okee soils. Wyocena soils are well drained and have a sandy mantle less than 20 inches thick. Wyocena soils are higher in the landscape than Okee soils. These included areas make up 5 to 15 percent of the unit.

Water and air move through the sandy mantle of this Okee soil at a moderately rapid rate and through the upper part of the subsoil at a moderate rate. Runoff from cultivated areas is slow or medium. Reaction ranges from slightly acid to neutral in the subsoil. It varies widely in the surface layer as a result of liming. The available water capacity is moderate. Natural fertility is low. The organic matter content of the surface layer is moderately low. The surface layer is very friable and easily tilled.

Most areas of this soil are in pasture or woodland. The potential is fair for cultivated crops and good for hay and pasture. It is fair for trees and most engineering uses.

This soil is suited to corn, small grains, and grasses and legumes for hay and pasture. If this soil is cultivated, there is a moderate erosion and soil blowing hazard. Minimum tillage, contour stripcropping, winter cover crops, contour farming, wind stripcropping, and windbreaks help prevent excessive soil loss. Returning crop residue or the addition of manure helps to improve fertility and maintain the organic matter content.

Using this soil as pasture or hayland also reduces erosion and soil blowing. Proper stocking rates, fertility management, pasture rotation, and timely deferment of grazing help keep the soil and pasture in good condition.

This soil is suited to trees. Seedling survival can be increased by careful planting of vigorous nursery stock. Competing vegetation that interferes with natural regeneration following harvest can be controlled by herbicides or mechanical removal.

This soil is suitable for most building site development, but the slope is a problem. It is suited to most onsite waste disposal, but slope and seepage are problems. It is suitable for septic tank absorption fields, but there is a danger of polluting the ground water because of the moderate or moderately rapidly permeable substratum. The slope can be overcome by land leveling.

This soil is in capability subclass IIIe and woodland suitability subclass 4s.

OkD—Okee loamy sand, 12 to 25 percent slopes. This moderately steep and steep, well drained and somewhat excessively drained soil is on convex ridgetops and side slopes of moraines. Individual areas of this soil are irregular in shape and range from 10 to 100 acres in size.

Typically, the surface layer is very dark grayish brown loamy sand about 3 inches thick. The subsurface layer is dark yellowish brown sand about 17 inches thick. The subsoil is yellowish red, friable sandy loam and very friable loamy sand about 6 inches thick. The substratum, to a depth of about 60 inches, is strong brown gravelly loamy sand. In some places the surface layer is sand. In some places the substratum is sand and gravel. In a few places the sandy mantle is less than 20 inches thick; in others it is more than 40 inches thick.

Included with this soil in mapping are small areas of Coloma and Wyocena soils. Coloma soils are somewhat excessively drained and are sandy throughout. They are lower in the landscape than Okee soils. Wyocena soils are well drained and have a sandy mantle less than 20 inches thick. Wyocena soils are higher in the landscape than Okee soils. Also included are areas where the slope is less than 12 percent. These included areas make up 5 to 15 percent of the unit.

Water and air move through the sandy mantle of this Okee soil at a moderately rapid rate and through the upper part of the subsoil at a moderate rate. Runoff from cultivated areas is medium or rapid. Reaction ranges from slightly acid to neutral in the subsoil. The available water capacity is moderate. Natural fertility is low. The organic matter content of the surface layer is moderately low. The surface layer is very friable and easily tilled.

Most areas of this soil are in woodland. The potential is fair for cultivated crops. It is good for hay and pasture, fair for trees, and poor for most engineering uses.

This soil is suited to cultivated crops, small grains, and grasses and legumes for hay and pasture. If it is cultivated, there is a severe erosion hazard and a soil blowing hazard. Minimum tillage, contour stripcropping, winter cover crops, and windbreaks help control erosion and soil blowing. Returning crop residue or the addition of manure improves fertility and maintains the organic matter content.

Using this soil as pasture or hayland also reduces erosion and soil blowing. Proper stocking rates, fertility management, pasture rotation, and timely deferment of grazing help keep the soil and pasture in good condition.

This soil is suited to trees. Erosion can be controlled by planting trees on the contour and by careful location of skid roads. Seedling survival can be increased by careful planting of vigorous nursery stock. Vegetation that might interfere with natural regeneration following harvest can be controlled by herbicides or mechanical removal.

This soil is generally unsuitable for building site development because of slopes. It is poorly suited to onsite disposal because of seepage and slope. There is a danger of polluting the ground water with effluent from septic tank absorption fields because of the moderate or moderately rapidly permeable substratum. The slope can be overcome by land leveling, or included areas of less slope can be selected for dwellings and septic tank absorption fields.

This soil is in capability subclass IVe and woodland suitability subclass 4s.

Pa—Palms muck. This nearly level, very poorly drained soil is in depressions on glacial lake plains and moraines. It is subject to frequent flooding. Individual areas of this soil are round or oblong in shape and range from 8 to 100 acres in size.

Typically, the organic layer is black muck about 36 inches thick. The substratum, to a depth of about 60 inches, is grayish brown silt loam. In some places the organic layer contains wood fragments. In some places the substratum is marl.

Included with this soil in mapping are small areas of very poorly drained Houghton and poorly drained Poygan soils. Houghton soils have an organic layer more than 51 inches thick and occupy positions in the landscape similar to Palms soils. Poygan soils are poorly drained and developed mostly in clayey sediment. They too occupy positions in the landscape similar to Palms soils. These included areas make up 5 to 10 percent of the unit.

Water and air move through this Palms soil at a moderately rapid rate in the organic layer and at a moderate or moderately slow rate in the substratum. Runoff is ponded. Reaction ranges from slightly acid to neutral throughout. The available water capacity is very high, natural fertility is low, and organic matter content is very high. The surface layer is friable and easily tilled if this soil is drained. Subsidence occurs if this soil is drained. Roots of most crops are restricted by the seasonal high water table, which is within a foot of the surface in undrained areas.

Most areas of this soil are farmed. If drained, this soil has fair potential for cultivated crops, hay, and pasture. The potential is fair for trees and poor for most engineering uses.

If drained with a system of open ditches or tile, this soil is suited to corn, certain vegetables, small grains, and grasses and legumes for hay and pasture. If this soil is drained and cultivated, however, there is a soil blowing hazard. The soil is subject to burning if the organic layer drys. Minimum tillage, windbreaks, wind stripcropping, and winter cover crops help prevent soil blowing. The use of controlled drainage will reduce the problem of subsidence and burning. Because of cold air drainage, there are fewer frost-free days per growing season on this soil than on adjacent upland soils.

Using this soil as hayland or pasture also reduces soil blowing. During dry periods undrained areas can be planted to water-tolerant plants and used for pasture. Drained areas must be managed to prevent overgrazing which will cause surface compaction. Proper stocking rates, pasture rotation, fertility management, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees. Soil wetness and the high water table during the tree planting season limit reforestation to natural regeneration. Harvest with heavy equipment is confined to when the soil is frozen. Harvest by clear-cut or area-selection methods will reduce windthrow of the remaining trees. Competing vegetation can be controlled by herbicides or mechanical removal to permit natural regeneration.

This soil is poorly suited to building site development and onsite waste disposal because of the high water table and flooding hazard.

This soil is in capability subclass IIIw drained and VIw undrained. It is in woodland suitability subclass 3w.

Pd—Pits. These are areas where sand and gravel or, in some places, sandstone or quartzite bedrock has been removed to a depth of at least several feet. Individual areas are irregular in shape and range from 5 to 160 acres in size.

Typically, the material in the bottom and sidewalls is sandy glacial till or, to a lesser extent, stratified sand and gravel, sandstone, or quartzite.

Included with this unit in mapping are areas of spoil, which includes soil pushed from the pit area before excavation and piles of material that was discarded because it did not contain enough gravel or for some other reason. Also included are stones or boulders too large to crush.

Soil material associated with pits is typically sandy and droughty. Other soil properties are too variable to rate.

Many pits are still in use; others have been abandoned and are grown up in brush and weeds. Some abandoned pits have water in them.

Pits have poor potential for cultivated crops, pasture, trees, and most engineering uses.

The main management concern is reclamation of the area after excavation. To support a vegetative cover, most areas require land shaping and the addition of suitable topsoil.

The suitability of pits for building site development and onsite waste disposal should be decided by onsite investigation. Where slope is not a limitation, pits are suited to septic tank absorption fields. There is, however, a danger of ground water contamination from sewage effluent. Small pits in sandy glacial drift may be suitable for dwellings with or without basements.

Pits are not assigned to a capability subclass or a woodland suitability subclass.

PfA—Plainfield sand, 0 to 2 percent slopes. This nearly level, excessively drained soil is on plane slopes on outwash plains. Individual areas of this soil are irregular in shape and range from 40 to 200 acres in size.

Typically, the surface layer is very dark brown sand about 3 inches thick. The subsurface layer is dark brown sand about 3 inches thick. The subsoil is about 29 inches thick. It is dark yellowish brown, very friable sand in the upper part and brown, very friable sand in the lower part. The substratum, to a depth of 60 inches, is yellowish brown sand. In some places the surface layer is loamy sand or fine sand. In some places the substratum has thin loamy bands at depths of more than 48 inches, and in some areas along the Wisconsin River the substratum is up to 85 percent gravel. Also, in a few places the surface layer is darker and the subsoil and substratum are redder.

Included with this soil in mapping are small areas of moderately well drained Brems and well drained Delton soils. The Brems soils occupy shallow depressions and are lower in the landscape than Plainfield soils. Delton soils are underlain by silty clay and occupy similar positions in the landscape as Plainfield soils. These included areas make up 2 to 5 percent of the unit.

Water and air move through this Plainfield soil at a rapid rate. Runoff is slow. Reaction ranges from very strongly acid to medium acid in the subsoil. It varies widely in the surface layer as a result of liming. The available water capacity and natural fertility are low. The organic matter content of the surface layer is very low or low. The surface layer is very friable and easily tilled over a wide range of moisture content. Roots of many crops are restricted by the droughty sand.

Most areas of this soil are in woodland. Unless this soil is irrigated, it has poor potential for cultivated crops, hay, and pasture. It has fair potential for trees and good potential for most engineering uses.

There is a severe drought and soil blowing hazard. If irrigation is used to overcome the drought hazard and practices are applied to control soil blowing, this soil is suited to general farm crops and vegetable crops such as snap beans, peas, potatoes, and sweet corn. Minimum tillage, planting windbreaks, wind stripcropping, mulching crop residues, and planting cover crops help to control soil blowing, conserve soil moisture, and maintain organic matter content. This soil is generally unsuited to pasture and hayland.

This soil is suited to trees. Seedling survival can be increased by careful planting of vigorous nursery stock. Competing vegetation that interferes with natural regeneration following harvest can be controlled by herbicides or mechanical removal.

This soil is suitable for building site development. It is unsuited to most onsite waste disposal because of seepage. It is suited to septic tank absorption fields, but because of the rapid permeability there is a danger of polluting the ground water.

This soil is in capability subclass VIs and woodland suitability subclass 3s.

PfB—Plainfield sand, 2 to 6 percent slopes. This gently sloping, excessively drained soil is on convex and concave slopes on knolls and depressions on outwash plains. Individual areas of this soil are irregular in shape and range from 50 to 1,000 acres in size.

Typically, the surface layer is very dark grayish brown sand about 4 inches thick. The subsoil is about 24 inches thick. It is dark yellowish brown, very friable sand in the upper part; strong brown, very friable sand in the middle; and yellowish brown, very friable sand in the lower part. The substratum, to a depth of about 60 inches, is yellowish brown sand. In some places the surface layer is loamy sand or fine sand. In some places the substratum has loamy bands below a depth of 48 inches.

Included with this soil in mapping are small areas of well drained and somewhat excessively drained Richford soils. Richford soils have a sandy loam subsoil and occupy depressions. These included areas make up 1 to 5 percent of the unit.

Water and air move through this Plainfield soil at a rapid rate. Runoff is slow. Reaction ranges from very strongly acid to medium acid in the subsoil. It varies widely in the surface layer as a result of liming. The available water capacity and natural fertility are low. The organic matter content of the surface layer is very low or low. The surface layer is very friable and easily tilled over a wide range of moisture content. Roots of many crops are restricted by the droughty sand.

Most areas of this soil are in woodland. Unless this soil is irrigated, it has poor potential for cultivated crops, hay, and pasture. It has fair potential for trees and good potential for most engineering uses.

Unless irrigated, this soil is generally unsuited to cultivated crops. There is a severe drought and soil blowing hazard. The water erosion hazard is slight. If irrigation is used, however, the rate of application should be carefully regulated to control erosion on this soil. The infiltration rate tends to slow when this soil is irrigated, and the erosion hazard becomes greater with each successive irrigation. Because of the slope, it is difficult to evenly distribute water, fertilizer, and herbicides through the irrigation system. Planting windbreaks, wind stripcropping, mulching crop residues, planting cover crops, and applying manure will help to control soil blowing, conserve moisture, and maintain organic matter content. If irrigated, this soil is suited to vegetable crops such as snap beans, peas, potatoes, and sweet corn. This soil is generally unsuited to pasture or hayland.

This soil is suited to trees. Seedling survival can be increased by careful planting of vigorous nursery stock. Competing vegetation that interferes with natural regeneration following harvest can be controlled by herbicides or mechanical removal.

This soil is suitable for building site development. It is unsuited to most onsite waste disposal because of seepage. It is suitable for septic tank absorption fields, but because of the rapid permeability there is a danger of polluting the ground water.

This soil is in capability subclass VIs and woodland suitability subclass 3s.

PfC—Plainfield sand, 6 to 12 percent slopes. This sloping, excessively drained soil is on stream terrace escarpments and ridges on ground moraines. Individual areas of this soil are either round or long and narrow in shape and range from 5 to 200 acres in size.

Typically, the surface layer is dark yellowish brown sand about 3 inches thick. The subsoil is about 31 inches thick. It is brown, very friable sand in the upper part and strong brown, very friable sand in the lower part. The substratum, to a depth of about 60 inches, is reddish yellow sand. In some places the surface layer is loamy sand or fine sand.

Included with this soil in mapping are small areas of well drained and somewhat excessively drained Richford soils. The Richford soils have a layer of sandy loam in the subsoil and occupy depressions. These included areas make up 1 to 3 percent of the unit.

Water and air move through this Plainfield soil at a rapid rate. Runoff from cultivated areas is slow. Reaction ranges from very strongly acid to medium acid in the subsoil. It varies widely in the surface layer as a result of liming. The available water capacity and natural fertility are low. The organic matter content of the surface layer is very low or low. The surface layer is very friable and easily tilled over a wide range of moisture content. Roots of many crops are restricted by the droughty sand.

Most areas of this soil are in woodland. The potential is poor for cultivated crops, hay, and pasture. It is fair for trees and most engineering uses.

This soil is generally unsuited to cultivated crops and is too steep for irrigation. It has a severe soil blowing and drought hazard. The erosion hazard is moderate.

This soil is poorly suited to pasture because of its droughty nature. Using this soil as pasture, however, will reduce the erosion and soil blowing hazard.

This soil is suited to trees. Seedling survival can be increased by careful planting of vigorous nursery stock. Competing vegetation that interferes with natural regeneration following harvest can be controlled by herbicides or mechanical removal.

This soil is suitable for building site development, but the slope is a problem. It is poorly suited to most onsite waste disposal because of seepage. It is suited to septic tank absorption fields, but again the slope is a problem. The slope problem for dwellings and septic tank absorption fields can be overcome by land leveling. There is a danger of polluting the ground water by effluent from septic tank absorption fields.

This soil is in capability subclass VIs and woodland suitability subclass 3s.

PfD—Plainfield sand, 12 to 35 percent slopes. This moderately steep to very steep, excessively drained soil is on convex hills on moraines and on stream terrace escarpments. Individual areas of this soil are either round or long and narrow in shape and range from 20 to 100 acres in size.

Typically, the surface layer is dark brown sand about 4 inches thick. The subsoil is about 23 inches thick. It is dark brown, very friable sand in the upper part and strong brown, very friable sand in the lower part. The substratum, to a depth of about 60 inches, is yellowish brown sand. In some places the substratum below a depth of about 60 inches has silty clay bands.

Included with this soil in mapping are small areas of well drained and excessively drained Richford soils. The Richford soils have a sandy loam layer in the subsoil and occupy depressions. These areas make up 1 to 2 percent of the unit.

Water and air move through this Plainfield soil at a rapid rate. Runoff from cultivated areas is medium or rapid. Reaction ranges from very strongly acid to medium acid in the surface layer and subsoil. The available water capacity and natural fertility are low. The organic matter content of the surface layer is very low. The surface layer is very friable. Roots of many crops are restricted by the droughty sand.

Most areas of this soil are in woodland. The potential is poor for cultivated crops, hay, and pasture. It is fair for trees and poor for most engineering uses.

This soil is generally unsuited to cultivated crops and hay. There is a severe drought and soil blowing hazard. The water erosion hazard is moderate or severe. This soil is too steep for irrigation.

This soil is poorly suited to pasture because of its droughty nature. Using this soil as pasture will, however, reduce the erosion and soil blowing hazard.

This soil is suited to trees. Erosion can be controlled by planting trees on the contour and by careful location of skid roads during harvest. Survival of planted trees can be increased by careful planting of vigorous nursery stock. Vegetation that competes with natural regeneration following harvest can be controlled by herbicides or mechanical removal.

This soil is generally unsuited to building site development and onsite waste disposal because of slope and seepage. The slope problem for dwellings and septic tank absorption fields can be overcome by land leveling or using included areas that are not as steep. There is a danger of polluting the ground water by effluent from septic tank absorption fields.

This soil is in capability subclass VIIs and woodland suitability subclass 3s.

Ps—Poygan silty clay loam. This nearly level, poorly drained soil is in drainageways and depressions on ground moraines and glacial lake plains. It is subject to frequent flooding. Individual areas of this soil are irregular in shape and range from 5 to 80 acres in size.

Typically, the surface layer is black silty clay loam about 9 inches thick. The subsoil is about 15 inches thick. It is grayish brown, olive gray, and reddish brown, firm silty clay. The substratum, to a depth of about 60 inches, is mixed reddish brown and olive gray silty clay. In some places the surface layer is silt loam or muck.

Included with this soil in mapping are small areas of somewhat poorly drained Manawa soils and very poorly drained Palms soils. Manawa soils formed in similar materials, but occupy slight rises or knolls higher in the landscape than Poygan soils. Palms soils formed in 16 to 51 inches of organic deposits and occupy depressional areas that are lower in the landscape than Poygan soils. Also included are areas of Poygan soils where the surface layer is fine sandy loam. These included areas make up 5 to 10 percent of the unit.

Water and air move through this Poygan soil at a slow rate. Runoff is very slow or ponded. Reaction is slightly acid to moderately alkaline throughout the surface layer and subsoil. The available water capacity is moderate. The organic matter content of the surface layer is high. Natural fertility is medium. The surface layer is friable, but has a tendency to crust or puddle if tilled when too wet. Roots of most crops are restricted by the seasonal high water table which is within a foot of the surface in undrained areas. The compact silty clay substratum also restricts root development.

Most areas of this soil are farmed. If drained, this soil has good potential for cultivated crops, hay, and pasture. It has good potential for growing trees and poor potential for most engineering uses.

If drained, this soil is suited to corn, soybeans, small grains, and grasses and legumes for pasture and hay. Excess water can be removed by a well designed tile or open ditch drainage system. Timeliness of tillage, minimum tillage, and returning crop residues will help to maintain organic matter content and good tilth.

Drainage, selection of suitable forage species, and controlled grazing are the main considerations in pasture management. Overgrazing or grazing when the soil is too wet will cause surface compaction and poor tilth. Proper stocking rates, pasture rotation, fertility management, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees. When natural regeneration is unreliable soil wetness generally makes it necessary to prepare ridges and plant seedlings by hand or machine. Large, vigorous nursery stock is essential. Harvest is frequently limited to when the soil is frozen. Harvest by clear-cut or area-selection methods reduces the danger of windthrow to trees left standing. Competing vegetation can be controlled by herbicides or mechanical removal to allow natural regeneration.

This soil is poorly suited to building site development because of wetness and flooding. It is poorly suited to onsite waste disposal systems because of wetness, flooding, and slow permeability.

This soil is in capability subclass IIw and woodland suitability subclass 2w.

RfA—Richford loamy sand, 0 to 2 percent slopes. This nearly level, well drained and somewhat excessively drained soil is on plain slopes in depressions on outwash plains. Individual areas of this soil are irregular in shape and range from 10 to 200 acres in size.

Typically, the surface layer is very dark brown loamy sand about 9 inches thick. The subsurface layer is about 17 inches thick. It is dark yellowish brown sand in the upper part; dark brown sand in the middle; and reddish brown, very friable loamy sand in the lower part. The subsoil is strong brown, friable sandy loam about 12 inches thick. The substratum, to a depth of about 60 inches, is brownish yellow sand. In some places the subsoil is sandy clay loam. In a few places the sandy mantle is more than 40 inches thick. In a few places the surface layer is sand.

Included with this soil in mapping are small areas of well drained Billet soils and excessively drained Plainfield soils. Billet soils have more clay in the surface layer and occupy knolls that are higher in the landscape than Richford soils. Plainfield soils are sandy throughout and occupy positions in the landscape similar to Richford soils. These included areas make up 5 to 15 percent of the unit.

Water and air move through this Richford soil at a moderately rapid rate in the subsoil and at a rapid rate in the substratum. Runoff from cultivated areas is slow. Reaction ranges from medium acid to slightly acid in the subsoil. It varies widely in the surface layer as a result of liming. The available water capacity and natural fertility are low. The organic matter content of the surface layer is very low or low. The surface layer is very friable and easily tilled over a wide range of moisture content. Roots of many crops are restricted by the droughty sand substratum.

Most areas of this soil are farmed. The potential is fair for cultivated crops and good for hay and pasture. It is fair for trees and good for most engineering uses.

This soil is suited to corn, soybeans, small grain, and grasses and legumes for hay and pasture. There is a soil blowing hazard and a drought hazard. Planting windbreaks, wind stripcropping, mulching crop residues, planting cover crops, minimum tillage, and applying manure are practices that help control soil blowing, maintain organic matter content, and conserve soil moisture. If this soil is irrigated, it is suited to vegetable crops such as snap beans, potatoes, peas, and sweet corn.

Using this soil as pasture or hayland reduces soil blowing. Proper stocking rates to maintain desirable plant species, rotation of pasture, fertility management, and deferment of grazing help keep the soil and pasture in good condition.

This soil is suited to trees. The only soil-related forest management problem is competing vegetation that interferes with natural regeneration following harvest. This vegetation can be controlled by herbicides or mechanical removal.

This soil is suited to building site development. It is poorly suited to most onsite waste disposal because of seepage. It is suited to septic tank absorption fields, but there is a danger of polluting the ground water because of the rapidly permeable substratum.

This soil is in capability subclass IIIs and woodland suitability subclass 3o.

RfB—Richford loamy sand, 2 to 6 percent slopes. This gently sloping, well drained and somewhat excessively drained soil is on convex and concave slopes of knolls on outwash plains. Individual areas of this soil are irregular in shape and range from 10 to 100 acres in size.

Typically, the surface layer is very dark grayish brown loamy sand about 7 inches thick. The subsurface layer is about 24 inches thick. It is dark brown loamy sand in the upper part; yellowish brown sand in the middle; and strong brown loamy sand in the lower part. The subsoil is about 14 inches thick. It is strong brown, friable sandy loam in the upper part and dark brown, very friable loamy sand in the lower part. The substratum, to a depth of about 60 inches, is strong brown sand. In some places the subsoil is sandy clay loam. In some places the sandy mantle is less than 20 inches thick, and in a few places the surface layer is sand.

Included with this soil in mapping are small areas of well drained and somewhat excessively drained Okee soils and well drained Wyocena soils. Okee soils are underlain by loamy sand or gravelly loamy sand. Wyocena soils have a thinner surface layer and have more clay in the substratum. Both soils occupy knolls and foot slopes of moraines and are higher in the landscape than the Richford soils. These included areas make up 5 to 10 percent of the unit.

Water and air move through this Richford soil at a moderately rapid rate in the subsoil and at a rapid rate in the substratum. Runoff is slow. Reaction ranges from medium acid to slightly acid in the subsoil. It varies widely in the surface layer as a result of liming. The available water capacity and natural fertility are low. The organic matter content of the surface layer is very low or low. The surface layer is very friable and easily tilled over a wide range of moisture content. Roots of many crops are restricted by the droughty sand substratum.

Most areas of this soil are farmed. The potential is fair for cultivated crops and good for hay and pasture. It is fair for trees and good for most engineering uses.

This soil is suited to corn, soybeans, small grain, and grasses and legumes for hay and pasture. There is a soil blowing and drought hazard. The water erosion hazard is slight. Planting windbreaks, wind stripcropping, mulching crop residues, planting cover crops, minimum tillage, and applying manure are practices that help control erosion and soil blowing. They also maintain organic matter content and conserve soil moisture. If this soil is irrigated, it is suited to vegetable crops such as snap beans, potatoes, peas, and sweet corn.

Using this soil for pasture or hayland reduces soil blowing and erosion. Proper stocking rates to maintain desirable plant species, fertility management, rotation of pasture, and deferment of grazing help to keep the soil and pasture in good condition.

This soil is suited to trees. The only soil-related forest management problem is competing vegetation that interferes with natural regeneration following harvest. This vegetation can be controlled by herbicides or mechanical removal.

This soil is suitable for building site development. It is poorly suited to most onsite waste disposal because of seepage. It is suited to septic tank filter fields, but because of the rapidly permeable substratum there is danger of polluting the ground water.

This soil is in capability subclass IIIs and woodland suitability subclass 3o.

RfC—Richford loamy sand, 6 to 12 percent slopes. This sloping, well drained and somewhat excessively drained soil is on knolls of outwash plains. Individual areas of this soil are long and narrow in shape and range from 10 to 100 acres in size.

Typically, the surface layer is dark yellowish brown loamy sand about 4 inches thick. The subsurface layer is about 18 inches thick. It is dark brown loamy sand in the upper part and dark brown sand in the lower part. The subsoil is about 10 inches thick. It is strong brown, friable sandy loam in the upper part and strong brown, very friable loamy sand in the lower part. The substratum, to a depth of about 60 inches, is strong brown sand. In some places the surface layer is sand. In some places the sandy mantle is less than 20 inches thick.

Included with this soil in mapping are small areas of well drained and somewhat excessively drained Okee soils and excessively drained Plainfield soils. Okee soils have a loamy sand substratum and occupy foot slopes on moraines. Plainfield soils are sandy throughout and occupy positions in the landscape similar to Richford soils. Also included are small areas of Richford soil with slopes of less than 6 percent. These included areas make up 5 to 10 percent of the unit.

Water and air move through this Richford soil at a moderately rapid rate in the subsoil and at a rapid rate in the substratum. Runoff from cultivated areas is slow or medium. Reaction ranges from medium acid to slightly acid in the subsoil. It varies widely in the surface layer as a result of liming. The available water capacity and natural fertility are low. The organic matter content of the surface layer is very low or low. The surface layer is very friable and easily tilled over a wide range of moisture content. Roots of many crops are restricted by the droughty sand substratum.

Most areas of this soil are farmed. The potential is fair for cultivated crops and good for hay and pasture. It is fair for trees and most engineering uses.

This soil is suited to corn, soybeans, small grain, and grasses and legumes for hay and pasture. There is a soil blowing and drought hazard. The water erosion hazard is moderate. Planting windbreaks, contour farming, mulching crop residues, planting cover crops, minimum tillage, and applying manure are practices that help control soil blowing and erosion. They also maintain organic matter content and conserve soil moisture.

Using this soil for pasture of hayland reduces soil blowing and erosion. Proper stocking rates to maintain desirable plant species, fertility management, rotation of pasture, and deferment of grazing help to keep the soil and pasture in good condition.

This soil is suited to trees. The only soil-related forest management problem is competing vegetation that interferes with natural regeneration following harvest. This vegetation can be controlled by herbicides or mechanical removal.

This soil is suitable for building site development, but the slope is a problem. It is poorly suited to most onsite waste disposal mainly because of seepage. It is suited to septic tank absorption fields, but because of the rapidly permeable substratum there is a danger of polluting ground water. The slope problem associated with dwelling sites and septic tank absorption fields can be overcome by land leveling. It may be possible to use an included area that is not as steep.

This soil is in capability subclass IIIe and woodland suitability subclass 3o.

SoB—Sisson fine sandy loam, 2 to 6 percent slopes. This gently sloping, well drained soil is on convex and concave slopes of glacial lake plains. Individual areas of this soil are irregular in shape and range from 10 to 200 acres in size.

Typically, the surface layer is dark brown fine sandy loam about 8 inches thick. The subsurface layer is brown fine sandy loam about 3 inches thick. The subsoil is about 25 inches thick. It is dark brown, friable fine sandy loam in the upper part; reddish brown friable loam in the middle; and reddish brown friable silt loam in the lower part. The substratum, to a depth of about 60 inches, is reddish brown stratified silt and fine sand.

Included with this soil in mapping are small areas of somewhat poorly drained Kibbie soils and excessively drained Plainfield soils. Kibbie soils are in drainageways and depressions that are lower in the landscape than Sisson soils. Plainfield soils occupy ridges and knolls and are sandy throughout. Also included are areas of Sisson soils where the surface layer is loamy fine sand or fine sand. These included areas make up 5 to 10 percent of the unit.

Water and air move through this Sisson soil at a moderate rate. Runoff from cultivated areas is medium. Reaction is strongly acid or medium acid in the subsoil. It varies widely in the surface layer as a result of liming. The available water capacity is high. Natural fertility is medium. The organic matter content of the surface layer is moderately low. The surface layer is friable and easily tilled over a wide range of moisture content.

Most areas of this soil are farmed. The potential is good for cultivated crops, hay, pasture, and trees. It is fair for most engineering uses.

This soil is suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. If this soil is cultivated, there is a slight or moderate erosion hazard. Contour stripcropping, diversions, terraces, and grassed waterways will help control erosion. Minimum tillage, returning crop residue, and applying manure will help maintain organic matter content and good soil tilth.

The use of this soil for pasture or hayland reduces erosion. Proper stocking rates, fertility management, and pasture rotation will help to keep the pasture and soil in good condition.

This soil is suited to trees. The only soil-related forest management problem is competing vegetation that interferes with natural regeneration following harvest. This vegetation can be controlled by herbicides or mechanical removal.

This soil is suitable for building site development, but it is subject to shrinking and swelling. It is suited to most kinds of onsite waste disposal. The shrinking and swelling problem of this soil can be overcome by placing a layer of coarse material such as sand and gravel around the foundation of dwellings and installing foundation tile to remove excess water.

This soil is in capability subclass IIe and woodland suitability subclass 2o.

SpA—Sparta loamy sand, 0 to 3 percent slopes. This nearly level and gently sloping, excessively drained soil in on convex slopes of outwash plains and stream terraces. Individual areas of this soil are irregular in shape and range from 10 to 200 acres in size.

Typically, the surface layer is loamy sand about 17 inches thick. It is very dark brown in the upper part and very dark grayish brown in the lower part. The subsoil is dark yellowish brown, very friable sand about 12 inches thick. The substratum, to a depth of about 60 inches, is yellowish brown sand. In a few places the substratum has loamy sand bands below a depth of about 4 feet. In some places the dark surface layer is less than 10 inches thick. The surface layer is sand in some places.

Included with this soil in mapping are small areas of well drained Billett soils. These soils occupy positions in the landscape similar to the Sparta soils but the surface layer and upper part of the subsoil is sandy loam. Also included are soils similar to Sparta except that the seasonal water table is between a depth of 40 to 60 inches. These included areas make up 3 to 5 percent of the unit.

Water and air move through this Sparta soil at a rapid rate. Runoff is slow. Reaction is strongly acid or medium acid in the subsoil. It varies widely in the surface layer as a result of liming. The available water capacity is low. Natural fertility is low and the organic matter content of the surface layer is moderately low. The surface layer is very friable and easily tilled over a wide range of moisture content. Roots of many crops are restricted by the droughty sand.

Most areas of this soil are farmed. The potential is fair for cultivated crops, hay, pasture, and trees. It is good for most engineering uses.

This soil is suited to corn, soybeans, small grains, and grasses and legumes for hay or pasture. If this soil is cultivated there is a severe drought hazard and a severe soil blowing hazard. Planting windbreaks, wind stripcropping, mulching crop residues, and planting cover crops will help to control soil blowing, maintain organic matter content, and conserve moisture. If irrigated, this soil is suited to general farm crops and vegetable crops such as peas, snap beans, sweet corn, and potatoes.

Using this soil for pasture or hayland reduces soil blowing. Proper stocking rates, fertility management, pasture rotation, and restricted use during dry periods help to keep this soil and pasture in good condition.

This soil is suited to trees. Seedling survival can be increased by careful planting of vigorous nursery stock. Competing vegetation that interferes with natural regeneration following harvest can be controlled by herbicides or mechanical removal.

This soil is suitable for building site development. Because of seepage, it is poorly suited to most onsite waste disposal. It is suited to septic tank absorption fields, but because of the rapid permeability there is danger of polluting the ground water.

This soil is in capability subclass IVs and woodland suitability subclass 3s.

TeA—Tell silt loam, 0 to 3 percent slopes. This nearly level and gently sloping, well drained soil is on convex slopes of stream terraces and outwash plains. Individual areas of this soil are irregular in shape and range from 5 to 120 acres in size.

Typically, the surface layer is brown silt loam about 9 inches thick. The subsurface layer is dark brown silt loam about 3 inches thick. The subsoil is about 23 inches thick. It is dark brown, friable silt loam in the upper part; dark brown, friable silty clay loam in the middle; and dark brown, friable loam and yellowish red sandy loam in the lower part. The substratum, to a depth of about 60 inches, is strong brown sand. In some places the depth to the sandy substratum is more than 60 inches. In a few places the solum is redder.

Included with this soil in mapping are small areas of well drained Billett and Grays soils. Billett soils are sandy loam in the surface layer and upper part of the subsoil and occupy knolls. Grays soils have stratified silt and fine sand in the substratum and occupy slight depressions. These included areas make up 5 to 10 percent of the unit.

Water and air move through this Tell soil at a moderate rate in the subsoil and at a rapid rate in the substratum. Runoff is slow. Reaction ranges from strongly acid to neutral in the subsoil. It varies widely in the surface layer as a result of liming. The available water capacity is moderate. Natural fertility is medium. The organic matter content of the surface layer is moderately low or moderate. The surface layer is friable and easily tilled over a fairly wide range of moisture content, but has a tendency to crust or puddle if tilled after heavy rains or when too wet.

Most areas of this soil are farmed. The potential is good for cultivated crops, hay, pasture, and tree. It is fair for most engineering uses.

This soil is suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. If this soil is cultivated, there is a moderate drought hazard. Minimum tillage, returning crop residues, and applying manure will help conserve soil moisture, maintain organic matter content, and keep the soil in good tilth.

Using this soil for pasture of hayland is effective in maintaining the organic matter content and good soil tilth. Overgrazing or grazing when the soil is wet may cause surface compaction and poor tilth. Proper stocking rates, fertility management, pasture rotation, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees. The only soil-related forest management problem is competing vegetation that interferes with natural regeneration following harvest. This vegetation can be controlled by herbicides or mechanical removal.

This soil is suitable for building site development, but it is subject to shrinking and swelling in the subsoil. Because of seepage, it is poorly suited to most kinds of onsite waste disposal. It is suited to septic tank absorption fields, but because of the rapid permeability in the substratum there is a danger of ground water contamination. The shrinking and swelling problem can be overcome by placing a layer of coarse material such as sand and gravel around the foundation of dwellings.

This soil is in capability subclass IIs and woodland suitability subclass 2o.

Wa—Wautoma loamy sand. This nearly level, poorly drained and very poorly drained soil is on plain slopes in drainageways and depressions of outwash plains bordering glacial lake plains. It is subject to frequent flooding. Individual areas of this soil are oblong in shape and range from 5 to 50 acres in size.

Typically, the surface layer is black loamy sand about 8 inches thick. The subsoil is about 22 inches thick. It is grayish brown, mottled sand and grayish brown, mottled loamy sand in the upper part and light brownish gray, mottled sandy loam and sandy clay loam in the lower part. The substratum, to a depth of about 60 inches, is dark brown, mottled silty clay loam in the lower part. In some places the sandy mantle is less than 20 inches thick, and in some places the surface layer is mucky loamy sand.

Included with this soil in mapping are small areas of somewhat poorly drained Meehan and Wyeville soils. Meehan soils are sandy throughout. Wyeville soils formed in materials similar to Wautoma soils. These included areas are in drainageways and depressions that are higher in the landscape than Wautoma soils.

Water and air move through this Wautoma soil at a moderately rapid rate in the upper sandy horizons and a slow or very slow rate in the lower part of the substratum. Runoff is very slow or ponded. Reaction is strongly acid or medium acid in the subsoil. It varies widely in the surface layer as a result of liming. The available water capacity is moderate. Natural fertility is low. The organic matter content of the surface layer is moderately low or low. The surface layer is very friable and easily tilled over a wide range in moisture content. Roots of most crops are restricted by the seasonal water table, which is within a foot of the surface in undrained areas.

Most areas of this soil are in pasture. If drained, this soil has fair potential for cultivated crops and good potential for pasture and hay. It has fair potential for trees and poor potential for most engineering uses.

If drained, this soil is suited to corn, soybeans, small grains, and grasses and legumes for hay or pasture. If this soil is drained and cultivated, there is a hazard of soil blowing. Diversions, surface drainage, or tile drainage will help to reduce flooding and lower the water table. If tile drainage is used, placing a filter over the tile will prevent sand from plugging the tile. Planting windbreaks, wind stripcropping, mulching crop residue, planting cover crops, minimum tillage, and applying manure are practices that will help control soil blowing, improve fertility, and maintain organic matter content.

The use of this soil for pasture or hayland also reduces soil blowing. Diversions, surface drainage, and grasses and legumes that tolerate wetness are needed for good pasture and hay production. Overgrazing and grazing this soil when it is too wet causes surface compaction. Proper stocking rates, pasture rotation, and timely deferment of grazing during wet periods help to keep the pasture and soil in good condition.

This soil is poorly suited to trees. Growth is so slow and form so poor that trees are barely merchantable at best. When natural regeneration is unreliable, soil wetness generally makes it necessary to prepare ridges and plant seedlings by hand or machine. Large, vigorous nursery stock is essential. Harvest is frequently limited to when the soil is frozen. Harvest by clear-cut or area-selection reduces the danger of windthrow to the remaining trees. Competing vegetation can be controlled by herbicides or mechanical removal to permit natural regeneration.

This soil is poorly suited to building site development because of wetness and flooding. It is poorly suited to onsite waste disposal because of wetness, flooding, seepage, or slow permeability. These problems are difficult to overcome, and it probably would be better to build on another soil.

This soil is in capability subclass IIIw drained and VIw undrained. It is in woodland suitability subclass 4w.

WeA—Wyeville loamy sand, 0 to 3 percent slopes. This nearly level and gently sloping, somewhat poorly drained soil is in drainageways and depressions on outwash plains, glacial lake plains, and stream terraces. It is subject to flooding at rare intervals. Individual areas of this soil are irregular in shape and range from 5 to 100 acres in size.

Typically, the surface layer is very dark grayish brown loamy sand about 10 inches thick. The subsurface layer is about 13 inches thick. It is light yellowish brown sand in the upper part and strong brown, mottled loamy sand in the lower part. The subsoil is yellowish red, mottled, firm silty clay loam about 4 inches thick. The substratum, to a depth of about 60 inches, is reddish brown, mottled silty clay. In some places the surface layer is sand. In some places the sandy mantle is more than 40 inches thick; in others it is less than 20 inches thick. A few small areas have thin sandy layers in the substratum.

Included with this soil in mapping are small areas of well drained Delton and poorly drained and very poorly drained Wautoma soils. The Delton soils are higher in the landscape than Wyeville soils. Wautoma soils occupy drainageways and depressions that are lower in the landscape than Wyeville soils. These included areas make up 5 to 12 percent of the unit.

Water and air move through this Wyeville soil at a moderately rapid rate in the upper sandy horizons and a slow or very slow rate in the subsoil and substratum. Runoff is slow. Reaction ranges from strongly acid to neutral in the subsoil. It varies widely in the surface layer as a result of liming. The available water capacity is moderate. Natural fertility is low. The organic matter content of the surface layer is very low or low. The surface layer is very friable and easily tilled over a wide range in moisture content. Roots of most crops are restricted by the seasonal water table which is at a depth of 1.5 to 3 feet in undrained areas. The compact silty clay substratum also restricts roots.

Most areas of this soil are farmed. If drained, this soil has fair potential for cultivated crops, hay, and pasture. It has fair potential for trees and fair potential for most engineering uses.

This soil is suited to corn, soybeans, small grain, and grasses and legumes for hay and pasture. If this soil is cultivated, there is a soil blowing hazard and a wetness hazard. Grassed waterways, diversions, and ditches help remove excess water. If tile drainage is used, a filter placed over the tile will prevent sand from plugging the tile. Windbreaks, wind stripcropping, minimum tillage, mulching crop residues, crop rotation, and applying manure are practices that will help maintain organic matter content, improve fertility, and reduce soil blowing.

Overgrazing or grazing this soil when it is too wet is a major concern of pasture management. Chief management needs are a system of drainage ditches to lower the water table, proper stocking rates to maintain adapted plants, rotation of pasture, fertility management, deferment of grazing, and restriction of grazing during wet periods.

This soil is suited to trees. The only soil-related forest management problem is competing vegetation that interferes with natural regeneration. This vegetation can be controlled by herbicides or mechanical removal.

This soil is generally unsuited to building site development because of flooding. It is poorly suited to onsite waste disposal because of wetness, slow permeability, or seepage. The flooding hazard for dwellings can be reduced by diversions or dikes and by drainage ditches to remove excess water. Dwellings should be constructed without basements, but foundation tile can be used to remove excess water from around dwellings with basements. The wetness problem for septic tank absorption fields can be overcome by tile or open ditch drainage.

This soil is in capability subclass IIIw and woodland suitability subclass 3o.

WyB—Wyocena loamy sand, 2 to 6 percent slopes. This gently sloping, well drained soil is on convex or concave slopes of ground moraines. Individual areas of this soil are irregular in shape and range from 5 to 120 acres in size.

Typically, the surface layer is dark brown loamy sand about 9 inches thick. The subsoil is about 21 inches thick. It is brown, friable loam and sandy loam in the upper part and yellowish red, very friable loamy sand in the lower part. The substratum, to a depth of about 60 inches, is the strong brown, loose sand. In some places the surface layer is sandy loam. In a few places the substratum is sandy loam.

Included with this soil in mapping are small areas of somewhat excessively drained Coloma and well drained and somewhat excessively drained Okee soils. Coloma soils are sandy throughout. Okee soils have a sandy mantle 20 to 40 inches thick over a sandy loam subsoil. These soils occupy landscape positions similar to the Wyocena soils and make up 5 to 10 percent of the unit.

Water and air move through this Wyocena soil at a moderately rapid rate in the subsoil and at a rapid rate in the substratum. Runoff is slow. Reaction ranges from medium acid to slightly acid in the subsoil. It varies widely in the surface layer as a result of liming. The available water capacity is moderate. Natural fertility is low. The organic matter content of the surface layer is moderately low or low. The surface layer is very friable and easily tilled over a wide range of moisture content. Roots of many crops are restricted by droughty sand.

Most areas of this soil are farmed. The potential is fair for cultivated crops and good for hay and pasture. It is fair for trees and good for most engineering uses.

This soil is suited to corn, soybeans, small grain, and grasses and legumes for hay and pasture. If this soil is cultivated, there is a soil blowing hazard and moderate drought hazard. The water erosion hazard is slight. Contouring and contour stripcropping help to control erosion. Minimum tillage, windbreaks, wind stripcropping, and winter cover crops will help control soil blowing. Returning crop residue and application of manure help to improve fertility and maintain organic matter content.

Using this soil for pasture or hayland also reduces erosion and soil blowing. Proper stocking rates, pasture rotation, fertility management, and pasture renovation help to keep the pasture and soil in good condition.

This soil is suited to trees. The only soil-related forest management problem is competing vegetation that interferes with natural regeneration following harvest. This vegetation can be controlled by herbicides or mechanical removal.

This soil is suitable for building site development. Because of seepage, it is poorly suited to most onsite waste disposal. It is suited to septic tank absorption fields, but because of the rapid permeability in the substratum there is danger of ground water pollution.

This soil is in capability subclass IIIe and woodland suitability subclass 3o.

WyC—Wyocena loamy sand, 6 to 12 percent slopes. This sloping, well drained soil is on convex ridgetops, knolls, and side slopes of ground moraines and end moraines. Individual areas of this soil are irregular in shape and range from 5 to 50 acres in size.

Typically, the surface layer is brown loamy sand about 8 inches thick. The subsurface layer is brown sandy loam about 4 inches thick. The subsoil is about 25 inches thick. It is brown, very friable sandy loam in the upper part; reddish brown and yellowish red, friable sandy loam in the middle; and brown, very friable loamy sand in the lower part. The substratum, to a depth of about 60 inches, is brown loamy sand in the upper part and dark yellowish brown sand in the lower part. In some places the surface layer is sandy loam or sand. Other areas have a sandy loam substratum.

Included with this soil in mapping are small areas of somewhat excessively drained Coloma and well drained and somewhat excessively drained Okee soils. Coloma soils are sandy throughout. Okee soils have a sandy mantle 20 to 40 inches thick over a sandy loam subsoil. These soils occupy similar positions in the landscape as

Wyocena soils. Also included are small areas of Wyocena soils with slopes less than 6 percent. These included areas make up 10 to 15 percent of the unit.

Water and air move through this Wyocena soil at a moderately rapid rate in the subsoil and at a rapid rate in the substratum. Runoff is slow or medium. Reaction ranges from medium acid to slightly acid in the subsoil. It varies widely in the surface layer as a result of liming. The available water capacity is moderate. Natural fertility is low. The organic matter content of the surface layer is moderately low or low. The surface layer is very friable and easily tilled over a wide range of moisture content. Roots of many crops are restricted by droughty sand.

Most areas of this soil are farmed. The potential is fair for cultivated crops and good for pasture and hay. It is fair for trees and fair or good for most engineering uses.

This soil is suited to corn, small grain, and grasses and legumes for hay and pasture. If this soil is cultivated, there is a soil blowing hazard and a moderate hazard of water erosion. Contouring, contour stripcropping, and planting windbreaks can help control soil blowing and erosion. Minimum tillage, returning crop residues, and applying manure help to improve fertility and maintain the organic matter content.

Using this soil for pasture or hayland also reduces soil blowing and erosion. Management needs are controlled grazing, pasture rotation, fertility management, and establishing desirable grasses and legumes.

This soil is suited to trees. The only soil-related forest management problem is competing vegetation that interferes with natural regeneration following harvest. This vegetation can be reduced by herbicides or mechanical removal.

The slope is a problem, but this soil is suited to building site development. It is poorly suited to most onsite waste disposal because of seepage or slope. It is suited to septic tank absorption fields, but because of the rapid permeability in the substratum there is a danger of ground water contamination. The slope problem for septic tank absorption fields and dwellings can be overcome by land leveling or, where possible, building on included Wyocena soils that are not as steep.

This soil is in capability subclass IVe and woodland suitability subclass 3o.

WyD—Wyocena loamy sand, 12 to 25 percent slopes. This moderately steep and steep, well drained soil is on convex ridges and knolls on end moraines. Individual areas of this soil are oblong in shape and range from 10 to 100 acres in size.

Typically, the surface layer is very dark grayish brown loamy sand about 5 inches thick. The subsoil is about 26 inches thick. It is dark yellowish brown, friable sandy loam in the upper part; strong brown friable sandy loam in the middle; and strong brown, very friable loamy sand in the lower part. The substratum, to a depth of about 60 inches, is yellowish red loamy sand. In some places the surface layer is sandy loam or sand.

Included with this soil in mapping are small areas of somewhat excessively drained Coloma and well drained and somewhat excessively drained Okee soils. Coloma soils are sandy throughout. Okee soils have a sandy mantle 20 to 40 inches thick over a sandy loam subsoil. These soils occupy similar positions in the landscape as Wyocena soils. Also included are small areas of Wyocena soils that have slopes of less than 12 percent. These included areas make up 10 to 15 percent of the unit.

Water and air move through this Wyocena soil at a moderately rapid rate in the subsoil and at a rapid rate in the substratum. Runoff from cultivated areas is medium or rapid. Reaction ranges from medium acid to slightly acid in the surface layer and subsoil. The available water capacity is moderate. Natural fertility is low. The organic matter content of the surface layer is moderately low. Roots of many crops are restricted by droughty sand.

Most areas of this soil are woodland or pasture. The potential is poor for cultivated crops and fair for hay, pasture, and trees. It is poor for most engineering uses.

This soil is generally unsuited to cultivated crops because of the severe erosion hazard. It is droughty and subject to soil blowing.

Using this soil as pasture reduces erosion and soil blowing. Pasture renovation, controlled grazing, and fertility management are needed to maintain a good plant cover.

This soil is suited to trees. Soil-related problems of forest management are associated with steepness of slope or plant encroachment following harvest. Contour planting of trees and careful location of skid roads during harvest will minimize erosion. Seedling survival on steeper slopes facing south or west can be increased by care in planting and use of vigorous planting stock. Competing vegetation that interferes with natural regeneration following harvest can be controlled by herbicide or mechanical removal. Skidding operations may expose enough mineral soil for adequate regeneration.

This soil is poorly suited to building site development because of slope. It is poorly suited to onsite waste disposal because of slope and seepage. The slope problem can be overcome by land leveling. Where septic tank absorption fields are built on leveled areas there is still a danger of pollution of ground water because of the rapid permeability in the substratum.

This soil is in capability subclass VIe and woodland suitability subclass 3r.

use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

crops and pasture

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

About 75,000 acres in Adams County was used for crops and pasture in 1976 according to preliminary data from the Wisconsin River Basin Cooperative Study. Of this total, about 50,000 acres was in row crops. About 28,000 acres of this was irrigated and used for snap beans, peas, sweet corn, potatoes, and field corn. About 5,000 acres was in small grain, about 15,000 acres was in hay and rotation pasture, and another 5,000 acres was native pasture or idle cropland.

The potential of the soils is good in Adams County for increased production of food. About 160,000 acres of potential irrigation land remains in woodland. Of this, about 50,000 acres also need drainage. Yields could also be increased by extending the latest crop production technology to all cropland in the county.

Soil blowing is the major soil problem on about 50 percent of the cropland and pasture in Adams County. Where the slope is more than 2 percent, *water erosion* also is a hazard.

Soil blowing and erosion are damaging in several ways. Productivity is reduced as the surface layer, particularly the organic matter, is lost and part of the subsoil is incorporated into the plow layer. Small plants are cut by blowing sand. Soil eroded from farmland enters streams as sediment and pollutes water intended for municipal use, for recreation, and for fish and wildlife.

Erosion control practices provide protective surface cover, increase the infiltration rate, and reduce runoff. Terraces and diversions, which shorten the slope, and contouring and contour stripcropping, however, are practical only on soils with smooth, uniform slopes. Most slopes in Adams County are so short and irregular that contour tillage or terracing is not practical. If minimum tillage is not used on these soils, cropping systems that provide substantial plant cover are necessary to control erosion.

Minimum tillage and leaving crop residue on the surface of the soil help to increase the infiltration rate, reduce the soil blowing and erosion hazards, and conserve soil moisture. These practices are adapted to most soils in the county.

Soil blowing is a hazard on the sandy soils such as Billett, Brems, Coloma, Delton, Meehan, Newson, and Plainfield soils and on the Adrian, Houghton, and Palms soils that formed in organic material. Soil blowing can damage these soils or the young plants in just a few hours if the winds are strong and the soil is dry and nearly bare of vegetation or surface mulch. Maintaining plant cover, surface mulch, wind stripcropping, and windbreaks minimizes soil blowing.

Information on the design of erosion control practices for each soil phase is contained in the Technical Guide at the local office of the Soil Conservation Service.

Soil drainage is a major management need on about 11 percent of the acreage used for crops and pasture in the county. Some soils are so naturally wet that it is not possible to grow the common crops on them unless they are drained. These are the very poorly drained and poorly drained soils such as Adrian, Houghton, Newson, Palms, Poygan, and Wautoma soils.

Unless drained, the somewhat poorly drained soils are so wet that crops are damaged during most years. In this category are soils such as Au Gres, Leola, Manawa, Meehan, and Wyeville soils.

The design of both surface and subsurface drainage varies with the soil phase and site conditions. A combination of surface drainage and subsurface drainage is needed in most areas of the poorly drained and very poorly drained soils that are used for intensive row cropping. Diversions are needed in some areas to divert runoff from adjacent slopes.

If organic soils are to be used for cropland, special management is necessary. Organic soils oxidize and subside when water is removed from the pore space and these pores fill with air. For these soils drainage systems are needed to control the depth and the period of drainage. Lowering the water table to a level that allows crop growth during the growing season and raising it to the surface during other times of the year minimizes the oxidation and subsidence of organic soils.

Information on drainage design for each soil phase is contained in the Technical Guide at the local office of the Soil Conservation Service.

Soil fertility is quite variable in the soils of Adams County, depending on the cropping history. All of the soils are naturally acid. If a soil has never been limed, it is likely to require applications of lime to raise the reaction pH to the desired level for the crop being grown. Natural levels of available potash are low in many soils of the county.

Addition of lime and fertilizer to any soil should be based on soil tests, the needs of the crops, and the desired level of yields. The Cooperative Extension Service can help determine the kinds and amounts of fertilizer and lime to apply.

Soil tilth is important in the germination of seeds, the emergence of seedlings, and the infiltration of water into the soil. Soils with good tilth are granular and porous.

Tilling or grazing when the soil is too wet can cause poor soil tilth, especially on soils with a silt loam or silty clay loam surface layer. Intense rainfall on bare soil can cause formation of a crust on the surface. This reduces infiltration and increases runoff and erosion. Good soil tilth is more difficult to maintain on eroded soils because they have a lower content of organic matter. Returning crop residues and the regular addition of manure help improve tilth.

General farm crops suited to most of the soils and to the climate of the county are limited unless irrigation is used. Corn and soybeans are commonly grown row crops. Oats are the most commonly grown small grain, and alfalfa-brome mixture is the most commonly grown species for hay and pasture. Bluegrass is the most common native pasture.

Vegetable crops grown commercially in the county include sweet corn, peas, snap beans, potatoes (fig. 8), cucumbers, and sunflowers. These crops are grown with irrigation. Most areas of the county have a plentiful water supply for irrigation, and the acreage of vegetables grown with irrigation is expanding rapidly.

yields per acre

The average yields per acre that can be expected of the principal nonirrigated crops under a high level of management are shown in table 4. The average yields per acre of the principal irrigated crops are shown in table 5. In any given year, yields may be higher or lower than those indicated in the tables because of variations in climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in tables 4 and 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

Figure 8.—Irrigated potatoes on Richford loamy sand, 0 to 2 percent slopes.

land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops (*11*). Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have slight limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIe-6.

The acreage of soils in each capability class and subclass is shown in table 6. The capability classification of each map unit is given in the section "Detailed soil map units."

woodland management and productivity

George W. Alley, forester, Soil Conservation Service, helped prepare this section.

Before agricultural settlement, most of Adams County was forested. Pine barrens covered most of the county except for a strip of oak savannah along the eastern border. The pine barrens were extensive sandy areas that supported jack pine and white pine, with some northern pin oak. The oak savannah was an open stand of northern pin oak, black oak, and white oak with an understory of prairie grasses and forbs. Small areas of prairie grassland, sedge meadows, lowland hardwood forest, and conifer swamp were scattered over the county (*13*).

At present about 60 percent of the land is forested. Of this wooded acreage, about 35 percent is conifer forest type; 29 percent is oak-hickory; 22 percent is aspen-birch; 7 percent is maple-beech-birch; 4 percent is elm-ash-cottonwood; and 3 percent is nonstocked (*16*).

Forestry products are important to the economy of the county. Pine pulpwood (fig. 9), hardwood pulpwood, and saw logs are the most important. Christmas trees, primarily Scotch pine, are grown and marketed rather extensively. The forests of Adams County also enhance the recreational value of the land to a large degree.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for

Figure 9.—Thinning a red pine plantation on Plainfield sand, 2 to 6 percent slopes. The thinning provides pulpwood and permits the remaining trees to grow larger.

each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, t, d, c, s, f, and r.

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *windthrow hazard* are based on soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that a few trees may be blown down by normal winds; *moderate*, that some trees will be blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suited to the soils and to commercial wood production.

Additional information about woodland management and productivity can be obtained from the Wisconsin Department of Natural Resources forester and the local office of the Soil Conservation Service or Cooperative Extension Service.

windbreaks and environmental plantings

Soil blowing is a serious problem on the extensive sandy soils of Adams County. To control blowing, many windbreaks were planted during the period 1940-1955 on soils that have a sandy surface layer, including the Plainfield, Brems, Okee, Coloma, Delton, and Wyeville soils. Most were three- and four-row plantings of red pine or eastern white pine. Occasionally a row was included of white spruce, Norway spruce, jack pine, or Scotch pine. Some of these windbreaks are now being removed to permit installation of center-pivot irrigation systems. Many are in need of renovation.

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, hold snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To insure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 8 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 8 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service, from a nursery, or from the Wisconsin Department of Natural Resources forester.

recreation

Adams County's lakes, streams, and woodlands have made the county a popular vacation ground for residents of southern Wisconsin and northern Illinois. Water-based recreation is especially important, and areas near the many lakes and streams are increasingly used for homesites and recreational facilities. Castle Rock Flowage and Petenwell Flowage are large lakes created by dams on the Wisconsin River. Lake Camelot, Lake Sherwood, and Fawn Lake are manmade lakes built specifically for summer home development. Because most of the soils in the county are sandy, many areas remain wooded and are appealing as building sites for both permanent and summer homes.

The large wooded areas attract many ruffed grouse hunters during bird season and many deer hunters during the bow and arrow and rifle seasons. A ski slope has been developed on the Boone-Rock outcrop areas north of Friendship. There is a golf course on an area of Delton and Plainfield soils west of Friendship. The county also has campgrounds and hiking trails. Winter sports include snowmobiling, cross-country skiing, and ice fishing.

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 9, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

wildlife habitat

Steve F. Baima, biologist, Soil Conservation Service, helped prepare this section.

Wildlife responds to good land management. Usually the population of adapted wildlife is in balance with the availability of essential habitat elements, including food, cover, and water. Soils directly affect the kind and amount of vegetation that is available as food and cover. Soils also affect the construction of ponds and other developments that provide water and wetland habitat elements.

The essential habitat elements generally depend on several kinds of soil and a combination of land uses. The diversity of wildlife is determined by the diversity of soils, land uses, and management.

In the following paragraphs, the seven map units on the General Soil Map are divided into four wildlife areas according to the species that inhabit the units and the potentials for wildlife habitat development. Wetland types in parentheses are those recognized by the U. S. Department of the Interior (*8*).

Wildlife area 1. The Coloma-Wyocena-Okee and the Plainfield-Brems map units make up this area. The soils range from moderately well drained to excessively drained.

Fifty-eight percent of the county is in this area. Woodland is the most common wildlife habitat in the area, but there is some open grassland. Jack pine, northern pin oak, black oak, and white oak are the predominant trees.

Of minor extent are somewhat poorly drained to very poorly drained soils that support adapted wetland plants. These soils are mostly in depressions and along drainageways, where they provide significant habitat diversity for the area. Many of the depressions and drainageways are wetlands, including fresh meadows (type 2), shrub swamps (type 6), and wooded swamps (type 7).

Upland wildlife predominate in wildlife area 1. White-tailed deer and ruffed grouse are the major game animals. Also common are gray and fox squirrels and cottontail rabbits. The gray and red fox are furbearers commonly in the area.

Wildlife area 2. The Kewaunee-Poygan map unit makes up this area. Kewaunee soils are well drained and Poygan soils are poorly drained.

This wildlife area covers only four percent of the county but provides significant wetland habitat found no other place in the county. This area is characterized by intensively cropped upland interspersed with numerous wetland depressions. Wet soils such as Poygan, Manawa, and Palms soils support wetlands of significant value to mallards, blue-winged teal, and wood ducks. More shallow fresh marshes (type 3), deep fresh marshes (type 4), and open fresh water (type 5) wetlands are in wildlife area 2 than all other areas in the county.

In addition to the waterfowl, deer and cottontail rabbits are major game animals. Muskrats and raccoon are principal wetland furbearers.

Wildlife area 3. The Meehan-Newson-Brems map unit makes up this area. The soils range from very poorly drained to moderately well drained.

Twenty-two percent of the county is in this area, which is characterized by wet woodlands. The woodlands are mixed, consisting of jack pine, aspen, northern pin oak, red maple, and paper birch. This habitat is excellent for deer and ruffed grouse. Fresh meadows (type 2), shrub swamps (type 6), and wooded swamps (type 7) are quite common. Large wetland acreages are associated with the state-owned Colburn Wildlife Area in the northwest corner of the county.

Upland wildlife predominate in wildlife area 3. White-tailed deer and ruffed grouse are the major game animals. Also common are gray and fox squirrels and cottontail rabbits. The gray and red fox are furbearers commonly in the area.

This area also supports a breeding population of sandhill cranes. The diversity of wetland and woodland makes wildlife area 3 the most productive area in the county for woodland-adapted wildlife.

Wildlife area 4. The Delton-Plainfield-Sisson, Plainfield-Richford-Billett, and Boone-Gale-Billett map units make up this area. The soils range from well drained to excessively drained.

Collectively, wildlife area 4 covers 16 percent of the county in three rather long and separate parcels. Land use is mixed; it includes intensive row cropping and irrigation, pasturing, woodland, and wildlife land. The Delton-Plainfield-Sisson map unit is the most intensively farmed unit and provides the least habitat diversity in the area. Wetlands are practically nonexistent throughout the area, but wildlife on the Boone-Gale-Billett map unit have direct access to the Wisconsin River and its associated wetlands and backwater areas.

Upland wildlife predominate in wildlife area 4. White-tailed deer and ruffed grouse are the major game animals. Also common are gray and fox squirrels and cottontail rabbits. The gray and red fox are furbearers commonly in the area.

In table 10, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, bluegrass, lovegrass, timothy, orchardgrass, bromegrass, clover, alfalfa, trefoil, and crownvetch.

Wild herbaceous plants are native or naturally established dryland grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, switchgrass, goldenrod, beggarweed, tickclover, and ragweed.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Coniferous plants furnish browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures (fig. 10). Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, cranes, shore birds, muskrat, mink, and beaver.

engineering

Peg. S. Whiteside, soil mechanics engineer, Soil Conservation Service, helped prepare this section.

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 feet of the

Figure 10.—Pond dug in Newson loamy sand to improve wildlife habitat.

surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

building site development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock, the available water capacity in the upper 40 inches, and the content of salts affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

sanitary facilities

Table 12 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 18 and 60 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock, and flooding affect absorption of the effluent. Large stones and bedrock interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope and bedrock can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation should be considered.

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 5 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

Table 13 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair, poor,* or *unsuited* as a source of these materials. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are used in great quantities in many kinds of construction. The ratings in table 13 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. Descriptions of grain size, kinds of minerals, reaction, and stratification are given in the soil series descriptions and in table 15.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 6 percent. They are naturally fertile or respond well to fertilizer and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel or stones, or soils that have slopes of 6 to 12 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 12 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

water management

Table 14 gives information on the soil properties that affect water management. The kind of soil limitations, if any, are given for pond reservoir areas; embankments, dikes, and levees; drainage; irrigation; terraces and diversions; and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are considered as a source of material for embankment fill. The descriptions apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ability of the natural soil to support an embankment is not considered. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock. The performance of a system is affected by the depth of the root zone, the amount of salts, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical pedons and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 18.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

engineering properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 18.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

physical and chemical properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility of soil to soil blowing and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.
2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control soil blowing are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to soil blowing.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 16, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

soil and water features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes are not considered flooding.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered is local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17. Only saturated zones within a depth of about 6 feet are indicated.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Depth to bedrock is shown for all soils that are underlain by bedrock at a depth of 5 feet or less. For many soils, the limited depth to bedrock is a part of the definition of the soil series. The depths shown are based on measurements made in many soil borings and on other observations during the mapping of the soils. The kind of bedrock and its hardness as related to ease of excavation is also shown. Rippable bedrock can be excavated with a single-tooth ripping attachment on a 200-horsepower tractor, but hard bedrock generally requires blasting.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence results from either dessication and shrinkage or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. Table 17 shows the expected total subsidence. This is the sum of initial subsidence, which usually is a result of drainage, and annual subsidence, which usually is a result of oxidation.

Not shown in the table is subsidence caused by an imposed surface load or by the withdrawal of ground water throughout an extensive area as a result of lowering the water table.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

engineering test data

Table 18 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are typical of the series, and some are described in the section "Soil series and their morphology." The soil samples were tested by the Wisconsin Department of Transportation, Division of Highways.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are: AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 423 (ASTM); Plasticity index—T 90 (AASHTO), D 424 (ASTM); Moisture density, Method A—T 99 (AASHTO), D 698 (ASTM).

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*10*). 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. In table 19, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten 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 Entisol.

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 Psamment (*Psamm*, meaning sandy, plus *ent*, from Entisol).

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 Udipsamments (*Ud*, meaning humid regions in midlatitude, plus *psamm*, the suborder of the Entisols that are sandy).

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 Udipsamments.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly 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, depth 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 sandy, mixed, mesic Typic Haplaquents.

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.

soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other 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 (*10*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*12*). 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 of each soil series are described in the section "Detailed soil map units."

Adrian series

The Adrian series consists of deep, very poorly drained, moderately rapidly permeable soils in depressions on outwash plains and glacial lake plains. The soils formed in organic material underlain by sandy outwash deposits. Slope ranges from 0 to 2 percent.

Adrian soils are similar to Houghton and Palms soils and are commonly adjacent to Newson soils in the landscape. Houghton soils have organic deposits more than 51 inches deep. Palms soils have organic deposits 16 to 51 inches deep over a loamy substratum. Newson soils are sandy throughout. These soils occupy positions in the landscape similar to Adrian soils.

Typical pedon of Adrian muck, 660 feet south and 150 feet east of the NW corner of section 17, T. 17 N., R. 5 E.

O1—0 to 3 inches; dark reddish brown (5YR 3/2) broken face and rubbed fibric material; about 95 percent fiber, 80 percent rubbed; massive; very strongly acid; abrupt smooth boundary.
Oa1—3 to 17 inches; black (10YR 2/1) broken faced and rubbed sapric material; about 15 percent fiber, 5 percent rubbed; moderate medium and fine granular structure; very strongly acid; clear wavy boundary.
Oa2—17 to 30 inches; very dark brown (10YR 2/2) broken faced and rubbed sapric material; about 30 percent fiber, 4 percent rubbed; weak coarse subangular blocky structure; strongly acid; clear wavy boundary.
Oa3—30 to 42 inches; very dark brown (10YR 2/2) broken faced and rubbed sapric material; about 20 percent fiber, 4 percent rubbed; weak coarse subangular blocky structure; medium acid; clear wavy boundary.
Oa4—42 to 45 inches; black (10YR 2/1) broken faced and rubbed sapric material; about 5 percent fiber, 1 percent rubbed; massive; about 15 percent fine sand; slightly acid; abrupt smooth boundary.
IIC—45 to 60 inches; grayish brown (10YR 5/2) sand; single grain; loose; slightly acid.

The thickness of the organic layers and depth to the sandy substratum ranges from 16 to 50 inches. Reaction in the organic layers ranges from very strongly acid to neutral and in the sandy substratum ranges from slightly acid to moderately alkaline.

The surface tier has chroma of 0 or 1. It is commonly sapric material. Some pedons, however, contain thin layers of fibric and hemic material. The subsurface and bottom tiers have hues of 10YR, 7.5YR, or 5YR; value of 2 or 3; and chroma of 0 to 3. They are primarily sapric material, but thin layers of hemic material are present in some pedons. The IIC horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 1 or 2.

Algansee series

The Algansee series consists of deep, somewhat poorly drained, rapidly permeable soils on flood plains. The soils formed in sandy alluvial deposits. Slope ranges from 0 to 3 percent.

Algansee soils are similar to Meehan soils and are commonly adjacent to Adrian soils, sandy Aquents, and Newson soils. Meehan soils are on outwash plains. Adrian soils are very poorly drained and have a muck layer 16 to 50 inches thick underlain by sand. Aquents, sandy, are poorly drained sandy soils. Newson soils have a darker A horizon and are poorly drained and very poorly drained. Adrian soils, sandy Aquents, and Newson soils are in depressions.

Typical pedon of Algansee loamy sand, 0 to 3 percent slopes, 2,440 feet south and 200 feet east of the NW corner of section 3, T. 15 N., R. 5 E.

A1—0 to 9 inches; dark brown (10YR 3/3) loamy sand, light brownish gray (10YR 6/2) dry; weak fine granular structure; very friable; neutral; abrupt wavy boundary.
C1—9 to 20 inches; strong brown (7.5YR 5/6) sand; many medium distinct yellowish red (5YR 4/8) mottles; single grain; loose; neutral; clear wavy boundary.
C2—20 to 32 inches; yellowish brown (10YR 5/4) sand; many fine prominent strong brown (7.5YR 5/8) and common medium distinct light brownish gray (10YR 6/2) mottles; single grain; loose; neutral; clear wavy boundary.
C3—32 to 60 inches; grayish brown (10YR 5/2) sand; single grain; loose; neutral.

The thickness of the A horizon, or the solum, ranges from 9 to 10 inches.

The A horizon has value of 3 or 4. Reaction in the A horizon and C horizon is medium acid to neutral.

Au Gres series

The Au Gres series consists of deep, somewhat poorly drained, rapidly permeable soils on outwash plains. The soils formed in sandy outwash deposits. Slope ranges from 0 to 2 percent.

Au Gres soils are adjacent to Adrian, Meehan, and Newson soils in the landscape. Adrian soils are very poorly drained organic soils that have muck 16 to 51 inches deep over sand. Meehan soils have no spodic horizon. Newson soils are poorly drained and very poorly drained and have no spodic horizon. Adrian and Newson soils are in depressions.

Typical pedon of Au Gres loamy sand, 2,200 feet west and 150 feet south of the NE corner of section 4, T. 19 N., R. 6 E.

A1—0 to 3 inches; black (10YR 2/1) loamy sand, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; common roots; strongly acid; abrupt smooth boundary.
A2—3 to 6 inches; brown (7.5YR 5/2) loamy sand; few medium prominent strong brown (7.5YR 5/8) mottles; weak medium subangular blocky structure; very friable; strongly acid; abrupt smooth boundary.
B21hir—6 to 13 inches; dark reddish brown (5YR 3/4) sand; few medium prominent yellowish red (5YR 5/8) mottles; weak medium subangular blocky structure; very friable; strongly acid; clear wavy boundary.
B22ir—13 to 25 inches; yellowish red (5YR 5/8) sand; many large distinct dark red (2.5YR 3/6) and many fine distinct yellowish red (5YR 4/6) mottles; weak

coarse subangular blocky structure; loose; strongly acid; clear wavy boundary.
B3—25 to 30 inches; strong brown (7.5YR 5/6) sand; few fine distinct yellowish red (5YR 5/8) mottles; single grain; loose; strongly acid; clear wavy boundary.
C1—30 to 40 inches; brown (7.5YR 5/4) sand; many medium prominent yellowish red (5YR 5/8) mottles; single grain; loose; strongly acid; clear wavy boundary.
C2—40 to 60 inches; yellowish brown (10YR 5/4) sand; common medium prominent strong brown (7.5YR 5/8) mottles; single grain; loose; strongly acid.

The solum ranges from 24 to 36 inches in thickness.

The A horizon has a hue of 10YR or 7.5YR, value of 2 to 6, and chroma of 1 or 2. The Bir horizons have a hue of 5YR or 7.5YR, value of 2 to 5, and chroma of 2 to 8. Reaction in the solum ranges from strongly acid to neutral. The C horizon ranges from strongly acid to neutral.

Billett series

The Billett series consists of deep, well drained soils on outwash plains. The soils formed in loamy and sandy outwash deposits. Permeability is moderately rapid through the subsoil and rapid through the substratum. Slope ranges from 0 to 3 percent.

Billett soils are adjacent to Plainfield and Richford soils in the landscape. Plainfield soils are sandy throughout. Richford soils have a sandy mantle 20 to 40 inches thick over a sandy loam subsoil. These soils occupy similar positions in the landscape as Billett soils.

Typical pedon of Billett sandy loam, 0 to 3 percent slopes, 1,320 feet west and 1,060 feet north of the SE corner of section 12, T. 14 N., R. 6 E.

Ap—0 to 8 inches; very dark brown (10YR 2/2) sandy loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; slightly acid; abrupt smooth boundary.
B1—8 to 15 inches; dark yellowish brown (10YR 4/4) sandy loam; weak coarse subangular blocky structure; friable; neutral; clear smooth boundary.
B2t—15 to 21 inches; dark brown (7.5YR 4/4) sandy loam; weak medium subangular blocky structure; friable; clay bridging of sand grains; neutral; clear smooth boundary.
B31—21 to 30 inches; dark yellowish brown (10YR 4/4) loamy sand; weak fine subangular blocky structure; very friable; estimated 5 percent pebbles; strongly acid; gradual wavy boundary.
B32—30 to 38 inches; dark brown (7.5YR 4/4) loamy sand; weak medium subangular blocky structure; very friable; estimated 4 percent pebbles; strongly acid; abrupt smooth boundary.
C—38 to 60 inches; yellowish brown (10YR 5/6) sand; single grain; loose; estimated 4 percent pebbles; slightly acid.

The solum ranges from 30 to 40 inches in thickness.

The A horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 to 3. The Bt horizon has hue of 10YR or 7.5YR and value and chroma of 4 to 6. It is dominantly loamy sand but is sandy loam in some pedons. The C horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 6 to 8. The reaction in the subsoil and substratum ranges from strongly acid to neutral.

Boone series

The Boone series consists of moderately deep, excessively drained, rapidly permeable soils on sandstone uplands. The soils formed in sandy residuum over weakly cemented sandstone. Slope ranges from 2 to 45 percent.

Boone soils are adjacent to Gale and Plainfield soils. Plainfield soils have no underlying sandstone bedrock and are lower in the landscape than the Boone soils. Gale soils have a mantle of loess and loamy material over sandstone and are typically higher than the Boone soils.

Typical pedon of Boone sand, 6 to 12 percent slopes, 150 feet south and 1,320 feet west of the center of section 2, T. 15 N., R. 5 E.

A1—0 to 3 inches; dark brown (10YR 3/3) sand, light brownish gray (10YR 6/2) dry; weak fine granular structure; very friable; very strongly acid; abrupt wavy boundary.
A2—3 to 4 inches; dark yellowish brown (10YR 3/4) sand; weak medium platy structure; very friable; very strongly acid; abrupt wavy boundary.
B1—4 to 7 inches; brown (7.5YR 4/4) sand; weak medium subangular blocky structure; very friable; strongly acid; clear wavy boundary.
B2—7 to 25 inches; strong brown (7.5YR 5/6) sand; weak coarse subangular blocky structure; very friable; strongly acid; clear wavy boundary.
C1—25 to 35 inches; strong brown (7.5YR 5/8) sand; single grain; loose; medium acid; clear smooth boundary.
C2—35 to 38 inches; strong brown (7.5YR 5/6) sand; single grain; loose; estimated 20 percent coarse sandstone fragments; medium acid; clear smooth boundary.
R—38 to 60 inches; yellowish red (5YR 4/8) indurated sandstone.

The thickness of the solum ranges from 15 to 25 inches. The depth to sandstone ranges from 20 to 40 inches.

The A horizon has chroma of 2 to 4. The B horizon has color value of 4 or 5 and chroma of 4 or 6. The C horizon has hue of 7.5YR or 10YR, value of 5 to 8, and chroma of 1 to 8. The reaction in the B horizon and C horizon ranges from strongly acid to neutral. The underlying sandstone ranges from weakly cemented to strongly cemented.

Brems series

The Brems series consists of deep, moderately well drained, rapidly permeable soils on outwash plains. The soils formed in sandy outwash deposits. Slope ranges from 0 to 3 percent.

Brems soils are similar to Meehan soils and are commonly adjacent to Meehan, Newson, and Plainfield soils. Meehan soils are somewhat poorly drained. Newson soils are poorly drained and very poorly drained and are in depressions. Plainfield soils are excessively drained and are higher than Brems soils.

Typical pedon of Brems loamy sand, 0 to 3 percent slopes, 30 feet west, 2,640 feet south of the NE corner of section 7, T. 19 N., R. 6 E.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) loamy sand, light brownish gray (10YR 5/2) dry; weak fine granular structure; very friable; strongly acid; abrupt smooth boundary.

A12—7 to 9 inches; dark yellowish brown (10YR 4/4) sand; weak fine granular structure; very friable; medium acid; abrupt smooth boundary.

B1—9 to 22 inches; yellowish brown (10YR 5/6) sand; few fine distinct strong brown (7.5YR 5/8) mottles; weak fine subangular blocky structure; very friable; strongly acid; clear wavy boundary.

B21—22 to 25 inches; strong brown (7.5YR 5/8) sand; few fine distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; very friable; strongly acid; clear wavy boundary.

B22—25 to 34 inches; strong brown (7.5YR 5/8) sand; common medium prominent light brownish gray (10YR 6/2) mottles; weak fine subangular blocky structure; very friable; very strongly acid; gradual wavy boundary.

B3—34 to 46 inches; strong brown (7.5YR 5/8) sand; common medium prominent light brownish gray (10YR 6/2) mottles; single grain; loose; very strongly acid; clear wavy boundary.

C—46 to 60 inches; yellowish brown (10YR 5/8) sand; common medium prominent light brownish gray (10YR 6/2) mottles; single grain; loose; very strongly acid.

The thickness of the solum ranges from 35 to 50 inches. The reaction is medium acid to very strongly acid in the B horizon and C horizon.

The Ap horizon has value of 3 to 5 and chroma of 2 or 3. The B2 horizon and C horizon have hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 to 8. Mottles with chroma of 2 or less are at depths between 25 to 40 inches.

Briggsville series

The Briggsville series consists of deep, well drained, moderately slowly permeable soils on glacial lake plains. The soils formed in silty and clayey lacustrine deposits. Slope ranges from 2 to 6 percent.

Briggsville soils are similar to Kewaunee soils and are commonly adjacent to Delton, Kibbie, and Sisson soils. Kewaunee soils are underlain by clayey glacial till. Delton soils have a sandy mantle 20 to 40 inches deep over loamy and clayey lacustrine deposits. They are typically higher than Briggsville soils in the landscape. Kibbie soils are somewhat poorly drained and are lower than Briggsville soils. Sisson soils are coarser throughout and are mostly between Briggsville soils and higher, sandier soils in the landscape.

Typical pedon of Briggsville silt loam, 2 to 6 percent slopes, 600 feet north, 100 feet east of the center of section 28, T. 16 N., R. 6 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; neutral; abrupt smooth boundary.

A2—9 to 12 inches; brown (10YR 4/3) silt loam; moderate thick platy structure; friable; neutral; abrupt wavy boundary.

B1—12 to 18 inches; reddish brown (5YR 4/4) silt loam; moderate medium subangular blocky structure; friable; neutral; clear wavy boundary.

B21t—18 to 25 inches; reddish brown (5YR 4/4) silty clay; strong fine angular blocky structure; firm; thick continuous clay films on faces of peds; neutral; clear wavy boundary.

B22t—25 to 31 inches; reddish brown (5YR 4/4) silty clay loam; strong medium subangular blocky structure; firm; thick continuous clay films on faces of peds; slightly acid; clear wavy boundary.

B3t—31 to 36 inches; yellowish red (5YR 4/8) silty clay loam; strong medium subangular blocky structure; firm; slightly acid; gradual wavy boundary.

C—36 to 60 inches; yellowish red (5YR 4/6) silty clay loam; massive; firm; slight effervescence; mildly alkaline.

The thickness of the solum ranges from 24 to 40 inches.

The A horizon has hue of 10YR or 7.5YR and chroma of 2 or 3. The B2t horizon has hue of 10YR, 7.5YR, or 5YR; value of 4 or 5; and chroma of 3 or 4. It is dominantly silty clay loam or silty clay, but thin subhorizons are silt loam. Reaction is strongly acid or neutral in the subsoil. The C horizon is dominantly silty clay loam but includes stratified silt loam, fine sandy loam, and loam. It is mildly alkaline or moderately alkaline.

Coloma series

The Coloma series consists of deep, somewhat excessively drained, rapidly permeable soils on outwash plains and moraines. The soils formed in sandy glacial till or outwash deposits. Slopes range from 2 to 25 percent.

Coloma soils are similar to Plainfield soils and adjacent to Okee and Wyocena soils in the landscape. Plainfield soils have no loamy sand lamellae. Okee soils formed in sandy deposits over a loamy subsoil and underlain by loamy sand or gravelly loamy sand glacial till. Wyocena soils have a sandy loam subsoil underlain by loamy sand or sand glacial till.

Typical pedon of Coloma sand, 6 to 12 percent slopes, 860 feet east and 30 feet north of the SW corner of section 16, T. 16 N., R. 7 E.

A1—0 to 2 inches; very dark gray (10YR 3/1) sand, grayish brown (10YR 5/2) dry; weak medium and fine granular structure; very friable; strongly acid; abrupt wavy boundary.

A21—2 to 6 inches; dark brown (7.5YR 4/4) sand; weak medium subangular blocky structure; very friable; strongly acid; clear wavy boundary.

A22—6 to 27 inches; yellowish brown (10YR 5/6) sand; weak fine subangular blocky structure; very friable; medium acid; clear wavy boundary.

A23—27 to 41 inches; dark brown (7.5YR 4/4) sand; weak fine subangular blocky structure; very friable; medium acid; clear wavy boundary.

A&B—41 to 55 inches; strong brown (7.5YR 5/6) sand (A); single grain; loose; neutral; yellowish red (5YR 5/6) loamy sand lamellae (B); lamellae are 1/8 to 1/4 inch thick; weak medium subangular blocky; very friable; slightly acid; gradual wavy boundary.

C—55 to 60 inches; strong brown (7.5YR 5/6) sand; single grain; loose; neutral.

The thickness of the solum ranges from 40 to 60 inches.

The A1 horizon has hue of 7.5YR or 10YR, value of 1 to 4, and value of 1 to 6. The A&B horizon has hue of 5YR, 7.5YR, or 10YR and chroma of 5 or 6. The C horizon has hue of 7.5YR or 10YR and chroma of 5 or 6. Reaction in the solum ranges from strongly acid to neutral. Reaction in the C horizon is slightly acid or neutral.

Delton series

The Delton series consists of deep, well drained soils on glacial lake plains and outwash plains. The soils formed in sandy deposits over clayey lacustrine deposits. Permeability is moderately rapid through the upper part of the subsoil and slow or very slow through the lower part of the subsoil and substratum. Slope ranges from 0 to 15 percent.

Delton soils are commonly adjacent to Plainfield, Sisson, and Wyeville soils in the landscape. Plainfield soils are sandy throughout. Sisson soils have finer texture in the upper part of the solum. Wyeville soils are somewhat poorly drained.

Typical pedon of Delton sand, 2 to 6 percent slopes, 1,900 feet west and 150 feet north of the SE corner of section 20, T. 18 N., R. 5 E.

Ap—0 to 10 inches; dark brown (10YR 3/3) sand, light brownish gray (10YR 6/2) dry; weak medium subangular blocky structure; very friable; neutral; abrupt smooth boundary.

A21—10 to 15 inches; dark brown (7.5YR 4/4) sand; weak medium subangular blocky structure; very friable; slightly acid; clear wavy boundary.

A22—15 to 28 inches; strong brown (7.5YR 5/6) sand; weak medium subangular blocky structure; very friable; slightly acid; clear wavy boundary.

IIB21t—28 to 34 inches; reddish brown (5YR 4/4) sandy loam; moderate medium subangular blocky structure; friable; few thin patchy clay films on faces of peds; medium acid; clear wavy boundary.

IIB22t—34 to 37 inches; reddish brown (5YR 4/4) silty clay loam; strong medium and fine subangular blocky structure; firm; thick continuous clay films on faces of peds; strongly acid; clear wavy boundary.

IIC—37 to 60 inches; reddish brown (5YR 4/4) silty clay; massive; firm; strongly acid.

The thickness of the solum ranges from 35 to 50 inches. Thickness of sandy deposits ranges from 20 to 40 inches.

The A horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2 to 6. The IIB2t horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 to 6. The IIC horizon has chroma of 4 to 6 and is silty clay or silty clay loam and averages 35 to 60 percent clay. In some pedons there is a sand or loamy sand IIIC horizon. Reaction in the subsoil and substratum ranges from strongly acid to medium acid.

Elkmound series

Elkmound series consist of shallow, well drained, moderately or moderately rapidly permeable soils on sandstone uplands. The soils formed in sandy and loamy deposits underlain by sandstone. Slope ranges from 2 to 6 percent. In Adams County, these soils have a surface layer that is darker and coarser than is defined for the series, but these differences do not alter their usefulness and behavior.

Elkmound soils are similar to Boone soils and are commonly adjacent to Plainfield soils in the landscape. Boone soils developed in sand over sandstone; depth to sandstone is greater than in Elkmound soils. Plainfield soils have a sand subsoil and substratum and are typically lower than Elkmound soils in the landscape.

Typical pedon of Elkmound loamy sand, 2 to 6 percent slopes, 1,200 feet east and 600 feet south of the NW corner of section 31, T. 16 N., R. 7 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loamy sand, dark grayish brown (10YR 4/2) dry; weak fine granular structure; very friable; estimated 4 percent sandstone fragments; medium acid; abrupt smooth boundary.

B1—9 to 13 inches; yellowish red (5YR 4/6) sandy loam; weak medium subangular blocky structure; very friable; estimated 4 percent sandstone fragments; strongly acid; clear smooth boundary.

B2t—13 to 17 inches; yellowish red (5YR 4/6) sandy loam; weak fine subangular blocky structure; very friable; clay bridging of sand grains; estimated 10 percent sandstone fragments; strongly acid; clear smooth boundary.

B3t—17 to 19 inches; yellowish red (5YR 4/8) channery sandy loam; weak medium subangular blocky structure; very friable; some clay bridging of sand grains; estimated 20 percent sandstone fragments; strongly acid; abrupt smooth boundary.

R—19 to 60 inches; reddish brown (5YR 4/4), reddish yellow (7.5YR 6/8), strong brown (7.5YR 5/6), and dark brown (7.5YR 4/4) partially weathered, platy sandstone.

The thickness of the solum ranges from 15 to 20 inches and commonly is the same as the depth to sandstone. The content of pebbles ranges from 2 to 20 percent in the solum.

The A horizon has hue of 7.5YR or 10YR and chroma of 2 to 4. The B2t horizon has hue of 5YR or 7.5YR and chroma of 4 to 8. It averages between 7 and 15 percent clay. Reaction in the B horizon is strongly acid or medium acid. The underlying sandstone ranges from weakly cemented to strongly cemented.

Fisk series

The Fisk series consist of deep, somewhat poorly drained, rapidly over moderately permeable soils on glacial lake plains and beaches. The soils formed in sandy and loamy deposits over silt loam, water-laid deposits. Slope ranges from 0 to 2 percent. In Adams County, these soils have no free carbonates and are more acid in the subsoil than is defined for the series, but these differences do not alter their usefulness and behavior.

Fisk soils are commonly adjacent to Meehan soils. Meehan soils are sandy throughout and are typically higher than the Fisk soils in the landscape.

Typical pedon of Fisk loamy sand, 600 feet north and 600 feet east of the SW corner of section 34, T. 19 N., R. 5 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loamy sand, light brownish gray (10YR 6/2) dry; weak medium subangular blocky structure parting to weak medium granular; very friable; common roots; slightly acid; abrupt smooth boundary.

B1—9 to 15 inches; pale brown (10YR 6/3) loamy fine sand; few medium prominent strong brown (7.5YR 5/6) and common fine prominent light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; very friable; medium acid; clear smooth boundary.

B21—15 to 22 inches; brown (10YR 5/3) sandy loam; many large prominent strong brown (7.5YR 5/6 and 7.5YR 5/8) and common fine faint light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; very friable; very strongly acid; clear smooth boundary.

B22—22 to 29 inches; light yellowish brown (10YR 6/4) fine sand; few medium prominent strong brown (7.5YR 5/8) mottles; weak medium subangular blocky structure; very friable; very strongly acid; clear smooth boundary.

B23—29 to 36 inches; mixed light brown (10YR 6/4) and strong brown (7.5YR 5/6 and 7.5YR 5/8) fine sand; weak medium subangular blocky structure; very friable; strongly acid; abrupt smooth boundary.

IIB24—36 to 42 inches; mixed pinkish gray (7.5YR 7/2) and strong brown (7.5YR 5/8) silt loam; many large prominent light reddish brown (5YR 6/4) mottles; weak fine subangular blocky structure; friable; strongly acid; clear smooth boundary.

IIC—42 to 60 inches; reddish brown (5YR 5/4) silt loam; few medium distinct light brownish gray (10YR 6/2) and common medium prominent strong brown (7.5YR 5/8) mottles; massive; friable; neutral.

The thickness of the solum ranges from 30 to 50 inches. The thickness of the sandy deposits ranges from 15 to 40 inches.

The A horizon has color value of 2 or 3 and chroma of 1 or 2. The B1 horizon has color value of 4 to 6 and chroma of 3 to 6. It is sand, fine sand, loamy sand, or loamy fine sand. The IIB2 horizon has hue of 2.5Y to 7.5YR, value of 5 to 7, and chroma of 2 to 8. Reaction in the B horizon and IIB horizon ranges from very strongly acid to neutral. The IIC horizon has hue of 5YR or 7.5YR, value of 4 to 6, and chroma of 2 to 6. Reaction in the IIC horizon ranges from medium acid to moderately alkaline.

Gale series

The Gale series consists of moderately deep, well drained soils on loess-covered sandstone uplands. The soils formed in loess and loamy deposits over sand weathered from the underlying sandstone. Permeability is moderate through the solum and moderately rapid or rapid through the substratum. Slope ranges from 2 to 12 percent.

Gale soils are similar to Tell soils and are commonly adjacent to Boone, Grays, and Sisson soils in the landscape. Tell soils formed in silty and loamy material underlain by sand. Boone soils formed in sand over sandstone. Grays soils have a darker surface layer, are silty throughout, and are underlain by strafitied silt and fine sand. Sisson soils are mostly loamy and are underlain by stratified silt and fine sand. All of these soils are generally lower than the Gale soils in the landscape.

Typical pedon of Gale silt loam, 2 to 6 percent slopes, 600 feet west and 1,950 feet north of the SE corner of section 28, T. 14 N., R. 6 E.

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; common roots; medium acid; abrupt smooth boundary.

B1—8 to 14 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; friable; medium acid; clear smooth boundary.

B21t—14 to 20 inches; brown (7.5YR 4/4) silty clay loam; moderate medium subangular blocky structure; friable; thin continuous clay films on faces of peds; strongly acid; clear wavy boundary.

B22t—20 to 26 inches; brown (7.5YR 4/4) silty clay loam; moderate medium and fine subangular blocky structure; friable; thin continuous clay films on faces of peds; strongly acid; clear smooth boundary.

IIB31t—26 to 29 inches; strong brown (7.5YR 5/6) loam; moderate medium and fine subangular blocky structure; friable; strongly acid; clear wavy boundary.

IIB32—29 to 31 inches; strong brown (7.5YR 5/6) sandy loam; weak fine subangular blocky structure; very friable; medium acid; abrupt smooth boundary.

IIC—31 to 38 inches; pink (7.5YR 7/4) sand; single grain; loose; medium acid; abrupt smooth boundary.

R—38 to 60 inches; reddish yellow (7.5YR 6/6) indurated sandstone.

The thickness of the solum ranges from 14 to 34 inches. Depth to sandstone ranges from 20 to 40 inches. Thickness of the argillic horizon ranges from 7 to 15 inches.

The A horizon has color value of 4 or 5 and chroma of 2 or 3. The B horizon and IIB horizon have hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. It is strongly acid to slightly acid. The IIC horizon has hue of 10YR or 7.5YR, value of 6 or 7, and chroma of 4 to 6. It is loamy sand or sand and medium acid or slightly acid. The underlying sandstone ranges from weakly cemented to strongly cemented.

Grays series

The Grays series consist of deep, well drained, moderately permeable soils on glacial lake plains. The soils formed in silty and loamy lacustrine deposits. Slope ranges from 2 to 12 percent. In Adams County, these soils are redder in the argillic horizons than is defined for the series, but this difference does not alter their usefulness and behavior.

Grays soils are similar to Sisson soils and commonly adjacent to Plainfield, Kibbie, and Sisson soils. Plainfield soils are sandy throughout. Kibbie soils are somewhat poorly drained and are in depressions and drainageways. Sisson soils have a lighter colored surface layer and are coarser in the solum than Grays soils. They are mostly on small knolls and rises.

Typical pedon of Grays silt loam, 2 to 6 percent slopes, 1,200 feet west and 600 feet north of the SE corner of section 10, T. 18 N., R. 5 E.

Ap—0 to 9 inches; very dark brown (10YR 2/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; neutral; abrupt smooth boundary.

A2—9 to 15 inches; yellowish brown (10YR 5/4) very fine sandy loam; moderate medium platy structure; friable; slight effervescence; moderately alkaline; clear smooth boundary.

B1—15 to 18 inches; dark brown (7.5YR 4/4) silt loam; moderate medium subangular blocky structure; friable; slight effervescence; moderately alkaline; clear smooth boundary.

B21t—18 to 26 inches; reddish brown (5YR 4/4) silty clay loam; moderate medium and fine subangular blocky structure; friable; thin continuous clay films on faces of peds; slightly acid; clear smooth boundary.

B22t—26 to 33 inches; reddish brown (5YR 4/4) silt loam; moderate medium subangular blocky structure; friable; thin continuous clay films on faces of peds; slightly acid; clear smooth boundary.

IIB3—33 to 39 inches; strong brown (7.5YR 5/6) silt loam; weak medium subangular blocky structure; friable; slightly acid; clear wavy boundary.

IIC1—39 to 50 inches; reddish brown (5YR 4/4) silt loam; massive; friable; neutral; abrupt wavy boundary.

IIC2—50 to 60 inches; brownish yellow (10YR 6/6) stratified silt and fine sand; massive and single grain; friable; neutral.

The thickness of the solum ranges from 20 to 40 inches. Thickness of the argillic horizon ranges from 10 to 15 inches.

The A horizon has color value of 2 or 3 and chroma of 1 or 2. The B2t horizon has color value of 4 or 5 and chroma of 4 or 6. It averages 25 to 35 percent clay. Reaction in the solum ranges from slightly acid to moderately alkaline. The IIC horizon has hue of 5YR, 7.5YR, or 10YR; value of 4 to 6; and chroma of 4 to 6. It is neutral or moderately alkaline.

Houghton series

The Houghton series consists of deep, very poorly drained, moderately rapidly permeable soils in depressions on glacial lake plains, outwash plains, and moraines. The soils formed chiefly in herbaceous organic material more than 51 inches thick. Slope ranges from 0 to 2 percent.

Houghton soils are similar to and adjacent to Adrian and Palms soils. Adrian soils have organic material 16 to 51 inches deep over sand. Palms soils have organic material 16 to 51 inches deep over loamy deposits.

Typical pedon of Houghton muck, 1,200 feet west and 300 feet south of the center of section 11, T. 20 N., R. 7 E.

Oa1—0 to 10 inches; black (10YR 2/1) broken face and rubbed sapric material; about 4 percent fiber, a trace rubbed; moderate coarse subangular blocky structure; medium acid; abrupt smooth boundary.

Oa2—10 to 15 inches; black (5YR 2/1) broken face and rubbed sapric material; about 5 percent fiber, a trace rubbed; moderate medium platy structure; medium acid; abrupt smooth boundary.

Oa3—15 to 20 inches; black (10YR 2/1) broken face and rubbed sapric material; about 10 percent fiber, a trace rubbed; massive; slightly acid; clear smooth boundary.

Oa4—20 to 36 inches; black (10YR 2/1) broken face and rubbed sapric material; about 15 percent fiber, a trace rubbed; moderate coarse prismatic structure; few woody fragments; medium acid; clear smooth boundary.

Oa5—36 to 48 inches; black (N 2/0) broken face and rubbed sapric material; about 15 percent fiber, a trace rubbed; weak medium subangular blocky structure; few woody fragments; medium acid; clear smooth boundary.

Oa6—48 to 55 inches; black (10YR 2/1) broken face and rubbed sapric material; about 10 percent fiber, 5 percent rubbed; weak medium subangular blocky structure; few woody fragments; medium acid; clear smooth boundary.

Oa7—55 to 60 inches; very dark brown (10YR 2/2) broken face and rubbed sapric material; about 25 percent fiber, 10 percent rubbed; weak medium subangular blocky structure; few woody fragments; medium acid.

The thickness of the organic layers is more than 51 inches.

The surface tier has hue of 10YR, 7.5YR, or 5YR; value of 2 or 3; and chroma of 0 to 3. It is dominantly sapric material but contains hemic layers.

The subsurface tier is similar in color to the surface tier. It is predominantly sapric material but has hemic materials which have a combined thickness of less than 10 inches and fabric material which has a combined thickness of less than 5 inches in some pedons. Reaction is medium acid or slightly acid throughout.

Kewaunee series

The Kewaunee series consists of deep, well drained, moderately slow or slowly permeable soils on ground moraines. The soils formed in a thin silty mantle and in reddish, clayey glacial till. Slope ranges from 2 to 20 percent.

Kewaunee soils are similar to Briggsville and are commonly adjacent to Manawa and Wyocena soils. Briggsville soils developed in silt loam and silty clay loam lacustrine sediment and are lower than Kewaunee soils in the landscape. Manawa soils are somewhat poorly drained and are on foot slopes and in depressions. Wyocena soils have less clay and more sand, are underlain by sandy glacial till, and occupy ridges and knolls.

Typical pedon of Kewaunee silt loam, 2 to 6 percent slopes, 900 feet west and 150 feet north of the SE corner of section 16, T. 14 N., R. 7 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium subangular blocky structure; friable; common roots; medium acid; abrupt smooth boundary.

A2—9 to 11 inches; brown (10YR 5/3) silt loam; moderate medium platy structure; friable; slightly acid; clear wavy boundary.

B1—11 to 14 inches; brown (7.5YR 4/4) silty clay loam; moderate fine subangular blocky structure; friable; neutral; clear wavy boundary.

B21t—14 to 19 inches; reddish brown (5YR 4/4) silty clay; strong fine angular blocky structure; firm; thin continuous clay films on faces of peds; neutral; gradual wavy boundary.

B22t—19 to 32 inches; reddish brown (5YR 4/4) silty clay; strong medium and fine angular blocky structure; firm; thick continuous clay films on faces of peds; slightly acid; gradual wavy boundary.

B3t—32 to 36 inches; reddish brown (2.5YR 4/4) silty clay; strong medium subangular blocky structure; firm; thin patchy clay films on faces of peds; slightly acid; gradual wavy boundary.

C1—36 to 48 inches; reddish brown (2.5YR 4/4) silty clay; massive; firm; slight effervescence; mildly alkaline; gradual wavy boundary.

C2—48 to 60 inches; reddish brown (5YR 5/4) silty clay; massive; firm; strong effervescence; moderately alkaline.

The solum ranges from 20 to 40 inches in thickness. The argillic horizon ranges from 17 to 27 inches in thickness.

The A horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2 to 4. The B2t horizon has hue of 7.5YR or 5YR, value of 3 to 5, and chroma of 3 or 4. It is silty clay or silty clay loam. Thin subhorizons are loam. Reaction in the solum ranges from medium acid to neutral. The C horizon has colors similar to the Bt horizon but also has hue of 2.5YR. It is clay loam, silty clay loam, or silty clay. Reaction ranges from neutral to moderately alkaline. The content of cobbles and stones ranges from 0 to 5 percent in the B and C horizons.

Kibbie series

The Kibbie series consists of deep, somewhat poorly drained, moderately permeable soils on glacial lake plains and outwash plains. The soils formed in silty lacustrine deposits. Slope ranges from 0 to 3 percent. In Adams County, these soils are redder in the argillic horizon and substratum than is defined for the series, but this difference does not alter their usefulness and behavior.

Kibbie soils are similar to Manawa soils and are commonly adjacent to Grays and Sisson soils. Manawa soils have finer textures in the subsoil and substratum. Grays and Sisson soils are well drained and are generally higher than Kibbie soils in the landscape.

Typical pedon of Kibbie silt loam, 0 to 3 percent slopes, 300 feet west and 150 feet south of the NE corner of section 21, T. 16 N., R. 7 E.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; moderate fine granular structure; friable; slightly acid; abrupt smooth boundary.

A2—9 to 12 inches; grayish brown (10YR 5/2) silt loam; few fine prominent strong brown (7.5YR 5/8) mottles; moderate fine granular structure; friable; neutral; clear smooth boundary.

B1—12 to 16 inches; dark brown (7.5YR 4/4) silt loam; few fine distinct strong brown (7.5YR 5/6) mottles; moderate fine subangular blocky structure; friable; neutral; clear wavy boundary.

B21t—16 to 19 inches; dark brown (7.5YR 4/4) silt loam; common fine distinct strong brown (7.5YR 5/6) mottles; moderate fine subangular blocky structure; friable; clay films on faces of peds; neutral; clear wavy boundary.

B22t—19 to 24 inches; dark yellowish brown (10YR 4/4) silty clay loam; common medium distinct light brownish gray (10YR 6/2) and strong brown (7.5YR 5/6) mottles; common medium prominent strong brown (7.5YR 5/8) mottles; moderate fine subangular blocky structure; firm; clay films on faces of peds; neutral; clear wavy boundary.

B3—24 to 35 inches; mixed reddish brown (5YR 5/4), yellowish brown (10YR 5/6), and light gray (10YR 7/1) silty clay loam; moderate medium subangular blocky structure; firm; slight effervescence; mildly alkaline; clear wavy boundary.

C—35 to 60 inches; light reddish brown (5YR 6/4) silty clay loam; massive; firm; slight effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates ranges from 30 to 40 inches. Thickness of the argillic horizon ranges from 7 to 10 inches.

The Ap horizon has color value of 2 or 3 and chroma of 1 or 2. The B2 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is slightly acid or neutral. The C horizon is silty clay loam or silt loam with bands of silt and fine sand in some pedons. It is neutral or mildly alkaline.

Leola series

The Leola series consists of deep, somewhat poorly drained soils on outwash plains. The soils formed in sandy and loamy deposits over sandy outwash deposits. Permeability is moderately rapid through the subsoil and rapid through the substratum. Slope ranges from 0 to 2 percent.

Leola soils are similar to Richford soils and are commonly adjacent to Brems, Meehan, and Newson soils. Richford soils are well drained and somewhat excessively drained. The moderately well drained Brems, somewhat poorly drained Meehan, and the poorly drained and very poorly drained Newson soils are sandy throughout. Brems soils are generally higher than Leola soils in the landscape and Meehan and Newson soils are generally lower than Leola soils in the landscape.

Typical pedon of Leola loamy sand, 1,500 feet south and 500 feet west of the NE corner of section 13, T. 20 N., R. 7 E.

Ap—0 to 9 inches; very dark gray (10YR 3/1) loamy sand, dark grayish brown (10YR 4/2) dry; weak medium subangular blocky structure; very friable; medium acid; abrupt smooth boundary.

A2—9 to 21 inches; brown (10YR 4/3) sand; common medium prominent brownish yellow (10YR 6/8) mottles; weak fine subangular blocky structure; very friable; medium acid; abrupt smooth boundary.

B2t—21 to 29 inches; brown (10YR 4/3) sandy loam; few medium distinct light brownish gray (10YR 6/2) and many coarse prominent brownish yellow (10YR 6/8) mottles; moderate medium subangular blocky structure; friable; clay bridging of sand grains; medium acid; clear smooth boundary.

B3t—29 to 34 inches; brown (10YR 4/3) loamy sand; few medium faint grayish brown (10YR 5/2) and many medium prominent yellowish brown (10YR 5/8) and brownish yellow (10YR 6/8) mottles; weak medium subangular blocky structure; very friable; weak clay bridging of sand grains; neutral; clear smooth boundary.

C1—34 to 40 inches; dark grayish brown (10YR 4/2) sand; many medium prominent yellowish brown (10YR 5/8) mottles; single grain; loose; mildly alkaline; clear smooth boundary.

C2—40 to 60 inches; grayish brown (10YR 5/2) sand; single grain; loose; mildly alkaline.

The thickness of the solum ranges from 30 to 50 inches. The argillic horizon ranges from 5 to 17 inches in thickness.

The A horizon has color value of 2 or 3 and chroma of 1 or 2. The Bt horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 to 8. Reaction is strongly acid to neutral. The C horizon has color value of 4 to 6 and chroma of 1 to 3. It is medium acid to mildly alkaline.

Manawa series

The Manawa series consists of deep, somewhat poorly drained, slowly permeable soils on ground moraines. The soils formed in thin loess over silty clay loam and silty clay glacial till. Slope ranges from 0 to 3 percent.

Manawa soils are similar and adjacent to the well drained Kewaunee and the poorly drained Poygan soils. Kewaunee soils are on steeper slopes and are typically higher in the landscape than Manawa soils. Poygan soils are in drainageways and depressions and are lower than Manawa soils.

Typical pedon of Manawa silt loam, 0 to 3 percent slopes, 600 feet south and 600 feet west of the center of section 34, T. 14 N., R. 7 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate coarse subangular blocky structure; friable; slightly acid; abrupt smooth boundary.

A2—9 to 13 inches; brown (10YR 5/3) silt loam; few fine prominent yellowish brown (10YR 5/8) mottles; moderate medium platy structure; friable; slightly acid; abrupt wavy boundary.

B21t—13 to 17 inches; reddish brown (5YR 4/4) silty clay loam; few fine prominent strong brown (7.5YR 5/8) and few medium distinct brown (7.5YR 5/2) mottles; moderate medium subangular blocky structure; firm; thick continuous clay films on faces of peds; estimated 5 percent pebbles; slightly acid; clear wavy boundary.

B22t—17 to 21 inches; reddish brown (5YR 4/3) silty clay; common medium prominent strong brown (7.5YR 5/6) and few fine faint reddish gray (5YR 5/2) mottles; strong medium angular blocky structure; firm; thick continuous clay films on faces of peds; estimated 10 percent pebbles; neutral; clear wavy boundary.

B23t—21 to 30 inches; reddish brown (5YR 4/3) silty clay; common medium prominent strong brown (7.5YR 5/6) mottles and common medium distinct brown (7.5YR 5/2) and pinkish gray (7.5YR 6/2) mottles; strong medium angular blocky structure; firm; thick continuous clay films on faces of peds; estimated 5 percent pebbles; neutral; clear wavy boundary.

C—30 to 60 inches; reddish brown (5YR 4/4) silty clay; common medium distinct strong brown (7.5YR 5/6) and pinkish gray (7.5YR 6/2) mottles; massive; firm; estimated 4 percent pebbles; slight effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates range from 20 to 40 inches. Thickness of the argillic horizon ranges from 14 to 17 inches.

The Ap horizon has color value of 2 or 3 and chroma of 1 or 2. The B2 horizon has color value of 4 or 5 and chroma of 3 or 4. It is silty clay, clay, or silty clay loam. Reaction is slightly acid or neutral. The C horizon is silty clay or clay. It is mildly alkaline or moderately alkaline.

Meehan series

The Meehan series consists of deep, somewhat poorly drained, rapidly permeable soils on outwash plains. The soils formed in sandy outwash deposits. Slope ranges from 0 to 3 percent.

Meehan soils are similar to Brems soils and are commonly adjacent to Au Gres and Newson soils. Brems soils are moderately well drained and are generally higher than Meehan soils in the landscape. Au Gres soils are somewhat poorly drained, have a spodic horizon, and occupy positions similar to Meehan soils. Newson soils are poorly drained and very poorly drained and are in depressions and drainageways.

Typical pedon of Meehan loamy sand, 0 to 3 percent slopes, 1,950 feet south and 120 feet east of the center of section 7, T. 20 N., R. 7 E.

Ap—0 to 8 inches; black (10YR 2/1) loamy sand, dark grayish brown (10YR 4/2) dry; granular structure; very friable; medium acid; abrupt smooth boundary.

A2—8 to 15 inches; brown (10YR 5/3) sand; few fine prominent yellowish brown (10YR 5/8) mottles; single grain; loose; slightly acid; clear wavy boundary.

B21—15 to 25 inches; mixed gray (10YR 6/1) and pale brown (10YR 6/3) sand; few fine prominent yellowish brown (10YR 5/8) mottles; single grain; loose; slightly acid; clear wavy boundary.

B22—25 to 36 inches; light brownish gray (10YR 6/2) sand; few fine prominent brownish yellow (10YR 6/8) mottles; single grain; loose; slightly acid; clear wavy boundary.

C—36 to 60 inches; light gray (10YR 7/2) sand; single grain; loose; slightly acid.

The thickness of the solum ranges from 24 to 48 inches.

The Ap horizon has color value of 2 or 3 and chroma of 1 or 2. The B horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 1 to 6. Reaction ranges from strongly acid to slightly acid. The C horizon has hue of 10YR or 7.5YR, value of 4 to 7, and chroma of 2 or 4. It is slightly acid to neutral.

Newson series

The Newson series consists of deep, poorly drained and very poorly drained, rapidly permeable soils on outwash plains, glacial lake plains, and stream terraces. The soils formed in sandy outwash deposits or alluvial deposits. Slope ranges from 0 to 2 percent.

Newson soils are similar to Adrian soils and are commonly adjacent to Meehan and Au Gres soils in the landscape. Adrian soils have organic deposits 16 to 51 inches deep over sand. Meehan soils are somewhat poorly drained and are higher than Newson soils in the landscape. Au Gres soils are somewhat poorly drained, have a spodic horizon, and are higher in the landscape.

Typical pedon of Newson loamy sand, 1,290 feet south and 990 feet west of the NE corner of section 19, T. 19 N., R. 5 E.

A1—0 to 8 inches; black (10YR 2/1) loamy sand, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; very friable; medium acid; abrupt smooth boundary.

B21g—8 to 17 inches; dark gray (10YR 4/1) loamy sand; weak medium subangular blocky structure; very friable; medium acid; abrupt wavy boundary.

B22g—17 to 24 inches; dark grayish brown (10YR 4/2) sand; weak medium subangular blocky structure; very friable; medium acid; clear wavy boundary.

B3—24 to 28 inches; grayish brown (2.5Y 5/2) sand; single grain; loose; medium acid; clear wavy boundary.

C—28 to 60 inches; brown (10YR 5/3) sand; single grain; loose; medium acid.

The thickness of the solum ranges from 20 to 40 inches.

The A horizon has color value of 2 or 3 and chroma of 1 or 2. The B2g horizon has color value of 4 or 5 and chroma of 1 or 2. Reaction is medium acid or slightly acid. The C horizon has color value of 5 to 7. It is strongly acid or medium acid.

Okee series

The Okee series consists of deep, well drained and somewhat excessively drained, moderately permeable soils on moraines. The soils formed in sandy and loamy deposits over sandy glacial till. Slope ranges from 2 to 25 percent.

Okee soils are similar to Richford soils and are commonly adjacent to Coloma and Wyocena soils in the landscape. Richford soils are underlain by sandy outwash. Coloma soils are sandy throughout and are generally lower than Okee soils in the landscape. Wyocena soils have a thinner sandy mantle over the argillic horizon and are generally higher than Okee soils in the landscape.

Typical pedon of Okee loamy sand, 2 to 6 percent slopes, 900 feet east and 900 feet south of the center of section 9, T. 16 N., R. 7 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) loamy sand, light brownish gray (10YR 6/2) dry; weak fine and medium granular structure; very friable; medium acid; abrupt smooth boundary.

A2—8 to 26 inches; yellowish brown (10YR 5/4) sand; weak fine and medium subangular blocky structure; very friable; medium acid; clear wavy boundary.

IIB2t—26 to 38 inches; yellowish red (5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; firm; many thin clay films on faces of peds; estimated 7 percent pebbles; slightly acid; clear wavy boundary.

IIB31t—38 to 42 inches; yellowish red (5YR 4/6) sandy loam; weak fine and medium subangular blocky structure; friable; few thin clay films on faces of peds; estimated 7 percent pebbles; slightly acid; clear wavy boundary.

IIB32—42 to 49 inches; strong brown (7.5YR 5/6) loamy sand; weak fine and medium subangular blocky structure; friable; about 8 percent pebbles and cobbles; neutral; gradual wavy boundary.

IIC—49 to 60 inches; strong brown (7.5YR 5/6) loamy sand; single grain; loose; estimated 10 percent pebbles and cobbles; slight effervescence; mildly alkaline.

The thickness of the solum ranges from 30 to 50 inches. Thickness of the argillic horizon ranges from 6 to 16 inches. The thickness of the sandy mantle ranges from 24 to 40 inches.

The Ap or A1 horizon has color value and chroma of 2 to 4. The A2 horizon has color value of 4 to 6 and chroma of 4 to 5. It is sand or loamy sand. The IIB2t horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 4 to 8. It is slightly acid or neutral. The IIC horizon is similar in color to the B horizon. It is mildly alkaline or moderately alkaline. It is loamy sand or gravelly loamy sand. Coarse fragments make up 5 to 20 percent of the solum and substratum.

Palms series

The Palms series consists of deep, very poorly drained soils in depressions on glacial lake plains and moraines. The soils formed in organic material underlain by loamy deposits. Permeability is moderate or moderately slow. Slope ranges from 0 to 2 percent.

Palms soils are similar to Adrian soils and are commonly adjacent to Manawa and Poygan soils in the landscape. Adrian soils have organic deposits 16 to 51 inches thick underlain by sand. The somewhat poorly drained Manawa and poorly drained Poygan soils formed primarily in clayey deposits.

Typical pedon of Palms muck, 1,230 feet north and 150 feet east of the SW corner of section 13, T. 14 N., R. 7 E.

Oa1—0 to 8 inches; black (10YR 2/1) broken face and rubbed sapric material; about 5 percent fiber, less than 5 percent rubbed; moderate medium and fine granular structure; primarily herbaceous fibers; neutral; abrupt smooth boundary.

Oa2—8 to 18 inches; black (10YR 2/1) broken face and rubbed sapric material; about 3 percent fiber, a trace rubbed; moderate medium and thick platy structure; primarily herbaceous fibers; neutral; abrupt wavy boundary.

Oa3—18 to 36 inches; black (10YR 2/1) broken face and rubbed sapric material; about 3 percent fiber, a trace rubbed; moderate coarse subangular blocky structure; primarily herbaceous fibers; neutral; abrupt smooth boundary.

IIC—36 to 60 inches; grayish brown (10YR 5/2) silt loam; massive; friable; neutral.

The thickness of the organic layers and depth to the loamy substratum ranges from 16 to 30 inches.

The surface and subsurface tiers have chroma of 1 or 2. They are predominantly sapric but contain thin hemic layers. The IIC horizon has color value of 4 to 6 and chroma of 1 or 2. It is silt loam, loam, or clay loam.

Plainfield series

The Plainfield series consist of deep, excessively drained, rapidly permeable soils on outwash plains, stream terraces, and ground moraines. The soils formed in sandy outwash deposits. Slope ranges from 0 to 35 percent.

Plainfield soils are similar to Coloma and Richford soils and are commonly near Brems and Meehan soils. Coloma soils have a B horizon that consists of lamellae of loamy sand. Richford soils have a sandy loam Bt horizon. Brems soils are moderately well drained. Meehan soils are somewhat poorly drained and are in depressions and drainageways.

Typical pedon of Plainfield sand, 2 to 6 percent slopes, 600 feet west and 200 feet north of the SE corner of section 14, T. 20 N., R. 5 E.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) sand, light brownish gray (10YR 6/2) dry; weak fine granular structure; very friable; very strongly acid; abrupt smooth boundary.

B1—4 to 7 inches; dark yellowish brown (10YR 4/4) sand; weak fine subangular blocky structure; very friable; strongly acid; clear wavy boundary.

B2—7 to 17 inches; strong brown (7.5YR 5/6) sand; weak medium subangular blocky structure; very friable; strongly acid; clear wavy boundary.

B3—17 to 28 inches; yellowish brown (10YR 5/6) sand; weak medium subangular blocky structure; very friable; medium acid; clear wavy boundary.

C—28 to 60 inches; yellowish brown (10YR 5/6) sand; single grain; loose; strongly acid.

The thickness of the solum ranges from 20 to 34 inches.

The A horizon has color value of 2 to 4 and chroma of 2 or 3. The B horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. The C horizon has hue of 10YR or 7.5YR, value of 5 to 7, and chroma of 4 to 6. The B horizon and C horizon are strongly acid or medium acid.

Poygan series

The Poygan series consists of deep, poorly drained, slowly permeable soils on ground moraines and glacial lake plains. The soils formed in silty and clayey glacial till or lacustrine deposits. Slope ranges from 0 to 2 percent. In Adams County, these soils have free carbonates at a shallower depth than is defined for the series and have no mottles in the lower part of the mollic epipedon or in the subhorizon immediately below the mollic epipedon. These differences do not alter their usefulness and behavior.

Poygan soils are similar to Manawa soils and are commonly adjacent to Manawa and Palms soils. Manawa soils are somewhat poorly drained and are generally higher than Poygan soils in the landscape. Palms soils have organic deposits 16 to 51 inches thick over a loamy substratum and are generally lower than Poygan soils in the landscape.

Typical pedon of Poygan silty clay loam, 400 feet east and 2,640 feet south of the NW corner of section 23, T. 14 N., R. 7 E.

Ap—0 to 9 inches; black (N 2/0) silty clay loam, dark gray (10YR 4/1) dry; weak coarse subangular blocky structure parting to moderate medium and fine granular; friable; neutral; abrupt smooth boundary.

B21g—9 to 13 inches; grayish brown (2.5Y 5/2) silty clay; moderate medium subangular blocky structure; firm; black (N 2/0) organic coatings in root channels; moderately alkaline; clear wavy boundary.

B22g—13 to 18 inches; olive gray (5Y 5/2) silty clay; common medium prominent yellowish red (5YR 5/6) mottles; moderate fine subangular blocky structure; firm; strong effervescence; moderately alkaline; clear wavy boundary.

B23—18 to 24 inches; reddish brown (5YR 5/4) silty clay; common medium prominent olive gray (5Y 5/2) mottles; moderate fine subangular blocky structure; firm; strong effervescence; moderately alkaline; gradual wavy boundary.

C—24 to 60 inches; reddish brown (5YR 5/4) silty clay; many medium and coarse olive gray (5Y 5/2) mottles; massive; very firm; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 20 to 27 inches. Depth to free carbonates ranges from 20 to 36 inches.

The Ap or A1 horizon is neutral or has hue of 10YR, value of 2 or 3, and chroma of 0 to 1 or is neutral. The B2g horizon has hue of 2.5Y or 5Y, value of 3 to 5, and chroma of 0 to 2. It is silty clay or clay and averages between 35 to 60 percent clay. The C horizon has hue of 5YR or 2.5YR. It is silty clay or clay. Reaction of the B horizon and C horizon ranges from slightly acid to moderately alkaline.

Richford series

The Richford series consists of deep, well drained and somewhat excessively drained soils on outwash plains. The soils formed in sandy and loamy deposits and in the underlying sandy outwash deposits. Permeability is moderately rapid through the subsoil and rapid through the substratum. Slope ranges from 0 to 12 percent.

Richford soils are similar to Okee soils and are commonly adjacent to Billett and Plainfield soils in the landscape. Okee soils are underlain by loamy sand or gravelly loamy sand glacial till. Billett soils have a darker and finer textured surface layer. Plainfield soils are sandy throughout and occupy similar positions in the landscape as Richford soils.

Typical pedon of Richford loamy sand, 2 to 6 percent slopes, 790 feet south and 10 feet west of the NE corner of section 10, T. 16 N., R. 7 E.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) loamy sand, light brownish gray (10YR 6/2) dry; weak medium granular structure; very friable; medium acid; abrupt smooth boundary.

A21—7 to 15 inches; dark brown (7.5YR 4/4) loamy sand; weak medium subangular blocky structure; very friable; estimated 5 percent pebbles; medium acid; clear wavy boundary.

A22—15 to 21 inches; yellowish brown (10YR 5/4) sand; weak fine subangular blocky structure; very friable; strongly acid; clear wavy boundary.

A23—21 to 31 inches; strong brown (7.5YR 5/6) loamy sand; weak medium subangular blocky structure; very friable; strongly acid; clear wavy boundary.

B2t—31 to 39 inches; strong brown (7.5YR 5/6) sandy loam; weak medium subangular blocky structure; friable; few thin clay coatings and clay bridging of sand grains; estimated 5 percent pebbles; strongly acid; clear wavy boundary.

B3t—39 to 45 inches; dark yellowish brown (10YR 4/4) loamy sand; weak medium subangular blocky structure; very friable; clay bridging of sand grains; estimated 5 percent pebbles; strongly acid; clear wavy boundary.

C—45 to 60 inches; strong brown (7.5YR 5/6) sand; single grain; loose; estimated 5 percent pebbles; strongly acid.

The solum ranges from 30 to 50 inches in thickness. The thickness of the sandy mantle ranges from 20 to 35 inches. Thickness of the argillic horizon ranges from 10 to 16 inches.

The Ap horizon has color value and chroma of 2 or 3. The A2 horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. The B2t horizon ranges from 5 to 8 inches in thickness and has color value of 4 or 5 and chroma of 4 to 6. It averages between 6 to 12 percent clay. Reaction is strongly acid to slightly acid. The C horizon has hue of 7.5YR or 10YR and value of 5 or 6. Reaction ranges from strongly acid to mildly alkaline. Content of pebbles ranges from 5 to 15 percent in the subsoil and substratum.

Sisson series

The Sisson series consists of deep, well drained, moderately permeable soils on glacial lake plains. The soils formed in loamy deposits underlain by stratified silt and fine sand lacustrine deposits. Slope ranges from 2 to 6 percent.

Sisson soils are similar to Grays soils and are commonly adjacent to Plainfield soils. Grays soils have finer textures in the solum. Plainfield soils are sandy throughout.

Typical pedon of Sisson fine sandy loam, 2 to 6 percent slopes, 125 feet south and 2,250 feet west of the NE corner of section 17, T. 18 N., R. 5 E.

Ap—0 to 8 inches; dark brown (10YR 4/3) fine sandy loam, pale brown (10YR 6/3) dry; moderate medium subangular blocky structure; friable; slightly acid; abrupt smooth boundary.

A2—8 to 11 inches; brown (10YR 5/3) fine sandy loam; moderate medium platy structure; friable; medium acid; abrupt wavy boundary.

B1—11 to 16 inches; dark brown (7.5YR 4/4) fine sandy loam; moderate medium subangular blocky structure; friable; medium acid; clear wavy boundary.

B21t—16 to 20 inches; reddish brown (5YR 4/4) silt loam; moderate medium and fine subangular blocky structure; friable; clay films on faces of peds; strongly acid; clear wavy boundary.

B22t—20 to 32 inches; reddish brown (5YR 4/4) silt loam; moderate medium and fine subangular blocky structure; friable; clay films on faces of peds; strongly acid; clear wavy boundary.

B3—32 to 36 inches; reddish brown (5YR 4/4) silt loam; moderate medium subangular blocky structure; friable; strongly acid; clear wavy boundary.

C—36 to 60 inches; reddish brown (5YR 4/4) stratified silt and fine sand; massive; friable; medium acid.

The thickness of the solum ranges from 24 to 42 inches. The thickness of the argillic horizon ranges from 9 to 16 inches.

The Ap horizon has color value of 4 or 5 and chroma of 2 or 3. The B2 horizon has hue of 7.5YR or 5YR and value of 4 or 5. It averages 18 to 25 percent clay. Reaction is strongly acid or medium acid. The C horizon has hue of 5YR or 7.5YR, value of 4 to 6, and chroma of 2 to 4. Reaction is medium acid or slightly acid.

Sparta series

The Sparta series consists of deep, excessively drained, rapidly permeable soils on outwash plains and stream terraces. The soils formed in sandy deposits. Slope ranges from 0 to 3 percent.

Sparta soils are similar to Brems and Plainfield soils and are commonly adjacent to Billett and Plainfield soils. Brems and Plainfield soils have lighter-colored or dark and thinner surface layers. Brems soils are moderately well drained. Billett soils have a sandy loam argillic horizon. All of these soils occupy similar positions in the landscape as Sparta soils.

Typical pedon of Sparta loamy sand, 0 to 3 percent slopes, 150 feet north and 150 feet west of the center of section 12, T. 18 N.,R. 4 E.

Ap—0 to 10 inches; very dark brown (10YR 2/2) loamy sand, dark grayish brown (10YR 4/2) dry; weak medium subangular blocky structure; very friable; slightly acid; abrupt smooth boundary.

A12—10 to 14 inches; very dark brown (10YR 2/2) loamy sand, dark grayish brown (10YR 4/2) dry; moderate coarse subangular blocky structure; very friable; slightly acid; clear wavy boundary.

A3—14 to 17 inches; very dark grayish brown (10YR 3/2) loamy sand, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; very friable; strongly acid; gradual wavy boundary.

B2—17 to 29 inches; dark yellowish brown (10YR 4/4) sand; weak medium subangular blocky structure; very friable; strongly acid; gradual wavy boundary.

C—29 to 60 inches; yellowish brown (10YR 5/4) sand; single grain; loose; medium acid.

The thickness of the solum ranges from 24 to 40 inches. Thickess of the mollic epipedon ranges from 11 to 24 inches.

The A horizon has hue of 10YR or 7.5YR and value of 2 or 3. The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is dominantly sand, but the range includes loamy sand. The C horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 4 to 6. Reaction in the B horizon and C horizon is strongly acid or medium acid.

Tell series

The Tell series consists of deep, well drained soils on stream terraces and outwash plains. The soils are moderately permeable in the upper part and rapidly permeable in the lower part. They formed in loess and loamy deposits underlain by sandy outwash deposits. Slope ranges from 0 to 3 percent.

Tell soils are similar to Gale and Grays soils and are commonly adjacent to Billett soils. Gale soils formed in loess and loamy deposits over sandstone. Grays soils are underlain by stratified silt and fine sand. Billett soils are sandy loam in the surface layer and upper part of the subsoil.

Typical pedon of Tell silt loam, 0 to 3 percent slopes, 1,200 feet west and 750 feet north of the center of section 34, T. 16 N., R. 5 E.

Ap—0 to 9 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; common roots; slightly acid; abrupt smooth boundary.

A2—9 to 12 inches; dark brown (7.5YR 4/4) silt loam; moderate medium platy structure; friable; brown (10YR 5/3) silt coatings on faces of peds; slightly acid; abrupt wavy boundary.

B1—12 to 16 inches; dark brown (7.5YR 4/4) silt loam; moderate medium subangular blocky structure; friable; neutral; clear wavy boundary.

B21t—16 to 26 inches; dark brown (7.5YR 4/4) silt loam; moderate fine subangular blocky structure; friable; thin patchy clay films on faces of peds; medium acid; clear wavy boundary.

B22t—26 to 30 inches; dark brown (7.5YR 4/4) silty clay loam; moderate medium and fine subangular blocky structure; friable; thick continuous clay films on faces of peds; strongly acid; clear wavy boundary.

IIB31t—30 to 33 inches; dark brown (7.5YR 4/4) loam; moderate medium subangular blocky structure; friable; thin patchy clay films on faces of peds; strongly acid; clear smooth boundary.

IIB32—33 to 35 inches; dark brown (7.5YR 4/4) sandy loam; weak medium subangular blocky structure; friable; medium acid; abrupt smooth boundary.

IIC—35 to 60 inches; strong brown (7.5YR 5/6) sand; single grain; loose; slightly acid.

The thickness of the solum ranges from 20 to 36 inches. The thickness of the argillic horizon ranges from 10 to 19 inches.

The Ap horizon has chroma of 2 or 3. The B2t horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. It averages 18 to 28 percent clay. Reaction is strongly acid or medium acid. The IIC horizon has color value of 4 or 5 and chroma of 4 to 6. Reaction is strongly acid to slightly acid.

Wautoma series

The Wautoma series consists of deep, poorly drained and very poorly drained soils on outwash plains bordering glacial lake plains. The soils formed in sandy and loamy deposits and underlying lacustrine deposits. Permeability is moderately rapid through the upper sandy horizons and slow or very slow through the lower part of the substratum. Slope ranges from 0 to 2 percent.

Wautoma soils are similar to Wyeville soils and are commonly adjacent to Newson and Wyeville soils. Newson soils are sandy throughout and are in depressions and drainageways. Wyeville soils are somewhat poorly drained and are generally higher than Wautoma soils in the landscape.

Typical pedon of Wautoma loamy sand, 300 feet west and 1,320 feet south of the NE corner of section 1, T. 15 N., R. 5 E.

Ap—0 to 8 inches; black (10YR 2/1) loamy sand, dark gray (10YR 4/1) dry; weak fine and medium granular structure; very friable; medium acid; abrupt smooth boundary.

B11—8 to 15 inches; grayish brown (2.5Y 5/2) sand; common medium faint light brownish gray (10YR 6/2) mottles; single grain; loose; medium acid; clear smooth boundary.

B12g—15 to 21 inches; grayish brown (2.5Y 5/2) loamy sand; common fine prominent yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; very friable; medium acid; clear smooth boundary.

B21g—21 to 26 inches; light brownish gray (2.5Y 6/2) sandy loam; many coarse prominent strong brown (7.5YR 5/6 and 7.5YR 5/8) mottles; moderate medium subangular blocky structure; friable; medium acid; clear smooth boundary.

IIB22g—26 to 30 inches; light brownish gray (2.5Y 6/2) sandy clay loam; many coarse prominent strong brown (7.5YR 5/6 and 7.5YR 5/8) mottles; moderate medium subangular blocky structure; friable; medium acid; clear smooth boundary.

IIC—30 to 60 inches; dark brown (7.5YR 4/4) silty clay loam; many medium distinct light brownish gray (10YR 6/2) and many medium distinct strong brown (7.5YR 5/6) mottles; massive; firm; medium acid.

The thickness of the sandy deposits ranges from 20 to 40 inches.

The Ap or A1 horizon has value of 2 or 3. The B11 and B12g horizons have color value of 4 or 5 and chroma of 1 or 2. They are loamy sand or sand. The IIB22g horizon has color value of 5 or 6 and chroma of 1 or 2. It is sandy clay loam or silty clay loam. Reaction is strongly acid or medium acid. The IIC horizon has hue of 2.5Y, 10YR, or 7.5YR; value of 4 to 6; and chroma of 2 to 6. It is silty clay or silty clay loam. Reaction ranges from medium acid to mildly alkaline.

Wyeville series

The Wyeville series consists of deep, somewhat poorly drained soils on outwash plains, glacial lake plains, and stream terraces. The soils formed in sandy and loamy deposits overlying fine-textured water-laid deposits. Permeability is moderately rapid through the upper sandy horizons and slow or very slow through the subsoil and substratum. Slope ranges from 0 to 3 percent.

Wyeville soils are similar to Wautoma and are commonly adjacent to Delton and Wautoma soils. Wautoma soils are poorly drained and very poorly drained and are generally lower than Wyeville soils in the landscape. Delton soils are well drained and are generally slightly higher in the landscape.

Typical pedon of Wyeville loamy sand, 0 to 3 percent slopes, 1,350 feet east and 600 feet south of the NW corner of section 28, T. 17 N., R. 5 E.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) loamy sand, dark grayish brown (10YR 4/2) dry; weak coarse subangular blocky structure parting to weak fine granular; very friable; neutral; abrupt smooth boundary.

A21—10 to 19 inches; light yellowish brown (10YR 6/4) sand; weak medium subangular blocky structure; very friable; mildly alkaline; abrupt wavy boundary.

A22—19 to 23 inches; strong brown (7.5YR 5/8) loamy sand; few fine prominent brown (7.5YR 5/4) mottles; single grain; loose; neutral; clear wavy boundary.

IIB2t—23 to 27 inches; yellowish red (5YR 5/6) silty clay loam; common medium prominent pinkish gray (5YR 6/2) and common fine distinct yellowish red (5YR 5/8) mottles; strong medium subangular blocky structures; firm; thick continuous clay films on faces of peds; neutral; clear smooth boundary.

IIC—27 to 60 inches; reddish brown (5YR 4/4) silty clay; few fine prominent light brownish gray (10YR 6/2) and few fine distinct strong brown (7.5YR 5/6) mottles; massive; firm; medium acid.

The thickness of the sandy mantle ranges from 23 to 40 inches. The thickness of the argillic horizon ranges from 3 to 6 inches.

The Ap or A1 horizon has color value of 2 or 3 and chroma of 1 to 3. The A2 horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 to 8. The IIB2t horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 to 8. It is silty clay loam or silty clay and averages between 35 and 55 percent clay. The reaction ranges from strongly acid to neutral. The IIC horizon has color value of 4 to 5 and chroma of 4 to 8. It is silty clay or silty clay loam. Reaction ranges from strongly acid to slightly acid.

Wyocena series

The Wyocena series consists of deep, well drained soils on ground moraines and end moraines. The soils formed in loamy and sandy glacial till. Permeability is moderately rapid through the upper part of the subsoil and rapid through the lower part of the subsoil and substratum. Slope ranges from 2 to 25 percent.

Wyocena soils are commonly adjacent to Coloma and Okee soils. Coloma soils are sandy throughout and have loamy sand argillic bands in the lower part of the solum. They occupy similar positions in the landscape as Wyocena soils. Okee soils have a sandy mantle 20 to 40 inches thick over a loamy subsoil. They are generally lower than the Wyocena soils in the landscape.

Typical pedon of Wyocena loamy sand, 6 to 12 percent slopes, 900 feet west and 300 feet south of the NE corner of section 27, T. 16 N., R. 7 E.

Ap—0 to 8 inches; brown (10YR 4/3) loamy sand, pale brown (10YR 6/3) dry; weak fine and medium granular structure; very friable; medium acid; abrupt smooth boundary.

A2—8 to 12 inches; brown (7.5YR 4/4) sandy loam; weak medium platy structure; very friable; slightly acid; clear smooth boundary.

B1—12 to 16 inches; brown (7.5YR 4/4) sandy loam; weak medium subangular blocky structure; very friable; estimated 3 percent pebbles; slightly acid; clear wavy boundary.

B21t—16 to 26 inches; reddish brown (5YR 4/4) sandy loam; weak medium subangular blocky structure; very friable; estimated 3 percent pebbles; thin clay films on faces of peds; slightly acid; clear smooth boundary.

B22t—26 to 34 inches; yellowish red (5YR 4/6) sandy loam; weak coarse subangular blocky structure; very friable; estimated 3 percent pebbles; thick clay films on faces of peds; medium acid; clear smooth boundary.

B3—34 to 37 inches; brown (7.5YR 4/4) loamy sand; weak medium subangular blocky structure; very friable; estimated 4 percent pebbles; slightly acid; clear wavy boundary.

C1—37 to 58 inches; brown (7.5YR 4/4) loamy sand; single grain; loose; estimated 8 percent pebbles; neutral; clear wavy boundary.

C2—58 to 60 inches; dark yellowish brown (10YR 4/4) sand; single grain; loose; estimated 8 percent pebbles; neutral.

The thickness of the solum ranges from 24 to 40 inches. The thickness of the argillic horizon ranges from 15 to 24 inches. The solum has 0 to 15 percent pebbles

The Ap horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 or 3. The B2t horizon has hue of 7.5YR or 5YR, value of 4 to 6, and chroma of 4 to 6. It averages between 10 and 17 percent clay. Reaction is medium acid or slightly acid. The C horizon has hue of 10YR, 7.5YR, or 5YR; value of 4 or 5; and chroma of 4 to 6. It is neutral or mildly alkaline.

formation of the soils

This section describes the geology and underlying material in Adams County. It also describes the factors of soil formation as they relate to the soils in the county and explains the processes of soil formation, or horizon differentiation.

geology and underlying material

Rocks of Precambrian and Upper Cambrian age are exposed in Adams County. A limited amount of an unnamed Precambrian quartzite outcrops at Hamilton Mound (sec. 26, T. 20 N., R. 6 E). A fine to coarse sandstone of the Wonewoc Formation was deposited as marine sand during the Dresbachian stage of the Upper Cambrian age. This Wonewoc sandstone is exposed in road cuts, on streambanks, and as conspicuous mounds or bluffs with several hundred feet of relief (*7*). It dips gently to the south and thickens from less than 100 feet in the north to nearly 400 feet in the southern part of the county (*5*). Both the quartzite and sandstone rock types are underlain by Precambrian igneous and metomorphic rocks. They may be overlain by alluvium, colluvium, and Pleistocene glacial deposits or soils of Recent age. Thickness of the Pleistocene and Recent materials is quite variable, ranging from 25 to more than 200 feet.

During the Pleistocene epoch there were several major ice advances and retreats. During the last, or Wisconsin stage, the Green Bay Ice Lobe left end moraines, outwash deposits, and glaciolacustrine deposits in part of Adams County. The most conspicuous glacial features are the Johnstown moraine in the southeastern part of the county and the flat bed of glacial Lake Wisconsin in the western half of the county. The sandstone projects through the glacial deposits in a few isolated, castlelike mounds such as Friendship Mound, Pilot Knob, and Roche-a-Cri Mound.

soil-forming factors

Soil is produced by soil-forming processes acting on materials deposited or accumulated by geologic forces. The characteristics of the soil at any given point are determined by (1) the *climate* under which the soil material has accumulated and existed; (2) the *plant and animal life* on and in the soil; (3) the *relief,* or lay of the land; (4) the composition of the *parent material;* and (5) the length of *time* the forces of soil formation have acted on the soil material (*9*).

Climate and vegetation act on parent material that has accumulated through the weathering or physical disintegration of rocks. These effects are conditioned by relief. The nature of the parent material itself also affects the kind of soil profile that is formed and, in some cases, determines it almost entirely. Finally, time is needed for changing the parent material into a soil with genetically related horizons. These five factors are so closely interrelated that only a few generalizations can be made about the effect of any one unless conditions are specified for the other four.

climate

Climate affects soil formation through moisture and heat. It weathers rocks and alters parent material through the mechanical action of freezing and thawing and the chemical action generated by the leaching of water.

Climate also has an indirect effect through its influence on plant and animal life. Where it provides an environment suitable for living organisms, it is of special significance in the rate of plant growth, the accumulation of organic matter, and the degree of soil fertility.

Adams County has a cool, subhumid continental climate that is characteristic of the north-central United States. The effects of this climate are modified locally by variations in the landscape.

The direction of slope, or aspect, affects the formation of soils. Where slopes face south or west, the soil is warmer and drier than where slopes face north because south-facing slopes receive more direct sunlight and prevailing winds are from the west and southwest. Soils on the cooler, more humid, north-facing slopes tend to support denser stands of trees. Soils on south-facing slopes tend to support grassy vegetation and thinner stands of trees.

plant and animal life

Plant and animal life chiefly provides organic matter and vegetative cover. Plants and animals increase the organic matter content, and plant roots move nutrients from lower to upper layers in the soils. Bacteria, fungi, earthworms, rodents, and human civilization are also important in soil formation or alteration.

In Adams County the most important biological factor has been the native vegetation. Early settlers found stands of oak and pine throughout most of the county. There were open stands of oak with grass understory in small areas adjacent to the end moraine and near the Wisconsin River. Soils that formed under the oak and pine have either a lighter-colored or a thinner, darker surface layer than soils that formed in the oak-grassland areas. For example, Plainfield soils formed under oak and pine and Billett soils formed under grasses.

relief and drainage

The differences in elevation and the variety of land surfaces in Adams County are reflections of geologic and hydrographic influences. Hills, valleys, benches, and outwash plains are the result of the work of rain, rivers, wind, glacial melt water, and glacial deposits over long periods of time. Where bedrock is the controlling factor of the topography, the resistance or lack of resistance of the underlying rocks to these forces has determined the relief.

Drainage characteristics generally are reflected in the color, degree, and kind of mottling or gleying in the soil horizons. Well drained and excessively drained soils are free of mottling throughout. Examples of these soils are the Coloma, Plainfield, and Wyocena soils. Moderately well drained soils such as Brems soils have bright-colored mottles in the upper part of the B horizon and gray mottles in the lower part of the B horizon. Manawa, Meehan, and Wyeville soils are examples of somewhat poorly drained soils. These soils are dominantly gray or have gray mottles throughout the B and C horizons. Poygan and Newson soils are examples of poorly drained and very poorly drained soils. They are gleyed in the upper part of the B horizon.

parent material

Glacial till and outwash are the most common parent material in Adams County, but there are also lacustrine deposits, organic material, and some residuum from sandstone. Overlying the glacial till in the southeast corner of the county is a thin loess cap.

Some soils formed in two kinds of parent material. Delton soils, for example, formed in sandy outwash deposits over silty clay loam and silty clay lacustrine deposits. Tell soils formed in loess and loamy deposits over outwash sand deposits.

Glacial till is unstratified, unsorted glacial debris composed of clay, silt, sand, gravel, and boulders. The till in the terminal moraine (Johnstown moraine) is loamy sand or sand. Okee and Wyocena soils formed in this till. The till on the ground moraine in the southeast part of the county is silty clay. Kewaunee and Manawa soils are examples of soils formed in thin loess and in the silty clay till.

Most of the glacial outwash in the county is acid sand. There is some gravel in the outwash adjacent to the end moraine and in the low terraces along the Wisconsin River. There is very little clay in the sand. Most of the soils that developed in outwash sand have no layer of clay accumulation in the subsoil and have little subsoil development. Plainfield, Sparta, and Brems soils are examples of soils formed in sandy outwash. Adjacent to the end moraine and the higher terraces along the Wisconsin River the outwash deposits contain more silt or clay. These deposits weathered to form the Billet soils, which have a sandy loam subsoil.

The lacustrine deposits are stratified silt and fine sand or massive silty clay. These sedimentary deposits were deposited in the still water of old glacial Lake Wisconsin. Grays and Sisson soils are examples of soils that formed in silty or loamy deposits underlain by stratified silt and fine sand (fig. 11). The Delton and Wyeville soils formed in outwash sand up to 40 inches thick over the massive silty clay.

Residuum weathered from sandstone is the parent material of Boone soils. Gale soils formed in loess and loamy deposits overlying sand weathered from the underlying sandstone.

Organic matter is the parent material of several soils in the county. It consists of decomposed reeds, sedges, grasses, and woody material. Adrian and Palms soils formed in 16 to 51 inches of this organic material over sand and loamy deposits respectively. Houghton soils formed in organic material more than 51 inches thick.

time

Time is required by the active factors of soil formation. The length of time required for the formation of a specific soil depends on the climate, plant and animal life, relief, and parent material. It may be a long or short period of time, but some time is always required for differentiation of soil horizons. Usually a long period of time is required for the development of distinct horizons. Most of Adams County's soils are formed in the sandy outwash deposited by the melting of the glacier or in the end moraine and are about 10,000 years old.

horizon differentiation

Soil formation is the differentiation of weathered material (parent material) into a soil with several

Figure 11.—Stratified silt and fine sand lacustrine deposits underlie Grays and Sisson soils. Measure shows feet from surface.

horizons. Water movement through the parent material is a significant factor in this horizon differentiation.

Parent material accumulates slowly if weathering and disintegration of bedrock is involved. In Adams County, however, glaciers deposited a thick mantle of previously weathered material over much of the area and this speeded soil formation.

Formation of an A1 horizon generally follows weathering. The A1 horizon is the first horizon in which transformation of the parent material takes place. Generally, a B horizon forms after the A horizon has become distinct, although both the A and B horizons can be formed at the same time. Some soils have an A horizon for a long time before a B horizon develops. The soils in Adams County that developed in sandy outwash have very weakly developed B horizons even though they are about 10,000 years old.

The soil at any point in the county is the result of the five soil-forming factors in conjunction with the processes of horizon differentiation. These processes include *additions* of organic and mineral materials to the soil, *losses* of these materials from the soil, *transfers* of materials within the soil, and *transformations* of materials within the soil. These processes are involved to different extents in the development of every soil and help account for the great diversity of soils.

Material is added to a soil through accumulation of organic litter and associated humus on the mineral soil surface. This results in a darkening of the surface layer to form an A1 horizon. Mineral additions to a soil occur through wind and water forces. Such action is evident in soils along the Wisconsin River.

Losses from a soil occur as a result of leaching or washing out of soluble constituents from the solum. Surface erosion also removes material through a combination of raindrop splash, runoff, wind, slump, and creep.

Transfers of materials from one horizon to another occur several ways. Mechanical migration of small mineral particles produces an horizon relatively rich in clay. Chemical migration includes movement of aluminum, iron, and organic matter from the eluvial horizon resulting in the concentration of silica in the illuvial horizon. Biological and physical churning and cycling (freeze-thaw and wet-dry cycles) of soil materials mixes the solum to varying degrees.

Transformations in a soil occur with the breakdown of mineral and organic materials and the synthesis of new substances. Examples include the oxidation and release of iron from primary minerals, which turns the soil brownish, reddish-brown, or red. The reduction of iron under waterlogged conditions produces a grayish, bluish, or greenish color, which in some soils is accompanied by reddish mottles and dark manganese concretions. These conditions are prevalent in many of the soils in Adams County.

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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.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim. An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by 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—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	More than 12

Base saturation. The degree to which material having base exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid. A soil having measurable amounts of calcium carbonate or magnesium carbonate.

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 film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coat, clay skin.

Coarse fragments. Mineral or rock particles up to 3 inches (2 millimeters to 7.5 centimeters) in diameter.

Coarse textured (light textured) soil. Sand or loamy sand.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures is difficult.

Complex, soil. A map unit of two or more kinds of soil occurring in such an intricate pattern that they cannot be shown separately on a soil map at the selected scale of mapping and publication.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Cutbanks cave. Unstable walls of cuts made by earthmoving equipment. The soil sloughs easily.

Deferred grazing. A delay in grazing until range plants have reached a specified stage of growth. Grazing is deferred in order to increase the vigor of forage and to allow desirable plants to produce seed. Contrasts with continuous grazing and rotation grazing.

Depth, soil. The depth to a root-impeding layer or horizon. In this publication it is the depth to bedrock. The soil is considered *deep* if this depth is more than 60 inches, *moderately deep* if it is 20 to 40 inches, and *shallow* if it is 10 to 20 inches.

Depth to rock. Bedrock at a depth that adversely affects 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.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

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.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Fast intake. The rapid movement of water into the soil.

Favorable. Favorable soil features for the specified use.

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 (heavy textured) soil. Sandy clay, silty clay, and clay.

Flooding. The temporary covering of soil with water from overflowing streams, runoff from adjacent slopes, and tides. Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; *November-May*, for example, means that flooding can occur during the period November through May. Water standing for short periods after rainfall or commonly covering swamps and marshes is not considered flooding.

Frost action. Freezing and thawing of soil moisture. Frost action can damage structures and plant roots.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the assorted and unassorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by melt water as it flows from glacial ice.

Glacial till (geology). Unassorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). 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 by water originating mainly from the melting of glacial ice. Many are interbedded or laminated.

Gleyed soil. A soil having one or more neutral gray horizons as a result of waterlogging and lack of oxygen. The term "gleyed" also designates gray horizons and horizons having yellow and gray mottles as a result of intermittent waterlogging.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

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 up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material from 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Green manure (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table, which is the upper limit of saturation.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

O horizon.—An organic layer, fresh and decaying plant residue, at the surface of a mineral soil.

A horizon.—The mineral horizon, formed or forming 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.

A2 horizon.—A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or a combination of these; (2) by prismatic or blocky structure; (3) by redder or browner colors than those in the A horizon; or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

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 A or B horizon. The material of a C horizon may be either like or unlike that from which the solum is presumed to have formed. If the material is known to differ from that in the solum the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but 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-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered, but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

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 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.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation include—

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.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Large stones. Rock fragments 10 inches (25 centimeters) or more across. Large stones adversely affect the specified use.

Leaching. The removal of soluble material from soil or other material by percolating water.

Light textured soil. Sand and loamy sand.

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 strength. Inadequate strength for supporting loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is greater than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous areas. Areas that have little or no natural soil, are too nearly inaccessible for orderly examination, or cannot otherwise be feasibly classified.

Moderately coarse textured (moderately light textured) soil. Sandy loam and fine sandy loam.

Moderately fine textured (moderately heavy textured) soil. Clay loam, sandy clay loam, and silty clay loam.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. 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. Mottling generally indicates poor aeration and impeded drainage. 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 mixed with mineral soil material. The content of organic matter is more than 20 percent.

Munsell notation. A designation of color by degrees of the three single variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3.

Nutrient, plant. Any element taken in by a plant, essential to its growth, and used by it in the production of food and tissue. Plant nutrients are nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, zinc, and perhaps other elements obtained from the soil; and carbon, hydrogen, and oxygen obtained largely from the air and water.

Organic matter. A general term for plant and animal material in all stages of decomposition. The content of organic matter in, or on, the soil is expressed as—

	Percent
Very low	Less than 0.5
Low	0.5 to 1.0
Moderately low	1.0 to 2.0
Moderate	2.0 to 4.0
High	4.0 to 8.0
Very high	8.0 to 20.68
Organic soil	More than 20.68

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by water that originated mainly from the melting of glacial ice. Glacial outwash is commonly in valleys on landforms known as valley trains, outwash terraces, eskers, kame terraces, kames, outwash fans, or deltas.

Outwash plain. A land form of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Parent material. The great variety of unconsolidated organic and mineral material in which soil forms. Consolidated bedrock is not yet parent material by this concept.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

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 downward movement of water through the soil.

Percs slowly. The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves through the soil. Terms describing permeability are *very slow* (less than 0.06 inch), *slow* (0.06 to 0.20 inch), *moderately slow* (0.2 to 0.6 inch), *moderate* (0.6 to 2.0 inches), *moderately rapid* (2.0 to 6.0 inches), *rapid* (6.0 to 20 inches), and *very rapid* (more than 20 inches).

Phase, soil. A subdivision of a soil series or other unit in the soil classification system based on differences in the soil that affect its management. A soil series, for example, may be divided into phases on the bases of differences in slope, stoniness, thickness, or some other characteristic that affects management. These differences are too small to justify separate series.

pH value. (See Reaction, soil). A numerical designation of acidity and alkalinity in soil.

Piping. Moving water of subsurface tunnels or pipelike cavities in 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 a semisolid to a plastic state.

Poorly graded. Refers to 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.

Poor outlets. Surface or subsurface drainage outlets difficult or expensive to install.

Productivity, soil. The capability of a soil by producing a specified plant or sequence of plants under a specified system of management. Productivity is measured in terms of output, or harvest, in relation to input.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. The degree 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 degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly 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

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulates over disintegrating rock.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth. Shallow root zone. The soil is shallow over a layer that greatly restricts roots. See Root zone.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged in stream channels from a drainage area. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground 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.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

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.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage. The rapid movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils, formed from a particular type of parent material, having horizons that, except for the texture of the A or surface horizon, are similar in all profile characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineralogical and chemical composition.

Shrink-swell. 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.

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.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

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. Soils are described in terms that indicate the range in slope gradient—

	Percent
Nearly level	0 to 2
Gently sloping	2 to 6
Sloping	6 to 12
Moderately steep	12 to 20
Steep	20 to 30
Very steep	more than 30

Slow intake. The slow movement of water into the soil.

Slow refill. The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones. Rock fragments 3 to 10 inches (7.5 to 25 centimeters) in diameter. Small stones adversely affect the specified use.

Soil. A natural, three-dimensional body at the earth's surface that 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 of separates recognized in the United States are as follows: *very coarse sand* (2.0 millimeters to 1.0 millimeter); *coarse sand* (1.0 to 0.5 millimeter); *medium sand* (0.5 to 0.25 millimeter); *fine sand* (0.25 to 0.10 millimeter); *very fine sand* (0.10 to 0.05 millimeter); *silt* (0.05 to 0.002 millimeter); and *clay* (less than 0.002 millimeter).

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristics of the soil are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stratified. Arranged in strata, or layers. The term refers to geologic material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining 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 grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil, or partly worked into the soil, to provide protection from soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

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. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface soil. 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."

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 or management.

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 it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally 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. A stream terrace is frequently called a second bottom, in contrast with a flood plain, and is seldom subject to overflow. A marine terrace, generally wide, was deposited by 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. Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The condition of the soil, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Topsoil (engineering). Presumably a fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Unstable fill. Risk of caving or sloughing in banks of fill material.

Water table. The upper limit of the soil or underlying rock material that is wholly saturated with water.

Water table, apparent. A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

Water table, perched. A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

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 a soil or soil material consisting of particles well distributed over a wide range in size or diameter. Such a soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

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tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Based on records kept at Hancock, Wisconsin, during the period 1930-1959]

Month	Temperature				Precipitation				
	Average daily maximum	Average daily minimum	2 years in 10 will have average: Maximum temperature equal to or higher than--	2 years in 10 will have average: Minimum temperature equal to or lower than--	Average total	1 year in 10 will have--: Less than--	1 year in 10 will have--: More than--	Days with 0.1 inch or more precipitation	Average precipitation in the form of snow and sleet
	°F	°F	°F	°F	In	In	In		In
January---	25.7	5.7	20	9	0.97	0.35	1.85	3	8.9
February--	28.8	7.6	22	15	0.99	0.30	2.41	3	7.1
March-----	38.6	18.5	31	24	1.50	0.53	2.31	5	7.9
April-----	56.4	32.5	48	41	2.58	0.80	4.09	5	2.0
May-------	69.7	44.3	61	54	3.68	1.42	6.61	8	0.4
June------	79.2	54.9	69	64	4.33	1.99	6.00	7	0.0
July------	84.4	59.4	73	69	3.19	1.52	5.77	6	0.0
August----	82.3	57.0	71	67	3.06	0.97	5.58	6	0.0
September-	73.0	48.4	63	59	3.46	1.01	7.58	6	trace
October---	61.2	38.0	53	46	2.30	0.82	4.70	4	0.3
November--	42.3	24.0	36	29	2.18	0.77	3.99	5	4.7
December--	29.4	11.8	24	15	1.03	0.45	1.61	4	6.8
Year---	55.9	33.5	46	43	29.27	23.82	39.54	62	38.1

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Based on records kept at Hancock, Wisconsin, during the period 1930-1959]

Probability	Temperature				
	16° F or lower	20° F or lower	24° F or lower	28° F or lower	32° F or lower
Spring:					
2 years in 10 later than--	Apr. 13	Apr. 26	May 6	May 16	May 27
4 years in 10 later than--	Apr. 6	Apr. 18	Apr. 29	May 9	May 20
6 years in 10 later than--	Mar. 31	Apr. 11	Apr. 22	May 13	May 14
8 years in 10 later than--	Mar. 23	Apr. 3	Apr. 15	Apr. 26	May 7
Fall:					
2 years in 10 earlier than	Oct. 26	Oct. 2	Oct. 9	Sept. 26	Sept. 19
4 years in 10 earlier than	Nov. 3	Oct. 28	Oct. 16	Oct. 4	Sept. 26
6 years in 10 earlier than	Nov. 9	Nov. 3	Oct. 23	Oct. 10	Oct. 3
8 years in 10 earlier than	Nov. 17	Nov. 10	Oct. 31	Oct. 18	Oct. 10

TABLE 3.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
Ad	Adrian muck	20,100	4.6
AlA	Algansee loamy sand, 0 to 3 percent slopes	5,170	1.2
An	Aquents, sandy	1,405	0.3
Au	Au Gres loamy sand	2,075	0.5
BlA	Billett sandy loam, 0 to 3 percent slopes	6,595	1.5
BnB	Boone sand, 2 to 6 percent slopes	3,325	0.8
BnC	Boone sand, 6 to 12 percent slopes	1,640	0.4
BnD	Boone sand, 12 to 25 percent slopes	905	0.2
BpF	Boone-Rock outcrop complex, 25 to 45 percent slopes	2,600	0.6
BrA	Brems loamy sand, 0 to 3 percent slopes	68,215	15.4
BsA	Brems-Newson loamy sands, 0 to 3 percent slopes	4,490	1.0
BtB	Briggsville silt loam, 2 to 6 percent slopes	885	0.2
CoB	Coloma sand, 2 to 6 percent slopes	6,510	1.5
CoC	Coloma sand, 6 to 12 percent slopes	8,510	1.9
CoD	Coloma sand, 12 to 25 percent slopes	5,385	1.2
DeA	Delton sand, 0 to 2 percent slopes	835	0.2
DeB	Delton sand, 2 to 6 percent slopes	8,905	2.0
DeC	Delton sand, 6 to 15 percent slopes	510	0.1
DsA	Delton sand, sandy substratum, 0 to 3 percent slopes	505	0.1
EvB	Elkmound loamy sand, 2 to 6 percent slopes	650	0.1
Fv	Fisk loamy sand	860	0.2
GaB	Gale silt loam, 2 to 6 percent slopes	1,280	0.3
GaC2	Gale silt loam, 6 to 12 percent slopes, eroded	305	0.1
GrB	Grays silt loam, 2 to 6 percent slopes	830	0.2
GrC	Grays silt loam, 6 to 12 percent slopes	315	0.1
Hm	Houghton muck	2,575	0.6
KnB	Kewaunee silt loam, 2 to 6 percent slopes	5,770	1.3
KnC	Kewaunee silt loam, 6 to 12 percent slopes	1,655	0.4
KnD2	Kewaunee silt loam, 12 to 20 percent slopes, eroded	585	0.1
KsA	Kibbie silt loam, 0 to 3 percent slopes	835	0.2
Le	Leola loamy sand	2,120	0.5
MbA	Manawa silt loam, 0 to 3 percent slopes	1,205	0.3
MoA	Meehan loamy sand, 0 to 3 percent slopes	29,875	6.8
Ne	Newson loamy sand	26,135	5.9
OkB	Okee loamy sand, 2 to 6 percent slopes	3,340	0.8
OkC	Okee loamy sand, 6 to 12 percent slopes	5,645	1.3
OkD	Okee loamy sand, 12 to 25 percent slopes	2,135	0.5
Pa	Palms muck	610	0.1
Pd	Pits	230	0.1
PfA	Plainfield sand, 0 to 2 percent slopes	22,405	5.1
PfB	Plainfield sand, 2 to 6 percent slopes	85,133	19.3
PfC	Plainfield sand, 6 to 12 percent slopes	29,610	6.7
PfD	Plainfield sand, 12 to 35 percent slopes	9,175	2.1
Ps	Poygan silty clay loam	1,230	0.3
RfA	Richford loamy sand, 0 to 2 percent slopes	2,320	0.5
RfB	Richford loamy sand, 2 to 6 percent slopes	7,905	1.8
RfC	Richford loamy sand, 6 to 12 percent slopes	305	0.1
SoB	Sisson fine sandy loam, 2 to 6 percent slopes	1,855	0.4
SpA	Sparta loamy sand, 0 to 3 percent slopes	2,115	0.5
TeA	Tell silt loam, 0 to 3 percent slopes	680	0.2
Wa	Wautoma loamy sand	940	0.2
WeA	Wyeville loamy sand, 0 to 3 percent slopes	5,115	1.2
WyB	Wyocena loamy sand, 2 to 6 percent slopes	3,085	0.7
WyC	Wyocena loamy sand, 6 to 12 percent slopes	3,760	0.9
WyD	Wyocena loamy sand, 12 to 25 percent slopes	2,415	0.5
	Water	26,112	5.9
	Total	439,680	100.0

TABLE 4.--YIELDS PER ACRE OF NONIRRIGATED CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn	Corn silage	Oats	Grass-legume hay	Kentucky bluegrass
	Bu	Ton	Bu	Ton	AUM
Ad------------------------ Adrian	100	17	---	---	3.0
AlA----------------------- Algansee	---	---	---	2.5	---
An*. Aquents					
Au------------------------ Au Gres	50	10	55	2.5	2.5
BlA----------------------- Billett	80	12	60	4.0	3.5
BnB----------------------- Boone	40	6	40	2.0	2.0
BnC----------------------- Boone	---	---	35	2.0	2.0
BnD----------------------- Boone	---	---	---	---	2.0
BpF----------------------- Boone-Rock outcrop	---	---	---	---	---
BrA----------------------- Brems	50	8	50	2.5	2.0
BsA----------------------- Brems-Newson	65	9	50	2.5	2.0
BtB----------------------- Briggsville	100	18	75	5.0	4.3
CoB----------------------- Coloma	55	9	55	2.5	2.5
CoC----------------------- Coloma	---	---	---	1.5	2.0
CoD----------------------- Coloma	---	---	---	---	1.5
DeA----------------------- Delton	90	14	70	3.5	3.3
DeB----------------------- Delton	85	13	70	3.5	3.3
DeC----------------------- Delton	70	9	55	4.0	3.0
DsA----------------------- Delton	90	14	70	4.0	3.3
EvB----------------------- Elkmound	65	12	60	3.0	3.3
Fv------------------------ Fisk	85	14	60	3.5	3.5

See footnote at end of table.

TABLE 4.--YIELDS PER ACRE OF NONIRRIGATED CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Corn silage	Oats	Grass-legume hay	Kentucky bluegrass
	Bu	Ton	Bu	Ton	AUM
GaB: Gale	95	16	75	4.5	4.0
GaC2: Gale	90	15	70	4.5	4.0
GrB: Grays	110	19	80	5.0	4.0
GrC: Grays	100	18	75	4.5	4.0
Hm: Houghton	120	20	---	---	3.5
KnB: Kewaunee	110	18	80	5.0	4.0
KnC: Kewaunee	100	17	75	4.5	3.5
KnD2: Kewaunee	90	14	70	3.5	3.0
KsA: Kibbie	110	18	80	4.0	3.5
Le: Leola	60	10	55	3.0	2.7
MbA: Manawa	110	18	75	5.0	4.5
MoA: Meehan	50	8	50	2.5	2.5
Ne: Newson	55	9	55	3.0	2.3
OkB: Okee	70	12	65	3.5	3.0
OkC: Okee	65	11	55	3.0	2.5
OkD: Okee	55	10	45	3.0	2.0
Pa: Palms	110	18	---	---	---
Pd*. Pits					
PfA, PfB, PfC: Plainfield	---	---	35	2.0	2.3
PfD: Plainfield	---	---	---	---	2.0
Ps: Poygan	110	18	75	5.0	4.5
RfA, RfB: Richford	55	9	55	3.0	2.3
RfC: Richford	50	8	45	2.5	2.0

See footnote at end of table.

TABLE 4.--YIELDS PER ACRE OF NONIRRIGATED CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Corn silage	Oats	Grass-legume hay	Kentucky bluegrass
	Bu	Ton	Bu	Ton	AUM
SoB----------------------- Sisson	110	18	80	4.5	4.5
SpA----------------------- Sparta	55	9	50	2.5	2.0
TeA----------------------- Tell	90	15	75	4.5	4.0
Wa------------------------ Wautoma	85	14	60	3.5	3.0
WeA----------------------- Wyeville	60	10	60	3.5	3.3
WyB----------------------- Wyocena	75	13	60	3.5	3.0
WyC----------------------- Wyocena	70	11	55	3.5	3.0
WyD----------------------- Wyocena	---	---	50	3.0	3.0

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 5.--YIELDS PER ACRE OF IRRIGATED CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not generally irrigated or the crop generally is not grown on the soil]

Soil name and map symbol	Corn	Sweet corn	Snap beans	Canning peas	Irish potatoes	Alfalfa hay
	Bu	Ton	Ton	Ton	Cwt	Ton
Au Au Gres	120	5.5	2.5	1.0	400	---
BlA Billett	140	7.5	3.5	1.6	500	6.0
BnB Boone	100	5.5	2.7	1.0	375	4.0
BnC Boone	90	5.0	2.5	0.8	350	3.7
BrA Brems	120	6.0	2.5	1.0	425	4.5
BsA Brems-Newson	120	5.5	2.5	1.0	375	---
CoB Coloma	125	6.0	3.0	1.2	425	5.5
CoC Coloma	115	5.5	2.5	1.0	375	5.0
DeA Delton	130	6.5	3.5	1.4	450	6.0
DeB Delton	120	6.0	3.2	1.2	425	5.5
DeC Delton	110	5.5	3.0	1.0	400	5.0
DsA Delton	140	7.0	3.5	1.6	475	6.0
EvB Elkmound	100	5.5	2.5	1.0	400	5.0
Fv Fisk	130	6.0	3.0	1.2	400	---
GaB Gale	150	7.0	3.7	1.8	475	6.0
GrB Grays	150	7.5	3.7	1.8	475	6.0
Le Leola	125	6.0	3.0	1.2	375	---
MoA Meehan	120	6.0	2.7	1.0	375	---
Ne Newson	120	5.5	2.5	1.0	375	---
OkB Okee	125	6.0	3.0	1.2	425	5.5
OkC Okee	115	5.5	2.5	1.0	375	5.0
PfA Plainfield	120	6.0	3.0	1.0	400	5.5
PfB Plainfield	115	5.5	2.7	0.9	375	5.2

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF IRRIGATED CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Sweet corn	Snap beans	Canning peas	Irish potatoes	Alfalfa hay
	Bu	Ton	Ton	Ton	Cwt	Ton
PfC----------------------- Plainfield	110	5.0	2.5	0.8	350	5.0
RfA----------------------- Richford	130	6.5	3.5	1.2	425	5.7
RfB----------------------- Richford	125	6.0	3.2	1.1	400	5.5
RfC----------------------- Richford	115	5.5	3.0	1.0	350	5.0
SoB----------------------- Sisson	160	7.5	4.0	2.0	500	6.5
SpA----------------------- Sparta	125	6.0	3.0	1.0	400	5.5
TeA----------------------- Tell	160	7.5	4.0	2.0	500	6.5
WeA----------------------- Wyeville	120	5.5	2.5	1.0	375	---
WyB----------------------- Wyocena	130	6.5	3.2	1.4	450	6.0
WyC----------------------- Wyocena	115	6.0	3.0	1.2	400	5.5

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

[Soils are considered undrained. Miscellaneous areas are excluded. Dashes mean no acreage]

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I	---	---	---	---
II	15,180	10,620	3,880	600
III	53,975	20,865	11,610	21,500
IV	166,504	6,990	80,160	79,354
V	---	---	---	---
VI	158,208	2,415	5,170	150,623
VII	16,635	---	---	16,635
VIII	1,405	---	1,405	---

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Trees to plant
Ad: Adrian	3w	Slight	Severe	Severe	Severe	Northern white-cedar	35	
						Red maple	---	
						Silver maple	---	
						White ash	---	
						Quaking aspen	---	
						Tamarack	---	
AlA: Algansee	3s	Slight	Slight	Moderate	Slight	Quaking aspen	60	White spruce, Norway spruce, red maple, white ash.
						Silver maple	---	
						White ash	---	
						Red maple	---	
						Eastern white pine	---	
Au: Au Gres	3s	Slight	Slight	Severe	Slight	Red pine	54	White spruce, eastern white pine, red pine.
						Quaking aspen	---	
						Balsam fir	---	
						Paper birch	---	
						Red maple	---	
						Eastern white pine	---	
BlA: Billett	3o	Slight	Slight	Slight	Slight	Northern red oak	60	Red pine, eastern white pine, white spruce, Norway spruce.
						Bur oak	---	
						Black oak	---	
						White oak	---	
						Northern pin oak	---	
						Black cherry	---	
						Shagbark hickory	---	
BnB, BnC: Boone	4s	Slight	Slight	Severe	Slight	Northern pin oak	44	Red pine, jack pine.
						Jack pine	---	
						Black oak	---	
BnD: Boone	4s	Moderate	Severe	Severe	Slight	Northern pin oak	44	Red pine, jack pine.
						Jack pine	---	
						Black oak	---	
BpF*:								
Boone	4s	Severe	Severe	Severe	Slight	Northern pin oak	44	Red pine, jack pine.
						Jack pine	---	
						Black oak	---	
Rock outcrop.								
BrA: Brems	3s	Slight	Slight	Moderate	Slight	Northern pin oak	59	Eastern white pine, red pine, jack pine.
						Black oak	---	
						Red maple	---	
						Jack pine	---	
BsA*:								
Brems	3s	Slight	Slight	Moderate	Slight	Northern pin oak	59	Eastern white pine, red pine, jack pine.
						Black oak	---	
						Red maple	---	
						Jack pine	---	
Newson	4w	Slight	Severe	Severe	Slight	Quaking aspen	50	Eastern white pine, white spruce.
						Paper birch	---	
						Eastern white pine	---	
BtB: Briggsville	2c	Slight	Slight	Moderate	Slight	Northern red oak	65	Eastern white pine, white spruce, red pine.
						Sugar maple	---	
						White ash	---	
						American basswood	---	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Trees to plant
CoB, CoC----------- Coloma	3s	Slight	Slight	Severe	Slight	Northern pin oak----	53	Red pine, eastern white pine, jack pine.
						Jack pine-----------	---	
						Black oak-----------	---	
						White oak-----------	---	
						Red pine------------	---	
						Eastern white pine--	---	
CoD---------------- Coloma	3s	Moderate	Moderate	Severe	Slight	Northern pin oak----	53	Red pine, eastern white pine, jack pine.
						Jack pine-----------	---	
						Black oak-----------	---	
						White oak-----------	---	
						Red pine------------	---	
						Eastern white pine--	---	
DeA, DeB, DeC, DsA- Delton	2s	Slight	Slight	Severe	Slight	Northern red oak----	65	Red pine, eastern white pine.
						White oak-----------	---	
						Jack pine-----------	---	
						Eastern white pine--	---	
						Red pine------------	---	
EvB---------------- Elkmound	4d	Slight	Slight	Moderate	Moderate	Northern red oak----	46	Red pine, jack pine, eastern redcedar.
						Black oak-----------	---	
						White oak-----------	---	
Fv----------------- Fisk	3o	Slight	Slight	Moderate	Slight	Eastern white pine--	55	Eastern white pine, white spruce, Norway spruce, silver maple, white ash.
						Red maple-----------	---	
GaB, GaC2---------- Gale	1o	Slight	Slight	Slight	Slight	Northern red oak----	74	Red pine, eastern white pine, white spruce.
						Sugar maple---------	---	
						White oak-----------	---	
GrB, GrC----------- Grays	1o	Slight	Slight	Slight	Slight	Northern red oak----	72	Eastern white pine, red pine, white spruce.
						Sugar maple---------	---	
						White ash-----------	---	
Hm----------------- Houghton	3w	Slight	Severe	Severe	Severe	Northern white-cedar	35	
						Red maple-----------	---	
						Silver maple--------	---	
						White ash-----------	---	
						Quaking aspen-------	---	
						Tamarack------------	---	
KnB, KnC----------- Kewaunee	2c	Slight	Slight	Slight	Slight	Northern red oak----	62	Eastern white pine, red pine, white spruce.
						Sugar maple---------	---	
						White ash-----------	---	
						American basswood---	---	
KnD2--------------- Kewaunee	2c	Moderate	Moderate	Slight	Slight	Northern red oak----	62	Eastern white pine, red pine, white spruce.
						Sugar maple---------	---	
						White ash-----------	---	
						American basswood---	---	
KsA---------------- Kibbie	2o	Slight	Slight	Slight	Slight	Sugar maple---------	63	Eastern white pine, red pine, white spruce, white ash.
						White ash-----------	---	
						Northern red oak----	---	
Le----------------- Leola	3s	Slight	Slight	Moderate	Slight	Jack pine-----------	55	Jack pine, eastern white pine.
						Eastern white pine--	---	
						Northern pin oak----	---	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Trees to plant
MbA----------------- Manawa	2c	Slight	Slight	Slight	Slight	Northern red oak----	61	Red maple, green ash, white ash, white spruce.
						Sugar maple---------	---	
						Green ash-----------	---	
						Red maple-----------	---	
MoA----------------- Meehan	3s	Slight	Slight	Moderate	Slight	Jack pine-----------	55	Eastern white pine, jack pine.
						Quaking aspen-------	---	
						Northern pin oak----	---	
Ne------------------ Newson	4w	Slight	Severe	Severe	Slight	Quaking aspen-------	50	Eastern white pine, white spruce.
						Paper birch---------	---	
						Eastern white pine--	---	
OkB, OkC----------- Okee	4s	Slight	Slight	Moderate	Slight	Northern pin oak----	45	Red pine, jack pine.
						Black oak-----------	45	
OkD---------------- Okee	4s	Moderate	Moderate	Moderate	Slight	Northern pin oak----	45	Red pine, jack pine.
						Black oak-----------	45	
Pa------------------ Palms	3w	Slight	Severe	Severe	Severe	Northern white-cedar	35	
						Red maple-----------	---	
						Silver maple--------	---	
						White ash-----------	---	
						Quaking aspen-------	---	
						Tamarack------------	---	
						Black ash-----------	---	
PfA, PfB, PfC------ Plainfield	3s	Slight	Slight	Severe	Slight	Red pine------------	55	Red pine, eastern white pine, jack pine.
						Eastern white pine--	---	
						Jack pine-----------	---	
						Northern pin oak----	---	
PfD----------------- Plainfield	3s	Moderate	Severe	Severe	Slight	Red pine------------	55	Red pine, eastern white pine, jack pine.
						Eastern white pine--	---	
						Jack pine-----------	---	
						Northern pin oak----	---	
Ps------------------ Poygan	2w	Slight	Severe	Moderate	Moderate	White ash-----------	65	White spruce, black spruce, red maple, silver maple.
						Red maple-----------	---	
						Silver maple--------	---	
						American elm--------	---	
RfA, RfB, RfC------ Richford	3o	Slight	Slight	Moderate	Slight	Northern red oak----	55	Eastern white pine, red pine.
						Red pine------------	---	
						Eastern white pine--	55	
SoB----------------- Sisson	2o	Slight	Slight	Slight	Slight	Northern red oak----	65	Eastern white pine, white spruce, Norway spruce, red pine.
						White ash-----------	---	
						American basswood---	---	
						White oak-----------	---	
						Sugar maple---------	---	
						Black cherry--------	---	
SpA----------------- Sparta	3s	Slight	Slight	Severe	Slight	Jack pine-----------	55	Red pine, eastern white pine, jack pine.
						Northern pin oak----	---	
						Red pine------------	---	
TeA----------------- Tell	2o	Slight	Slight	Slight	Moderate	Northern red oak----	65	Red pine, eastern white pine, white spruce.
						Sugar maple---------	---	
						White oak-----------	---	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
Wa------------------ Wautoma	4w	Slight	Severe	Moderate	Moderate	Red maple-----------	45	Red maple, silver maple, white ash, green ash.
						Silver maple--------	---	
						White ash-----------	---	
						Green ash-----------	---	
WeA----------------- Wyeville	3o	Slight	Slight	Slight	Slight	Red maple-----------	60	Red maple, silver maple, green ash, white ash.
						Silver maple--------	---	
						Green ash-----------	---	
						White ash-----------	---	
WyB, WyC------------ Wyocena	3o	Slight	Slight	Slight	Slight	Black oak-----------	55	Red pine, eastern white pine, jack pine, Norway spruce.
						Bur oak-------------	---	
						White oak-----------	---	
						Shagbark hickory----	---	
						Northern pin oak----	---	
WyD----------------- Wyocena	3r	Moderate	Moderate	Slight	Slight	Black oak-----------	55	Red pine, eastern white pine, jack pine, Norway spruce.
						Bur oak-------------	---	
						White oak-----------	---	
						Shagbark hickory----	---	
						Northern pin oak----	---	

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil]

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of-- <8	8-15	16-25	26-35	>35
Ad-----------------Adrian	Silky dogwood, common ninebark.	Japanese tree lilac.	Siberian crabapple	---	Carolina poplar.
AlA-----------------Algansee	Redosier dogwood	Lilac-------------	White spruce, northern white-cedar, Norway spruce.	Red pine, eastern white pine.	Carolina poplar.
An*. Aquents					
Au-----------------Au Gres	Redosier dogwood, silky dogwood.	Northern white-cedar.	Norway spruce, white spruce.	Eastern white pine, red pine.	---
BlA-----------------Billett	---	Northern white-cedar, common ninebark, silky dogwood, lilac.	White spruce, Norway spruce.	Eastern white pine, red pine.	---
BnB, BnC, BnD-----Boone	Manyflower cotoneaster.	Lilac-------------	Norway spruce, Siberian peashrub.	Eastern white pine, red pine, jack pine.	---
BpF*:					
Boone------------	Manyflower cotoneaster.	Lilac-------------	Norway spruce, Siberian peashrub.	Eastern white pine, red pine, jack pine.	---
Rock outcrop.					
BrA-----------------Brems	Redosier dogwood	Northern white-cedar.	White spruce, Norway spruce.	Eastern white pine, jack pine, Siberian crabapple, red pine.	---
BsA*:					
Brems------------	Redosier dogwood	Northern white-cedar.	White spruce, Norway spruce.	Eastern white pine, jack pine, Siberian crabapple, red pine.	---
Newson-----------	---	Northern white-cedar, redosier dogwood, nannyberry viburnum.	Green ash, white spruce.	Eastern white pine, jack pine, silver maple.	---
BtB-----------------Briggsville	---	Northern white-cedar, lilac, common ninebark, silky dogwood.	White spruce, Norway spruce.	Eastern white pine, red pine.	---
CoB, CoC, CoD-----Coloma	Manyflower cotoneaster.	Lilac-------------	Norway spruce, Siberian peashrub.	Eastern white pine, red pine, jack pine.	---
DeA, DeB, DeC-----Delton	---	Northern white-cedar, silky dogwood, common ninebark, lilac.	White spruce, Norway spruce.	Eastern white pine, red pine.	---
DsA-----------------Delton	Manyflower cotoneaster.	Lilac-------------	Siberian peashrub, Norway spruce.	Eastern white pine, red pine, jack pine.	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of-- <8	8-15	16-25	26-35	>35
EvB: Elkmound	Manyflower cotoneaster.	Lilac	Siberian peashrub, Norway spruce.	Eastern white pine, jack pine, red pine.	---
Fv: Fisk	---	Northern white-cedar, redosier dogwood, nannyberry viburnum.	Green ash, white spruce.	Eastern white pine, jack pine, silver maple.	---
GaB, GaC2: Gale	---	Northern white-cedar, common ninebark, lilac, silky dogwood.	White spruce, Norway spruce.	Eastern white pine, red pine.	---
GrB, GrC: Grays	Silky dogwood	Amur maple, lilac	Norway spruce, white spruce.	Eastern white pine, red pine.	---
Hm: Houghton	Redosier dogwood	Silky dogwood, Japanese tree lilac.	Siberian crabapple	---	Carolina poplar.
KnB, KnC, KnD2: Kewaunee	---	Northern white-cedar, lilac, common ninebark, silky dogwood.	White spruce, Norway spruce.	Eastern white pine, red pine.	---
KsA: Kibbie	---	Silky dogwood, American cranberrybush.	White spruce, Norway spruce.	Red pine, eastern white pine.	Carolina poplar, white ash.
Le: Leola	---	Northern white-cedar, redosier dogwood, nannyberry viburnum.	Green ash, white spruce.	Eastern white pine, jack pine, silver maple.	---
MbA: Manawa	---	Northern white-cedar, lilac, common ninebark, silky dogwood.	White spruce, Norway spruce.	Eastern white pine, red pine.	---
MoA: Meehan	---	Northern white-cedar, redosier dogwood, nannyberry viburnum.	Green ash, white spruce.	Eastern white pine, jack pine, silver maple.	---
Ne: Newson	---	Northern white-cedar, redosier dogwood, nannyberry viburnum.	Green ash, white spruce.	Eastern white pine, jack pine, silver maple.	---
OkB, OkC, OkD: Okee	Manyflower cotoneaster.	Lilac	Norway spruce, Siberian peashrub.	Eastern white pine, red pine, jack pine.	---
Pa: Palms	Redosier dogwood	Silky dogwood, American cranberrybush, Japanese tree lilac.	Siberian crabapple	---	Carolina poplar.
Pd*. Pits					

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
PfA, PfB, PfC, PfD: Plainfield	Manyflower cotoneaster.	Lilac	Norway spruce, Siberian peashrub.	Eastern white pine, red pine, jack pine.	---
Ps: Poygan	---	Northern white-cedar, redosier dogwood, nannyberry viburnum.	Green ash, white spruce.	Eastern white pine, silver maple.	---
RfA, RfB, RfC: Richford	Manyflower cotoneaster.	Lilac	Norway spruce, Siberian peashrub.	Eastern white pine, red pine, jack pine.	---
SoB: Sisson	Silky dogwood	Northern white-cedar, lilac.	White spruce, Norway spruce.	Eastern white pine, red pine.	Green ash, Carolina poplar.
SpA: Sparta	Manyflower cotoneaster.	Siberian peashrub, lilac, Siberian crabapple, Russian-olive.	Norway spruce, common hackberry.	Red pine, eastern white pine, jack pine.	---
TeA: Tell	---	Northern white-cedar, silky dogwood, common ninebark, lilac.	White spruce, Norway spruce.	Eastern white pine, red pine.	---
Wa: Wautoma	---	Northern white-cedar, redosier dogwood, nannyberry viburnum.	Green ash, white spruce.	Eastern white pine, jack pine, silver maple.	---
WeA: Wyeville	---	Northern white-cedar, redosier dogwood, nannyberry viburnum.	Green ash, white spruce.	Eastern white pine, jack pine, silver maple.	---
WyB, WyC, WyD: Wyocena	---	Northern white-cedar, silky dogwood, common ninebark, lilac.	White spruce, Norway spruce.	Eastern white pine, red pine.	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Ad-------------------- Adrian	Severe: wetness, floods, excess humus.	Severe: wetness, excess humus.	Severe: wetness, floods, excess humus.	Severe: wetness, excess humus.	Severe: excess humus, floods, wetness.
AlA------------------- Algansee	Severe: floods, wetness.	Moderate: floods, wetness, too sandy.	Severe: wetness, floods.	Moderate: wetness, too sandy, floods.	Severe: floods.
An*. Aquents					
Au-------------------- Au Gres	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, too sandy.	Severe: wetness.
BlA------------------- Billett	Slight----------	Slight----------	Slight----------	Slight------------	Slight.
BnB------------------- Boone	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
BnC------------------- Boone	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: too sandy.
BnD------------------- Boone	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: too sandy, slope.
BpF*:					
Boone----------------	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy, slope.	Severe: too sandy, slope.
Rock outcrop.					
BrA------------------- Brems	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
BsA*:					
Brems----------------	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
Newson---------------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
BtB------------------- Briggsville	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight------------	Slight.
CoB------------------- Coloma	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
CoC------------------- Coloma	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: too sandy.
CoD------------------- Coloma	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: slope, too sandy.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
DeA, DeB-------------- Delton	Severe: percs slowly, too sandy.	Severe: too sandy.	Severe: too sandy, percs slowly.	Severe: too sandy.	Severe: too sandy.
DeC------------------ Delton	Severe: percs slowly, too sandy.	Severe: too sandy.	Severe: slope, too sandy, percs slowly.	Severe: too sandy.	Severe: too sandy.
DsA------------------ Delton	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
EvB------------------ Elkmound	Slight----------	Slight----------	Severe: depth to rock.	Slight------------	Severe: thin layer.
Fv------------------- Fisk	Severe: wetness.	Moderate: wetness, too sandy.	Severe: wetness.	Moderate: wetness, too sandy.	Moderate: too sandy, wetness.
GaB------------------ Gale	Slight----------	Slight----------	Moderate: slope, depth to rock.	Slight------------	Moderate: thin layer.
GaC2----------------- Gale	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight------------	Moderate: slope, thin layer.
GrB------------------ Grays	Slight----------	Slight----------	Moderate: slope.	Slight------------	Slight.
GrC------------------ Grays	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight------------	Moderate: slope.
Hm------------------- Houghton	Severe: wetness, floods, excess humus.	Severe: wetness, excess humus.	Severe: wetness, floods, excess humus.	Severe: wetness, excess humus.	Severe: excess humus, wetness, floods.
KnB------------------ Kewaunee	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight------------	Slight.
KnC------------------ Kewaunee	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight------------	Moderate: slope.
KnD2----------------- Kewaunee	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
KsA------------------ Kibbie	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Le------------------- Leola	Moderate: wetness, too sandy.	Moderate: wetness, too sandy.	Moderate: small stones, too sandy, wetness.	Moderate: too sandy.	Moderate: too sandy, wetness.
MbA------------------ Manawa	Severe: floods, wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, floods.
MoA------------------ Meehan	Moderate: wetness, too sandy.	Moderate: wetness, too sandy.	Moderate: too sandy, wetness.	Moderate: too sandy.	Moderate: too sandy, wetness.
Ne------------------- Newson	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
OkB: Okee	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: too sandy.
OkC: Okee	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: too sandy, slope.
OkD: Okee	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too sandy, slope.	Severe: slope.
Pa: Palms	Severe: wetness, floods, excess humus.	Severe: wetness, excess humus.	Severe: wetness, floods, excess humus.	Severe: wetness, excess humus.	Severe: wetness, floods, excess humus.
Pd*. Pits					
PfA, PfB: Plainfield	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
PfC: Plainfield	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: too sandy.
PfD: Plainfield	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: too sandy, slope.
Ps: Poygan	Severe: floods, wetness.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.
RfA: Richford	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
RfB: Richford	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: too sandy.
RfC: Richford	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: too sandy, slope.
SoB: Sisson	Slight	Slight	Moderate: slope.	Slight	Slight.
SpA: Sparta	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
TeA: Tell	Slight	Slight	Slight	Slight	Slight.
Wa: Wautoma	Severe: floods, wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.
WeA: Wyeville	Severe: floods, percs slowly.	Moderate: wetness, too sandy.	Severe: percs slowly.	Moderate: too sandy.	Moderate: too sandy, wetness.
WyB: Wyocena	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: too sandy.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
WyC-------------------- Wyocena	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: too sandy, slope.
WyD-------------------- Wyocena	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too sandy, slope.	Severe: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Ad----------------- Adrian	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
AlA---------------- Algansee	Very poor.	Fair	Fair	Poor	Poor	Fair	Fair	Poor	Poor	Fair.
An*. Aquents										
Au----------------- Au Gres	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Fair	Poor	Very poor.
BlA---------------- Billett	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
BnB, BnC, BnD------ Boone	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
BpF*: Boone--------------	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Rock outcrop.										
BrA---------------- Brems	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Fair	Poor	Poor.
BsA*: Brems--------------	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Fair	Poor	Poor.
Newson------------	Fair	Fair	Fair	Poor	Poor	Good	Good	Fair	Poor	Good.
BtB---------------- Briggsville	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
CoB---------------- Coloma	Fair	Fair	Fair	Fair	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
CoC, CoD----------- Coloma	Poor	Fair	Fair	Fair	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
DeA, DeB----------- Delton	Good	Good	Good	Good	Good	Poor	Fair	Good	Good	Very poor.
DeC---------------- Delton	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
DsA---------------- Delton	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
EvB---------------- Elkmound	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
Fv----------------- Fisk	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
GaB---------------- Gale	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
GaC2--------------- Gale	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
GrB, GrC: Grays	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Hm: Houghton	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
KnB, KnC: Kewaunee	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
KnD2: Kewaunee	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
KsA: Kibbie	Good	Good	Good	Good	Fair	Fair	Fair	Good	Good	Fair.
Le: Leola	Fair	Fair	Good	Good	Good	Fair	Poor	Fair	Good	Poor.
MbA: Manawa	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good.
MoA: Meehan	Poor	Fair	Good	Fair	Fair	Fair	Poor	Poor	Fair	Poor.
Ne: Newson	Fair	Fair	Fair	Poor	Poor	Good	Good	Fair	Poor	Good.
OkB, OkC: Okee	Fair	Good	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
OkD: Okee	Poor	Fair	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Pa: Palms	Good	Poor	Poor	Poor	Poor	Good	Good	Fair	Poor	Poor.
Pd*. Pits										
PfA, PfB: Plainfield	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
PfC, PfD: Plainfield	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Ps: Poygan	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good.
RfA, RfB, RfC: Richford	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
SoB: Sisson	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
SpA: Sparta	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
TeA: Tell	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Wa: Wautoma	Fair	Fair	Good	Good	Good	Good	Good	Fair	Good	Good.
WeA: Wyeville	Fair	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Fair.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
WyB----------------- Wyocena	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WyC----------------- Wyocena	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
WyD----------------- Wyocena	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Ad----------------- Adrian	Severe: wetness, cutbanks cave, floods.	Severe: wetness, floods, low strength.	Severe: wetness, floods, low strength.	Severe: wetness, floods, low strength.	Severe: wetness, floods. low strength.	Severe: excess humus, floods, wetness.
AlA---------------- Algansee	Severe: wetness, floods, cutbanks cave.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: floods.
An*. Aquents						
Au----------------- Au Gres	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
BlA---------------- Billett	Severe: cutbanks cave.	Slight----------	Slight----------	Slight----------	Moderate: frost action.	Slight.
BnB---------------- Boone	Severe: cutbanks cave.	Slight----------	Moderate: depth to rock.	Moderate: slope.	Slight----------	Severe: too sandy.
BnC---------------- Boone	Severe: cutbanks cave.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Moderate: slope.	Severe: too sandy.
BnD---------------- Boone	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: too sandy, slope.
BpF*: Boone-------------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: too sandy, slope.
Rock outcrop.						
BrA---------------- Brems	Severe: cutbanks cave.	Slight----------	Moderate: wetness.	Slight----------	Slight----------	Moderate: too sandy.
BsA*: Brems-------------	Severe: cutbanks cave.	Slight----------	Moderate: wetness.	Slight----------	Slight----------	Moderate: too sandy.
Newson------------	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
BtB---------------- Briggsville	Moderate: too clayey.	Severe: low strength.	Severe: low strength.	Severe: low strength.	Severe: low strength, frost action.	Slight.
CoB---------------- Coloma	Severe: cutbanks cave.	Slight----------	Slight----------	Moderate: slope.	Slight----------	Severe: too sandy.
CoC---------------- Coloma	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: too sandy.
CoD---------------- Coloma	Severe: slope, cutbanks cave.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, too sandy.
DeA---------------- Delton	Moderate: too clayey.	Slight----------	Moderate: shrink-swell.	Slight----------	Slight----------	Severe: too sandy.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
DeB Delton	Moderate: too clayey.	Slight	Moderate: shrink-swell.	Moderate: slope.	Slight	Severe: too sandy.
DeC Delton	Moderate: too clayey, slope.	Moderate: slope.	Moderate: shrink-swell, slope.	Severe: slope.	Moderate: slope.	Severe: too sandy.
DsA Delton	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Slight	Severe: too sandy.
EvB Elkmound	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock, low strength.	Severe: thin layer.
Fv Fisk	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: too sandy, wetness.
GaB Gale	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: slope, shrink-swell.	Severe: frost action, low strength.	Moderate: thin layer.
GaC2 Gale	Moderate: depth to rock, slope.	Moderate: slope, shrink-swell.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope.	Severe: frost action, low strength.	Moderate: slope, thin layer.
GrB Grays	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: frost action, low strength.	Slight.
GrC Grays	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, slope.	Severe: slope.	Severe: frost action, low strength.	Moderate: slope.
Hm Houghton	Severe: wetness, floods, excess humus.	Severe: wetness, floods, low strength.	Severe: wetness, low strength, floods.	Severe: wetness, floods, low strength.	Severe: wetness, floods, low strength.	Severe: excess humus, wetness, floods.
KnB Kewaunee	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
KnC Kewaunee	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell.	Severe: low strength, shrink-swell.	Moderate: slope.
KnD2 Kewaunee	Severe: slope.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: low strength, slope.	Severe: slope.
KsA Kibbie	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action, low strength.	Moderate: wetness.
Le Leola	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, frost action.	Moderate: too sandy, wetness.
MbA Manawa	Severe: wetness, too clayey, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: floods, low strength, wetness.	Moderate: wetness, floods.
MoA Meehan	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, frost action.	Moderate: too sandy, wetness.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Ne: Newson	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
OkB: Okee	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: too sandy.
OkC: Okee	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: too sandy, slope.
OkD: Okee	Severe: slope, cutbanks cave.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Pa: Palms	Severe: wetness, excess humus, floods.	Severe: wetness, low strength, floods.	Severe: wetness, floods, low strength.	Severe: wetness, floods, low strength.	Severe: wetness, floods, low strength.	Severe: wetness, floods, excess humus.
Pd*. Pits						
PfA: Plainfield	Severe; cutbanks cave.	Slight	Slight	Slight	Slight	Severe: too sandy.
PfB: Plainfield	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Severe: too sandy.
PfC: Plainfield	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: too sandy.
PfD: Plainfield	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: too sandy, slope.
Ps: Poygan	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods, low strength.	Severe: wetness, floods.
RfA: Richford	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: too sandy.
RfB: Richford	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: too sandy.
RfC: Richford	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: too sandy, slope.
SoB: Sisson	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: low strength.	Slight.
SpA: Sparta	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: too sandy.
TeA: Tell	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
Wa: Wautoma	Severe: wetness, cutbanks cave, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
WeA: Wyeville	Severe: wetness.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: wetness, floods, frost action.	Moderate: too sandy, wetness.
WyB: Wyocena	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Moderate: too sandy.
WyC: Wyocena	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: too sandy, slope.
WyD: Wyocena	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ad: Adrian	Severe: wetness, floods.	Severe: wetness, seepage, floods.	Severe: wetness, floods, seepage.	Severe: wetness, floods, seepage.	Poor: hard to pack, wetness.
AlA: Algansee	Severe: wetness, floods.	Severe: wetness, floods, seepage.	Severe: wetness, floods, seepage.	Severe: wetness, floods, seepage.	Poor: wetness, too sandy, seepage.
An*. Aquents					
Au: Au Gres	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage, too sandy.	Severe: wetness, seepage.	Poor: too sandy, wetness, seepage.
BlA: Billett	Slight**	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
BnB: Boone	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: too sandy, seepage.
BnC: Boone	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: too sandy, seepage.
BnD: Boone	Severe: slope, depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: seepage, slope.	Poor: slope, too sandy, seepage.
BpF*: Boone	Severe: slope, depth to rock.	Severe: seepage, depth to rock, slope.	Severe: slope, depth to rock, seepage.	Severe: seepage, slope.	Poor: slope, too sandy, seepage.
Rock outcrop.					
BrA: Brems	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, too sandy, wetness.	Severe: seepage, wetness.	Poor: too sandy, seepage.
BsA*: Brems	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, too sandy, wetness.	Severe: seepage, wetness.	Poor: too sandy, seepage.
Newson	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage, too sandy.	Severe: wetness, seepage.	Poor: wetness, too sandy, seepage.
BtB: Briggsville	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.

See footnotes at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
CoB: Coloma	Slight**	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: too sandy.
CoC: Coloma	Moderate:** slope.	Severe: slope, seepage.	Severe: seepage.	Severe: seepage.	Poor: too sandy.
CoD: Coloma	Severe:** slope.	Severe: slope, seepage.	Severe: slope, seepage.	Severe: slope, seepage.	Poor: slope, too sandy.
DeA, DeB: Delton	Severe: percs slowly.	Severe: seepage.	Severe: too clayey.	Severe: seepage.	Poor: too sandy, seepage.
DeC: Delton	Severe: percs slowly.	Severe: seepage, slope.	Severe: too clayey.	Severe: seepage.	Poor: too sandy, seepage.
DsA: Delton	Severe: percs slowly.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
EvB: Elkmound	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: area reclaim.
Fv: Fisk	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Poor: seepage, wetness.
GaB: Gale	Severe: depth to rock.	Severe: seepage.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: area reclaim.
GaC2: Gale	Severe: depth to rock.	Severe: slope, seepage.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: area reclaim.
GrB: Grays	Slight	Moderate: slope, seepage.	Slight	Slight	Good.
GrC: Grays	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Hm: Houghton	Severe: wetness, floods, percs slowly.	Severe: wetness, seepage, floods.	Severe: wetness, floods, seepage.	Severe: wetness, floods, seepage.	Poor: hard to pack, wetness.
KnB: Kewaunee	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
KnC: Kewaunee	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
KnD2: Kewaunee	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, slope.
KsA: Kibbie	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Le: Leola	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage.

See footnotes at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
MbA----------------- Manawa	Severe: wetness, percs slowly, floods.	Slight-----------	Severe: wetness, too clayey, floods.	Severe: wetness, floods.	Poor: too clayey, wetness.
MoA----------------- Meehan	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
Ne------------------ Newson	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage, too sandy.	Severe: wetness, seepage.	Poor: wetness, too sandy, seepage.
OkB----------------- Okee	Slight**---------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage.
OkC----------------- Okee	Moderate:** slope.	Severe: slope, seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage.
OkD----------------- Okee	Severe:** slope.	Severe: slope, seepage.	Severe: slope, seepage.	Severe: slope, seepage.	Poor: slope, seepage.
Pa------------------ Palms	Severe: wetness, floods, subsides.	Severe: wetness, seepage, floods.	Severe: wetness, floods, seepage.	Severe: wetness, floods, seepage.	Poor: wetness, hard to pack.
Pd*. Pits					
PfA, PfB------------ Plainfield	Slight**---------	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
PfC----------------- Plainfield	Moderate:** slope.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
PfD----------------- Plainfield	Severe:** slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: too sandy, slope, seepage.
Ps------------------ Poygan	Severe: wetness, percs slowly, floods.	Slight-----------	Severe: wetness, floods, too clayey.	Severe: wetness, floods.	Poor: wetness, too clayey.
RfA, RfB------------ Richford	Slight**---------	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
RfC----------------- Richford	Moderate:** slope.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
SoB----------------- Sisson	Slight-----------	Moderate: seepage, slope.	Slight-----------	Slight-----------	Good.
SpA----------------- Sparta	Slight**---------	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.

See footnotes at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
TeA: Tell	Slight**	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Wa: Wautoma	Severe: wetness, percs slowly, floods.	Severe: wetness, seepage.	Severe: wetness, floods, seepage.	Severe: wetness, floods, seepage.	Poor: wetness, too clayey.
WeA: Wyeville	Severe: wetness, percs slowly.	Severe: seepage.	Severe: wetness, too clayey.	Severe: wetness, seepage.	Poor: too clayey.
WyB: Wyocena	Slight**	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
WyC: Wyocena	Moderate:** slope.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage,	Poor: seepage, too sandy.
WyD: Wyocena	Severe:** slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

** Excessive permeability rate may cause pollution of ground water.

TABLE 13.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and "poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Ad: Adrian	Poor: wetness, low strength.	Good	Unsuited: excess fines, excess humus.	Poor: wetness, excess humus.
AlA: Algansee	Poor: wetness.	Fair: excess fines.	Unsuited: excess fines.	Fair: too sandy.
An*. Aquents				
Au: Au Gres	Poor: wetness.	Good	Unsuited: excess fines.	Poor: wetness.
BlA: Billett	Good	Fair: excess fines.	Fair: excess fines.	Good.
BnB, BnC: Boone	Poor: thin layer, area reclaim.	Poor: thin layer.	Unsuited: excess fines.	Poor: too sandy.
BnD: Boone	Poor: thin layer, area reclaim.	Poor: thin layer.	Unsuited: excess fines.	Poor: too sandy, slope.
BpF*:				
Boone	Poor: slope, thin layer, area reclaim.	Poor: thin layer.	Unsuited: excess fines.	Poor: too sandy, slope.
Rock outcrop.				
BrA: Brems	Fair: wetness.	Fair: excess fines.	Unsuited: excess fines.	Fair: too sandy.
BsA*:				
Brems	Fair: wetness.	Fair: excess fines.	Unsuited: excess fines.	Fair: too sandy.
Newson	Poor: wetness.	Fair: excess fines.	Unsuited: excess fines.	Poor: wetness.
BtB: Briggsville	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
CoB, CoC: Coloma	Good	Good	Unsuited: excess fines.	Poor: too sandy.
CoD: Coloma	Fair: slope.	Good	Unsuited: excess fines.	Poor: slope, too sandy.
DeA, DeB, DeC: Delton	Fair: thin layer.	Poor: thin layer.	Unsuited: excess fines.	Poor: too sandy.
DsA: Delton	Good	Fair: excess fines.	Unsuited: excess fines.	Poor: too sandy.
EvB: Elkmound	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: area reclaim.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Fv: Fisk	Poor: wetness.	Poor: excess fines, thin layer.	Unsuited: excess fines.	Fair: too sandy.
GaB: Gale	Poor: area reclaim, thin layer.	Poor: thin layer.	Unsuited: excess fines.	Fair: area reclaim, thin layer.
GaC2: Gale	Poor: area reclaim, thin layer.	Poor: thin layer.	Unsuited: excess fines.	Fair: slope, area reclaim, thin layer.
GrB: Grays	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
GrC: Grays	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, slope.
Hm: Houghton	Poor: wetness, low strength.	Unsuited: excess humus.	Unsuited: excess humus.	Poor: wetness, excess humus.
KnB: Kewaunee	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
KnC: Kewaunee	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, slope.
KnD2: Kewaunee	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
KsA: Kibbie	Poor: wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Le: Leola	Fair: wetness.	Good	Unsuited: excess fines.	Fair: too sandy.
MbA: Manawa	Poor: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
MoA: Meehan	Fair: wetness.	Good	Unsuited: excess fines.	Fair: too sandy.
Ne: Newson	Poor: wetness.	Fair: excess fines.	Unsuited: excess fines.	Poor: wetness.
OkB: Okee	Good	Fair: excess fines.	Unsuited: excess fines.	Fair: too sandy.
OkC: Okee	Good	Fair: excess fines.	Unsuited: excess fines.	Fair: too sandy, slope.
OkD: Okee	Fair: slope.	Fair: excess fines.	Unsuited: excess fines.	Poor: slope.
Pa: Palms	Poor: wetness, low strength.	Unsuited: excess humus, excess fines.	Unsuited: excess humus, excess fines.	Poor: wetness, excess humus.
Pd*. Pits				

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
PfA, PfB, PfC Plainfield	Good	Good	Unsuited: excess fines.	Poor: too sandy.
PfD Plainfield	Fair: slope.	Good	Unsuited: excess fines.	Poor: too sandy, slope.
Ps Poygan	Poor: wetness, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
RfA, RfB Richford	Good	Good	Unsuited: excess fines.	Fair: too sandy.
RfC Richford	Good	Good	Unsuited: excess fines.	Fair: too sandy, slope.
SoB Sisson	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
SpA Sparta	Good	Fair: excess fines.	Unsuited: excess fines.	Fair: too sandy.
TeA Tell	Good	Good	Unsuited: excess fines.	Fair: thin layer.
Wa Wautoma	Poor: wetness, thin layer.	Poor: thin layer.	Unsuited: excess fines.	Poor: wetness.
WeA Wyeville	Poor: low strength.	Poor: thin layer.	Unsuited: excess fines.	Fair: too sandy.
WyB Wyocena	Good	Fair: excess fines.	Unsuited: excess fines.	Fair: too sandy.
WyC Wyocena	Good	Fair: excess fines.	Unsuited: excess fines.	Fair: too sandy, slope.
WyD Wyocena	Fair: slope.	Fair: excess fines.	Unsuited: excess fines.	Poor: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Ad------------------ Adrian	Seepage---------	Seepage, wetness.	Floods, frost action.	Wetness, fast intake, soil blowing.	Not needed-----	Wetness.
AlA---------------- Algansee	Seepage---------	Seepage---------	Floods----------	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Wetness, droughty.
An*. Aquents						
Au------------------ Au Gres	Seepage---------	Seepage, wetness.	Favorable-------	Fast intake, droughty, wetness.	Wetness, too sandy, soil blowing.	Droughty, wetness.
BlA---------------- Billett	Seepage---------	Seepage---------	Not needed------	Soil blowing---	Too sandy, soil blowing.	Favorable.
BnB---------------- Boone	Depth to rock, seepage.	Seepage, thin layer.	Not needed------	Droughty, fast intake, soil blowing.	Depth to rock, too sandy.	Droughty, depth to rock.
BnC---------------- Boone	Slope, depth to rock, seepage.	Seepage, thin layer.	Not needed------	Droughty, fast intake soil blowing.	Depth to rock, too sandy.	Slope, droughty, depth to rock.
BnD---------------- Boone	Slope, depth to rock, seepage.	Seepage, thin layer.	Not needed------	Droughty, fast intake, soil blowing.	Slope, depth to rock, too sandy.	Slope, droughty, depth to rock.
BpF*: Boone-------------	Slope, depth to rock, seepage.	Seepage, thin layer.	Not needed------	Droughty, fast intake, soil blowing.	Slope, depth to rock, too sandy.	Slope, droughty, depth to rock.
Rock outcrop.						
BrA---------------- Brems	Seepage---------	Seepage---------	Favorable-------	Droughty, fast intake, soil blowing.	Not needed-----	Droughty.
BsA*: Brems-------------	Seepage---------	Seepage---------	Favorable-------	Droughty, fast intake, soil blowing.	Not needed-----	Droughty.
Newson------------	Seepage---------	Seepage, wetness.	Favorable-------	Wetness, fast intake, droughty.	Wetness, too sandy, soil blowing.	Wetness, droughty.
BtB---------------- Briggsville	Slope-----------	Hard to pack---	Not needed------	Slope, erodes easily.	Erodes easily	Erodes easily.
CoB---------------- Coloma	Seepage, slope.	Seepage, piping.	Not needed------	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
CoC, CoD----------- Coloma	Seepage, slope.	Seepage, piping.	Not needed------	Droughty, fast intake, soil blowing.	Too sandy, soil blowing, slope.	Droughty, slope.
DeA---------------- Delton	Seepage---------	Seepage, piping.	Not needed------	Fast intake, soil blowing.	Too sandy, soil blowing.	Percs slowly.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
DeB: Delton	Seepage, slope.	Seepage, piping.	Not needed	Fast intake, soil blowing, slope.	Too sandy, soil blowing.	Percs slowly.
DeC: Delton	Seepage, slope.	Seepage, piping.	Not needed	Fast intake, soil blowing, slope.	Slope, too sandy, soil blowing.	Slope, percs slowly.
DsA: Delton	Seepage	Seepage	Not needed	Fast intake, soil blowing, percs slowly.	Too sandy, soil blowing.	Percs slowly.
EvB: Elkmound	Seepage, depth to rock.	Thin layer	Not needed			Droughty, rooting depth, depth to rock.
Fv: Fisk	Seepage	Piping, wetness.	Frost action	Wetness, fast intake, soil blowing.	Wetness, too sandy, soil blowing.	Wetness, erodes easily.
GaB: Gale	Slope, seepage, depth to rock.	Thin layer	Not needed	Slope, erodes easily, rooting depth.	Too sandy, depth to rock.	Depth to rock, erodes easily.
GaC2: Gale	Slope, seepage, depth to rock.	Thin layer	Not needed	Slope, erodes easily, rooting depth.	Slope, too sandy depth to rock.	Slope, depth to rock, erodes easily.
GrB: Grays	Seepage, slope.	Piping	Not needed	Slope, erodes easily.	Erodes easily	Erodes easily.
GrC: Grays	Seepage, slope.	Piping	Not needed	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Hm: Houghton	Seepage	Excess humus, wetness.	Frost action, excess humus, floods.	Soil blowing, wetness, floods.	Not needed	Wetness.
KnB: Kewaunee	Slope	Hard to pack	Not needed	Slope, percs slowly.	Percs slowly	Erodes easily, percs slowly.
KnC, KnD2: Kewaunee	Slope	Hard to pack	Not needed	Slope, percs slowly.	Slope, percs slowly.	Slope, erodes easily, percs slowly.
KsA: Kibbie	Seepage	Piping, wetness.	Frost action	Wetness	Erodes easily, wetness.	Wetness, erodes easily.
Le: Leola	Seepage	Seepage, wetness.	Favorable	Wetness, fast intake, soil blowing.	Wetness, too sandy, soil blowing.	Favorable.
MbA: Manawa	Favorable	Hard to pack, wetness.	Percs slowly, floods, frost action.	Percs slowly, wetness.	Wetness, percs slowly.	Wetness, percs slowly.
MoA: Meehan	Seepage	Seepage, wetness.	Favorable	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Droughty.
Ne: Newson	Seepage	Seepage, wetness.	Favorable	Wetness, fast intake, droughty.	Wetness, too sandy, soil blowing.	Wetness, droughty.
OkB: Okee	Seepage, slope.	Seepage	Not needed	Soil blowing, fast intake, slope.	Too sandy, soil blowing.	Favorable.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
OkC, OkD---------- Okee	Seepage, slope.	Seepage--------	Not needed-----	Soil blowing, fast intake, slope.	Slope, too sandy, soil blowing.	Slope.
Pa---------------- Palms	Seepage--------	Excess humus, wetness.	Floods, frost action, excess humus.	Wetness, soil blowing, floods.	Not needed-----	Wetness.
Pd*. Pits						
PfA--------------- Plainfield	Seepage--------	Seepage--------	Not needed-----	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
PfB--------------- Plainfield	Seepage, slope.	Seepage--------	Not needed-----	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
PfC, PfD---------- Plainfield	Seepage, slope.	Seepage--------	Not needed-----	Droughty, fast intake, soil blowing.	Slope, too sandy, soil blowing.	Droughty, slope.
Ps---------------- Poygan	Favorable------	Hard to pack, wetness.	Percs slowly, floods, frost action.	Wetness, percs slowly, floods.	Wetness, percs slowly.	Wetness, percs slowly.
RfA--------------- Richford	Seepage--------	Seepage--------	Not needed-----	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
RfB--------------- Richford	Seepage, slope.	Seepage--------	Not needed-----	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
RfC--------------- Richford	Seepage, slope.	Seepage--------	Not needed-----	Droughty, fast intake, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
SoB--------------- Sparta	Seepage, slope.	Favorable------	Not needed-----	Soil blowing, slope.	Soil blowing---	Erodes easily.
SpA--------------- Sparta	Seepage--------	Piping, seepage.	Not needed-----	Fast intake, droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
TeA--------------- Tell	Seepage--------	Thin layer, seepage.	Not needed-----	Erodes easily	Too sandy, erodes easily.	Erodes easily.
Wa---------------- Wautoma	Seepage--------	Wetness--------	Floods, percs slowly. soil blowing.	Wetness, too sandy, percs slowly.	Wetness, too sandy,	Wetness, percs slowly.
WeA--------------- Wyeville	Seepage--------	Wetness, hard to pack.	Percs slowly---	Wetness, soil blowing, percs slowly.	Wetness, too sandy, soil blowing.	Percs slowly.
WyB--------------- Wyocena	Seepage, slope.	Thin layer, seepage.	Not needed-----	Fast intake, soil blowing, slope.	Soil blowing, too sandy.	Favorable.
WyC, WyD---------- Wyocena	Seepage, slope.	Thin layer, seepage.	Not needed-----	Fast intake, soil blowing, slope.	Slope, soil blowing, too sandy.	Slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Ad-----------------Adrian	0-45	Sapric material	Pt	A-8	---	---	---	---	---	---	---
	45-60	Sand, loamy sand, fine sand.	SP, SM	A-2, A-3, A-1	0	80-100	60-100	35-75	0-30	---	NP
AlA----------------Algansee	0-9	Loamy sand------	SM	A-2-4	0	100	100	50-75	15-30	---	NP
	9-60	Sand------------	SM, SP-SM	A-3, A-2-4	0	100	100	50-70	5-15	---	NP
An*. Aquents											
Au-----------------Au Gres	0-6	Loamy sand------	SM, SP-SM	A-2-4	0	95-100	90-100	50-75	10-25	---	NP
	6-30	Sand, loamy sand	SP-SM, SP, SM	A-2-4, A-3	0	95-100	90-100	60-80	0-15	---	NP
	30-60	Sand------------	SP, SP-SM	A-3, A-2-4	0	95-100	90-100	50-80	0-10	---	NP
BlA----------------Billett	0-8	Sandy loam------	SM, SM-SC	A-2, A-4	0	100	95-100	85-100	25-50	12-23	NP-5
	8-21	Sandy loam------	SM, SC, SM-SC	A-2, A-4, A-6	0	100	95-100	85-100	25-50	<25	NP-15
	21-38	Sandy loam, gravelly sandy loam, loamy sand.	SM, SM-SC, SC	A-2, A-4	0	95-100	80-95	75-90	25-45	<25	NP-10
	38-60	Loamy sand, gravelly sand, sand.	SM, SP-SM	A-1, A-2, A-3	0	85-100	80-95	45-70	5-15	---	NP
BnB, BnC, BnD------Boone	0-4	Sand------------	SM, SP-SM	A-2, A-3	0	100	100	65-80	5-35	---	NP
	4-38	Fine sand, sand	SM, SP-SM	A-2, A-3	0	100	100	50-75	5-30	---	NP
	38-60	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---
BpF*:											
Boone-------------	0-3	Sand------------	SM, SP-SM	A-2, A-3	0	100	100	65-80	5-35	---	NP
	3-38	Fine sand, sand	SM, SP-SM	A-2, A-3	0	100	100	50-75	5-30	---	NP
	38-60	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
BrA----------------Brems	0-7	Loamy sand------	SM, SP-SM	A-2-4	0	100	85-100	50-85	10-30	---	NP
	7-60	Sand, fine sand, loamy sand.	SM, SP-SM	A-3, A-2-4	0	100	80-100	50-85	5-25	---	NP
BsA*:											
Brems-------------	0-7	Loamy sand------	SM, SP-SM	A-2-4	0	100	85-100	50-85	10-30	---	NP
	7-60	Sand, fine sand, loamy sand.	SM, SP-SM	A-3, A-2-4	0	100	80-100	50-85	5-25	---	NP
Newson------------	0-8	Loamy sand------	SM	A-2, A-4	0	100	100	50-85	15-50	---	NP
	8-28	Sand, loamy sand	SM, SP-SM	A-2, A-3	0	100	100	50-90	5-30	---	NP
	28-60	Sand, loamy sand	SM, SP-SM	A-2, A-3	0	100	100	50-90	5-30	---	NP

See footnote at end of table.

TABLE 15.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
BtB---------------- Briggsville	0-12	Silt loam-------	CL, CL-ML	A-4, A-6	0	100	100	85-100	60-90	20-40	5-15
	12-36	Silty clay, silty clay loam.	CH, CL	A-6, A-7	0	100	100	90-100	70-100	35-55	15-45
	36-60	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	85-100	30-65	25-45
CoB, CoC, CoD------ Coloma	0-41	Sand------------	SP, SM, SP-SM	A-2, A-3	0-5	85-100	85-100	50-70	2-15	---	NP
	41-60	Sand, fine sand, loamy sand.	SP, SM, SP-SM	A-2, A-3	0-5	80-100	80-100	50-90	2-25	---	NP
DeA, DeB, DeC------ Delton	0-10	Sand------------	SM, SP-SM	A-3, A-2	0	100	100	50-80	5-35	---	NP
	10-28	Loamy fine sand, fine sand, sand.	SM, SP-SM	A-2, A-3	0	100	100	50-90	5-35	---	NP
	28-34	Sandy loam, loamy very fine sand.	SM, ML, CL-ML, SM-SC	A-2, A-4	0	100	100	50-95	30-75	<20	2-6
	34-60	Silty clay loam, silty clay, clay.	CL, CH	A-7	0	100	100	95-100	75-95	40-60	23-40
DsA---------------- Delton	0-10	Sand------------	SM, SP-SM	A-2, A-3	0	100	100	50-70	5-15	---	NP
	10-26	Sand, loamy sand	SM, SP-SM	A-3, A-2	0	100	100	50-75	5-30	---	NP
	26-42	Silty clay, loam	CH	A-7	0	100	100	85-100	65-95	50-60	30-40
	42-60	Sand, loamy sand	SM, SP-SM	A-2, A-3	0	100	100	80-90	5-30	---	NP
EvB---------------- Elkmound	0-9	Loamy sand------	SM	A-2	0	100	95-100	50-75	15-30	---	NP
	9-19	Sandy loam, loam, channery sandy loam.	SM, SC, ML, CL	A-2, A-4, A-6	0-10	70-100	70-100	45-90	20-70	10-30	2-13
	19-60	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---
Fv----------------- Fisk	0-9	Loamy sand------	SM	A-2	0	100	100	80-100	15-30	---	NP
	9-36	Fine sand, loamy fine sand, sandy loam.	SP-SM, SM	A-2, A-3, A-4	0	100	100	60-80	5-40	<20	NP-7
	36-60	Silt loam, loam, very fine sandy loam.	ML, CL-ML, CL	A-4	0	100	100	90-100	50-90	<25	2-9
GaB, GaC2---------- Gale	0-8	Silt loam-------	CL-ML, CL	A-4	0	100	100	90-100	70-90	20-30	5-10
	8-26	Silt loam, silty clay loam.	CL	A-6	0	100	100	90-100	70-95	25-40	10-22
	26-31	Loam, silt loam, sandy loam.	CL, CL-ML, SC, SM-SC	A-4, A-6, A-2	0	100	100	60-100	30-95	20-30	5-12
	31-38	Loamy sand, sand	SM, SP-SM	A-3, A-2	0	100	100	50-75	5-30	---	NP
	38-60	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---
GrB, GrC----------- Grays	0-18	Silt loam, very fine sandy loam	CL, CL-ML	A-4, A-6	0	100	95-100	90-100	80-95	25-40	5-20
	18-39	Silty clay loam, silt loam.	CL	A-6, A-7, A-4, A-5	0	100	95-100	90-100	60-90	25-45	7-25
	39-60	Stratified silt to very fine sand.	ML, CL, SM, SC	A-4, A-2, A-6	0	90-100	80-100	70-100	30-70	15-40	NP-20

See footnote at end of table.

TABLE 15.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Hm----------------- Houghton	0-60	Sapric material	Pt	A-8	0	---	---	---	---	---	---
KnB, KnC, KnD2----- Kewaunee	0-11	Silt loam-------	ML, CL, CL-ML	A-4	0	95-100	95-100	85-100	50-90	20-30	3-10
	11-36	Clay, silty clay, silty clay loam.	CL, CH	A-7	0-5	85-95	80-95	75-95	60-90	45-70	30-45
	36-60	Clay, silty clay, silty clay loam.	CL, CH	A-6, A-7	0-5	85-95	80-95	75-95	60-90	30-60	15-35
KsA---------------- Kibbie	0-12	Silt loam-------	ML	A-4, A-6	0	100	100	75-95	50-85	25-40	2-14
	12-60	Silt loam, silty clay loam, sandy clay loam.	CL, CL-ML, SC, SM-SC	A-4, A-6, A-7	0	90-100	85-100	80-100	35-90	25-45	6-25
Le----------------- Leola	0-9	Loamy sand------	SM, SP-SM	A-1, A-2	0	70-100	70-100	35-75	10-30	---	NP
	9-34	Loamy sand, sand, sandy loam.	SM, SM-SC SP-SM, SP-SC	A-1, A-3 A-2, A-4	0	70-100	70-100	40-70	5-40	<20	NP-6
	34-60	Sand------------	SP, SM, SW, SW-SM	A-1, A-3, A-2	0	70-90	70-90	35-70	1-15	---	NP
MbA---------------- Manawa	0-13	Silt loam-------	ML, CL, CL-ML	A-4, A-6	0	100	100	85-100	60-90	20-40	3-15
	13-30	Silty clay, silty clay loam, clay.	CH, CL	A-7	0-5	90-100	90-100	85-100	65-95	45-70	30-45
	30-60	Silty clay, silty clay loam, clay.	CH, CL	A-6, A-7	0-5	90-100	90-100	85-100	65-95	30-60	15-35
MoA---------------- Meehan	0-8	Loamy sand------	SM	A-2	0	100	100	50-75	15-30	---	NP
	8-36	Sand, loamy sand, coarse sand.	SM, SP-SM, SP	A-1, A-2, A-3	0	100	100	40-90	3-30	---	NP
	36-60	Sand, coarse sand.	SP, SP-SM	A-1, A-3	0	100	100	40-95	0-5	---	NP
Ne----------------- Newson	0-8	Loamy sand------	SM	A-2, A-4	0	100	100	50-85	15-50	---	NP
	8-28	Sand, loamy sand	SM, SP-SM	A-2, A-3	0	100	100	50-90	5-30	---	NP
	28-60	Sand, loamy sand	SM, SP-SM	A-2, A-3	0	100	100	50-95	5-30	---	NP
OkB, OkC, OkD------ Okee	0-26	Loamy sand, sand	SM, SP-SM	A-2, A-3 A-4, A-1-B	0	90-100	90-100	45-85	5-40	---	NP
	26-38	Sandy clay loam, sandy loam.	SC, SM, ML, CL	A-2, A-4	0-3	90-100	90-100	50-90	20-55	<25	2-10
	38-49	Sandy loam, loamy sand.	SM, SP-SM	A-2, A-4, A-1-B	0-5	85-100	85-100	40-75	10-40	<15	NP-3
	49-60	Gravelly sandy loam, sandy loam, loamy sand.	SM, SP-SM, GP, GP-GM	A-2, A-4, A-3, A-1-B	1-10	50-100	50-100	25-85	5-40	---	NP
Pa----------------- Palms	0-36	Sapric material	Pt	---	---	---	---	---	---	---	---
	36-60	Clay loam, silt loam, loam.	CL-ML, CL	A-4, A-6	0	85-100	80-100	70-100	50-90	25-40	5-20
Pd*. Pits											

See footnote at end of table.

TABLE 15.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
PfA, PfB, PfC, PfD Plainfield	0-4	Sand------------	SP-SM, SM, SP	A-3, A-2	0	75-100	75-100	40-80	3-35	---	NP
	4-60	Sand------------	SP	A-3, A-1	0	75-100	75-100	40-95	1-4	---	NP
Ps---------------- Poygan	0-9	Silty clay loam	CL, CH	A-7	0	100	100	90-100	75-95	45-55	25-35
	9-24	Silty clay, silty clay loam, clay.	CL, CH	A-7	0-5	90-100	90-100	85-100	70-95	45-70	30-45
	24-60	Clay, silty clay, silty clay loam.	CL, CH	A-7, A-6	0-5	90-100	90-100	85-100	70-100	30-70	15-45
RfA, RfB, RfC------ Richford	0-15	Loamy sand------	SM	A-2, A-4	0	95-100	85-100	50-60	15-40	---	NP
	15-31	Loamy sand, sand	SM, SP-SM	A-1, A-2, A-3	0	80-100	80-100	45-65	5-15	---	NP
	31-45	Sandy loam, loamy sand.	SM	A-2, A-4	0	80-100	80-100	50-95	15-40	<20	2-6
	45-60	Loamy sand, sand.	SM, SP-SM	A-1, A-3 A-2	0	80-100	80-100	45-70	5-30	---	NP
SoB---------------- Sisson	0-16	Fine sandy loam	CL, ML, SM, SC	A-4	0	100	100	60-85	35-55	<28	NP-10
	16-36	Loam, clay loam, silt loam.	CL	A-4, A-6	0	100	100	85-100	60-90	18-40	7-25
	36-60	Stratified silt to fine sand.	CL, ML, SM, SC	A-2, A-4, A-6	0	100	95-100	65-95	25-90	<35	NP-15
SpA---------------- Sparta	0-17	Loamy sand------	SM	A-2, A-4	0	85-100	85-100	50-95	15-50	---	NP
	17-29	Loamy sand, fine sand, sand.	SP-SM, SM	A-2, A-3, A-4	0	85-100	85-100	50-95	5-50	---	NP
	29-60	Sand, fine sand	SP-SM, SM	A-2, A-3	0	85-100	85-100	50-95	5-30	---	NP
TeA---------------- Tell	0-12	Silt loam-------	ML, CL-ML, CL	A-4	0	100	100	90-100	85-95	20-30	3-10
	12-30	Silty clay loam, silt loam.	CL	A-6, A-4	0	100	100	90-100	85-95	25-40	8-20
	30-35	Loam, sandy loam, sandy clay loam.	CL, ML, SM, SC	A-4, A-6	0	100	90-100	60-95	35-75	10-29	2-13
	35-60	Sand, loamy sand	SM, SP-SM, SP	A-2, A-3	0	100	90-100	50-75	0-15	---	NP
Wa----------------- Wautoma	0-8	Loamy sand------	SM	A-2, A-4	0	100	100	50-90	15-40	---	NP
	8-21	Sand, loamy sand, loamy fine sand.	SM, SP-SM	A-2, A-3, A-4	0	100	100	50-90	5-40	---	NP
	21-26	Sandy loam, fine sandy loam, loam.	SM, SC, ML, CL	A-2, A-4	0	100	100	70-95	30-75	<25	2-10
	26-60	Sandy clay loam, silty clay loam, clay.	CH, CL	A-7	0	100	100	90-100	85-95	40-55	25-35
WeA---------------- Wyeville	0-10	Loamy sand------	SM	A-2, A-4	0	100	100	50-90	15-40	---	NP
	10-23	Sand, loamy fine sand, loamy sand.	SM, SP-SM	A-3, A-2, A-4	0	100	100	50-90	5-40	---	NP
	23-60	Silty clay loam, silty clay, clay.	CL, CH	A-7	0	100	100	90-100	75-95	45-65	25-35

See footnote at end of table.

TABLE 15.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
WyB, WyC, WyD------ Wyocena	0-8	Loamy sand------	SM	A-2, A-4	0-5	90-100	90-100	50-85	15-50	---	NP
	8-34	Sandy loam------	SM, SM-SC	A-2, A-4	0-5	90-100	90-100	60-70	15-40	<20	2-7
	34-60	Sand, loamy sand	SM, SP-SM	A-1, A-2, A-3	0-5	85-100	80-100	40-70	5-25	---	NP

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm^3	In/hr	In/in	pH					Pct
Ad----------------	0-45	---	0.30-0.55	2.0-6.0	0.35-0.45	4.5-7.3	-------------	----	---	3	55-75
Adrian	45-60	---	1.40-1.75	6.0-20	0.03-0.08	6.1-8.4	Low----------	----			
AlA---------------	0-9	0-15	1.29-1.72	6.0-20	0.10-0.12	5.6-7.3	Low----------	0.17	5	2	1-4
Algansee	9-60	0-18	1.72-1.92	6.0-20	0.05-0.07	5.6-7.3	Low----------	0.17			
An*. Aquents											
Au----------------	0-6	10-15	0.63-1.59	6.0-20	0.07-0.09	4.5-7.3	Low----------	0.15	5	2	2-4
Au Gres	6-30	1-15	1.22-1.57	6.0-20	0.06-0.09	4.5-7.3	Low----------	0.15			
	30-60	0-8	1.22-1.65	6.0-20	0.05-0.07	5.1-7.3	Low----------	0.15			
BlA---------------	0-8	8-12	1.35-1.70	2.0-6.0	0.13-0.17	5.1-6.0	Low----------	0.20	5	3	1-2
Billett	8-21	10-15	1.40-1.70	2.0-6.0	0.12-0.14	5.1-7.3	Low----------	0.20			
	21-38	7-11	1.45-1.65	2.0-6.0	0.12-0.14	5.1-7.3	Low----------	0.20			
	38-60	2-7	1.55-1.70	6.0-20	0.02-0.08	5.1-7.3	Low----------	0.10			
BnB, BnC, BnD-----	0-4	2-3	1.55-1.65	6.0-20	0.08-0.10	4.5-6.5	Low----------	0.15	3	1	<1
Boone	4-38	0-3	1.55-1.70	6.0-20	0.06-0.08	5.1-7.3	Low----------	0.15			
	38-60	---	---	---	---	---	-------------	----			
BpF*: Boone-----------	0-3	2-3	1.55-1.65	6.0-20	0.08-0.10	4.5-6.5	Low----------	0.15	3	1	<1
	3-38	0-3	1.55-1.70	6.0-20	0.06-0.08	5.1-7.3	Low----------	0.15			
	38-60	---	---	---	---	---	-------------	----			
Rock outcrop.											
BrA---------------	0-7	2-8	1.20-1.65	6.0-20	0.10-0.12	5.1-6.5	Low----------	0.17	5	2	2-3
Brems	7-60	1-4	1.50-1.65	6.0-20	0.05-0.08	4.5-6.0	Low----------	0.17			
BsA*: Brems-----------	0-7	2-8	1.20-1.65	6.0-20	0.10-0.12	5.1-6.5	Low----------	0.17	5	2	2-3
	7-60	1-4	1.50-1.65	6.0-20	0.05-0.08	4.5-6.0	Low----------	0.17			
Newson-----------	0-8	4-12	1.35-1.65	2.0-6.0	0.10-0.13	5.1-6.0	Low----------	0.17	5	2	4-8
	8-28	1-4	1.50-1.65	6.0-20	0.06-0.11	4.5-5.5	Low----------	0.17			
	28-60	1-4	1.50-1.65	6.0-20	0.05-0.10	4.5-6.5	Low----------	0.17			
BtB---------------	0-12	14-25	1.35-1.55	0.6-2.0	0.20-0.24	5.1-7.3	Low----------	0.37	5	6	1-2
Briggsville	12-36	35-50	1.60-1.80	0.2-0.6	0.11-0.20	5.1-7.3	Moderate-----	0.37			
	36-60	40-55	1.65-1.85	0.2-0.6	0.08-0.20	7.4-8.4	Moderate-----	0.37			
CoB, CoC, CoD-----	0-41	4-9	1.35-1.65	6.0-20	0.06-0.09	5.1-6.0	Low----------	0.17	5	1	<1
Coloma	41-60	1-4	1.50-1.65	6.0-20	0.03-0.06	5.1-6.5	Low----------	0.17			
DeA, DeB, DeC-----	0-10	2-8	1.55-1.70	6.0-20	0.07-0.09	5.1-6.0	Low----------	0.17	4	1	<1
Delton	10-28	2-10	1.55-1.70	2.0-6.0	0.06-0.11	5.1-6.0	Low----------	0.17			
	28-34	5-18	1.60-1.70	2.0-2.0	0.12-0.14	5.1-6.0	Low----------	0.17			
	34-60	35-60	1.65-1.85	<0.2	0.10-0.20	5.6-6.0	Moderate-----	0.32			
DsA---------------	0-10	2-6	1.55-1.70	6.0-20	0.07-0.09	5.1-6.0	Low----------	0.15	4	1	<1
Delton	10-26	2-8	1.55-1.70	2.0-6.0	0.06-0.11	5.1-6.0	Low----------	0.15			
	26-42	40-60	1.65-1.85	0.06-0.2	0.11-0.13	5.1-6.0	Moderate-----	0.32			
	42-60	2-10	1.50-1.65	6.0-20	0.05-0.10	5.1-6.0	Low----------	0.15			
EvB---------------	0-9	2-8	1.20-1.65	2.0-6.0	0.10-0.12	4.5-6.5	Low----------	0.17	2	2	.5-1
Elkmound	9-19	7-15	1.55-1.65	0.6-6.0	0.12-0.19	4.5-6.0	Low----------	0.24			
	19-60	---	---	---	---	---	-------------	----			

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH					Pct
Fv------ Fisk	0-9	3-12	1.40-1.70	6.0-20	0.09-0.14	5.1-7.3	Low-------	0.17	5	2	.5-2
	9-36	2-12	1.40-1.70	6.0-20	0.05-0.14	4.5-7.3	Low-------	0.17			
	36-60	10-20	1.55-1.65	0.6-2.0	0.17-0.22	5.6-7.8	Low-------	0.37			
GaB, GaC2------ Gale	0-8	15-20	1.40-1.55	0.6-2.0	0.22-0.24	5.1-7.3	Low-------	0.37	4	5	2-4
	8-26	18-34	1.50-1.70	0.6-2.0	0.18-0.22	5.6-6.5	Moderate-----	0.37			
	26-31	18-34	1.50-1.70	0.6-2.0	0.17-0.22	5.6-6.5	Low-------	0.37			
	31-38	1-10	1.30-1.50	2.0-20	0.06-0.11	5.6-6.5	Low-------	0.15			
	38-60	---	---	---	---	---	-------	----			
GrB, GrC------ Grays	0-18	15-20	1.35-1.55	0.6-2.0	0.22-0.24	6-1-7.4	Low-------	0.32	5	6	2-4
	18-39	25-35	1.55-1.65	0.6-2.0	0.18-0.20	6.1-7.4	Moderate-----	0.43			
	39-60	5-20	1.45-1.70	0.6-6.0	0.14-0.22	6.6-8.4	Low-------	0.43			
Hm------ Houghton	0-60	---	0.15-0.45	2.0-6.0	0.35-0.45	5.6-6.5	-------	----	---	3	>70
KnB, KnC, KnD2--- Kewaunee	0-11	12-20	1.35-1.55	0.6-2.0	0.20-0.24	5.6-7.3	Low-------	0.32	3	5	2-3
	11-36	35-60	1.40-1.60	0.06-0.6	0.07-0.20	5.6-7.8	High-------	0.32			
	36-60	35-60	1.55-1.65	0.06-0.6	0.06-0.20	7.4-8.4	Moderate-----	0.32			
KsA------ Kibbie	0-12	5-25	1.43-1.73	0.6-2.0	0.16-0.24	5.6-7.3	Low-------	0.28	5	5	1-3
	12-60	5-35	1.44-1.81	0.6-2.0	0.17-0.22	6.1-7.8	Low-------	0.43			
Le------ Leola	0-9	4-10	1.35-1.65	2.0-6.0	0.08-0.12	5.1-6.0	Low-------	0.17	5	2	.5-2
	9-34	6-15	1.65-1.75	2.0-2 .0	0.09-0.14	5.1-6.5	Low-------	0.17			
	34-60	1-8	1.55-1.70	6.0-20	0.05-0.07	5.6-6.5	Low-------	0.17			
MbA------ Manawa	0-13	15-27	1.30-1.45	0.6-2.0	0.20-0.24	6.1-7.8	Low-------	0.32	3	6	2-4
	13-30	35-60	1.55-1.65	0.06-0.2	0.09-0.20	6.1-7.3	Moderate-----	0.32			
	30-60	35-60	1.85-1.95	0.06-0.2	0.08-0.20	7.4-8.4	Moderate-----	0.32			
MoA------ Meehan	0-8	4-10	1.35-1.65	6.0-20	0.10-0.12	5.1-7.3	Low-------	0.17	5	2	.5-2
	8-36	4-9	1.35-1.65	6.0-20	0.06-0.11	5.1-6.5	Low-------	0.17			
	36-60	1-4	1.50-1.65	6.0-20	0.02-0.07	6.1-7.3	Low-------	0.17			
Ne------ Newson	0-8	4-12	1.35-1.65	2.0-6.0	0.10-0.13	5.1-6.0	Low-------	0.17	5	2	4-8
	8-28	1-4	1.50-1.65	6.0-20	0.06-0.11	5.6-6.5	Low-------	0.17			
	28-60	1-4	1.50-1.65	6.0-20	0.05-0.10	5.1-6.0	Low-------	0.17			
OkB, OkC, OkD---- Okee	0-26	4-10	1.55-1.70	2.0-6.0	0.12-0.14	6.1-7.3	Low-------	0.17	4	2	1-2
	26-38	10-18	1.55-1.70	0.6-2.0	0.12-0.16	6.1-7.3	Low-------	0.24			
	38-49	4-15	1.55-1.65	0.6-6.0	0.09-0.11	6.1-7.3	Low-------	0.24			
	49-60	4-15	1.35-1.85	0.6-6.0	0.07-0.12	7.4-8.4	Low-------	0.17			
Pa------ Palms	0-36	---	0.25-0.45	2.0-6.0	0.35-0.45	5.1-8.4	-------	----	---	3	>75
	36-60	7-35	1.46-2.00	0.2-2.0	0.14-0.22	6.1-8.4	Low-------	----			
Pd*. Pits											
PfA, PfB, PfC, PfD------ Plainfield	0-4	4-9	1.35-1.65	6.0-20	0.04-0.09	4.5-7.3	Low-------	0.17	5	1	<1
	4-60	1-4	1.50-1.65	6.0-20	0.04-0.07	5.1-6.0	Low-------	0.17			
Ps------ Poygan	0-9	27-45	1.35-1.65	0.2-0.6	0.11-0.23	6.1-7.8	Moderate-----	0.32	3	7	4-7
	9-24	35-60	1.65-1.75	0.06-0.2	0.09-0.18	6.1-8.4	Moderate-----	0.32			
	24-60	35-60	1.85-1.95	0.06-0.2	0.08-0.20	7.4-8.4	Moderate-----	0.32			
RfA, RfB, RfC---- Richford	0-15	4-10	1.35-1.65	2.0-6.0	0.08-0.12	5.6-7.3	Low-------	0.17	5	2	<1
	15-31	2-12	1.65-1.75	2.0-20	0.08-0.11	5.6-7.3	Low-------	0.17			
	31-45	6-12	1.75-1.90	2.0-6.0	0.11-0.14	5.6-6.5	Low-------	0.17			
	45-60	2-12	1.75-1.90	6.0-20	0.06-0.10	6.1-7.8	Low-------	0.17			

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm^3	In/hr	In/in	pH					Pct
SoB---------------- Sisson	0-16	8-15	1.35-1.60	0.6-2.0	0.13-0.18	6.1-7.3	Low-----------	0.24	5	3	1-2
	16-36	18-25	1.55-1.65	0.6-2.0	0.15-0.22	5.1-6.0	Moderate-----	0.43			
	36-60	5-20	1.45-1.70	0.6-2.0	0.05-0.22	5.6-6.5	Low-----------	0.43			
SpA---------------- Sparta	0-17	3-10	1.20-1.40	2.0-6.0	0.09-0.12	5.1-7.3	Low-----------	0.17	5	2	1-2
	17-29	2-8	1.40-1.60	6.0-20	0.05-0.11	5.1-6.0	Low-----------	0.17			
	29-60	0-5	1.50-1.70	6.0-20	0.04-0.07	5.1-6.0	Low-----------	0.17			
TeA---------------- Tell	0-12	14-18	1.35-1.55	0.6-2.0	0.22-0.24	5.1-7.3	Low-----------	0.37	4	5	1-3
	12-30	20-28	1.55-1.65	0.6-2.0	0.18-0.22	5.1-6.0	Moderate-----	0.37			
	30-35	10-25	1.55-1.65	0.6-2.0	0.12-0.19	5.1-6.0	Low-----------	0.37			
	35-60	2-8	1.55-1.70	6.0-20	0.05-0.07	5.1-6.0	Low-----------	0.15			
Wa----------------- Wautoma	0-8	4-10	1.55-1.70	2.0-6.0	0.10-0.12	5.1-6.5	Low-----------	0.17	4	2	1-3
	8-21	2-10	1.55-1.70	2.0-6.0	0.06-0.11	5.1-6.0	Low-----------	0.17			
	21-26	5-18	1.60-1.70	0.6-6.0	0.12-0.19	5.1-6.0	Low-----------	0.17			
	26-60	35-55	1.65-1.85	<0.2	0.08-0.20	6.1-7.8	Moderate-----	0.32			
WeA---------------- Wyeville	0-10	4-10	1.55-1.70	2.0-6.0	0.10-0.12	5.6-7.3	Low-----------	0.17	5	2	<1
	10-23	2-10	1.55-1.70	2.0-6.0	0.06-0.11	5.1-7.3	Low-----------	0.17			
	23-60	35-55	1.65-1.85	<0.2	0.10-0.20	5.1-6.5	Moderate-----	0.32			
WyB, WyC, WyD----- Wyocena	0-8	3-8	1.20-1.65	2.0-6.0	0.10-0.12	5.1-7.3	Low-----------	0.17	4	2	1-2
	8-34	4-13	1.35-1.65	2.0-6.0	0.09-0.14	5.1-6.5	Low-----------	0.17			
	34-60	2-8	1.55-1.70	6.0-20	0.05-0.10	6.6-7.8	Low-----------	0.17			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--SOIL AND WATER FEATURES

[The definitions of "flooding" and "water table" in the Glossary explain terms such as "rare," "brief," "apparent," and "perched." The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Total subsi-dence	Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard-ness			Uncoated steel	Concrete
					Ft			In		In			
Ad-------------- Adrian	A/D	Frequent----	Long------	Nov-May	0-1.0	Apparent	Nov-May	>60	---	29-33	High-----	High-----	Moderate.
AlA------------- Algansee	B	Frequent----	Long------	Nov-May	1.0-2.0	Apparent	Nov-May	>60	---	---	Moderate	Low------	Low.
An*------------- Aquents	---	---	---	---	---	---	---	---	---	---	---	---	---
Au-------------- Au Gres	B	None--------	---	---	0.5-1.5	Apparent	Nov-May	>60	---	---	Moderate	Low------	Moderate.
BlA------------- Billett	A	None--------	---	---	>6.0	---	---	>60	---	---	Moderate	Low------	Moderate.
BnB, BnC, BnD--- Boone	A	None--------	---	---	>6.0	---	---	20-40	Rip-pable	---	Low------	Low------	Moderate.
BpF*:													
Boone----------	A	None--------	---	---	>6.0	---	---	20-40	Rip-pable	---	Low------	Low------	Moderate.
Rock outcrop.													
BrA------------- Brems	A	None--------	---	---	2.5-3.5	Apparent	Jan-Apr	>60	---	---	Low------	Low------	High.
BsA*:													
Brems----------	A	None--------	---	---	2.5-3.5	Apparent	Jan-Apr	>60	---	---	Low------	Low------	High.
Newson---------	A/D	None--------	---	---	0-1.0	Apparent	Nov-Jun	>60	---	---	Moderate	High-----	High.
BtB------------- Briggsville	C	None--------	---	---	>6.0	---	---	>60	---	---	High-----	High-----	Moderate.
CoB, CoC, CoD--- Coloma	A	None--------	---	---	>6.0	---	---	>60	---	---	Low------	Low------	Moderate.
DeA, DeB, DeC, DsA------------ Delton	B	None--------	---	---	>6.0	---	---	>60	---	---	Low------	High-----	Moderate.
EvB------------- Elkmound	D	None--------	---	---	>6.0	---	---	10-20	Rip-pable	---	Moderate	Moderate	Moderate.
Fv-------------- Fisk	B	None--------	---	---	1.0-3.0	Apparent	Nov-Jun	>60	---	---	High-----	High-----	Moderate.
GaB, GaC2------- Gale	B	None--------	---	---	>6.0	---	---	20-40	Rip-pable	---	High-----	Moderate	Moderate.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Total subsi-dence	Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard-ness			Uncoated steel	Concrete
					Ft			In		In			
GrB, GrC-------- Grays	B	None--------	---	---	>6.0	Apparent	Feb-Apr	>60	---	---	High-----	Moderate	Moderate.
Hm-------------- Houghton	A/D	Frequent----	Long------	Nov-May	0-1.0	Apparent	Sep-Jun	>60	---	55-60	High-----	High-----	Low.
KnB, KnC, KnD2-- Kewaunee	C	None--------	---	---	>6.0	---	---	>60	---	---	Moderate	High-----	Low.
KsA------------- Kibbie	B	None--------	---	---	1.0-2.0	Apparent	Nov-May	>60	---	---	High-----	Low------	High.
Le-------------- Leola	B	None--------	---	---	1.5-3.0	Apparent	Nov-Apr	>60	---	---	Moderate	Moderate	Moderate.
MbA------------- Manawa	C	Occasional	Brief-----	Nov-May	1.0-3.0	Perched	Nov-Jun	>60	---	---	High-----	High-----	Low.
MoA------------- Meehan	B	None--------	---	---	1.5-3.0	Apparent	Nov-May	>60	---	---	Moderate	Low------	Moderate.
Ne-------------- Newson	A/D	None--------	---	---	0-1.0	Apparent	Nov-Jun	>60	---	---	Moderate	High-----	High.
OkB, OkC, OkD--- Okee	A	None--------	---	---	>6.0	---	---	>60	---	---	Low------	Moderate	Moderate.
Pa-------------- Palms	A/D	Frequent----	Long------	Nov-May	0-1.0	Apparent	Nov-May	>60	---	25-32	High-----	High-----	Moderate.
Pd*. Pits													
PfA, PfB, PfC, PfD------------ Plainfield	A	None--------	---	---	>6.0	---	---	>60	---	---	Low------	Low------	High.
Ps-------------- Poygan	D	Frequent----	Long------	Nov-Jun	0-1.0	Perched	Nov-Jul	>60	---	---	High-----	High-----	Low.
RfA, RfB, RfC--- Richford	A	None--------	---	---	>6.0	---	---	>60	---	---	Low------	Low------	Moderate.
SoB------------- Sisson	B	None--------	---	---	>6 .0	---	---	>60	---	---	Moderate	Low------	Low.
SpA------------- Sparta	A	None--------	---	---	>6.0	---	---	>60	---	---	Low------	Low------	Moderate.
TeA------------- Tell	B	None--------	---	---	>6.0	---	---	>60	---	---	High-----	Moderate	Moderate.
Wa-------------- Wautoma	D	Frequent----	Brief-----	Nov-May	0-1.0	Apparent	Nov-May	>60	---	---	Moderate	Moderate	Moderate.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Total subsidence	Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness			Uncoated steel	Concrete
					Ft			In		In			
WeA------------- Wyeville	C	Rare---------	---	---	1.5-3.0	Apparent	Nov-Apr	>60	---	---	Moderate	Moderate	Moderate.
WyB, WyC, WyD--- Wyocena	B	None---------	---	---	>6.0	---	---	>60	---	---	Moderate	Low-------	Moderate.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--ENGINEERING TEST DATA

[Absence of an entry indicates that no determination was made]

Soil name and location	Parent material	Sample number	Depth	Moisture density: Maximum dry density	Moisture density: Optimum moisture	Percentage passing sieve--*: No. 4	Percentage passing sieve--*: No. 10	Percentage passing sieve--*: No. 40	Percentage passing sieve--*: No. 200	Percentage smaller than--*: 0.05 mm	Percentage smaller than--*: 0.02 mm	Percentage smaller than--*: 0.005 mm	Percentage smaller than--*: 0.002 mm	Liquid limit	Plasticity index	Classification: AASHTO	Classification: Unified
			In	Lb/cu ft	Pct									Pct			
Briggsville silt loam: SW1/4SW1/4 sec. 28, T. 16 N., R. 6 E.	Silt and clay lacustrine deposits.	S77WI-01-2-(1)	18-25	--	--	--	100	97	83	82	75	53	39	48	29	A-7-6 (17)	CL
		S77WI-01-2-(2)	36-60	100	22	--	--	100	97	97	93	70	51	62	40	A-7-6 (20)	CH
Coloma sand: SW1/4SW1/4 sec. 16, T. 16 N., R. 7 E.	Sandy glacial drift.	S76WI-01-5-(1)	41-55	--	--	--	100	90	11	8	6	5	4	--	NP**	A-2-4 (0)	SP-SM
Delton sand: SW1/4NE1/4 sec. 20, T. 18 N., R. 5 E.	Sandy outwash over lacustrine silt and clay.	S75WI-01-1-(1)	15-28	--	--	--	100	86	9	8	7	5	3	--	NP	A-3(0)	SP-SM
		S75WI-01-1-(2)	28-34	--	--	--	100	94	41	41	38	28	20	16	5	A-4(1)	SC-SM
		S75WI-01-1-(3)	37-60	--	--	--	100	99	92	91	87	73	60	59	37	A-7-6 (20)	CH
Grays silt loam:*** SE1/4SE1/4 sec. 10, T. 18 N., R. 5 E.	Silty lacustrine deposits.	S77WI-01-1-(1)	18-26	--	--	--	100	99	77	68	39	21	17	26	7	A-4(8)	CL
		S77WI-01-1-(2)	50-60	111	14	--	100	100	79	62	27	11	8	20	NP	A-4(8)	ML
Meehan loamy sand: SW1/4SE1/4 sec. 7, T. 20 N., R. 7 E.	Sandy outwash	S74WI-01-1-(1)	15-25	--	--	--	100	85	3	2	2	1	1	--	NP	A-3(0)	SP
		S74WI-01-1-(2)	36-60	--	--	--	100	94	2	1	1	1	1	--	NP	A-3(0)	SP
Newson loamy sand: NE1/4NW1/4 sec. 20, T. 20 N., R. 5 E.	Sandy outwash	S74WI-01-2-(1)	9-20	--	--	--	100	86	8	7	5	2	2	--	NP	A-3(0)	SP-SM
		S74WI-01-2-(2)	30-60	--	--	--	100	94	6	5	3	2	2	--	NP	A-3(0)	SP-SM
Okee loamy sand: NE1/4NE1/4 sec. 9, T. 16 N., R. 7 E.	Sandy alluvium over sandy glacial till.	S77WI-01-3-(1)	24-30	--	--	95	93	82	20	17	15	11	10	--	NP	A-2-4 (0)	SM-SC
		S77WI-01-3-(2)	34-60	126	10	98	97	85	20	18	13	9	8	--	NP	A-2-4 (0)	SM-SC

See footnotes at end of table.

TABLE 18.--ENGINEERING TEST DATA--Continued

Soil name and location	Parent material	Sample number	Depth	Moisture density: Maximum dry density	Moisture density: Optimum moisture	Percentage passing sieve--*: No. 4	No. 10	No. 40	No. 200	Percentage smaller than--*: 0.05 mm	0.02 mm	0.005 mm	0.002 mm	Liquid limit	Plasticity index	Classification: AASHTO	Classification: Unified
			In	Lb/cu ft	Pct									Pct			
Plainfield sand: SW1/4SE1/4 sec. 14, T. 20 N., R. 5 E.	Sandy outwash	S75WI-01-2-(1)	7-17	--	--	--	100	94	4	4	3	2	2	--	NP	A-3(0)	SP
		S75WI-01-2-(2)	28-60	--	--	--	100	91	1	1	1	1	1	--	NP	A-3(0)	SP
Richford loamy sand: NW1/4SE1/4 sec. 8, T. 16 N., R. 7 E.	Sandy outwash	S76WI-01-4-(1)	25-38	--	--	90	87	64	17	15	11	8	7	--	NP	A-2-4 (0)	SM-SC
Wyocena loamy sand: NE1/4NE1/4 sec. 27, T. 16 N., R. 7 E.	Sandy glacial deposits.	S75WI-01-3-(1)	26-34	--	--	--	100	67	15	13	11	8	7	--	NP	A-2-4 (0)	SM
		S75WI-01-3-(2)	37-58	--	--	--	100	67	8	8	7	4	3	--	NP	A-3(0)	SP-SM

* Mechanical analysis according to the AASHTO Designation T88-57 (1). Results from this procedure can differ somewhat from the results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHTO procedure, the fine material is analyzed by hydrometer method and the various grain-size fractions are calculated on the basis of all material up to and including that 3 inches in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from the calculation of grain-size fraction. The mechanical analysis data used in this table are not suitable for use in naming textural classes of soils.

** NP means nonplastic.

*** These soils are taxadjuncts. See the series description for explanation.

TABLE 19.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series]

Soil Name	Family or higher taxomomic class
Adrian	Sandy or sandy-skeletal, mixed, euic, mesic Terric Medisaprists
Algansee	Mixed, mesic Aquic Udipsamments
Aquents	Sandy, mixed, mesic Aquents
Au Gres	Sandy, mixed, frigid Entic Haplaquods
Billett	Coarse-loamy, mixed, mesic Mollic Hapludalfs
Boone	Mesic, uncoated Typic Quartzipsamments
Brems	Mixed, mesic Aquic Udipsamments
Briggsville	Fine, mixed, mesic Typic Hapludalfs
Coloma	Mixed, mesic Alfic Udipsamments
Delton	Loamy, mixed, mesic Arenic Hapludalfs
*Elkmound	Loamy, mixed, mesic Lithic Dystrochrepts
*Fisk	Sandy over loamy, mixed, mesic Aquic Dystric Eutrochrepts
Gale	Fine-silty over sandy or sandy-skeletal, mixed, mesic Typic Hapludalfs
*Grays	Fine-silty, mixed, mesic Mollic Hapludalfs
Houghton	Euic, mesic Typic Medisaprists
Kewaunee	Fine, mixed, mesic Typic Hapludalfs
*Kibbie	Fine-loamy, mixed, mesic Aquollic Hapludalfs
Leola	Sandy, mixed, mesic Aquic Arenic Hapludalfs
Manawa	Fine, mixed, mesic Aquollic Hapludalfs
Meehan	Mixed, frigid Aquic Udipsamments
Newson	Mixed, frigid Humaqueptic Psammaquents
Okee	Loamy, mixed, mesic Arenic Hapludalfs
Palms	Loamy, mixed, euic, mesic Terric Medisaprists
Plainfield	Mixed, mesic Typic Udipsamments
*Poygan	Fine, mixed, mesic Typic Haplaquolls
Richford	Sandy, mixed, mesic Psammentic Hapludalfs
Sisson	Fine-loamy, mixed, mesic Typic Hapludalfs
Sparta	Sandy, mixed, mesic Entic Hapludolls
Tell	Fine-silty over sandy or sandy-skeletal, mixed, mesic Typic Hapludalfs
Wautoma	Sandy over clayey, mixed, nonacid, mesic Mollic Haplaquents
Wyeville	Clayey, mixed, mesic Aquic Arenic Hapludalfs
Wyocena	Coarse-loamy, mixed, mesic Typic Hapludalfs

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