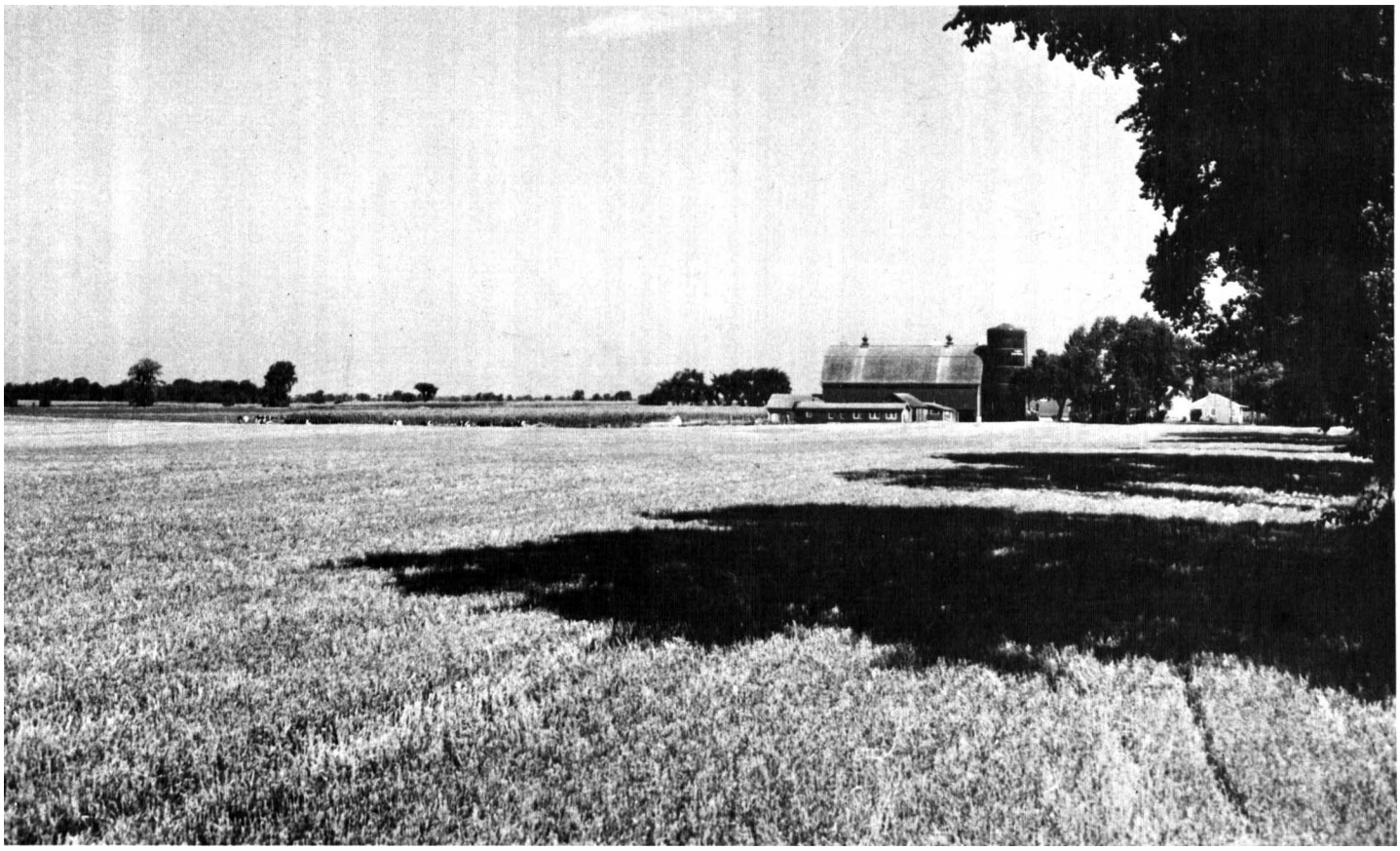
SOIL SURVEY OF

Fond du Lac County, Wisconsin



United States Department of Agriculture
Soil Conservation Service
In cooperation with
University of Wisconsin
Department of Soil Science
Wisconsin Geological and Natural History Survey, and
Wisconsin Agricultural Experiment Station

Issued April 1973

Major fieldwork for this soil survey was done in the period 1958 to 1963. Soil names and descriptions were approved in 1967. Unless otherwise indicated, statements in this publication refer to conditions in the county in 1963. This survey was made cooperatively by the Soil Conservation Service, the University of Wisconsin, Department of Soil Science, the Wisconsin Geological and Natural History Survey, and the Wisconsin Agricultural Experiment Station. It is part of the technical assistance furnished to the Fond du Lac County Soil and Water Conservation District.

Either enlarged or reduced copies of the soil map in this publication can be made by commercial photographers, or they can be purchased on individual order from the Cartographic Division, Soil Conservation Service, United States Department of Agriculture, Washington, D.C. 20250.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms and woodland; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All the soils of Fond du Lac County are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the county in alphabetic order by map symbol and gives the capability classification of each. It also shows the page where each soil is described and the page for the capability unit, woodland suitability group, and wildlife group in which the soil has been placed.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the discussions of the capability units and woodland suitability groups.

Foresters and others can refer to the section "Woodland," where the soils of the county are grouped according to their suitability for trees.

Game managers, sportsmen, and others can find information about soils and wildlife in the section "Wildlife."

Engineers and builders can find, under "Engineering Uses of the Soils," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices.

Scientists and others can read about how the soils formed and how they are classified in the section "Formation, Morphology, and Classification of the Soils."

Newcomers in Fond du Lac County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the section "General Nature of the County."

Cover: A typical farm scene in Fond du Lac County. Kewaunee soils are in the foreground and in the gently sloping areas near the trees; Manawa and Poygan soils are at left center.

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SOIL SURVEY OF FOND DU LAC COUNTY, WISCONSIN

BY ERNEST G. LINK

FIELDWORK BY RICHARD HIGGINS, IRVING L. KORTH, ERNEST G. LINK, AND ROBERT A. PATZER,[1] SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE UNIVERSITY OF WISCONSIN, DEPARTMENT OF SOIL SCIENCE, WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY, AND THE WISCONSIN AGRICULTURAL EXPERIMENT STATION

FOND DU LAC COUNTY, in the east-central part of Wisconsin, (fig. 1), has a land area of 463,360 acres, or about 724 square miles. The county is 36 miles from east to west, and the eastern part is about 27 miles from north to south.

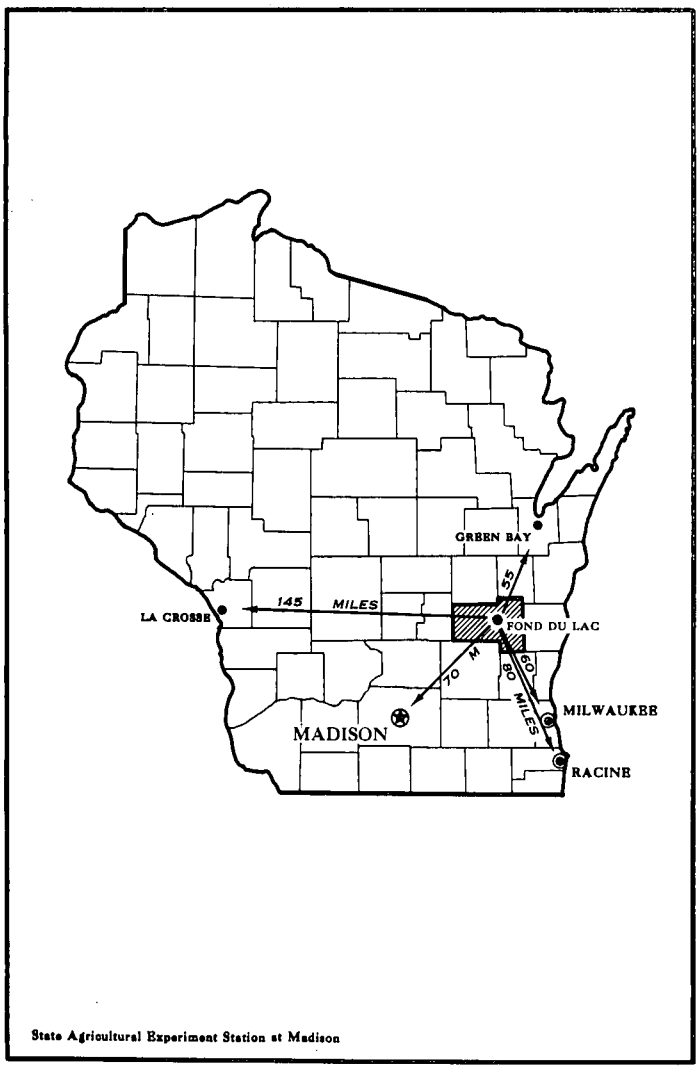

Figure 1.—Location of Fond du Lac County in Wisconsin.

The county seat and largest city is Fond du Lac, on the southern shore of Lake Winnebago. The city of Fond du Lac had a population of 32,719 in 1960.

The Niagara Escarpment (*5*),[2] the Kettle Moraine (*10*), and Lake Winnebago are important physiographic features of the county. The Niagara Escarpment, locally known as "the ledge," is Niagara dolomite. It is a highly irregular, west-facing scarp that approximately parallels the eastern shore of Lake Winnebago. It extends from a mile north of Eden nearly to the Calumet County line. Elevations are 60 to 150 feet. The Kettle Moraine is in the extreme southeastern corner of the county. It consists of a series of steep glacial deposits and potholes that formed as a part of the glacial system in Wisconsin 11,000 to 30,000 years ago. The Kettle Moraine is a prominent landmark at elevations of about 50 to 150 feet. The southern tip of Lake Winnebago extends into the northern part of Fond du Lac County.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Fond du Lac County, where they are located, and how they can be used. The soil scientists went into the county knowing they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes, the size and speed of streams, the kinds of native plants or crops, the kinds of rock, and many facts about the soils. They dug many holes to expose 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 that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures (*12*). The soil series and the soil phase are the categories of soil classification most used in a local survey.

[1] Other soil scientists who assisted in the fieldwork include NORMAN SCHMEICHEL, THOMAS SCHULTZ, JAMES R. TOMLINSON, GEORGE WALKER, ARTHUR WALSH, BUREL S. BUTMAN, VICTOR KILMER, CHARLES F. LEONARD, WILLIAM PARKER, HAROLD SEIBEL, and DELBERT D. THOMAS.

[2] Italic numbers in parentheses refer to Literature Cited, page 113.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Lamartine and Lomira, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Casco loam, 2 to 6 percent slopes, is one of several phases within the Casco series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil phase.

Some mapping units are made up of soils of different series, or of different phases within one series. One such mapping unit, the soil complex, is shown on the soil map of Fond du Lac County.

A soil complex consists of areas of two or more soils, so intermingled or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. The name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Lomira-Knowles silt loams, 0 to 2 percent slopes, is an example.

In most areas surveyed there are places where the soil material is so rocky, so shallow, or so severely eroded that it cannot be classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Rock land is an example of a land type in Fond du Lac County.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soil in other places are assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil. Yields under defined management are estimated for all the soils.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in such a way as to be readily useful to different groups of users, among them farmers, managers of woodland, and engineers.

On the basis of yield and practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. Then they adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Fond du Lac County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area, or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field, or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The soil associations in Fond du Lac County are discussed in the following pages. The terms for texture used in the descriptive headings of these associations apply to the surface layer. For example, in the heading for association 6, the word "loamy" refers to the texture of the surface layer.

1. Lomira-Virgil association

Well-drained and somewhat poorly drained, silty, moderately permeable soils underlain by calcareous loam till

This association is part of a ground moraine underlain by calcareous loam glacial till. The landscape is mostly one of low ridges and knobs, and between the ridges, nearly level uplands and depressions (fig. 2). This association is mainly in the western part of the county. The largest area is between the villages of Rosendale and Brandon.

This association is about 175 square miles in area, and it makes up about 24 percent of Fond du Lac County. It is about 60 percent Lomira soils, 15 percent Virgil soils, and 5 percent Pella soils. The remaining 20 percent is Palms, Rollin, and Houghton soils.

Lomira soils are nearly level to moderately steep, deep, and well drained. They formed in silt over glacial till of loam texture.

Virgil soils are nearly level and somewhat poorly drained. They are in or adjacent to wide depressions and low areas and are subject to occasional flooding.

Pella soils are nearly level to gently sloping, and they are poorly drained.

Figure 2.—**Landscape in Lomira-Virgil association.**

This association is used mainly for crops. Limitations are slight to moderate. Wetness is the main limitation for the Virgil and Pella soils. Before cultivation, the Lomira soils supported forests of oak, sugar maple, and basswood. Marsh grass and shrubs grew on the other soils.

2. *Theresa-Pella-Lamartine association*

Well-drained to poorly drained, silty, moderately permeable soils underlain by calcareous loam and sandy loam till

This association is mainly on a ground moraine consisting of calcareous loam glacial till. Much of this moraine is sloping to steep knobs and oval drumlins. Between the sloping areas are numerous long, narrow valleys and a few broad depressions (fig. 3). This association has an immature, weakly established drainage pattern. It includes segments of a recessional moraine that has complex slopes. The largest continuous block is in the eastern third of the county and includes nearly all of the town of Empire. Other areas are in the northwestern and western parts.

This association has an area of about 160 square miles and makes up about 22 percent of the county. It is about 30 percent Theresa soils, 20 percent Pella soils, and 5 percent Lamartine soils. The remaining 45 percent is Brookston, Casco, Fox, Virgil, Houghton, Hochheim, Mayville, and Palms soils.

Theresa soils are nearly level to moderately steep and well drained. They formed in thin to moderately deep silt underlain by loam glacial till.

Pella soils are nearly level to gently sloping and poorly drained. They occupy depressional areas.

Lamartine soils are nearly level to gently sloping and somewhat poorly drained. They generally adjoin depressional areas.

A large part of this association is used for crops.

The soils are easy to farm. Erosion and wetness are the two main limitations. Woodlots are common on the steeper slopes. The somewhat poorly drained and well-drained soils originally supported forests of oak, sugar maple, and basswood, and the poorly drained soils supported white-cedar, black spruce, tamarack or black ash, elm, and willow.

3. *Plano-Mendota association*

Well-drained, silty, moderately permeable soils underlain by calcareous loam till

This association is on a ground moraine underlain by calcareous loam glacial till. The landscape is one of gently sloping and sloping low ridges and knobs and nearly level uplands and depressions (fig. 4). It is dissected by the shallow waterways of an immature drainage pattern. A few segments of a recessional moraine that has complex slopes also occur within the association.

This association has a total area of about 65 square miles and makes up about 9 percent of the county. It is about 40 percent Plano soils and 35 percent Mendota soils. The re-

Figure 3.—Drumlin landscape in the Theresa-Pella-Lamartine association.

Figure 4.—Landscape in the Plano-Mendota association.

maining 25 percent is Elburn and Pella soils. Plano and Mendota soils developed under prairie vegetation.

Plano soils are nearly level and gently sloping and are well drained. They formed in silt that is underlain by glacial till at a depth of 20 to 36 inches or more.

Mendota soils are nearly level, gently sloping, and sloping and are well drained. They formed in silt underlain by glacial till.

Elburn soils are somewhat poorly drained, and Pella soils are poorly drained. Both are similar to Plano soils, but they are adjacent to or in depressions or nearly level areas and have a high water table.

Almost all of this association is used for crops. A few isolated areas are used for woodlots and permanent pasture. The limitation is slight to moderate for farming. Erosion is a hazard in sloping areas if row crops are grown.

Prairie grass was the original vegetation on Mendota and Plano soils. A few oak and hickory trees have invaded some of the uncultivated areas. Some areas are used for woodlots. Pella soils originally supported marsh grasses and water-tolerant shrubs.

4. *Beecher-Elliott association*

Somewhat poorly drained, silty and clayey, moderately slowly permeable soils underlain by moderately alkaline shale and till that has a high shale content

This association occupies a ground moraine of calcareous clay loam to silty clay glacial till that has a high shale content. The landscape is one of nearly level to moderately steep uplands, nearly level depressions, waterways, and broad lowlands. This association does not have a mature or well-defined drainage pattern. It is in the south-central part of the county. It occupies most of the towns of Oakfield and Byron and most of the upper watershed of the valley of the East Branch Fond du Lac River.

This association is about 40 square miles in area and makes up about 6 percent of the county. It is about 30 percent Beecher soils, 20 percent Elliott soils, and 15 percent Morley soils. The remaining 35 percent is Ashkum, Pella, Morley, Poygan, Houghton, Manawa, and Lomira soils.

Beecher soils are nearly level and gently sloping and have a thin, dark-colored surface layer. They formed in less than 24 inches of silty soil underlain by calcareous clay loam and silty clay glacial till.

Elliott soils, also, are nearly level and gently sloping. They have a thick, dark-colored surface layer. They formed in silty soil material, less than 24 inches thick, that is underlain by calcareous clay loam and silty clay glacial till.

Ashkum and Pella soils are nearly level and occur in shallow drainageways and wide, wet areas. Morley soils are gently sloping to moderately steep and have a light-colored surface layer.

Most areas are used for crops. A few are used as permanent pasture and woodlots, or are idle. Prairie grasses and sparse stands of oak and hickory were the original vegetation on Beecher and Elliott soils. Marsh grasses and other water-tolerant plants grow in undisturbed areas of Ashkum and Pella soils.

5. *Kewaunee-Manawa-Poygan association*

Well-drained to poorly drained, silty and clayey, moderately slowly to slowly permeable soils underlain by calcareous till or lacustrine sediments

This association occupies glacial ground moraines, terminal moraines, and areas underlain by lacustrine deposits. It is mainly in an area 1 to 6 miles wide bordering Lake Winnebago. The ground moraines, which are on uplands, are nearly level to sloping. The terminal moraines are gently sloping to steep. The areas of lacustrine deposits are nearly level to gently sloping. The drainage pattern is complex and weakly developed, especially on the lower slopes.

This association has a total area of about 111 square miles and makes up about 15 percent of the county. It is about 35 percent Kewaunee soils, 25 percent Manawa soils, and 25 percent Poygan soils. The remaining 15 percent is Peebles, Oshkosh, Wauseon, Casco, and Ionia soils.

The well-drained, nearly level to steep Kewaunee soils formed under forest. They developed in reddish-brown silty clay or clay glacial till. In some places a thin layer of silt loam covers the till. The sloping to steep Kewaunee soils are subject to erosion if they are used for row crops. The nearly level soils have poor tilth in places and are difficult to work in spring or after a heavy rain.

Manawa soils are somewhat poorly drained and nearly level to gently sloping. They formed under grass. Their use is limited mainly by wetness.

Almost all of the poorly drained Poygan soils are nearly level. They formed under grass. Their main limitation is wetness.

Among the minor soils, the nearly level to gently sloping Peebles and Oshkosh soils generally are associated with Kewaunee soils. Oshkosh soils are underlain by reddish-brown lake-laid silty clay and clay. The shallow, nearly level Wauseon soils occupy drainageways near Lake Winnebago. The clay subsoil variants of the Casco and Ionia soils are on glacial lake beaches about 50 feet above Lake Winnebago.

Most of this association is used for crops. A few steep areas are used for permanent pasture or woodlots. Some poorly drained areas are in permanent pasture; some are idle. Sugar maple, basswood, and oak trees are common in this association.

6. *Fox-Casco association*

Well-drained, loamy, moderately permeable soils underlain by calcareous sand and gravel

This association is on outwash plains and terraces. The soils are nearly level to gently sloping. They formed in stratified sand and gravel deposited by glacial melt waters. These deposits occur mainly as plains dissected by shallow drainageways (fig. 5). In some places the plain is interspersed with a few to many, sloping to steep-sided kettle holes or depressions. These kettle-shaped depressions range from a fraction of an acre to 15 acres or more in size.

This association is about 58 square miles in area, or about 8 percent of the county. It is about 35 percent Fox soils and 20 percent Casco soils. The remaining 45 percent is Ionia and Sebewa soils, shallow organic soils, and Alluvial land.

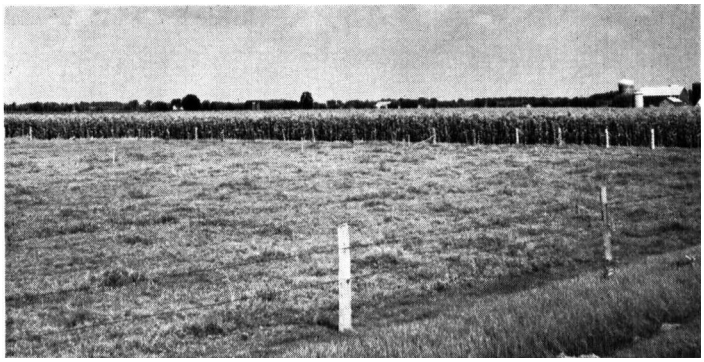

Figure 5.—Landscape in the Fox-Casco association.

Fox soils generally are nearly level to sloping, and they are well drained. They are underlain by sand and gravel at a depth of 24 to 40 inches. They have a low to medium available water capacity and are somewhat droughty. Erosion is a serious hazard.

Casco soils also are well drained. They are less than 24 inches deep over sand and gravel. The steeper Casco soils are on side slopes of kettle holes and depressions. They are subject to erosion and are droughty. They have a low available water capacity.

The nearly level Ionia and Sebewa soils are adjacent to wet areas or at the bottom of large kettle holes and depressions. They are subject to ponding in spring and during periods of heavy rainfall. The shallow organic soils are in some of the large kettle holes. Some areas of Alluvial land occur near major streams.

The major soils of this association are used mainly for crops. In spite of the hazards of drought and erosion, they are easy to farm. A large acreage of Sebewa soils is used for permanent pasture or woodlots. Oak, sugar maple, and basswood forests are native to this association.

7. *Casco-Rodman association*

Well-drained to excessively drained, loamy, moderately and rapidly permeable soils underlain by calcareous sandy and gravelly outwash or drift

This association occupies the Kettle Moraine part of the county. The Kettle Moraine, which formed between lobes of glacial ice, is a series of ridges, knobs, and kettle holes that have complex slopes (fig. 6). Organic deposits, ponds, or lakes occupy many of the kettle holes. Nearly level and gently sloping terraces, ranging from a few acres to several hundred acres in size, occur at various elevations among the hills and kettle holes. A large area east of U.S. Highway 45 lies within the boundaries of the Kettle Moraine State Forest.

This association has an area of about 58 square miles and makes up about 8 percent of the county. It is about 35 percent Casco soils, 25 percent Rodman soils, and 15 percent Fox soils. The remaining 25 percent is Ionia, Sebewa, and Fox soils and organic soils.

The Casco-Rodman loams range from 6 to 30 percent or more in slope. The well-drained Casco soils are on terraces throughout the association. The depth to underlying material is 10 to 24 inches in Casco soils and less than 10 inches in Rodman soils.

Ionia and Sebewa soils are nearly level. They occur as narrow areas adjacent to wetlands or low terraces. Fox soils, which are gently sloping to moderately steep, occupy terraces. The organic soils occupy kettle holes and large depressions.

This association is used mainly for woodland, wildlife, or recreational purposes. The nearly level to sloping soils used for crops are mainly west of U.S. Highway 45. Sugar maple, basswood, and oak trees are native to this association.

8. *Houghton-Palms association*

Organic soils over calcareous outwash, till, or lacustrine deposits

This association occupies large, nearly level depressions and wetland areas throughout Fond du Lac County. The soils formed in fibrous plant remains. They are poorly drained and are subject to ponding.

This association has a total area of about 58 square miles, or about 8 percent of the county. It is about 45 percent Houghton soils, 35 percent Palms soils, and the remaining 20 percent is other organic soils.

Houghton soils are mainly decomposed nonwoody plant residue that is more than 42 inches thick. Palms soils developed in similar organic material, but they are underlain by loam at a depth of less than 42 inches.

The organic soils in this association include the Carbondale, Adrian, Ogden, and Rollin soils. Carbondale soils formed mainly from woody plants. Adrian soils are underlain by sand, Ogden soils by clay, and Rollin soils by marl.

If drainage is improved, this association can be used for crops. Wetness is the main limitation. Undrained areas are in permanent pasture, are in swamp forest, or are idle. The native vegetation is marsh grasses and white-cedar, black spruce, tamarack, black ash, elm, and willow trees.

Use and Management of the Soils

This section briefly describes the system of capability classification used by the Soil Conservation Service. It discusses the use and management of groups of soils, or capability units, and gives a table showing the estimated yields per acre of the principal crops grown in Fond du Lac County. It includes a section on woodland and wildlife, as well as a section that discusses the engineering uses of the soils.

Basic Practices of Management

Following are management practices that can be used on all soils of Fond du Lac County:

Maintaining good soil structure and tilth is always important, especially on steep soils. Soils that have good structure take in and hold more water than soils in which structure has deteriorated. If good structure and tilth are maintained, erosion is less serious and more water is available for crops. The sod-forming crops improve the structure and tilth of the soil and help reduce erosion by keeping the soil covered (*3*).

Practices that control erosion are needed on most of the more sloping soils. Contour stripcropping, terracing, and the use of diversions are common erosion control practices.

Figure 6.—**A Kettle Moraine landscape in the Casco-Rodman association.**

In part of the county, much of the natural supply of plant nutrients has been exhausted. Commercial fertilizer that contains phosphorus and potassium is beneficial. Nitrogen is needed in places. Liming helps reduce acidity and furnishes calcium for plant use.

Hayfields and pasture are renovated to establish or reestablish adequate plant cover of suitable varieties of grasses or legumes and to furnish a better supply of good-quality forage. Application of fertilizer at the time of renovation is also beneficial.

Capability Grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The groups are made according to the limitations of the soils when used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops requiring special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for range, for forest trees, or engineering.

In the capability system, the kinds of soils are grouped at three levels: the capability class, the subclass, and the unit. These are discussed 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, defined as follows:

Class I soils have few 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, require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, 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 largely to pasture, range, woodland, or wildlife.

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Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife.

Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture or range, woodland, or wildlife.

Class VIII soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife, or water supply, or to esthetic purposes.

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 too cold or too dry. Subclass *c* does not occur in Fond du Lac County.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife, or recreation.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example. IIe–1 or IIIe–2. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

In the following pages, the capability units in Fond du Lac County are described, and suggestions for the use and management of the soils are given. Unless the unit contains only one soil, the soils are identified only by the name of the series. Listing of the series name does not mean that all the soils of that series are in the particular unit. To find the classification of individual soils, refer to the "Guide to Mapping Units." Where the need for lime and fertilizer is indicated, the amount of lime and the kinds and amounts of fertilizer to apply should be determined by soil tests.

In Fond du Lac County, the capability units are set up and numbered within a system of capability classification that is used throughout the State of Wisconsin. Not all the capability units in this system are applicable, and for this reason the numbering of the capability units is not consecutive in all cases.

CAPABILITY UNIT I–1

This unit consists of deep and moderately deep, nearly level, moderately well drained and well drained silt loams that are uneroded or only slightly eroded. These soils are in the Dodge, Juneau, Knowles, Lomira, Mayville, Mendota, Plano, St. Charles, and Theresa series.

These soils have high available water capacity and are moderately permeable. They are moderately high in fertility.

These soils are well suited to all crops commonly grown in the county, such as alfalfa, bromegrass, clover, oats, barley, and corn. They are also well suited to such special crops as beets, peas, and sweet corn, and to pasture.

These soils are easy to cultivate. They can be cropped intensively if a good supply of plant nutrients and organic matter is maintained. Tilth is easy to maintain. Crops respond well to fertilizer.

CAPABILITY UNIT IIe–1

This unit consists of gently sloping, moderately well drained and well drained silt loams and loams that are slightly to moderately eroded. These soils are in the Casco, Dodge, Hochheim, Juneau, Knowles, Leroy, Lomira, Markesan, Mayville, Mendota, Plano, St. Charles, Sisson, and Theresa series.

These soils are moderately permeable. Except for the Knowles and Casco soils, they are deep and have high available water capacity. The Knowles and Casco soils occur in complexes. The Knowles soils are moderately deep and have medium available water capacity; the Casco soils are shallow and have low available water capacity. Soils of this unit are moderate or high in natural fertility.

These soils are used mainly for corn, oats, bromegrass, timothy, red clover, and alfalfa. They are well suited to such special crops as peas, beets, and sweet corn. Small areas are used for permanent pasture and woodlots.

Crops respond well to applications of manure and fertilizer, and good tilth is generally easy to maintain. The application of commercial fertilizer and barnyard manure and the plowing under of green-manure crops supplies plant nutrients and organic matter to the soil. Stripcropping and terracing help to control erosion. The Juneau soils in this unit receive runoff from surrounding soils.

CAPABILITY UNIT IIe–2

This unit consists of moderately deep and deep, gently sloping, well drained and moderately well drained soils underlain by stratified sand and gravel or by dolomite bedrock. These soils are in the Casco, Fox, Ionia, Kewaunee, Knowles, and Warsaw series. Ionia silt loam, clayey subsoil variant, 2 to 6 percent slopes, is underlain by clayey material.

These soils have medium available water capacity and moderate to moderately slow permeability. The erosion hazard is slight, and good tilth is easy to maintain.

These soils are used for crops, permanent pasture, and woodland. They are well suited to alfalfa, grasses, small grains, and corn.

Crop response to applications of manure and fertilizer is good. The application of commercial fertilizer and barnyard manure and the plowing under of green-manure crops supplies plant nutrients and organic matter to the soil. Stripcropping and terracing help control erosion.

CAPABILITY UNIT IIe-6

This unit consists of gently sloping, well-drained, moderately well drained, and somewhat poorly drained silt loam, loam, and silty clay loam soils of the Beecher, Kewaunee, Milton, Morley, Oshkosh, and Peebles series, and the clayey subsoil variant of the Casco series. These soils are dominantly clayey in the subsoil or underlying material.

Permeability is moderately slow or slow. The available water capacity is medium to high. Natural fertility is moderate to high, and crop response to manure and fertilizer is good. Maintaining good tilth is difficult in areas where the surface layer is silty clay loam or where the clayey subsoil is exposed.

The soils of this unit are used mainly for crops or rotation pasture. They are suited to corn, oats, barley, alfalfa, red clover, and timothy. A few areas are used for woodlots. Green manure and barnyard manure help in maintaining and improving tilth; stripcropping and terracing help in controlling erosion.

CAPABILITY UNIT IIw-1

This unit consists of nearly level and gently sloping, poorly drained silt loams and silty clay loams of the Ashkum, Brookston, Pella, Poygan, Sebewa, and Washtenaw series. These soils have medium to high available water capacity and moderate to slow permeability.

Soils of this capability unit are used for crops, permanent pasture, and woodlots. Where drainage has been improved, they are well suited to corn, oats, grasses, and legumes, including alfalfa (fig. 7). Suitable plants for permanent pasture are bluegrass, marsh grass, and sedge. These soils are also suitable for wetland wildlife habitat.

The main limitation to use of these soils for farming is the high water table that is less than a foot below the surface during some seasons. Where the soils are gently sloping, there is a slight hazard of water erosion. Crop response to manure and fertilizer is good. Generally, the maintenance of good tilth is difficult, especially on the silty clay loam soils.

Figure 7.—**Shallow ditches help remove excess water from Poygan soil.**

CAPABILITY UNIT IIw-2

This unit consists of deep, nearly level to gently sloping, somewhat poorly drained soils of the Beecher, Elburn, Elliott, Kibbie, Lamartine, Manawa, Martinton, Rimer, and Virgil series. These soils have high available water capacity and moderate natural fertility. They are moderately to slowly permeable.

Nearly all of the areas have been drained and are used for crops. They are used mainly for corn, small grains, grass, and legumes. In some areas red clover is less susceptible to winterkill than alfalfa. Small areas are in permanent pasture and woodlots.

The main limitation to farming these soils is a seasonal high water table that is 1 to 3 feet below the surface during wet periods. There is also a slight erosion hazard in gently sloping areas. A combination of tile drains and shallow ditches can be used to remove excess water. Moderately eroded soils, or those that have a silty clay loam surface layer, puddle if tilled when wet, and it is hard to keep them in good tilth. Tilth can be improved or maintained by applying barnyard manure and fertilizer, plowing under green-manure crops, and returning all crop residue to the soil.

CAPABILITY UNIT IIw-5

This unit consists of somewhat poorly drained and poorly drained, loamy soils that are moderately deep and deep to sand and gravel and, in some places, to clay. These are soils of the Sebewa, Virgil, and Wauseon series. They are nearly level and gently sloping.

Soils of this unit have high available water capacity and are moderately to slowly permeable. They are subject to ponding during wet seasons, and there is a slight water erosion hazard on sloping soils.

Where they have been drained, these soils are used mostly for crops. A few areas remain in permanent pasture or isolated woodlots. Principal crops are corn, oats, barley, bromegrass, timothy, and clover. Crop response to manure and fertilizer is good, and the maintenance of good tilth is not difficult.

CAPABILITY UNIT IIw-8

This capability unit consists of poorly drained organic soils underlain by loam at a depth of 12 to 42 inches. These are soils of the Palms series. They have a high water table that is less than 1 foot below the surface.

These soils are subject to flooding. There is a hazard of soil blowing in drained and cultivated areas. Soils of this capability unit are moderately low in natural fertility, and they are generally low in available potash. Soils of this unit are used mainly for permanent pasture, woodland, and wildlife habitat. Some areas are idle. Drained areas are used for crops. In drained areas, crop response to commercial fertilizer is good. Wind strips or shelterbelts are desirable for large drained areas.

CAPABILITY UNIT IIw-11

Only DePere silty clay loam, 0 to 3 percent slopes, is in this unit. This is a deep soil that formed in alluvial deposits. It is subject to flooding and occasional seepage, and it has a seasonal high water table. This soil has high available water capacity and moderately slow permeability.

This unit is used mainly for permanent pasture. Bluegrass is the common pasture forage plant. In a few areas, where drainage has been improved, the soil is used for crops.

The plowing under of green-manure crops and heavy applications of barnyard manure help to improve tilth. Crop response to applications of manure and fertilizer is good.

CAPABILITY UNIT IIw–13

This unit consists of alluvial deposits on flood plains that are occasionally flooded. These areas annually receive deposition from upland areas. Alluvial land and Wallkill silt loam are in this unit. Both are nearly level and generally are moderately permeable.

Areas protected from flooding can be used for row crops. Unprotected areas can be used for specialized late-season crops. Wallkill soils respond well to open-ditch and surface drainage.

CAPABILITY UNIT IIs–1

This unit consists of moderately deep, nearly level, well drained and moderately well drained soils that are underlain by stratified sand and gravel or by dolomite bedrock. These soils are of the Fox, Ionia, and Knowles series. They are subject to slight hazard of drought.

Permeability is moderate, and the available water capacity is medium. Crop response to manure and fertilizer is good, and good tilth is easy to maintain.

These soils are used for crops, permanent pasture, and woodland. They are well suited to alfalfa, bromegrass, timothy, oats, barley, and corn. Shallow-rooted crops, such as oats, may be affected by lack of moisture during periods of low rainfall or when rainfall is poorly distributed. Moisture conserving practices, therefore, are beneficial. The available water capacity can be improved by plowing under green manure and applying barnyard manure.

CAPABILITY UNIT IIs–7

This unit consists of moderately deep and deep, well drained and moderately well drained, nearly level soils of the Kewaunee, Milton, Oshkosh, and Peebles series. These soils are dominantly clayey in the subsoil and substratum. They have moderately slow and slow permeability and medium to high available water capacity. They have moderate to high natural fertility.

Soils of this capability unit are used mostly for crops or rotation pasture. Suitable crops are corn, oats, barley, bromegrass, timothy, red clover, and alfalfa. A few small areas are used for permanent pasture and woodlots.

These soils dry out slowly in spring or after heavy rainfall. Crop response to applications of manure and fertilizer is good. Good tilth is difficult to maintain where the soils have a silty clay loam surface layer. Plowing down green manure, as well as barnyard manure, helps to maintain and improve tilth.

CAPABILITY UNIT IIIe–1

This unit consists of deep and moderately deep, gently sloping and sloping, well-drained soils. There is a moderate erosion hazard. These soils are in the Casco, Hochheim, Knowles, LeRoy, Lomira, Markesan, Mendota, and Theresa series. Erosion has caused loss of surface soil and organic matter in some soils. The sloping soils are slightly and moderately eroded; the gently sloping soils are severely eroded.

These soils are moderately permeable. They have moderate to high natural fertility. Except for the Casco and Knowles soils, they have high available water capacity. The Knowles soils have medium available water capacity; the Casco soils have low available water capacity.

Soils of this capability unit are used for corn, oats, bromegrass, timothy, red clover, and alfalfa. In some places small areas are used for permanent pasture and woodlots. These soils are also suited to special crops, such as peas, beets, and sweet corn.

Crop response to manure and fertilizer is good. Except where these soils are severely eroded, the maintenance of good tilth is not difficult. Organic matter can be supplied by plowing under barnyard manure and green manure crops.

CAPABILITY UNIT IIIe–2

This unit consists of sloping, well-drained soils that are moderately deep to stratified sand and gravel or dolomite bedrock. These are soils of the Fox and Knowles series. These soils are slightly and moderately eroded.

These soils are moderately permeable. They have medium available water capacity. The surface layer is low in organic-matter content. It is dominantly silt loam and loam but ranges from silt loam to heavy clay loam in eroded areas.

Soils of this capability unit are used for crops, permanent pasture, and woodland. They are well suited to alfalfa, grass, small grains, and corn. White oak and black oak grow well in natural stands or in planted areas. White pine is well suited to solid planting.

Crop response to manure and fertilizer is good, and tilth generally is not difficult to maintain. Organic matter can be supplied by the application of barnyard manure and plowing down green manure.

CAPABILITY UNIT IIIe–3

This unit consists of well-drained, gently sloping soils underlain by sand and gravel at a depth of 24 inches or less. These soils are of the Casco and Hochheim series. They have low available water capacity. The Hochheim component of Casco-Hochheim loams, 2 to 6 percent slopes, is underlain by loamy till and has high available water capacity.

These soils are subject to water erosion. The surface layer is medium in organic-matter content and moderate in natural fertility. Textures include sandy loam, loam, and silt loam.

Soils of this capability unit are used mainly for crops or permanent pasture. Some scattered areas are in woodland. Corn, small grain, bromegrass, timothy, clover, and alfalfa are commonly grown on these soils.

Response to manure and fertilizer is good, and tilth is not difficult to maintain. Organic matter can be supplied by heavy applications of barnyard manure and the plowing down of green-manure crops. This also improves tilth and the available water capacity.

CAPABILITY UNIT IIIe–6

This capability unit consists of deep, well-drained, sloping and gently sloping soils of the Kewaunee, Milton, and Morley series. The gently sloping soils are severely eroded; the sloping soils are slightly and moderately eroded.

These soils have moderately slow to slow permeability and medium to high available water capacity. They are

moderate in natural fertility. The texture of the surface layer ranges from loam to silty clam loam; the texture of the subsoil and substratum ranges from clay loam to clay.

Soils of this capability unit are used mainly for crops or rotation pasture. They are suited to corn, oats, barley, alfalfa, red clover, timothy, and such special crops as sugar beets and peas.

These soils dry out slowly in spring and after heavy rains. Response to manure and fertilizer is good, but good tilth and relatively high infiltration rates are difficult to maintain. The control of erosion, the plowing down of green manure, and heavy application of barnyard manure improves tilth and helps to maintain productivity.

CAPABILITY UNIT IIIw-3

Only Keowns silt loam is in this unit. This poorly drained soil is underlain at a depth of about 2 feet by silt and very fine sand.

Where this soil is drained, most row crops can be grown successfully. In undrained areas, a high water table interferes with the growth of crops that cannot tolerate wetness. Surface drainage systems function well in this soil, but tile drains rapidly clog with silt and fine sand and cease to function within a short time.

CAPABILITY UNIT IIIw-9

This capability unit consists of deep and moderately deep, poorly drained, organic soils of the Carbondale, Houghton, and Ogden series. These soils have a high water table that is less than a foot below the surface in wet seasons. Ponding occurs in some areas. Where drainage has been improved, there is a moderate to severe hazard of soil blowing and subsidence. These soils are moderately low to low in natural fertility.

Soils of this capability unit are used mainly for permanent pasture and woodland. Drained areas can be used for crops. Reed canarygrass grows well in undrained areas.

Soils of this capability unit are generally low in available potash. Response to commercial fertilizer is good. Wind strips or shelterbelts are necessary to control erosion in large drained areas.

CAPABILITY UNIT IIIs-4

This unit consists of well drained and moderately well drained, nearly level to gently sloping, sandy soils that are moderately deep to stratified sand and gravel. These are soils of the Fox and Ionia series. These soils have moderate permeability and medium available water capacity. There is a slight erosion hazard.

Soils of this capability unit are mainly used for crops, including corn, oats, legumes, and grass. A few small areas are in woodlots and permanent pasture.

Practices that help conserve moisture and control erosion are beneficial. Response to applications of manure and fertilizer is good, and maintenance of good tilth is not difficult. The application of barnyard manure and plowing down of green-manure crops increase the organic-matter content of the surface layer and improve the available water capacity.

CAPABILITY UNIT IVe-1

This unit consists of deep, well-drained, sloping and moderately steep soils of the Casco, Hochheim, LeRoy, Lomira, Markesan, and Theresa series. The sloping soils are severely eroded; the moderately steep soils are slightly eroded and moderately eroded.

These soils are moderate in permeability and natural fertility. The erosion hazard is severe. All the soils have high available water capacity, except the Casco component of Theresa-Casco silt loams, 12 to 20 percent slopes, eroded, which has low available water capacity.

Soils of this capability unit are used for crops, permanent pasture, and, in some places, for woodland. They are suited to corn, oats, bromegrass, timothy, red clover, and alfalfa. Crop response to manure and fertilizer is good, and generally the maintenance of good tilth is not difficult. Plant nutrients and organic matter can be supplied by commercial fertilizer, by barnyard manure, and by green-manure crops plowed into the soils.

CAPABILITY UNIT IVe-2

Only Knowles silt loam, 12 to 30 percent slopes, eroded, is in this unit. This soil is underlain at a depth of about 36 inches by dolomite bedrock. It is moderately permeable. Runoff is rapid, and the erosion hazard is severe.

This soil can be used successfully for row crops about once in 5 years if erosion is controlled. Suitable erosion control practices are contour cultivation, stripcropping, the use of vegetative cover, and the return of crop residue to the soil.

CAPABILITY UNIT IVe-3

This unit consists of excessively drained and well-drained soils that are underlain by sand and gravel or loamy till. These are soils of the Casco and Hochheim series. Because they have low available water capacity, the soils are somewhat droughty. They are also subject to soil blowing and erosion. They are moderate to high in natural fertility, and the organic-matter content of the surface layer is moderate.

Soils of this capability unit are used for crops, pasture, and woodland. They are suited to corn, oats, barley, bromegrass, timothy, clover, and alfalfa.

Response to manure and fertilizer is good, and except in the severely eroded soils, tillage is not difficult. Organic matter can be supplied by heavy application of barnyard manure and the plowing down of green-manure crops. This is especially important in severely eroded areas.

CAPABILITY UNIT IVe-6

This capability unit consists of deep, well-drained, sloping and moderately steep soils of the Kewaunee and Morley series. These soils are moderately to slowly permeable and have high available water capacity. They are moderate in natural fertility.

Soils of this capability unit are used for crops, rotation pasture, permanent pasture, and woodland. They generally are not suited to row crops, but alfalfa grows well. Open areas can be planted to suitable species of trees. Odd areas can be planted to evergreens, shrubs, and legumes to provide food and cover for wildlife.

Response to manure and fertilizer is good. Tilth, good infiltration rates, and soil structure are difficult to maintain. The plowing down of green manure and heavy application of barnyard manure help to maintain and improve tilth and productivity of these soils. Plant nutrients should be provided on the basis of soil tests. Woodland and

wildlife areas need to be protected from grazing and fire. Undesirable species and diseased trees should be removed.

CAPABILITY UNIT IVw-7

This capability unit consists of poorly drained organic soils underlain by sand or marl at a depth of 12 to 42 inches. These are soils of the Adrian and Rollin series. They have a high water table that is less than 1 foot below the surface. Where they have been drained, the soils are subject to soil blowing and subsidence. They are moderate to low in natural fertility and have high available water capacity.

Soils of this capability unit are used for permanent pasture or woodland and, in places, they are idle. A few areas have been drained and are suited to corn and vegetables. Reed canarygrass is grown for forage in undrained areas.

These soils are generally low in available potash. Response to commercial fertilizer is good in drained areas.

CAPABILITY UNIT Vw-14

Alluvial land, wet, is the only soil in this unit. It consists of nearly level, frequently flooded areas. This land type is not suitable for crops, but it can be used successfully for pasture, woodland, or wildlife habitat. Protected areas can be used for meadow.

CAPABILITY UNIT Vw-16

Brookston stony silt loam, 0 to 3 percent slopes, is the only soil in this unit. This soil is deep, poorly drained, and very stony. It is subject to flooding and has a high water table most of the year. This soil is moderate in natural fertility, and it has high available water capacity.

This soil is used mainly for permanent pasture. A few areas are in sparse stands of timber. Response to manure and fertilizer is good. Because of stoniness, flooding hazard, and wetness, this soil is better suited to pasture, woodland, or wildlife habitat than to crops.

CAPABILITY UNIT VIe-1

This unit consists of well-drained, moderately steep and steep soils of the Casco, Hixton, Hochheim, LeRoy, Lomira, Markesan, and Theresa series. Most of these soils are deep, but the Hixton soils are moderately deep to sand and gravel and the Casco component of the Theresa-Casco complex is shallow to sand and gravel. The hazard of erosion is severe. The steep soils are slightly or moderately eroded; the moderately steep soils are severely eroded.

Permeability is moderate, and the surface layer is low to high in organic-matter content. These soils range from low to high in natural fertility. The available water capacity is moderate, except in the Casco component of the Theresa-Casco complex, where it is low.

These soils are used for hay and permanent pasture, and a few slightly eroded areas are in woodland. They are well suited to permanent hay, pasture, woodland, or wildlife habitat.

Response to manure and fertilizer is good. The maintenance of good tilth generally is not difficult, except on severely eroded soils. A good sod cover can be maintained by controlling grazing. Soils in permanent hay or pasture need to be renovated every 5 years. Topdressing each year can be substituted for renovation.

CAPABILITY UNIT VIe-3

This unit consists of well-drained loams and silt loams underlain by sand and gravel. These soils are of the Casco, Hochheim, and Rodman series. The Hochheim soils in the Casco-Hochheim complex are underlain by loamy till. The soils of this unit have a severe water erosion hazard. They also have very low to high available water capacity. The surface layer is low to moderate in organic-matter content. These soils are low to moderate in natural fertility.

These soils are suited to hay, pasture, woodland, or wildlife habitat. Renovation of hayland once every 5 years is beneficial. Response to manure and fertilizer is good. Except in severely eroded areas, the maintenance of good tilth is not difficult.

CAPABILITY UNIT VIe-6

This capability unit consists of deep, well-drained, moderately steep and steep soils of the Kewaunee and Morley series. These soils range from silt loam to silty clay loam in the surface layer and from clay loam to clay in the subsoil and substratum. They have moderate to slow permeability and high available water capacity. They are moderately fertile. The erosion hazard is severe.

These soils are used mainly for permanent pasture and woodland, and a few areas are used for rotation hay crops. These soils are not suited to row crops, but alfalfa grows well. They are better suited to hay, pasture, woodland, or wildlife habitat.

Response to manure and fertilizer is good. Tilth, a good infiltration rate, and good soil structure are difficult to maintain. Renovation of hayland once every 5 years is beneficial.

CAPABILITY UNIT VIs-5

This unit consists of Old beaches and Sogn soils. The Old beaches are shallow, excessively drained, gravelly, gently sloping and sloping, and the Sogn soils are very shallow, well drained, stony, nearly level and gently sloping. The Sogn soils are underlain by bedrock at a depth of 12 inches or less.

The soils of this unit are very droughty, and they have very low available water capacity. They are low in natural fertility, and the surface layer is moderate in organic-matter content.

Soils of this unit are used for permanent pasture and woodland. They are suited to hay, pasture, woodland, or wildlife habitat. Moisture-conserving practices, pasture renovation, and application of topdressing are ways of increasing forage production.

CAPABILITY UNIT VIIe-1

This unit consists of Hochheim soils, 20 to 30 percent slopes, severely eroded. These soils have lost all of the original surface layer and part of the subsoil through water erosion.

These soils are moderately permeable. Because of the steep slopes and loss of the original surface layer, the erosion hazard is very severe. The existing surface layer is low in organic-matter content, has poor structure, and has poor tilth. Runoff is rapid.

These soils are suitable for grass or trees.

CAPABILITY UNIT VIIe-3

This unit consists of well-drained, moderately steep and steep soils of the Casco, Hochheim, and Rodman series.

Most of the soils are severely eroded. They are underlain by sand and gravel and loamy glacial till.

The erosion hazard is very severe. These soils have very low to high available water capacity, and the surface layer is low in organic-matter content. These soils are low to high in natural fertility.

Soils of this capability unit are well suited to hay, pasture, woodland, or wildlife habitat. Response to manure and fertilizer is fairly good, but tilth is difficult to maintain. Renovation of pastures every 5 years is beneficial, but topdressing each year can be substituted for renovation. Heavy applications of manure and fertilizer help to establish young plants. Applications of manure improve tilth.

CAPABILITY UNIT VIIs–5

This capability unit consists of well-drained to excessively drained, sloping to very steep, eroded soils that are shallow to sand and gravel. These soils are of the Casco and Rodman series. The surface layer is loam, gravelly loam, or gravelly sand.

Soils of this capability unit have very low available water capacity and low natural fertility. They are moderately to rapidly permeable. The surface layer is moderate in organic-matter content. The erosion hazard is severe.

Soils of this capability unit are used mainly for permanent pasture and woodland. They are well suited to limited grazing, woodland, or wildlife habitat. Response to manure and fertilizer is poor. Renovation or topdressing with fertilizer may be beneficial in some places. In areas used for pasture, controlled grazing helps to maintain good sod cover.

CAPABILITY UNIT VIIIw–15

This unit consists only of Marsh. The areas are flooded nearly all the time. The dominant vegetation consists of grasses, cattails, rushes, or other herbaceous plants.

This soil is used mainly for wetland wildlife habitat. A few areas that border better drained soils along major streams are used for pasture during the dry summer months.

CAPABILITY UNIT VIIIs–10

This unit consists only of Rock land. The areas are sloping to steep. They consist of rock outcrops and surface boulders and small areas of very shallow soil. The vegetation is limited to grass and shrubs and scattered small trees.

This land type is not suited to harvestable vegetation. It produces only enough vegetation to stabilize the slopes and control erosion. It is suited to wildlife habitat.

Predicted Yields

Table 1 contains yield predictions for the principal crops grown in the county. These predictions are based on interviews with farmers, on results obtained by the agricultural experiment station, and on observations made by farm workers who are familiar with soils of the county. Yields for crops grown under an average level of management and under a high level of management are given.

Under average management, a farmer uses about 12,000 plants of hybrid corn per acre and applies about 8 tons of manure and 100 pounds of commercial fertilizer per acre.

Under a high level of management, a farmer fertilizes and adds lime according to the needs indicated by soil tests; uses at least 10 tons of manure per acre; grows 18,000 to 20,000 plants per acre on the best soils and fewer plants on less productive soils; seeds, sprays, cultivates, and harvests at the right time; and uses erosion control practices on sloping soils and drainage practices on wet soils.

When growing oats under average management, a farmer applies up to 150 pounds of fertilizer that has a high content of phosphate and potash. Only a minimum of lime is used.

Under a high level of management, a farmer selects a variety of good seed that is suited to the soil; applies phosphate and potash fertilizer according to soil tests; seeds, sprays, and harvests at the right time; and uses erosion control on sloping soils and drainage practices on wet soils.

When growing alfalfa and bromegrass hay under average management, a farmer cuts hay twice each year and permits grazing in fall.

The farmer who uses a high level of management on hayland adds lime according to the needs indicated by soil tests; seeds suitable varieties that are resistant to wilt and winterkill; cuts at the right time so that three crops can be harvested during the growing season; does not permit grazing between September 15 and October 15; topdresses with manure or a commercial fertilizer at least once every 2 years; and installs adequate drainage on wet soils.

The same general management principles used in growing field crops apply to pasture production. Under average management, a farmer reseeds pastures occasionally. Minimum amounts of lime and fertilizer are used.

Under a high level of management, a farmer uses lime and fertilizer as indicated by soil tests; reseeds with suitable varieties of a grass-legume mixture, such as alfalfa-bromegrass; carefully prepares the seedbed; carefully manages grazing; applies high-nitrogen fertilizer on soils that cannot be reseeded; and adequately drains wet soils. Higher yields of field crops than those shown in table 1 can be obtained if large amounts of fertilizer are used and the soil is carefully managed.

Misuse of a good soil over a period of years may lower its productivity to a point where the casual observer would conclude that the soil has little value for crops. It is possible, however, to restore a soil that is badly run down. A poorly managed Fox silt loam, 2 to 6 percent slopes, for example, may produce lower yields than a well-managed Casco silt loam, 2 to 6 percent slopes. If a high level of management is used on the Fox soils, yields easily can be raised to a level that cannot be attained on the Casco soils.

The predictions given in table 1 can be used as a check to see if present management practices are adequate and to help in determining the kind of management practices that will give the desired results. Consult your county agent or experiment station for specific suggestions about the kinds and amounts of fertilizer, lime, and seeding mixtures to use.

TABLE 1.—*Predicted average yields per acre of principal crops under two levels of management*

[Absence of yield data indicates soil is not suitable for the crop or that the crop ordinarily is not grown]

Soil	Corn		Oats		Alfalfa-bromegrass hay [1]		Alfalfa-bromegrass pasture	
	Average	High	Average	High	Average	High	Average	High
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Cow-acre-days* [2]	*Cow-acre-days* [2]
Adrian mucky peat							55	130
Alluvial land	50	65	35	40			95	135
Alluvial land, wet							50	80
Ashkum silty clay loam, 0 to 3 percent slopes	70	95	30	65		4.0	95	145
Beecher silt loam, 0 to 2 percent slopes	60	90	42	65	2.25	4.0	95	140
Beecher silt loam, 2 to 6 percent slopes	70	90	55	70	2.5	4.0	95	140
Beecher silt loam, shaly subsoil variant, 2 to 6 percent slopes	55	85	45	65	2.5	4.0	95	140
Brookston silt loam, 0 to 3 percent slopes	75	115	50	65		4.0	80	145
Brookston stony silt loam, 0 to 3 percent slopes					2.5	4.0		130
Brookston silty clay loam, 0 to 3 percent slopes	70	115	50	65		4.0	80	145
Carbondale mucky peat		110		85		3.0	55	130
Casco sandy loam, 2 to 6 percent slopes	40	60	35	50	1.5	2.25	65	100
Casco sandy loam, 6 to 12 percent slopes	35	55	30	45	1.25	2.0	60	90
Casco loam, 2 to 6 percent slopes	50	70	40	55	1.75	2.75	75	120
Casco loam, 6 to 12 percent slopes, eroded	40	60	35	50	1.5	2.25	70	110
Casco loam, 12 to 20 percent slopes, eroded					1.25	2.0	65	100
Casco soils, 2 to 6 percent slopes, severely eroded	30	50	30	45	1.25	2.0	50	85
Casco soils, 6 to 12 percent slopes, severely eroded					1.25	2.0	40	75
Casco soils, 12 to 20 percent slopes, severely eroded					1.0	2.0	40	70
Casco loam, loamy subsoil variant, 0 to 6 percent slopes	55	75	40	60	2.0	3.0	75	120
Casco loam, clayey subsoil variant, 2 to 6 percent slopes	50	70	40	55	1.75	2.75	75	120
Casco-Hochheim loams, 2 to 6 percent slopes	60	95	55	75	3.25	4.5	90	135
Casco-Hochheim loams, 6 to 12 percent slopes, eroded	55	90	50	70	2.5	4.0	80	125
Casco-Hochheim loams, 12 to 20 percent slopes, eroded					2.5	3.5	70	110
Casco-Hochheim complex, 6 to 12 percent slopes, severely eroded					2.0	3.0	60	90
Casco-Hochheim complex, 12 to 20 percent slopes, severely eroded					1.5	2.5	50	80
Casco-Rodman loams, 6 to 12 percent slopes, eroded					1.5	2.0	50	90
Casco-Rodman loams, 12 to 30 percent slopes					1.0	1.5	45	80
Casco-Rodman loams, 12 to 30 percent slopes, severely eroded					1.0	1.5	40	65
Casco-Rodman loams, 30 to 45 percent slopes					1.0	1.5	30	
DePere silty clay loam, 0 to 3 percent slopes [3]	55	70	50	75	2.5	4.0	105	140
Dodge silt loam, 0 to 2 percent slopes	75	110	60	80	3.0	4.5	110	140
Dodge silt loam, 2 to 6 percent slopes	75	105	60	75	3.0	4.5	110	140
Dodge silt loam, 2 to 6 percent slopes, eroded	60	95	55	70	3.0	4.5	100	135
Elburn silt loam, 0 to 3 percent slopes	85	120	55	65	2.5	4.75	95	140
Elliott silt loam, 0 to 2 percent slopes	60	95	55	70	2.75	4.5	90	130
Elliott silt loam, 2 to 6 percent slopess	70	95	60	70	3.0	4.5	90	130
Fox sandy loam, 2 to 6 percent slope	40	65	35	50	1.5	2.5	60	90
Fox loam, 2 to 6 percent slopes	50	75	45	60	2.5	3.0	80	115
Fox loam, 2 to 6 percent slopes, eroded	45	70	40	55	2.25	2.75	75	110
Fox loam, 6 to 12 percent slopes, eroded	35	65	35	50	2.0	2.5	60	100
Fox silt loam, 0 to 2 percent slopes	60	85	50	65	2.5	3.5	85	120
Fox silt loam, 2 to 6 percent slopes	55	80	50	65	2.5	3.5	85	120
Fox silt loam, 2 to 6 percent slopes, eroded	50	75	45	60	2.25	3.0	80	115
Fox silt loam, 6 to 12 percent slopes, eroded	40	70	35	55	2.0	2.5	75	110
Hixton loam, 12 to 30 percent slopes, eroded	40	75	45	55	1.75	3.0	55	85
Hochheim loam, 2 to 6 percent slopes	75	100	60	75	3.0	4.0	110	135
Hochheim loam, 2 to 6 percent slopes, eroded	70	95	55	70	3.0	4.0	100	130
Hochheim loam, 6 to 12 percent slopes	70	95	55	70	3.0	4.0	100	120
Hochheim loam, 6 to 12 percent slopes, eroded	65	90	50	65	2.75	3.75	90	125
Hochheim loam, 12 to 20 percent slopes	60	85	45	60	2.5	3.5	85	110
Hochheim loam, 12 to 20 percent slopes, eroded	55	80	40	55	2.25	3.0	80	100
Hochheim loam, 20 to 30 percent slopes					2.0	2.75	70	95
Hochheim soils, 2 to 6 percent slopes, severely eroded	55	85	45	65	2.5	3.5	90	110

See footnotes at end of table.

TABLE 1.—*Predicted average yields per acre of principal crops under two levels of management*—Continued

Soil	Corn		Oats		Alfalfa-bromegrass hay [1]		Alfalfa-bromegrass pasture	
	Average	High	Average	High	Average	High	Average	High
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Cow-acre-days* [2]	*Cow-acre-days* [2]
Hochheim soils, 6 to 12 percent slopes, severely eroded	50	80	40	55	2. 25	3. 0	80	105
Hochheim soils, 12 to 20 percent slopes, severely eroded					2. 0	2. 75	70	100
Hochheim soils, 20 to 30 percent slopes, severely eroded					1. 5	2. 5	60	90
Houghton mucky peat		110		85		3. 0		130
Ionia sandy loam, 0 to 3 percent slopes	40	65	40	55	2. 0	3. 5	80	120
Ionia silt loam, 0 to 2 percent slopes	55	90	55	65	2. 25	4. 0	90	130
Ionia silt loam, 2 to 6 percent slopes	60	90	58	65	2. 25	4. 0	90	130
Ionia silt loam, loamy subsoil variant, 0 to 3 percent slopes	55	105	50	60	2. 5	4. 5	90	130
Ionia silt loam, clayey subsoil variant, 2 to 6 percent slopes	55	105	50	65	2. 0	4. 25	90	130
Juneau silt loam, 0 to 2 percent slopes	65	100	55	70	3. 0	4. 5	110	145
Juneau silt loam, 2 to 6 percent slopes	65	100	55	70	3. 0	4. 5	105	140
Keowns silt loam	60	90	45	60		3. 5	85	115
Kewaunee silt loam, 0 to 2 percent slopes	65	95	50	80	3. 0	4. 5	90	140
Kewaunee silt loam, 2 to 6 percent slopes	70	100	55	80	3. 0	4. 5	90	135
Kewaunee silt loam, 2 to 6 percent slopes, eroded	65	95	52	80	2. 75	4. 5	80	130
Kewaunee silt loam, 6 to 12 percent slopes, eroded	60	90	55	80	2. 5	4. 0	75	120
Kewaunee silty clay loam, 0 to 2 percent slopes	40	90	45	75	2. 75	4. 5	80	140
Kewaunee silty clay loam, 2 to 6 percent slopes	60	95	45	75	2. 75	4. 5	80	140
Kewaunee silty clay loam, 2 to 6 percent slopes, eroded	60	90	52	80	2. 5	4. 5	75	130
Kewaunee silty clay loam, 6 to 12 percent slopes, eroded	55	85	50	80	2. 25	4. 0	70	120
Kewaunee silty clay loam, 12 to 20 percent slopes, eroded	45	75	48	75	2. 0	3. 75	65	110
Kewaunee silty clay loam, 20 to 30 percent slopes, eroded					2. 0	3. 5	55	100
Kewaunee soils, 2 to 6 percent slopes, severely eroded	50	80	50	80	2. 5	4. 5	75	130
Kewaunee soils, 6 to 12 percent slopes, severely eroded	40	75	48	75	2. 25	4. 0	70	120
Kewaunee soils, 12 to 20 percent slopes, severely eroded					2. 0	3. 75	65	110
Kewaunee silt loam, moderately shallow variant, 2 to 6 percent slopes	50	85	55	80	3. 0	4. 5	90	135
Kibbie silt loam, 0 to 2 percent slopes	70	100	50	70	2. 5	4. 0	90	130
Knowles silt loam, 0 to 2 percent slopes	55	80	45	65	2. 0	3. 0	75	115
Knowles silt loam, 2 to 6 percent slopes	50	75	40	60	2. 0	3. 0	75	115
Knowles silt loam, 6 to 12 percent slopes, eroded	40	65	35	55	1. 5	2. 0	60	90
Knowles silt loam, 12 to 30 percent slopes, eroded					1. 25	2. 0	50	80
Lamartine silt loam, 0 to 2 percent slopes	70	105	50	65	2. 5	4. 0	90	130
Lamartine silt loam, 2 to 6 percent slopes	70	105	55	65	2. 75	4. 0	90	130
LeRoy silt loam, 2 to 6 percent slopes, eroded	65	100	55	75	3. 0	4. 5	100	130
LeRoy silt loam, 6 to 12 percent slopes, eroded	60	95	50	65	2. 5	4. 0	85	115
LeRoy silt loam, 12 to 20 percent slopes	60	85	45	60	2. 5	4. 0	80	100
LeRoy silt loam, 12 to 20 percent slopes, eroded	55	80	40	55	2. 0	3. 5	80	100
LeRoy silt loam, 20 to 30 percent slopes						3. 0	70	90
LeRoy soils, 6 to 12 percent slopes, severely eroded	50	85	45	60	2. 5	4. 0	80	105
LeRoy soils, 12 to 20 percent slopes, severely eroded					2. 0	3. 75	70	95
Lomira silt loam, 0 to 2 percent slopes	75	110	55	80	3. 0	4. 5	115	145
Lomira silt loam, 2 to 6 percent slopes	75	110	55	80	3. 0	4. 5	115	145
Lomira silt loam, 2 to 6 percent slopes, eroded	75	105	55	75	3. 0	4. 5	110	140
Lomira silt loam, 6 to 12 percent slopes	55	90	50	70	3. 0	4. 5	100	135
Lomira silt loam, 6 to 12 percent slopes, eroded	50	85	45	65	2. 5	4. 25	90	130
Lomira silt loam, 6 to 12 percent slopes, severely eroded	45	80	40	55	2. 25	4. 0	85	110
Lomira silt loam, 12 to 20 percent slopes	50	85	45	65	2. 5	4. 25	85	120
Lomira silt loam, 12 to 20 percent slopes, eroded	45	80	40	55	2. 25	4. 0	80	110
Lomira silt loam, 12 to 20 percent slopes, severely eroded					2. 0	3. 5	75	100

See footnotes at end of table.

TABLE 1.—*Predicted average yields per acre of principal crops under two levels of management*—Continued

Soil	Corn		Oats		Alfalfa-bromegrass hay [1]		Alfalfa-bromegrass pasture	
	Average	High	Average	High	Average	High	Average	High
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Cow-acre-days* [2]	*Cow-acre-days* [2]
Lomira-Knowles silt loams, 0 to 2 percent slopes	55	90	55	75	2. 5	4. 0	110	135
Lomira-Knowles silt loams, 2 to 6 percent slopes	55	90	50	75	2. 5	4. 0	110	135
Lomira-Knowles silt loams, 2 to 6 percent slopes, eroded	50	85	45	65	2. 5	4. 0	95	125
Lomira-Knowles silt loams, 6 to 12 percent slopes, eroded	45	80	40	60	2. 25	3. 5	85	120
Manawa silt loam, 0 to 2 percent slopes	60	90	60	75	2. 5	4. 0	95	140
Manawa silt loam, 2 to 6 percent slopes	55	85	55	75	2. 75	4. 0	95	140
Manawa silty clay loam, 0 to 2 percent slopes	55	85	45	70	2. 5	4. 0	90	145
Manawa silty clay loam, 2 to 6 percent slopes	50	80	50	75	2. 75	4. 0	90	145
Markesan silt loam, 2 to 6 percent slopes	60	95	55	65	3. 0	4. 5	110	140
Markesan silt loam, 2 to 6 percent slopes, eroded	55	90	50	60	3. 0	4. 5	100	130
Markesan silt loam, 6 to 12 percent slopes, eroded	50	85	45	55	2. 5	4. 25	100	130
Markesan silt loam, 6 to 12 percent slopes, severely eroded	45	85	40	55	2. 5	4. 25	90	110
Markesan silt loam, 12 to 20 percent slopes, eroded	45	85	40	55	2. 5	4. 25	90	120
Markesan silt loam, 12 to 20 percent slopes, severely eroded					2. 0	4. 0	85	105
Marsh								
Martinton silt loam, 0 to 2 percent slopes	65	100	50	65	2. 25	4. 0	95	140
Martinton silt loam, 2 to 6 percent slopes	70	100	55	65	2. 5	4. 0	95	140
Mayville silt loam, 0 to 2 percent slopes	80	110	65	80	3. 0	4. 5	90	130
Mayville silt loam, 2 to 6 percent slopes	75	110	60	75	3. 0	4. 5	90	130
Mendota silt loam, 0 to 2 percent slopes	85	110	65	75	3. 0	4. 5	110	150
Mendota silt loam, 2 to 6 percent slopes	80	105	60	70	3. 0	4. 5	110	150
Mendota silt loam, 2 to 6 percent slopes, eroded	75	100	55	65	3. 0	4. 5	100	140
Mendota silt loam, 6 to 12 percent slopes, eroded	70	90	45	60	2. 75	4. 25	100	135
Milton silt loam, 0 to 2 percent slopes	55	85	52	80	3. 0	4. 5	85	130
Milton silt loam, 2 to 6 percent slopes, eroded	55	80	50	70	2. 75	4. 25	75	120
Milton silt loam, 6 to 20 percent slopes, eroded	50	80	50	70	2. 75	4. 25	75	120
Morley silt loam, 2 to 6 percent slopes	65	85	50	70	3. 0	4. 5	90	140
Morley silt loam, 2 to 6 percent slopes, eroded	60	85	45	65	2. 75	4. 25	80	130
Morley silt loam, 6 to 12 percent slopes, eroded	50	80	40	60	2. 5	4. 0	75	120
Morley silt loam, 12 to 20 percent slopes, eroded	45	75	40	60	2. 25	3. 75	65	105
Morley soils, 6 to 12 percent slopes, severely eroded	40	70	35	55	2. 5	4. 0	70	115
Morley soils, 12 to 20 percent slopes, severely eroded					2. 5	4. 0	60	105
Ogden mucky peat		90		70		3. 0		120
Old beaches					1. 5	2. 0	50	90
Oshkosh silt loam, 0 to 2 percent slopes	60	80	55	75	3. 0	4. 5	90	140
Oshkosh silt loam, 2 to 6 percent slopes	55	75	50	75	3. 0	4. 5	90	140
Oshkosh silty clay loam, 0 to 2 percent slopes	65	85	60	80	2. 5	4. 5	80	140
Oshkosh silty clay loam, 2 to 6 percent slopes	60	80	55	75	2. 5	4. 5	80	140
Palms muck		110		85		3. 0		120
Palms mucky peat		110		85		3. 0		120
Peebles silt loam, 0 to 2 percent slopes	65	90	55	80	3. 0	4. 5	90	140
Peebles silt loam, 2 to 6 percent slopes	65	90	55	80	3. 0	4. 5	90	140
Pella silt loam, 0 to 3 percent slopes	75	115	55	65		4. 0	80	145
Pella silty clay loam, 0 to 2 percent slopes	70	110	45	65		4. 0	80	145
Plano silt loam, 0 to 2 percent slopes	90	130	70	80	3. 0	4. 75	115	150
Plano silt loam, 2 to 6 percent slopes	85	125	65	75	3. 0	4. 75	115	150
Plano silt loam, 2 to 6 percent slopes, eroded	80	120	60	70	3. 0	4. 5	110	140
Plano fine sandy loam, sandy variant, 2 to 6 percent slopes	70	100	60	70	3. 0	4. 5	85	120
Poygan silty clay loam	65	90	50	65		4. 0	75	135
Rimer loam, 2 to 6 percent slopes	60	85	45	65	2. 5	3. 5	80	120
Rock land								
Rodman gravelly sand, 6 to 20 percent slopes, eroded					1. 0	1. 5	40	65
Rodman gravelly sand, 20 to 30 percent slopes, eroded					1. 0	1. 5	40	65
Rodman gravelly loam, 12 to 20 percent slopes, eroded					1. 0	1. 5	45	80
Rodman gravelly loam, 20 to 45 percent slopes, eroded					1. 0	1. 5	40	65

See footnotes at end of table.

TABLE 1.—*Predicted average yields per acre of principal crops under two levels of management*—Continued

Soil	Corn		Oats		Alfalfa-bromegrass hay [1]		Alfalfa-bromegrass pasture	
	Average	High	Average	High	Average	High	Average	High
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Cow-acre-days* [2]	*Cow-acre-days* [2]
Rollin mucky peat							55	130
St. Charles silt loam, 0 to 2 percent slopes	85	120	70	85	3. 0	4. 75	110	150
St. Charles silt loam, 2 to 6 percent slopes	80	115	65	75	3. 0	4. 75	110	150
St. Charles silt loam, gravelly substratum, 0 to 2 percent slopes	80	115	65	80	3. 0	4. 5	110	140
St. Charles silt loam, gravelly substratum, 2 to 6 percent slopes	75	110	60	70	3. 0	4. 5	110	140
Sebewa silt loam, 0 to 2 percent slopes	65	95	45	65		4. 0	75	135
Sebewa silt loam, 2 to 6 percent slopes	60	90	45	65		4. 0	75	135
Sebewa silt loam, deep, 0 to 2 percent slopes	70	110	45	65		4. 0	80	140
Sebewa silt loam, loamy subsoil variant, 0 to 3 percent slopes	70	110	45	65		4. 0	90	145
Sisson silt loam, 2 to 6 percent slopes, eroded	70	95	50	70	2. 75	3. 75	90	120
Sogn stony silt loam, 0 to 6 percent slopes			35	45	1. 5	2. 0	50	
Theresa silt loam, 0 to 2 percent slopes	75	110	60	80	3. 0	4. 5	115	145
Theresa silt loam, 2 to 6 percent slopes	70	100	55	75	3. 0	4. 5	110	140
Theresa silt loam, 2 to 6 percent slopes, eroded	65	95	50	65	3. 0	4. 5	100	135
Theresa silt loam, 6 to 12 percent slopes	65	95	50	65	3. 0	4. 5	100	135
Theresa silt loam, 6 to 12 percent slopes, eroded	60	90	45	60	3. 0	4. 5	90	130
Theresa silt loam, 12 to 20 percent slopes	50	85	40	60	2. 5	4. 0	85	120
Theresa silt loam, 12 to 20 percent slopes, eroded	45	80	40	55	2. 0	3. 5	80	110
Theresa soils, 6 to 12 percent slopes, severely eroded	50	80	40	55	2. 25	4. 0	85	110
Thesesa soils, 12 to 20 percent slopes, severely eroded					2. 0	3. 5	75	100
Theresa-Casco silt loams, 2 to 6 percent slopes, eroded	60	90	45	60	3. 0	4. 5	90	135
Theresa-Casco silt loams, 6 to 12 percent slopes, eroded	55	85	40	55	2. 75	4. 0	80	125
Theresa-Casco silt loams, 12 to 20 percent slopes, eroded					2. 0	3. 5	70	110
Theresa-Casco silt loams, 20 to 30 percent slopes, eroded					1. 5	3. 0	65	100
Virgil silt loam, 0 to 2 percent slopes	80	115	55	65	2. 5	4. 5	90	130
Virgil silt loam, 2 to 6 percent slopes	85	100	60	70	2. 75	4. 5	90	130
Virgil silt loam, gravelly substratum, 0 to 2 percent slopes	80	115	55	65	2. 5	4. 0	90	135
Virgil silt loam, gravelly substratum, 2 to 6 percent slopes	85	120	60	70	2. 5	4. 0	90	135
Wallkill silt loam	65	100	40	65		4. 0	90	130
Warsaw silt loam, 2 to 6 percent slopes	50	85	45	60	2. 5	3. 5	85	120
Washtenaw silt loam, 0 to 2 percent slopes	65	100	40	65		4. 0	90	130
Washtenaw silt loam, 2 to 6 percent slopes	70	100	45	65		4. 0	90	130
Wauseon loam	60	90	45	65		3. 5	70	105
Wauseon silt loam	60	90	45	65		3. 5	70	105

[1] Average of first- and second-year hay after stands are established.

[2] Cow-acre-days is a term used to express the carrying capacity of pasture. It is the number of animal units carried per acre multiplied by the number of days the pasture is grazed during a single grazing season without injury to the sod. An acre of pasture that provides 30 days of grazing for 2 cows has a carrying capacity of 60 cow-acre-days.

[3] Yields obtained where soil is protected from flooding.

Woodland [3]

A relatively small part of Fond du Lac County, about 33,300 acres, or 7 percent of the land area, is classified as woodland. Most of this acreage is in hardwoods—oak, elm, maple, ash, and some birch and aspen. About 70 percent, or 23,000 acres of the woodland, is poorly stocked with trees. About 40 percent of the woodland, or more than 14,000 acres, is heavily grazed by livestock.

Originally, a much larger area, perhaps half the county, was timbered. In this virgin stand the principal species were northern hardwoods with a mixture of some white pine. There were minor areas of tamarack, white-cedar, and swamp hardwoods. In the eastern part of the county, a typical forest stand was a mixture of maple, basswood, and oak. Oak openings, intermingled with native grass prairie, covered a considerable area in the western part of the county.

Today, the principal products from Fond du Lac County woodlands are lumber logs, veneer logs, pulpwood, and fuelwood. The 1956 forest inventory showed woodland harvest exceeding annual growth by 9 percent. This excess was principally cordwood.

Suitability of the soils for woodland

Management of woodland is determined, to a large extent, by the quantity and kind of forest products that can be grown in an area. The potential annual yield varies from very little usable wood to several hundred board feet per acre. Some areas that produce hardwoods are suited to pines; others are not. Some areas now producing low-value species are capable of producing more valuable trees.

Woodland suitability groups

In this survey soils that give similar response to tree growth and management have been placed in woodland suitability groups. The soils in each group are similar in those characteristics that affect growth of the trees. They have similar limitations that affect seedling mortality, plant competition, soil-associated diseases, and windthrow and erosion hazards.

Measurements have been taken by a team of foresters and soil scientists to determine actual growth of trees on some important forest soils. The potential productivity of a soil for trees is rated by means of an average site index. The site index for a given soil is expressed as the total height, in feet, that the dominant or codominant trees of a given species, growing in an even-aged, well-stocked stand, will attain in 50 years. In this survey when this information is not available for a soil, data from similar soils have been used.

The woodland suitability groups are numbered according to a Statewide system. The numbers are not consecutive, because only those groups that apply to Fond du Lac County are discussed here. The group to which each soil has been assigned is listed in the "Guide to Mapping Units."

WOODLAND SUITABILITY GROUP 1

This group consists of medium-textured soils that are well drained and moderately well drained, moderately deep to deep, and gently sloping to steep. These soils are deep enough for roots to develop; they have low to high fertility and moderate to high available water capacity. They are moderate to moderately slow in permeability. Because of their value for farming, these soils are generally used for crops rather than for trees.

The native trees on these soils are mainly maple, oak, and basswood. The wetter areas support elm and ash. The south- and west-facing slopes tend to be droughty, and they support such species as black oak and bur oak.

The measured site index is 50 to 60 for red oak, and other hardwoods make somewhat faster growth. On slopes facing south and west, the site index for upland oaks is estimated to be only 40 to 50.

The soils of this group produce tall, well-formed trees suitable for veneer logs and sawlogs of high quality. Eroded soils on upper slopes produce lower quality sawlogs and posts.

Although hardwood plantings seldom succeed on these soils, white pine plantations generally grow well. White pine, white-cedar, and white spruce are suitable for farm windbreaks.

Competition from brush, weeds, and grass is a hazard to the establishment of seedlings. The use of logging equipment on these soils is limited only during extremely wet seasons. The erosion hazard is severe on the steeper slopes, and roads and skid trails must be located carefully. Machine tree planting and fire control are difficult on steep slopes.

WOODLAND SUITABILITY GROUP 2

This group consists of medium-textured and fine-textured soils that are moderately shallow to deep and moderately well drained to well drained. These soils are well suited to hardwoods. The measured site index, on the basis of limited data, is 62 to 72 for red oak and about 70 for sugar maple. Conifers are not so well suited.

White oak, red oak, sugar maple, basswood, and white ash are suitable hardwoods. Conifers, especially white pine and white spruce, are suitable for plantings in windbreaks or for reforestation.

Brush, weeds, and grass that compete for moisture are hazards to the establishment of trees and the survival of seedlings. Other hazards are a tendency to droughtiness in the upper soil horizons during prolonged dry spells and a high probability of frost heaving.

Limitations to the use of equipment are moderately severe because of the risk of soil compaction in wet weather. Wetness delays tree planting and interrupts logging operations.

WOODLAND SUITABILITY GROUP 3

This group consists of moderately deep and deep, moderately coarse textured soils and moderately deep, medium-textured soils. These soils are moderately well drained and well drained, and they are droughty. Tree species native to these soils are aspen, black oak, and bur oak.

Oaks and other hardwoods grow slowly on these soils, and many of the trees are poorly formed. White pine grows well in most places. All species grow poorly where the soils are eroded. White pine is suitable for reforestation.

Young trees planted on these soils are likely to be damaged by heat or drought. Other limitations to establishment of seedlings are minor. Except on the steeper soils, these soils are well suited to use of equipment. Erosion is a serious hazard on the steep soils.

[3] By R. E. Greenlaw and G. W. Alley, woodland conservationists, Soil Conservation Service.

WOODLAND SUITABILITY GROUP 5

This group consists of medium-textured to moderately coarse textured, shallow to moderately deep, well-drained soils. The limited depth of these soils restricts the development of tree roots and limits the water available for tree growth. Native trees are oak, sugar maple, basswood, and aspen. Very droughty and eroded areas support redcedar and bur oak. The measured site index is 48 for red oak and 47 to 59 for sugar maple.

White pine is well suited to reforestation. It is suited to plantings for windbreaks on slopes that face north and east and for underplanting in existing stands. Eastern redcedar is favored for planting on slopes that face south and west and on eroded soils.

Heat and droughtiness are severe hazards to the establishment of seedlings on slopes that face south and west, but they are much less of a hazard on other slopes and in more nearly level areas. Damage from rabbits and meadow mice is a hazard to young plantations. Plantings in grassy areas are susceptible to damage by white grubs.

The use of equipment is limited by steep slopes, gullies, and stoniness. Logging roads and skid trails need to be located carefully on steep soils because the erosion hazard is severe.

WOODLAND SUITABILITY GROUP 6

This group consists of shallow, medium-textured to coarse-textured, excessively drained soils that are less than 12 inches deep. Important native trees are northern pin oak, bur oak, and whitepine. Many eroded areas support only brush, grass, and weeds.

The measured site index for oaks, based on a limited sample, is 40 or less. This is below the growth potential that is considered economically feasible.

White pine is well suited to reforestation on the better soils of this group; eastern redcedar is the only tree suitable to the steep and eroded soils. Red pine is poorly suited.

Heat and drought are severe hazards to the establishment of seedlings on these soils. Other hazards are generally unimportant.

The use of equipment is seriously limited by the slope and the stoniness of the soils. The erosion hazard is severe on the steep soils.

WOODLAND SUITABILITY GROUP 7

This group consists of medium-textured to fine-textured, somewhat poorly drained to poorly drained soils. Tree species native to the somewhat poorly drained soils are oak, aspen, and other hardwoods; species common on the poorly drained soils are soft maple, ash, elm, and some northern white-cedar.

Tree growth potential is medium to good for all species on the somewhat poorly drained soils; the estimated site index for aspen is 70 to 80. Tree growth is fair to poor on the poorly drained soils; the estimated site index for aspen is 55 to 70.

Excessive wetness is a moderate hazard to the establishment of seedlings on somewhat poorly drained soils, and it is a severe hazard on poorly drained soils. Competition from brush, weeds, and grass is a severe hazard.

The hazard of root rot and white pine blister rust is moderate to severe in some places. The windthrow hazard is severe in many places because of shallow root development.

The use of equipment is severely limited on these soils. Spring wetness disrupts planting operations. Compacted soils and impassable roads restrict logging to dry seasons and the winter months. Generally, erosion is not a hazard.

WOODLAND SUITABILITY GROUP 9

This group consists of somewhat poorly drained to poorly drained alluvial soils. Hardwoods grow well on the somewhat poorly drained soils; the estimated site index for soft maple is 75 to 90. Growth is slower on the poorly drained soils; the estimated site index for soft maple is 60 to 75.

Severe hazards to the establishment and survival of seedlings are excessive wetness and competition from brush and weeds. Other hazards to young trees are minor.

Stem and root rot are moderate to severe hazards to established plantings. Windthrow is a severe hazard on soils that have a high water table.

Limitations to the use of equipment are severe. Machine planting is difficult or impossible on the poorly drained soils in spring. In many of the wetter areas, logging is restricted to the winter, when the ground is frozen, or to extremely dry seasons. Cuttings need to be planned carefully to prevent serious erosion damage. There is a hazard of streambank erosion and scouring during floods.

WOODLAND SUITABILITY GROUP 10

This group consists of organic soils that vary widely in their potential to support trees. Most areas are poorly suited.

Native tree species are willow, northern white-cedar, tamarack, black ash, soft maple, and alder. The measured site index for northern white-cedar is 32 to 35; for tamarack, it is 42 to 55.

Most areas of these soils are unsuited to woodland. Frost and excessive wetness are severe hazards to the establishment and growth of seedlings. The windthrow hazard is severe.

The use of equipment is severely limited, and machine planting is difficult or impossible. Logging is generally done in winter, when the soil is frozen.

WOODLAND SUITABILITY GROUP 11

This group consists of miscellaneous unproductive land types that have very severe limitations if used as woodland. The native vegetation is small shrubs, grass, and scattered small trees. The growth potential is poor for all species. The hazards to establishment and growth of seedlings are severe.

Soils in this group are suited to wildlife habitat and watersheds. Where they are so used, a continuous plant cover needs to be maintained.

WOODLAND SUITABILITY GROUP 12

This group is made up of medium-textured to fine-textured, very shallow to deep, well-drained to somewhat poorly drained prairie soils. True woodland is not native to these soils. The native vegetation is prairie grasses intermingled with open-grown oak trees. The principal trees are bur oak, northern pin oak, and eastern redcedar. The growth potential for all species is poor.

Tree plantings on these soils are generally for windbreak purposes. Suitable species for windbreak plantings on the well drained and moderately well drained soils are white

pine, northern white-cedar, Norway spruce, European larch, and eastern redcedar. Species suitable for the somewhat poorly drained soils are white spruce, northern white-cedar, and cottonwood.

The hazards to the establishment and survival of seedlings are severe. These are primarily related to competition for available moisture. There is a severe hazard that white grubs will damage young trees growing in grassy areas.

Wildlife

The soils of Fond du Lac County vary widely in physical and chemical characteristics, and this, in turn, affects the kind of vegetation the soils produce and the kinds and numbers of wildlife that they support. Table 2 groups all the soils of the county according to their suitability for various elements of wildlife habitat. Table 3 lists species of wildlife important in the county and rates the various elements of habitat according to their importance for each wildlife species.

The suitability of any given soil for a species of wildlife can be determined by using both tables. For example, table 3 shows that critical elements of the habitat for pheasants are grain and seed crops, grasses and legumes, wild herbaceous upland plants, herbaceous wetland plants, and shrubs. Table 2 shows that the soils in groups 1 and 5 are suitable.

In table 2 the soils of the county have been placed in seven groups on the basis of similar texture and drainage. The groups are then rated for their suitability for establishment, improvement, and maintenance of various elements of wildlife habitat. Most of the major soil types have a high potential for wildlife habitat, but because they are more valuable for farming and other uses, little wildlife habitat is produced. Probably the most important soils for wildlife are the somewhat poorly drained and poorly drained soils in group 4 and the organic soils in group 5. These are the most valuable wetlands. Other soils important for wildlife habitat are those that have woodlots, small marshes, or other cover that can be used by wildlife.

Land management practices for the improvement of wildlife habitat include food and cover plantings on soils used primarily for wildlife and food and cover plantings where wildlife is of secondary importance. Wildlife also benefit from many soil and water conservation practices, such as stripcropping, fertilization, and planting of trees.

TABLE 2.—*Suitability of the soils for*

Group and soil symbols	Grain and seed crops	Grass and legumes	Wild herbaceous upland plants
Group 1: Loamy, well drained to moderately well drained soils: CcB, CcC, CeB, CeC2, CeD2, CfB3, CfC3, CfD3, CgB, ChB, CmB, CmC2, CmD2, CnC3, CnD3, CpC2, CpE, CpE3, DdA, DdB, DdB2, FmB, FoB, FoB2, FoC2, FsA, FsB, FsB2, FsC2, HhE2, HmB, HmB2, HmC, HmC2, HmD, HmD2, HmE, HoB3, HoC3, HoD3, HoE3, InA, IoA, IoB, IrA, IsB, KwA, KwB, KwC2, KwE2, LrB2, LrC2, LrD, LrD2, LrE, LtC3, LtD3, LvA, LvB, LvB2, LvC, LvC2, LvC3, LvD, LvD2, LvD3, LwA, LwB, LwB2, LwC2, MoA, MoB, ScA, ScB, SeA, SeB, SuB2, ThA, ThB, ThB2, ThC, ThC2, ThD, ThD2, TrC3, TrD3, TsB2, TsC2, TsD2, TsE2.	Well suited where slope is 0 to 6 percent, suited where slope is 6 to 12 percent, poorly suited where slope is more than 12 percent; water erosion hazard.	Well suited where slope is 0 to 12 percent, suited where slope is 12 to 20 percent, poorly suited where slope is more than 20 percent.	Well suited where slope is 0 to 20 percent, suited where slope is more than 20 percent.
Group 2: Loamy, well-drained prairie soils: MdB, MdB2, MdC2, MdC3, MdD2, MdD3, MsA, MsB, MsB2, MsC2, PsA, PsB, PsB2, WhB.	Well suited where slope is 0 to 6 percent, suited where slope is 6 to 12 percent, poorly suited where slope is more than 12 percent.	Well suited where slope is 0 to 12 percent, suited where slope is 12 to 20 percent, poorly suited where slope is more than 20 percent.	Well suited where slope is 0 to 20 percent, suited where slope is more than 20 percent.
Group 3: Clayey, well drained to moderately well drained soils: KnA, KnB, KnB2, KnC2, KoA, KoB, KoB2, KoC2, KoD2, KoE2, KsB3, KsC3, KsD3, KtB, MzaA, MzaB2, MzaD2, MzdB, MzdB2, MzdC2, MzdD2, MzeC3, MzeD3, OhA, OhB, OkA, OkB, PfA, PfB.	Well suited where slope is 0 to 6 percent, suited where slope is 6 to 12 percent, poorly suited where slope is more than 12 percent; water erosion hazard.	Well suited where slope is 0 to 12 percent, suited where slope is 12 to 20 percent, poorly suited where slope is more than 20 percent.	Well suited where slope is 0 to 20 percent, suited where slope is more than 20 percent.

Engineering Uses of the Soils

Some soil properties are of special interest to engineers because they affect the construction and maintenance of roads, airports, pipelines, building foundations, facilities for water storage, erosion control structures, drainage systems, and sewage systems. Among the soil properties most important to the engineer are permeability to water, shear strength, compaction characteristics, drainage, shrink-swell potential, grain size, plasticity, and reaction (pH). The depth to the water table, depth to bedrock or to sand and gravel, and topography also are important.

Information in this publication can be used in conjunction with standard soil survey maps to:

1. Make soil and land use studies that will aid in selecting and developing industrial, business, residential, and recreational sites.
2. Make preliminary estimates of the engineering properties of soils in planning agricultural drainage systems, farm ponds, irrigation systems, and diversion terraces.
3. Make preliminary evaluations of soil and ground conditions that will aid in selecting highway, airport, pipeline, and cable locations, and in planning detailed investigations at selected locations.
4. Locate probable sources of gravel and other construction materials.
5. Correlate performance of engineering structures with soil to develop information for overall planning that will be useful in designing and maintaining certain engineering practices and structures.
6. Determine the suitability of soils for cross-country movement of vehicles and construction equipment.
7. Supplement the information obtained from other published maps and reports and aerial photographs to make maps and reports that can be used readily by engineers.
8. Develop other preliminary estimates for construction purposes pertinent to the particular area.

With the use of the soil map for identification, the engineering interpretations reported here can be useful for many purposes. It should be emphasized that they do not eliminate the need for sampling and testing at the site

elements of wildlife habitat

Woody plants		Wetland food and cover plants	Shallow and deep-water developments
Hardwood trees and shrubs	Coniferous trees		
Well suited where slope is 0 to 20 percent, suited where slope is more than 20 percent.	Well suited where slope is 0 to 20 percent, suited where slope is more than 20 percent.	Poorly suited where slope is 0 to 2 percent, unsuited where slope is more than 2 percent; few species are suited.	Poorly suited where slope is 0 to 2 percent, unsuited where slope is more than 2 percent; moderately permeable subsoil.
Suited where slope is 0 to 20 percent, poorly suited where slope is more than 20 percent; competition from grasses.	Suited; competition from grasses.	Poorly suited where slope is 0 to 2 percent, unsuited where slope is more than 2 percent; few species are suited.	Poorly suited where slope is 0 to 2 percent, unsuited where slope is more than 2 percent; moderately permeable.
Well suited where slope is 0 to 20 percent, suited where slope is more than 20 percent.	Well suited where slope is 0 to 20 percent, suited where slope is more than 20 percent.	Poorly suited where slope is 0 to 2 percent, unsuited where slope is more than 2 percent; few species are suited.	Suited where slope is 0 to 2 percent, poorly suited where slope is more than 2 percent; moderately slowly permeable to slowly permeable subsoil.

of specific engineering works involving heavy loads or excavations deeper than the depths of layers here reported. Even in these situations, the soil map is useful for planning more detailed field investigations and for suggesting the kinds of problems that may be expected.

Some of the terms used by the soil scientist may be unfamiliar to the engineer, and some words, such as clay, silt, and sand, have a special meaning in soil science. These and other terms are defined in the Glossary.

Much of the information useful to engineers is given in tables 4, 5, 6, and 7. Table 4 contains available engineering test data for representative soils sampled in Fond du Lac County. Table 5 gives the classification of the soils and their estimated physical and chemical properties. Tables 6 and 7 contain soil interpretations that are useful to engineers.

Engineering classification systems

The United States Department of Agriculture system of classifying soils by texture is used by agricultural scientists. In this system the textural class of a soil is based on the proportions of sand, silt, and clay in the soil (*12*).

Most highway engineers classify soil materials in accordance with the system approved by the American Association of State Highway Officials (AASHO) (*1*).

In this system soil materials are classified in seven principal groups based on the size gradation, liquid limit, and plasticity index of the soils. The groups are designated A–1 through A–7. The best soils for subgrade (gravelly soils of high bearing capacity) are classified as A–1; the next best, A–2; and so on to the poorest, A–7, which are clay soils having low strength when wet. Within each group, the relative engineering value of the soil material is indicated by a group index number. Group index numbers range from 0 for the best materials to 20 for the poorest. The group index number is shown in parentheses after the soil group symbol.

In the Unified system soils are classified on the basis of particle size distribution, plasticity, liquid limit, and organic-matter content. They are grouped according to their performance as material for engineering construction (*14*). Soils are grouped in 15 classes—eight classes of coarse-grained soils, six classes of fine-grained soils, and one class of highly organic soils. Table 5 gives the classification of all soils in the county according to all three systems.

Engineering test data

To help evaluate the soils for engineering purposes, soil samples from major horizons of representative profiles were tested. Table 4 contains the engineering test data for several of the more extensive soils in Fond du Lac County.

The engineering classifications are based on data obtained by mechanical analysis and by tests to determine liquid limit and plastic limit. The mechanical analyses were made by combined sieve and hydrometer methods. Percentages of silt and clay determined by the hydrometer method should not be used in naming textural classes for soil classification. The information, however, is useful in determining engineering properties of the soils.

The tests for liquid limit and the plasticity index are a

TABLE 2.—*Suitability of the soils for*

Group and soil symbols	Grain and seed crops	Grass and legumes	Wild herbaceous upland plants
Group 4: Somewhat poorly drained and poorly drained soils: An, AtA, BcA, BcB, BeB, BsA, BtA, BuA, EbA, EsA, EsB, Km, KuA, LmA, LmB, MaA, MaB, McA, McB, Mf, MmA, MmB, PhA, PnA, PuB, Py, SmA, SmB, SnA, SpA, VgA, VgB, VsA, VsB, Wa, WsA, WsB, Wt, Wu.	Well suited where drained, suited and poorly suited where undrained; seasonally wet.	Well suited where drained, unsuited where undrained; wet soil; few species are suited.	Unsuited; wet soil; a few species are suited.
Group 5: Poorly drained organic soils: Ak, Ca, Hu, Od, Pa, Pc, Rw.	Suited where drained, unsuited where undrained; wet soil.	Suited where drained, unsuited where undrained; wet soil; few species are suited.	Unsuited; wet soil; a few species are suited.
Group 6: Well drained and moderately well drained alluvial soils: Am, DcA, JuA, JuB.	Well suited where protected from flooding, suited where subject to flooding; water erosion hazard.	Well suited; hazard of flooding.	Well suited; hazard of flooding.
Group 7: Land types and very shallow, droughty soils: CpF, Oe, ReB, Rm, RnD2, RnE2, RoD2, RoF2, SwB.	Poorly suited where slope is 0 to 6 percent, unsuited where slope is more than 6 percent; droughty; water erosion hazard.	Suited where slope is 0 to 12 percent, poorly suited where slope is more than 12 percent; droughty; some species not suited.	Suited where slope is 0 to 20 percent, unsuited where slope is more than 20 percent; droughty; some species not suited.

measure of the effect of water on the consistence of the soil material. Very dry, clayey soil is generally in a semisolid state. Clayey soils that have greater moisture content are in a plastic state. If the moisture content is very high, the soil is generally in a liquid state. The plastic limit is the moisture content at which the soil material passes from a solid to a plastic. The liquid limit is the moisture content at which the material changes from plastic to liquid. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is plastic.

The table also gives optimum moisture and maximum dry density values for most of the tested soils. The highest stability generally is obtained if the soil is compacted to maximum dry density when at optimum moisture content.

Engineering properties of the soils

Classification of the soils and their estimated physical and chemical properties are given in table 5. The information is based on the test data in table 4 and on data from tests on similar soils in other counties. If test data were not available, estimates were made by comparisons with similar soils and by studies of the soils in the field.

The estimates in table 5 are for soils as they occur in their natural state and not for disturbed areas that have been altered by cut and fill operations. The estimated percentages of material passing the various sieves for each of the major soil horizons have been rounded off to the nearest 5 percent. The range of values is generally ±5 percent of the values given.

Permeability is the rate at which water moves downward through a saturated, uncompacted soil. It does not include lateral seepage. Texture, structure, and consistence of the soil are the principal factors that affect soil permeability. The permeability rate of the whole soil generally is determined by the least permeable layer.

The estimated available water capacity, given in inches per inch of soil, refers to the amount of water that can be stored in the soil for plant use.

Reaction is the degree of acidity or alkalinity of the soils, expressed as a pH value. A neutral soil, for example, has a pH value of 7. A pH value lower than 7 indicates acidity, and a pH value higher than 7 indicates alkalinity. A knowledge of the pH value of soil horizons can be used to indicate the need for liming and to determine the hazard of corrosion for metal conduits and the risk of deterioration for concrete tile.

The shrink-swell potential refers to the change in volume of the soil material to be expected when the moisture content changes. It is based on volume change tests or on observance of other physical properties of the soils. The amount and kind of clay and the content of organic matter in a soil affect the shrink-swell behavior.

Engineering interpretations

Interpretations of engineering properties of the soils in Fond du Lac County are given in tables 6 and 7. Table 6 lists rural fringe uses, and table 7 lists farm uses. Some of the interpretations, however, are useful for both purposes.

elements of wildlife habitat—Continued

Woody plants		Wetland food and cover plants	Shallow and deep-water developments
Hardwood trees and shrubs	Coniferous trees		
Suited; seasonally wet; some species not suited.	Suited; seasonally wet; some species not suited.	Well suited to suited where slope is 0 to 2 percent, poorly suited where slope is more than 2 percent; some species not suited.	Well suited to suited where slope is 0 to 2 percent, poorly suited where slope is more than 2 percent; moderately to slowly permeable.
Poorly suited; wet soil; a few species are suited.	Suited; wet soil; some species not suited.	Well suited; wet soil	Well suited; high water table.
Suited; hazard of flooding	Suited; hazard of flooding; some species not suited.	Poorly suited: few species suited.	Poorly suited where slope is 0 to 2 percent, unsuited where slope is more than 2 percent; moderately permeable.
Poorly suited; droughty; a few species are suited.	Poorly suited; droughty; few species suited.	Unsuited; droughty	Unsuited; rapidly permeable or shallow to bedrock.

In table 6 the suitability of the soils as a source of topsoil refers to the use of soil material as a topdressing for roadbanks, parks, gardens, and lawns. The ratings are based on the texture of the soil and on the content of organic matter. For example, a soil that is medium textured and high in organic-matter content has a suitability rating of good as a source of topsoil. On the other hand, a soil that is very fine textured or coarse textured and low in organic-matter content is rated poor or unsuitable.

Soils that are suitable as a source of sand and gravel are underlain by sand and gravel within a depth of 5 feet. No distinction is made between mainly coarse-grained deposits and coarse-grained deposits that contain an appreciable amount of finer materials.

Only the subsoil and underlying material were considered in rating the soils for highway location, and only the underlying material was considered in rating them as foundation material for low buildings. Factors considered were texture, content of organic matter, depth to bedrock, and presence of stones and boulders. Also considered were the depth to the water table, flooding hazard, susceptibility to frost heaving, stability of slopes, bearing capacity, and need for cut and fill.

Limitations of the soils for onsite sewage systems indicate the ability of the soil to absorb and dispose of sewage effluent without contamination of surrounding areas. The rating is slight if the limitations are few and easy to overcome, moderate if the limitations can be overcome by good management and careful design, severe if the limitations are difficult to overcome, and very severe if use for the given purpose is generally unsound. Those soils that have a moderate to severe limitation require onsite investigations and appropriate tests before suitability can be determined.

Factors that affect the limitations of soils for onsite sewage systems are permeability and percolation, structural stability, ground water level, depth of the soil, kind of underlying material, susceptibility to flooding, slope, and proximity to streams and lakes.

The corrosion potential of soils for underground metal pipes and concrete conduits is closely related to soil reaction, drainage, and electrical conductivity. Most conduits are laid in the lower part of the soil or underlying material. Generally, poor aeration and high pH values, high electrical conductivity, and high moisture content

TABLE 3.—*Importance of elements of wildlife habitat for selected species of wildlife*

[Habitat elements are rated 1, little or no value to species; 2, some value to species; 3, important to species; 4, very important to species. Absence of a figure indicates element is not applicable]

Kind of wildlife	Kinds of vegetation									Water areas	
	Grain and seed crops		Grasses and legumes		Wild herbaceous upland plants	Woody plants			Herbaceous wetland plants [1]	Shallow water [2]	Deep water [3]
	Harvested	Unharvested	Harvested	Unharvested		Shrubs	Hardwoods	Conifers			
Migratory waterfowl:											
Ducks	3	3	1	3	3		1		[4] 4	[4] 4	4
Geese	4	4	4	1					2	3	4
Upland game birds:											
Hungarian partridge	4	4	3	4	4	1			1		
Pheasants	[4] 4	[4] 4		[4] 4	[4] 4	4		1	[4] 4	3	
Quail	4	4	[4] 2	[4] 4	4	[4] 4	2	1	4	3	
Ruffed grouse	1	1	1	2	2	[4] 4	[4] 4	3			
Woodcock			1	3	3	4	4	2	3		
Small game:											
Rabbits, cottontail	3	4	3	[4] 4	[4] 4	[4] 4	3	1	2	3	
Rabbits, snowshoe				1	1	[4] 4	3	[4] 4	1		
Raccoon	3	4		1	1	2	4		1	[4] 4	4
Squirrels, fox and gray	3	4		1	1	2	[4] 4	1			
Large game:											
Deer	3	4	3	3	4	4	4	4	3	3	2
Furbearers:											
Beaver						4	[4] 4		4	4	[4] 4
Fox, red [5]	2	3	2	3	3	3	2	1	3	3	1
Mink [5]						2	1	1	3	[4] 4	[4] 4
Muskrat	1	1				1			4	[4] 4	[4] 4

[1] Type 1 and 2 wetlands as defined by United States Department of the Interior. Includes seasonally flooded basins and flats and inland fresh meadows.

[2] Type 3 and 4 wetlands as defined by United States Department of the Interior. Includes inland shallow fresh marshes and inland deep fresh marshes.

[3] Type 5 wetlands as defined by United States Department of the Interior. Consists of inland open fresh water, generally less than 10 feet deep. This type includes shallow ponds and reservoirs.

[4] Key or critical elements for the species.

[5] Carnivorous species not strictly dependent on elements listed.

are characteristic of soils that are corrosive to metal conduits. Soils that have a low pH value are the most corrosive for concrete conduits. In both cases corrosion is more rapid when the moisture content of the soil is high. The ratings given are low, medium, and high, and are based on relative corrosivity.

In table 7 limitations for both reservoir areas and embankments are given for pond development. These limitations are influenced mainly by ground water level, permeability, stoniness, depth to bedrock, strength and stability, shrink-swell potential, and organic-matter content. Unless otherwise indicated, the entire soil profile was considered in making these evaluations. The ratings given for reservoir areas are for undisturbed soils; the ratings given for embankments are for soil materials that have been disturbed. Controlled compaction of embankments commonly results in increased density and lowered permeability. The terms "subsoil" and "underlying material" in the "Embankments" column refer to soil materials that have been removed from these horizons and placed in the embankment.

Some of the factors to be considered in drainage of soils are rate of water movement into and through the soil, restricting layers, depth to the water table, and topographic positions.

Some of the characteristics considered in evaluating the soils for irrigation were soil depth, available water capacity, permeability, natural drainage, rate of water intake, and slope.

Features considered in rating the soils for terraces and diversions were soil stability, texture and thickness of the soil material, stoniness and rockiness, and topography.

The suitability of the soils for grassed waterways was based on soil stability, texture and thickness of the soil material, ease in establishing and maintaining a suitable vegetative cover, and slope.

TABLE 4.—*Engineering*

[Tests performed by State Highway Commission of Wisconsin in cooperation with Bureau of Public Roads

Soil name and location	Depth from surface	Moisture-density data [1]		Mechanical analysis [2]		
		Maximum dry density	Optimum moisture	Percentage passing sieve—		
				1-inch	¾-inch	No. 4 (4.7 mm.)
	In.	*Lb. per. cu. ft.*	*Pct.*			
Beecher silt loam:						
T. 14 N., R. 17 E., SE¼NW¼ sec. 16.	16–20	100. 0	21. 4			
	30	111. 5	17. 7			
Hochheim silt loam:						
T. 16 N., R. 18 E., NW¼NE¼ sec. 36.	11–15	110. 1	15. 7	99	99	96
	25	140. 2	6. 8	91	90	82
Kewaunee silt loam:						
T. 16 N., R. 16 E., NE¼NE¼ sec. 4.	10–21	97. 8	20. 2			99
	28–47	115. 0	16. 0	99	98	92
Peebles silt loam:						
T. 15 N., R. 17 E., SE¼SW¼ sec. 29.	11–20					
	39–48			100	99	97
Manawa silt loam:						
T. 16 N., R. 16 E., NW¼SE¼ sec. 25.	11–17	102. 9	18. 9	100	98	95
	44–54	124. 1	10. 8	95	93	87
Morley silt loam:						
T. 14 N., R. 17 E., NW¼NW¼ sec. 33.	21–27	98. 2	25. 3			
	33	119. 5	14. 4			
Oshkosh silt loam: (Winnebago Co.)						
T. 20 N., R. 17 E., NW¼SW¼ sec. 33.	8–19	99. 6	19. 9			
	35–62	102. 0	23. 8			
Poygan silty clay loam: (Winnebago Co.)						
T. 17 N., R. 15 E., SE¼NE¼ sec. 6.	18–23					
	30–37			100	98	93
Theresa silt loam:						
T. 15 N., R. 18 E., SW¼SE¼ sec. 15.	18–26	116. 1	13. 5			
	33	135. 0	8. 8	97	94	83

[1] Based on AASHO Designation: T99–57, Method C (*1*).

[2] According to AASHO Designation: T-88 (*1*). Results obtained by this procedure frequently may differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure the fine material is analyzed by the hydrometer method, and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters 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 calculations of grain-size fractions. The data used in this table are not suitable for naming extural classes for soils.

test data

in accordance with standard procedures of the American Association of State Highway Officials (AASHO)]

Mechanical analysis [2]—Continued							Liquid limit	Plasticity index	Classification	
Percentage passing sieve—Continued			Percentage smaller than—						AASHO	Unified [3]
No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.				
							Pct.			
----------	100	98	96	84	54	44	58	36	A–7–6(20)	CH
100	98	93	92	87	66	48	39	20	A–6(12)	CL
95	91	68	63	53	38	33	44	25	A–7–6(13)	CL
78	71	49	41	28	14	9	15	3	A–4(3)	SM
99	97	88	87	86	74	62	54	28	A–7–6(18)	CH
89	84	74	71	64	52	41	44	24	A–7–6(14)	CL
100	99	95	95	93	79	65	72	39	A–7–5(20)	MH–CH
97	96	92	92	91	77	62	52	31	A–7–6(18)	CH
95	93	80	77	69	53	43	54	28	A–7–6(18)	CH
87	81	69	67	58	43	32	35	18	A–6 (10)	CL
100	99	96	95	91	71	55	56	32	A–7–6(19)	CH
100	97	90	86	73	46	25	27	10	A–4 (8)	CL
100	99	98	98	97	86	64	69	38	A–7–5(20)	CH
----------	----------	----------	100	99	95	81	58	35	A–7–6(20)	CH
100	99	97	97	95	84	68	70	46	A–7–6(20)	CH
91	89	81	81	78	69	54	55	32	A–7–6(19)	CH
100	95	81	78	58	33	28	35	18	A–6 (11)	CL
79	71	46	40	26	13	10	21	6	A–4 (2)	SM–SC

[3] SCS and BPR have agreed that a soil having a plasticity index within 2 points of the A-line is to be given a borderline classification. MH-CH is an example of a borderline classification arrived at on this basis.

TABLE 5.—*Estimated*

[The miscellaneous land types Alluvial land, Marsh, Old

Soil series and map symbols	Depth to—		Depth from surface	Classification
	Bedrock	Seasonal high water table		Dominant USDA texture
	Feet	*Feet*	*Inches*	
Adrian: Ak	5	0–1	0–28	Muck and peat
			28–60	Sand and gravel
Ashkum: AtA	5	0–1	0–10	Silty clay loam
			10–30	Silty clay loam and silty clay
			30–60	Silty clay loam
Beecher:[3] BcA, BcB	5	1–3	0–12	Silt loam
			12–30	Silty clay loam and silty clay
			30–60	Silty clay loam
Beecher, shaly subsoil variant: BeB	2–3½	1–3	0–9	Silt loam
			9–30	Silty clay loam
			30–60	Shale bedrock.
Brookston:				
BsA, BtA	5	0–1	0–14	Silt loam
			14–30	Clay loam
			30–60	Gravelly loam
BuA	5	0–1	0–12	Silty clay loam
			12–30	Silty clay loam
			30–60	Gravelly loam
Carbondale: Ca	5	0–1	0–60	Muck and peat
Casco:				
CeB, CeC2, CeD2, CfB3, CfC3, CfD3, CmB, CmC2, CmD2, CnC3, CnD3, CpC2, CpE, CpE3, CpF. (For properties of Hochheim component of CmB, CmC2, CmD2, CnC3, CnD3, see Hochheim series. For properties of Rodman component of CpC2, CpE, CpE3, and CpF, see Rodman series.)	5	5	0–8	Loam
			8–21	Clay loam
			21–60	Sand and gravel
CcB, CcC	5	5	0–9	Sandy loam
			9–22	Sandy clay loam
			22–60	Sand and gravel
Casco, clayey subsoil variant: ChB	5	5	0–13	Loam, silt loam
			13–26	Clay loam
			26–35	Gravelly sand
			35–60	Silty clay
Casco, loamy subsoil variant: CgB	5	5	0–7	Loam
			7–20	Loam, clay loam
			20–32	Gravelly sand
			32–60	Sand and silt
DePere: DcA	5	0–1	0–9	Silty clay loam
			9–60	Silty clay
Dodge: DdA, DdB, DdB2	5	5	0–11	Silt loam
			11–37	Silt loam, silty clay loam
			37–60	Loam
Elburn: EbA	5	1–3	0–18	Silt loam
			18–48	Silt loam
			48–60	Gravelly loam
Elliott: EsA, EsB	5	1–3	0–17	Silt loam
			17–28	Silty clay
			28–60	Silty clay loam

See footnotes at end of table.

engineering properties

beaches, and Rock land are not included in this table]

Classification—Continued		Percentage passing sieve [1]			Permeability	Available water supplying capacity	Reaction	Shrink-swell potential
Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No 200 (0.074 mm.)				
					Inches per hour	*Inches per inch of soil*	*pH*	
Pt					2. 0–6. 3	0. 2–0. 5	(2)	Low.
SM-SP	A–3	100	100	5	6. 3–20. 0	0. 10–0. 12	(2)	Low.
MH	A–7	100	95	95	0. 63–2. 0	0. 20–0. 24	6. 6–7. 3	Moderate.
CH	A–7	95	95	90	0. 2–0. 63	0. 12–0. 16	6. 6–7. 8	High.
CL	A–6	95	90	90	0. 2–0. 63	0. 16–0. 20	7. 4–8. 4	Moderate.
ML-CL	A–4	100	100	95	0. 63–2. 0	0. 20–0. 24	5. 6–6. 5	Moderate.
CH	A–7	100	100	95	0. 2–0. 63	0. 14–0. 18	5. 6–6. 5	High.
CL	A–6	100	95	90	0. 2–0. 63	0. 16–0. 20	7. 4–8. 4	Moderate.
ML-CL	A–4 or A–6	100	100	100	0. 63–2. 0	0. 20–0. 24	5. 6–6. 5	Moderate.
CH	A–7	100	100	95	0. 2–0. 63	0. 16–0. 20	5. 6–6. 5	Moderate.
ML-CL	A–4 or A–6	100	100	95	0. 63–2. 0	0. 20–0. 24	5. 6–7. 3	Moderate.
CL	A–7	100	95	90	0. 63–2. 0	0. 16–0. 20	6. 6–7. 3	Moderate.
CL	A–4	80	75	65	0. 2–0. 63	0. 16–0. 20	7. 4–8. 4	Low.
MH-CH	A–7	100	100	95	2. 0–6. 3	0. 20–0. 24	5. 6–7. 3	Moderate.
CL	A–7	100	95	90	0. 63–2. 0	0. 20–0. 24	6. 6–7. 3	Moderate.
CL	A–4	80	75	65	0. 2–0. 63	0. 16–0. 20	7. 4–8. 4	Low.
Pt					2. 0–6. 3	0. 2–0. 5	(2)	Low.
ML	A–4	95	85	60	0. 63–2. 0	0. 18–0. 22	5. 6–7. 3	Low.
CL	A–7	95	85	70	0. 63–2. 0	0. 16–0. 20	5. 6–6. 5	Moderate.
SW-SM	A–1 or A–2	65	45	5	6. 3–20. 0	0. 02–0. 06	7. 4–8. 4	Very low.
SM	A–4	95	85	40	2. 0–6. 3	0. 10–0. 16	5. 6–7. 3	Low.
SC	A–6	95	85	45	0. 63–2. 0	0. 14–0. 18	5. 6–6. 5	Moderate.
SW-SM	A–1	65	45	5	6. 3–20. 0	0. 02–0. 06	7. 4–8. 4	Very low.
ML	A–4	95	85	55	0. 63–2. 0	0. 18–0. 22	7. 4–7. 8	Low.
CL	A–7	95	85	60	0. 63–2. 0	0. 16–0. 20	7. 4–7. 8	Moderate.
SW-SM	A–1 or A–2	65	45	5	6. 3–20. 0	0. 02–0. 06	7. 9–8. 4	Very low.
CH	A–7	90	100	80	0. 2–0. 63	0. 14–0. 18	7. 9–8. 4	High.
ML	A–4	95	85	60	0. 63–2. 0	0. 18–0. 21	5. 6–7. 3	Low.
CL	A–6	95	85	70	0. 63–2. 0	0. 17–0. 21	5. 6–6. 5	Moderate.
SW-SM	A–1 or A–2	65	45	5	6. 3–20. 0	0. 02–0. 06	7. 0–8. 4	Very low.
ML	A–4	100	90	60	0. 63–2. 0	0. 10–0. 14	7. 4–8. 4	Very low.
CH	A–7	100	95	95	0. 63–2. 0	0. 20–0. 24	6. 6–7. 8	Moderate.
CH	A–7	100	95	90	0. 2–0. 63	0. 14–0. 18	7. 4–8. 4	High.
ML-CL	A–4	100	100	95	0. 63–2. 0	0. 18–0. 22	5. 6–7. 3	Low.
CL	A–6	100	95	90	0. 63–2. 0	0. 16–0. 20	4. 5–6. 5	Moderate.
ML	A–4	95	85	55	0. 63–2. 0	0. 16–0. 20	7. 4–8. 4	Low.
ML-CL	A–4	100	100	95	2. 0–6. 30	0. 18–0. 22	5. 6–6. 5	Low.
CL	A–6	100	100	95	0. 63–2. 0	0. 16–0. 20	5. 6–6. 5	Moderate.
ML	A–4	80	70	55	0. 63–2. 0	0. 16–0. 20	7. 4–8. 4	Low.
ML-CL	A–4	100	100	95	0. 63–2. 0	0. 28–0. 22	5. 6–6. 5	Moderate.
CL	A–7	100	100	90	0. 2–0. 63	0. 16–0. 20	5. 6–6. 5	Moderate.
CL	A–6	100	95	80	0. 2–0. 63	0. 16–0. 20	7. 4–8. 4	Moderate.

TABLE 5.—*Estimated*

Soil series and map symbols	Depth to—		Depth from surface	Classification
	Bedrock	Seasonal high water table		Dominant USDA texture
	Feet	*Feet*	*Inches*	
Fox:				
FoB, FoB2, FoC2	5	5	0–10	Loam
			10–35	Sandy clay loam
			35–60	Sand and gravel
FmB	5	5	0–15	Sandy loam
			15–30	Sandy clay loam
			30–60	Sand and gravel
FsA, FsB, FsB2, FsC2	5	5	0–10	Silt loam
			10–35	Silty clay loam
			35–60	Sand and gravel
Hixton: HhE2	2–4	5	0–7	Loam
			7–29	Loam, fine sandy loam, and sandy loam.
			29–60	Sand
Hochheim: HmB, HmB2, HmC, HmC2, HmD, HmD2, HmE, HoB3, HoC3, HoD3, HoE3.	5	5	0–9	Loam
			9–17	Clay loam
			17–60	Gravelly loam
Houghton: Hu	5	0–1	0–60	Muck and peat
Ionia:				
InA	5	3–5	0–11	Sandy loam
			11–26	Sandy clay loam
			26–60	Sand and gravel
IoA, IoB	5	3–5	0–9	Silt loam
			9–24	Silty clay loam
			24–29	Gravelly loam
			29–60	Sand and gravel
Ionia, loamy subsoil variant: IrA	5	3–5	0–8	Silt loam
			8–27	Clay loam
			27–60	Fine sand, silt, and silty clay loam
Ionia, clayey subsoil variant: IsB	5	3–5	0–8	Loam, silt loam
			8–18	Clay loam
			18–26	Sand and gravel
			26–60	Silty clay
Juneau: JuA, JuB	5	3–5	0–33	Silt loam
			33–60	Silty clay loam and clay loam
			60–72	Loam
Keowns: Km	5	0–1	0–10	Silt loam
			10–16	Silt loam
			16–24	Fine sandy loam
			24–60	Silt and fine sand
Kewaunee:[3]				
KnA, KnB, KnB2, KnC2	5	5	0–7	Silt loam
			7–28	Clay
			28–60	Clay, silty clay
KoA, KoB, KoB2, KoC2, KoD2, KoE2, KsB3, KsC3, KsD3.	5	5	0–7	Silty clay loam
			7–24	Clay
			24–60	Clay
Kewaunee, moderately shallow variant: KtB	2–3½	5	0–8	Silt loam
			8–25	Clay
			25–37	Clay, silty clay
			37–60	Dolomite

See footnotes at end of table.

engineering properties—Continued

Classification—Continued		Percentage passing sieve [1]			Permeability	Available water supplying capacity	Reaction	Shrink-swell potential
Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				
					Inches per hour	*Inches per inch of soil*	*pH*	
ML-CL	A–4	100	90	55	0. 63–2. 0	0. 18–0. 22	5. 6–6. 5	Low.
SC	A–6	100	100	40	0. 63–2. 0	0. 14–0. 18	4. 5–6. 5	Moderate.
SW-SM	A–1	65	45	5	6. 3–20. 0	0. 02–0. 06	7. 4–8. 4	Low.
SM	A–4	95	85	40	2. 0–6. 3	0. 10–0. 16	5. 6–6. 5	Low.
SC	A–6	100	95	45	0. 63–2. 0	0. 14–0. 18	4. 5–5. 5	Moderate.
SW-SM	A–1	65	45	5	6. 3–20. 0	0. 02–0. 06	7. 4–8. 4	Low.
ML-CL	A–4	100	100	95	0. 63–2. 0	0. 18–0. 22	5. 6–6. 5	Low.
CL	A–7	100	100	95	0. 63–2. 0	0. 16–0. 20	4. 5–5. 5	Moderate.
SW-SM	A–1 or A–2	65	45	5	6. 3–20. 0	0. 02–0. 06	7. 4–8. 4	Low.
ML	A–4	100	100	55	0. 63–2. 0	0. 18–0. 22	4. 5–6. 0	Low.
ML	A–4	100	100	60	0. 63–2. 0	0. 16–0. 20	4. 5–5. 5	Low.
SW-SM	A–3	100	95	5	6. 3–20. 0	0. 03–0. 05	5. 6–6. 5	Low.
MC-CL	A–4	95	95	55	0. 63–2. 0	0. 18–0. 22	6. 6–7. 3	Low.
CL	A–6	95	95	70	0. 63–2. 0	0. 16–0. 20	6. 6–7. 3	Moderate.
ML	A–4	80	80	50	0. 63–2. 0	0. 16–0. 20	7. 4–8. 4	Low.
Pt	----------	----------	----------	----------	2. 0–6. 3	>0. 20	(2)	Low.
SM	A–4	95	85	40	2. 0–6. 3	0. 10–0. 14	7. 4–7. 8	Low.
SC	A–6	95	85	45	0. 63–2. 0	0. 14–0. 18	6. 6–7. 8	Moderate.
SW-SM	A–1	65	45	5	6. 3–20. 0	0. 02–0. 06	7. 9–8. 4	Low.
ML-CL	A–4	100	100	85	0. 63–2. 0	0. 18–0. 22	7. 4–7. 8	Low.
CL	A–7	100	85	90	0. 63–2. 0	0. 16–0. 20	6. 6–7. 8	Moderate.
CL	A–4	80	70	55	0. 63–2. 0	0. 16–0. 20	6. 6–7. 8	Moderate.
SW-SM	A–1	65	45	5	6. 3–20. 0	0. 02–0. 06	7. 9–8. 4	Very low.
ML-CL	A–4	100	100	85	0. 63–2. 0	0. 18–0. 22	7. 4–7. 8	Low.
CL	A–7	95	85	70	0. 63–2. 0	0. 16–0. 20	7. 4–7. 8	Moderate.
ML	A–4	100	100	80	0. 2–0. 63	0. 16–0. 20	7. 9–8. 4	Low.
ML	A–4	95	85	70	0. 63–2. 0	0. 18–0. 22	7. 4–7. 8	Low.
CL	A–7	95	85	65	0. 63–2. 0	0. 16–0. 20	7. 4–7. 8	Moderate.
SW-SM	A–1 or A–2	65	45	5	6. 3–20. 0	0. 02–0. 06	7. 9–8. 4	Low.
CL	A–7	90	100	90	0. 06–0. 2	0. 14–0. 18	7. 9–8. 4	High.
ML	A–4	100	100	95	0. 63–2. 0	0. 20–0. 24	6. 6–7. 3	Low.
CL	A–6	95	95	90	0. 63–2. 0	0. 16–0. 20	6. 1–6. 5	Moderate.
ML	A–4	80	75	60	0. 63–2. 0	0. 16–0. 20	7. 9–8. 4	Low.
ML-CL	A–4	100	100	95	0. 63–2. 0	0. 18–0. 22	7. 4–7. 8	Low.
ML-CL	A–4	100	100	95	0. 63–2. 0	0. 18–0. 22	7. 4–7. 8	Low.
ML	A–4	100	100	50	0. 2–0. 63	0. 14–0. 18	7. 9–8. 4	Low.
ML	A–4	100	100	80	0. 2–0. 63	0. 14–0. 18	7. 9–8. 4	Low.
ML-CL	A–4	100	100	95	0. 63–2. 0	0. 18–0. 22	5. 6–7. 3	Low.
CH	A–7	100	100	90	0. 2–0. 63	0. 12–0. 16	5. 6–7. 8	High.
CH	A–7	100	100	75	0. 06–0. 2	0. 12–0. 16	7. 4–8. 4	High.
MH	A–7	100	100	95	0. 2–0. 63	0. 20–0. 24	5. 6–7. 3	Moderate.
MH-CH	A–7	100	100	90	0. 2–0. 63	0. 12–0. 16	5. 6–7. 8	High.
CH	A–7	90	100	75	0. 06–0. 2	0. 12–0. 16	7. 4–8. 4	High.
MH	A–7	100	100	95	0. 2–0. 63	0. 18–0. 22	5. 6–7. 3	Moderate.
CH	A–7	100	100	90	0. 2–0. 63	0. 12–0. 16	5. 6–7. 8	High.
CH	A–7	90	100	75	0. 2–0. 63	0. 12–0. 16	7. 4–8. 4	High.
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TABLE 5.—*Estimated*

Soil series and map symbols	Depth to—		Depth from surface	Classification
	Bedrock	Seasonal high water table		Dominant USDA texture
	Feet	*Feet*	*Inches*	
Kibbie: KuA	5	1–3	0–14	Silt loam
			14–32	Silty clay loam
			32–60	Silt and fine sand
Knowles: KwA, KwB, KwC2, KwE2	2–4	5	0–11	Silt loam
			11–36	Silty clay loam and clay loam
			36–60	Limestone
Lamartine: LmA, LmB	5	1–3	0–12	Silt loam
			12–33	Silty clay loam and clay loam
			33–60	Loam
LeRoy: LrB2, LrC2, LrD, LrD2, LrE, LtC3, LtD3	5	5	0–8	Silt loam
			8–23	Silty clay loam
			23–60	Channery loam
Lomira: LvA, LvB, LvB2, LvC, LvC2, LvC3, LvD, LvD2, LvD3, LwA, LwB, LwB2, LwC2. (For properties of Knowles component of LwA, LwB, LwB2, and LwC2, see Knowles series.)	5	5	0–9	Silt loam
			9–38	Silty clay loam and clay loam
			38–60	Loam
Manawa: [3]				
MaA, MaB	5	1–3	0–9	Silt loam
			9–28	Silty clay
			28–60	Silty clay
McA, McB	5	1–3	0–9	Silty clay loam
			9–20	Silty clay
			20–60	Silty clay
Markesan: MdB, MdB2, MdC2, MdC3, MdD2, MdD3	5	5	0–15	Silt loam
			15–22	Silty clay loam and clay loam
			22–60	Channery loam till
Martinton: MmA, MmB	5	1–3	0–9	Silt loam
			9–27	Silty clay loam
			27–60	Silty clay loam
Mayville: MoA, MoB	5	3–5	0–10	Silt loam
			10–32	Silty clay loam, silt loam, and loam
			32–60	Loam
Mendota: MsA, MsB, MsB2, MsC2	5	5	0–16	Silt loam
			16–33	Silty clay loam and clay loam
			33–60	Loam
Milton: MzaA, MzaB2, MzaD2	2–4	3	0–12	Silt loam
			12–20	Silty clay
			20–36	Clay loam
			36–60	Dolomite
Morley: MzdB, MzdB2, MzdC2, MzdD2, MzeC3, MzeD3.	5	3	0–9	Silt loam
			9–33	Silty clay loam
			33–60	Silty clay loam
Ogden: Od	5	0–1	0–25	Muck and peat
			25–60	Silty clay
Oshkosh: [3]				
OhA, OhB	5	3–5	0–12	Silt loam
			12–25	Clay
			25–60	Clay
OkA, OkB	5	3–5	0–10	Silty clay loam
			10–25	Clay
			25–60	Clay

See footnotes at end of table.

engineering properties—Continued

Classification—Continued		Percentage passing sieve [1]			Permeability	Available water supplying capacity	Reaction	Shrink-swell potential
Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				
					Inches per hour	*Inches per inch of soil*	*pH*	
ML	A–4	100	100	80	0. 63–2. 0	0. 18–0. 22	7. 4–7. 8	Low.
ML–CL	A–6	100	100	80	0. 63–2. 0	0. 16–0. 20	6. 6–7. 3	Moderate.
ML	A–4	100	100	80	0. 63–2. 0	0. 16–0. 20	7. 9–8. 4	Low.
ML	A–4	100	100	100	0. 63–2. 0	0. 18–0. 22	5. 6–7. 3	Low.
CL	A–6	100	100	65	0. 63–2. 0	0. 16–0. 20	4. 5–6. 5	Moderate.
							7. 4–8. 4	
ML–CL	A–4	100	100	100	0. 63–2. 0	0. 18–0. 22	5. 6–6. 5	Low.
CL	A–6	100	95	90	0. 2–0. 63	0. 16–0. 20	5. 6–7. 3	Moderate.
ML	A–4	75	65	60	0. 2–0. 63	0. 16–0. 20	7. 4–8. 4	Low.
ML–CL	A–4	100	100	100	0. 63–2. 0	0. 18–0. 22	6. 6–7. 8	Low.
CL	A–6	100	95	90	0. 63–2. 0	0. 16–0. 20	6. 1–7. 3	Moderate.
ML	A–4	80	75	60	0. 63–2. 0	0. 12–0. 16	7. 9–8. 4	Low.
ML–CL	A–4	100	100	95	0. 63–2. 0	0. 18–0. 22	6. 6–7. 8	Low.
CL	A–6	100	95	90	0. 63–2. 0	0. 16–0. 20	6. 1–7. 3	Moderate.
ML	A–4	80	75	60	0. 63–2. 0	0. 16–0. 20	7. 9–8. 4	Low.
ML–CL	A–6	100	100	90	0. 63–2. 0	0. 18–0. 22	6. 6–7. 3	Moderate.
CH	A–7	100	100	90	0. 2–0. 63	0. 14–0. 18	6. 1–7. 8	High.
CH or CL	A–7 or A–6	100	95	90	0. 06–0. 2	0. 14–0. 18	7. 9–8. 4	High.
MH–CH	A–7	100	100	100	0. 63–2. 0	0. 20–0. 24	6. 6–7. 3	High.
CH	A–7	100	100	90	0. 2–0. 63	0. 14–0. 18	6. 1–7. 8	High.
CH or CL	A–7 or A–6	100	95	90	0. 06–0. 2	0. 14–0. 18	7. 9–8. 4	High.
ML–CL	A–6	100	100	100	2. 0–6. 3	0. 18–0. 22	6. 1–7. 3	Low.
CL	A–7	100	85	75	0. 63–2. 0	0. 16–0. 20	6. 6–7. 3	Moderate.
ML	A–4	80	75	60	0. 63–2. 0	0. 12–0. 16	7. 4–8. 4	Low.
ML–CL	A–4	100	100	95	0. 63–2. 0	0. 18–0. 22	6. 6–7. 3	Low.
CH	A–7	100	100	95	0. 2–0. 63	0. 14–0. 18	6. 6–7. 3	High.
CL	A–6	100	100	95	0. 2–0. 63	0. 14–0. 18	7. 4–8. 4	Moderate.
ML–CL	A–4	100	100	95	0. 63–2. 0	0. 18–0. 22	7. 4–7. 8	Low.
CL	A–6	95	90	90	0. 63–2. 0	0. 16–0. 20	6. 6–7. 8	Moderate.
ML	A–4	80	70	65	0. 63–2. 0	0. 16–0. 20	7. 9–8. 4	Low.
ML–CL	A–6	100	100	100	2. 0–6. 3	0. 18–0. 22	5. 6–6. 5	Low.
CL	A–6	100	95	95	0. 63–2. 0	0. 16–0. 20	5. 6–6. 5	Moderate.
ML	A–4	80	75	60	0. 63–2. 0	0. 16–0. 20	7. 4–8. 4	Low.
CL–ML	A–4	100	100	85	0. 63–2. 0	0. 18–0. 22	5. 6–7. 3	Low.
CH	A–7	100	100	95	0. 2–0. 63	0. 14–0. 18	5. 6–7. 3	High.
CL	A–6	100	100	90	0. 2–0. 63	0. 16–0. 20	7. 4–8. 4	Moderate.
							7. 4–8. 4	
ML–CL	A–4	100	100	85	0. 63–2. 0	0. 18–0. 22	5. 6–7. 3	Moderate.
CH	A–7	100	100	95	0. 2–0. 63	0. 14–0. 18	5. 6–7. 3	High.
CL	A–6 or A–4	100	100	90	0. 2–0. 63	0. 16–0. 20	7. 4–8. 4	Moderate.
Pt					2. 0–6. 3	0. 2–0. 5	[2]	Low.
CH	A–7	100	100	95	0. 06–0. 2	0. 14–0. 18	[2]	High.
ML–CL	A–6	100	100	95	0. 63–2. 0	0. 18–0. 22	5. 6–6. 5	Moderate.
CH	A–7	100	100	100	0. 2–0. 63	0. 12–0. 16	5. 6–7. 3	High.
CH	A–7	100	100	100	0. 06–0. 2	0. 12–0. 16	7. 4–8. 4	High.
MH–CH	A–7	100	100	100	0. 63–2. 0	0. 20–0. 24	5. 6–7. 3	Moderate.
CH	A–7	100	100	100	0. 2–0. 63	0. 12–0. 16	5. 6–7. 3	High.
CH	A–7	100	100	100	0. 06–0. 2	0. 12–0. 16	7. 4–8. 4	High.

TABLE 5.—*Estimated*

Soil series and map symbols	Depth to—		Depth from surface	Classification
	Bedrock	Seasonal high water table		Dominant USDA texture
	Feet	*Feet*	*Inches*	
Palms: Pa, Pc	5	0–1	0–35	Muck and peat
			35–60	Silt loam
Peebles:[3] PfA, PfB	5	3–5	0–11	Silt loam
			11–25	Clay
			25–60	Clay, silty clay
Pella:				
PhA	5	0–1	0–12	Silt loam
			12–36	Silty clay loam
			36–60	Silt loam and silty clay loam
PnA	5	0–1	0–12	Silty clay loam
			12–30	Silty clay loam
			30–60	Silt loam
Plano: PsA, PsB, PsB2	5	5	0–13	Silt loam
			13–46	Silty clay loam and silt loam
			46–60	Loam
Plano, sandy variant: PuB	5	5	0–16	Fine sandy loam
			16–38	Fine sandy loam and sandy clay loam
			38–60	Silt loam
Poygan:[3] Py	5	0–1	0–7	Silty clay loam
			7–27	Clay
			27–60	Silty clay and clay loam
Rimer: ReB	5	1–3	0–10	Loam
			10–16	Fine sandy loam
			16–22	Fine sand
			22–60	Silty clay
Rodman:				
RoD2, RoF2	5	5	0–6	Gravelly loam
			6–60	Sand and gravel
RnD2, RnE2	5	5	0–6	Gravelly sand
			6–60	Sand
Rollin: Rw	5	0–1	0–32	Muck and peat
			32–60	Marl
St. Charles: ScA, ScB	5	3–5	0–12	Silt loam
			12–50	Silty clay loam
			50–60	Loam
St. Charles, gravelly substratum: SeA, SeB	5	5	0–12	Silt loam
			12–44	Silty clay loam
			44–60	Sand and gravel
Sebewa:				
SmA, SmB	5	0–1	0–10	Silt loam
			10–27	Silty clay loam
			27–60	Sand and gravel
SnA	5	0–1	0–8	Silt loam
			8–45	Silty clay loam
			45–60	Sand and gravel
Sebewa, loamy subsoil variant: SpA	5	0–1	0–10	Silt loam
			10–27	Clay loam
			27–60	Fine sand and silt

See footnotes at end of table.

engineering properties—Continued

Classification—Continued		Percentage passing sieve [1]			Permeability	Available water supplying capacity	Reaction	Shrink-swell potential
Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				
					Inches per hour	*Inches per inch of soil*	*pH*	
Pt					2. 0–6. 3	0. 2–0. 5	([2])	Low.
ML–CL	A–6 or A–4	90	85	65	0. 63–2. 0	0. 18–0. 22	([2])	Low.
ML–CL	A–6	100	100	95	0. 63–2. 0	0. 18–0. 22	5. 6–6. 5	Moderate.
MH–CH	A–7	100	100	90	0. 2–0. 63	0. 12–0. 16	7. 9–8. 4	High.
CH	A–7	90	100	75	0. 06–0. 2	0. 12–0. 16	7. 9–8. 4	High.
ML–CL	A–4	100	100	100	2. 0–6. 3	0. 20–0. 24	6. 6–7. 3	Low.
CH	A–7	100	100	95	0. 63–2. 0	0. 16–0. 20	6. 6–7. 3	Moderate.
ML–CL	A–7	100	100	95	0. 63–2. 0	0. 18–0. 22	7. 4–8. 4	Low.
MH–CH	A–7	100	100	100	2. 0–6. 3	0. 20–0. 24	6. 6–7. 3	Moderate.
CH	A–7		100	95	0. 63–2. 0	0. 16–0. 20	6. 6–7. 3	Moderate.
ML–CL	A–7		100	95	0. 63–2. 0	0. 18–0. 22	7. 4–8. 4	Low.
ML–CL	A–7	100	100	95	0. 63–2. 0	0. 18–0. 22	5. 6–6. 5	Low.
CL	A–7	100	100	95	0. 63–2. 0	0. 16–0. 20	4. 5–6. 5	Moderate.
ML	A–4	90	70	60	0. 63–2. 0	0. 16–0. 20	7. 4–8. 4	Low.
ML	A–4	100	100	100	0. 63–2. 0	0. 12–0. 16	5. 6–6. 5	Low.
CL	A–6	100	100	100	0. 63–2. 0	0. 14–0. 18	4. 5–6. 5	Moderate.
ML–CL	A–6	100	100	100	0. 63–2. 0	0. 18–0. 22	7. 4–8. 4	Low.
CH	A–7	100	100	100	0. 63–2. 0	0. 20–0. 24	6. 6–7. 3	Moderate.
CH	A–7	100	100	90	0. 2–0. 63	0. 12–0. 16	6. 6–7. 3	High.
CL or CH	A–7	100	100	90	0. 06–0. 2	0. 14–0. 18	7. 4–8. 4	High.
ML	A–4	95	90	60	0. 63–2. 0	0. 18–0. 22	7. 4–7. 8	Low.
SM	A–4	100	100	40	2. 0–6. 3	0. 14–0. 18	7. 4–7. 8	Low.
SM–SP	A–3	100	60	5	6. 3–20. 0	0. 06–0. 08	7. 9–8. 4	Very low.
CL	A–7	90	100	85	0. 2–0. 63	0. 14–0. 18	7. 9–8. 4	High.
SP–SM	A–2	70	50	10	6. 3–20. 0	0. 12–0. 16	7. 9–8. 4	Low.
SW–SM	A–1	65	45	5	>20. 0	0. 02–0. 06	7. 9–8. 4	Very low.
SP–SM	A–3 or A–2	100	60	5	6. 3–20. 0	0. 02–0. 06	7. 4–8. 4	Very low.
SP	A–3	100	70	3	6. 3–20. 0	0. 02–0. 06	7. 9–8. 4	Very low.
Pt					2. 0–6. 3	0. 2–0. 5	6. 6–7. 3	Low.
MH	A–5	100	100	100	0. 06–0. 2	0. 16–0. 20	7. 4–8. 4	Low.
ML–CL	A–4	100	100	95	0. 63–2. 0	0. 18–0. 22	5. 6–7. 3	Low.
CL	A–6	100	100	95	0. 63–2. 0	0. 20–0. 24	4. 5–6. 5	Moderate.
ML	A–4	85	80	60	0. 63–2. 0	0. 16–0. 20	7. 4–8. 4	Low.
ML–CL	A–4	100	100	95	0. 63–2. 0	0. 18–0. 22	5. 6–6. 5	Low.
CL	A–7	100	100	95	0. 63–2. 0	0. 20–0. 24	5. 6–6. 5	Moderate.
SW–SM	A–1	65	45	5	6. 3–20. 0	0. 02–0. 06	7. 4–8. 4	Low.
ML–CL	A–4	100	100	85	0. 63–2. 0	0. 18–0. 22	7. 4–7. 8	Low.
CL	A–6	95	85	70	0. 63–2. 0	0. 16–0. 20	6. 6–7. 8	Moderate.
SP	A–1	65	55	5	>20. 0	0. 02–0. 06	7. 4–7. 8	Low.
ML–CL	A–6	100	100	95	0. 63–2. 0	0. 18–0. 22	5. 6–7. 3	Low.
CL	A–6	100	100	95	0. 63–2. 0	0. 16–0. 20	5. 6–7. 3	Moderate.
SP	A–1	65	55	5	6. 3–20. 0	0. 02–0. 06	7. 4–8. 4	Low.
ML–CL	A–4	100	100	85	0. 63–2. 0	0. 18–0. 22	7. 4–7. 8	Low.
CL	A–7	95	85	70	0. 63–2. 0	0. 16–0. 20	6. 6–7. 8	Moderate.
ML	A–4	100	100	80	0. 63–2. 0	0. 12–0. 16	7. 9–8. 4	Low.

TABLE 5.—*Estimated*

Soil series and map symbols	Depth to—		Depth from surface	Classification
	Bedrock	Seasonal high water table		Dominant USDA texture
	Feet	*Feet*	*Inches*	
Sisson: SuB2	5	5	0–8	Silt loam
			8–24	Silty clay loam and loam
			24–60	Silt and sand
Sogn: SwB	0–1	5	0–10	Silt loam
			10–60	Dolomite
Theresa:[3] ThA, ThB, ThB2, ThC, ThC2, ThD, ThD2, TrC3, TrD3, TsB2, TsC2, TsD2, TsE2. (For properties of Casco component of TsB2, TsC2, TsD2, and TsE2, see Casco series.)	5	5	0–10	Silt loam
			10–32	Silty clay loam and clay loam
			32–60	Light loam
Virgil: VgA, VgB	5	1–3	0–13	Silt loam
			13–43	Silty clay loam and silt loam
			43–60	Loam
Virgil, gravelly substratum: VsA, VsB	5	1–3	0–12	Silt loam
			12–46	Silty clay loam
			46–60	Sand and gravel
Wallkill: Wa	5	0–1	0–22	Silt loam
			22–60	Mucky peat
Warsaw: WhB	5	5	0–17	Silt loam
			17–31	Silty clay loam
			31–60	Sand and gravel
Washtenaw: WsA, WsB	5	0–3	0–22	Silt loam
			22–42	Silty clay loam
			42–60	Silt loam
Wauseon:				
Wt	5	0–1	0–7	Loam
			7–26	Loamy fine sand
			26–60	Silty clay
Wu	5	0–1	0–11	Silt loam
			11–26	Loamy fine sand
			26–60	Silty clay

[1] Percentage passing various sieve sizes is ±5 percent of the value given.
[2] Variable.

engineering properties—Continued

Classification—Continued		Percentage passing sieve [1]			Permeability	Available water supplying capacity	Reaction	Shrink-swell potential
Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				
					Inches per hour	*Inches per inch of soil*	*pH*	
ML	A-4	100	100	80	0. 63–2. 0	0. 18–0. 22	5. 6–7. 3	Low.
ML-CL	A-6	100	100	85	0. 63–2. 0	0. 16–0. 20	5. 6–7. 3	Moderate.
ML	A-4	100	100	80	0. 63–2. 0	0. 12–0. 16	7. 4–8. 4	Low.
ML-CL	A-6	100	95	95	0. 63–2. 0	0. 18–0. 22	6. 6–7. 3 7. 4–8. 4	Low.
ML-CL	A-4	100	100	95	0. 63–2. 0	0. 18–0. 22	6. 6–7. 3	Low.
CL	A-6	100	100	80	0. 63–2. 0	0. 16–0. 20	5. 6–7. 3	Moderate.
SC	A-4	85	80	45	0. 63–2. 0	0. 12–0. 16	7. 4–8. 4	Low.
ML-CL	A-4	100	100	95	0. 63–2. 0	0. 18–0. 22	5. 6–7. 3	Low.
CL	A-6	100	100	100	0. 63–2. 0	0. 16–0. 20	5. 6–7. 3	Moderate.
ML	A-4	80	70	60	0. 63–2. 0	0. 16–0. 20	7. 4–8. 4	Low.
ML-CL	A-4	100	100	95	0. 63–2. 0	0. 18–0. 22	6. 6–7. 3	Low.
CL	A-6	100	100	90	0. 63–2. 0	0. 16–0. 20	6. 6–7. 8	Moderate.
SW-SM	A-1 or A-2	65	55	5	>20. 0	0. 02–0. 06	7. 4–7. 8	Low.
ML	A-4	100	100	95	0. 63–2. 0	0. 18–0. 22	7. 4–7. 8	Low.
Pt					2. 0–6. 3	0. 2–0. 5	6. 6–7. 3	Low.
ML	A-7	100	100	95	0. 63–2. 0	0. 18–0. 22	6. 6–7. 8	Low.
CL	A-7	95	95	60	0. 63–2. 0	0. 16–0. 20	6. 1–6. 5	Moderate.
SW-SM	A-1	65	45	5	6. 3–20. 0	0. 02–0. 06	7. 4–7. 8	Low.
ML	A-4	100	100	95	0. 63–2. 0	0. 18–0. 22	5. 6–6. 5	Low.
CL	A-7	100	100	95	0. 2–0. 63	0. 16–0. 20	5. 6–6. 5	Moderate.
ML	A-4	90	80	70	0. 2–0. 63	0. 18–0. 22	7. 4–8. 4	Low.
ML	A-4	100	100	60	0. 63–2. 0	0. 18–0. 22	7. 9–8. 4	Low.
SP-SM	A-3	95	90	5	6. 3–20. 0	0. 06–0. 08	7. 9–8. 4	Low.
CL	A-7	100	90	85	0. 06–0. 2	0. 14–0. 18	7. 9–8. 4	High.
ML	A-4	100	90	85	0. 63–2. 0	0. 18–0. 22	7. 9–8. 4	Low.
SP-SM	A-3	95	90	5	6. 3–20. 0	0. 06–0. 10	7. 9–8. 4	Low.
CL	A-7	90	100	85	0. 06–0. 2	0. 14–0. 18	7. 9–8. 4	High.

[1] Physical and chemical properties are based on tests performed by the State Highway Commission of Wisconsin, Soil Conservation Service Laboratories, or by the Bureau of Public Roads.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability as a source of—		Soil features affecting—
	Topsoil	Sand and gravel	Highway location [1]
Adrian: Ak	Poor: erodible; oxidizes rapidly; high water table.	Unsuitable: high water table.	Unstable organic soils; high water table.
Alluvial land: Am	Fair to good: gravelly in places.	Unsuitable: gravel not extensive.	Low stability and low bearing capacity when wet.
An	Fair: gravelly in places.	Unsuitable	Low stability and bearing capacity.
Ashkum: AtA	Surface layer—fair: thick; dark colored. Subsoil—unsuitable: clayey; high water table.	Unsuitable	Subsoil and substratum—moderate to high shrink-swell potential; low bearing capacity; high elasticity.
Beecher: BcA, BcB	Surface layer—good: dark colored. Subsoil—unsuitable: clayey.	Unsuitable	Subsoil and substratum—moderate to high shrink-swell potential; low bearing capacity.
Beecher, shaly subsoil variant: BeB	Surface layer—good: dark colored. Subsoil—unsuitable: clayey.	Unsuitable	Subsoil—high shrink-swell potential; low bearing capacity. Substratum—shale residuum and shale bedrock.
Brookston: BsA, BtA, BuA	Surface layer—good: thick; dark colored. Subsoil—poor: clayey in places; high water table.	Unsuitable	Subsoil—moderate shrink-swell potential; low bearing capacity; elastic. Substratum—low shrink-swell potential; fair stability.
Carbondale: Ca	Poor: erodible; oxidizes rapidly; high water table.	Unsuitable	High water table; unstable organic material; low bearing capacity.
Casco: CcB, CcC, CeB, CeC2, CeD2, CfB3, CfC3, CfD3, CmB, CmC2, CmD2, CnC3, CnD3, CpC2, CpE, CpE3, CpF. (For properties of Hochheim component of CmB, CmC2, CmD2, CnC3, and CnD3, see Hochheim series. For properties of Rodman component of CpC2, CpE, CpE3, and CpF, see Rodman series.)	Surface layer—good: thin. Subsoil—poor: clay loam and sandy clay loam, thin over gravel.	Good: poorly graded sand and gravel; stratified.	Subsoil—moderate shrink-swell potential; elastic. Substratum—highly stable.
Casco, clayey subsoil variant: ChB	Surface layer—good: thin. Subsoil—poor: clay loam and silty clay.	Fair: poorly graded sand and gravel. Lower part of substratum unsuitable.	Subsoil—moderate shrink-swell potential; elasticity. Upper part of substratum—highly stable. Lower part of substratum—high volume change; low bearing capacity.
Casco, loamy subsoil variant: CgB	Surface layer—good: thin. Subsoil—poor: clay loam; thin.	Fair: poorly graded sand and gravel; stratified. Lower part of substratum—unsuitable.	Subsoil—moderate shrink-swell potential; low bearing capacity. Upper part of substratum—highly stable. Lower part of substratum—relatively unstable.
DePere: DcA	Surface layer—good. Substratum—fair to good: clayey; thick.	Unsuitable	Subsoil and substratum—high plasticity; high shrink-swell potential.

See footnote at end of table.

interpretations for specified uses

Soil features affecting—Continued	Limitations for sewage disposal systems	Corrosion potential of soil for—	
Foundations for low buildings [1]		Uncoated steel	Concrete
Unstable organic soils; high water table	Very severe: high water table	High in organic material, moderate in sand.	High where pH is less than 5.5, low where pH is above 5.5.
Liquefies easily; subject to frost heaving; fair shear strength; moderate compressibility.	Severe: subject to flooding; filter fields do not function when soil is flooded.	Low	Low.
Liquefies easily; subject to frost heaving; fair shear strength; moderate compressibility.	Very severe: high water table; subject to flooding.	Low	Low.
Moderate to high shrink-swell potential; fair shear strength, high compressibility; low bearing capacity; high water table.	Very severe: high water table; moderately slow permeability.	High	Low.
Moderate to high shrink-swell potential; fair shear strength; moderate to high compressibility.	Severe: seasonal high water table; moderately slow permeability.	High	Low.
Shale residuum has high shrink-swell potential, moderate compressibility.	Severe: seasonal high water table; moderately slow permeability.	Moderate	Low.
High water table; high bearing capacity; good shear strength; low compressibility.	Very severe: high water table	High	Low.
High water table; low stability	Very severe: high water table	High	High where pH is below 5.5.
High bearing capacity; good shear strength; negligible compressibility; low shrink-swell potential.	Moderate: possible contamination of ground water.	Low	Low.
Lower part of substratum—high shrink-swell potential; fair shear strength; moderate compressibility.	Moderate: clayey; moderately slowly permeable in lower part of substratum.	Moderate	Low.
Liquefies easily; subject to frost heaving; low bearing capacity.	Slight: moderate permeability	Low in upper part of substratum, moderate in lower part of substratum.	Low in substratum.
Liquefies easily; high water table; fair shear strength; moderate compressibility.	Very severe: high water table; subject to flooding.	Moderate	Low.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability as a source of—		Soil features affecting—
	Topsoil	Sand and gravel	Highway location [1]
Dodge: DdA, DdB, DdB2	Surface layer—good. Subsoil—poor: silty clay loam.	Unsuitable	Subsoil—moderate shrink-swell potential; low bearing capacity. Substratum—good stability; low shrink-swell potential.
Elburn: EbA	Surface layer—good: thick; dark colored. Subsoil—fair to poor: thick.	Unsuitable	Subsoil—moderate shrink-swell potential; low bearing capacity. Substratum—high stability; low shrink-swell potential.
Elliott: EsA, EsB	Surface layer—good: thick; dark colored. Subsoil—poor: clayey.	Unsuitable	Subsoil and substratum—moderate to high shrink-swell potential; low bearing capacity.
Fox: FmB, FoB, FoB2, FoC2, FsA, FsB, FsB2, FsC2.	Surface layer—good. Subsoil—fair: lower part of subsoil gravelly.	Good: poorly graded sand and gravel.	Subsoil—moderate shrink-swell potential; low bearing capacity; elastic. Substratum—high stability; low shrink-swell potential.
Hixton: HhE2	Surface layer—good. Subsoil—fair.	Good: poorly graded sand and fragments of sandstone bedrock.	Subsoil—low shrink-swell potential. Substratum—high stability.
Hochheim: HmB, HmB2, HmC, HmC2, HmD, HmD2, HmE, HoB3, HoC3, HoD3, HoE3,	Surface layer—good: thin. Subsoil—fair: clay loam.	Unsuitable	Subsoil—moderate shrink-swell potential; low bearing capacity. Substratum—low shrink-swell potential; medium stability.
Houghton: Hu	Poor: erodible; oxidizes rapidly; high water table.	Unsuitable	Very low stability; very low bearing capacity; high water table.
Ionia: InA, IoA, IoB	Surface layer—fair. Subsoil—fair: sandy clay loam to silty clay loam.	Good: poorly graded sand and gravel.	Subsoil—moderate bearing capacity. Substratum—high stability.
Ionia, loamy subsoil variant: IrA	Surface layer—good. Subsoil—fair to poor: clay loam.	Fair: poorly graded sand and gravel. Lower part of substratum contains fine sand and silt.	Subsoil—moderate shrink-swell potential; low bearing capacity. Upper part of substratum—high stability. Lower part of substratum—moderate shrink-swell potential; low stability.
Ionia, clayey subsoil variant: IsB	Surface layer—good. Subsoil—fair to poor: clay loam to silty clay.	Fair: poorly graded sand and gravel. Lower part of substratum unsuitable.	Subsoil—moderate shrink-swell potential; low bearing capacity. Upper part of substratum—high stability. Lower part of substratum—high shrink-swell potential; low bearing capacity.
Juneau: JuA, JuB	Surface layer—good: thick. Subsoil—fair: clayey in places.	Unsuitable	Subsoil—low shrink-swell potential; low bearing capacity. Substratum—low shrink-swell potential; medium stability.
Keowns: Km	Surface layer—good: dark colored; thick. Subsoil—fair: high water table.	Poor: contains layers of fine sand and silt.	Subsoil—relatively unstable. Substratum—low shrink-swell potential; low stability.
Kewaunee: KnA, KnB, KnB2, KnC2, KoA, KoB, KoB2, KoC2, KoD2, KoE2, KsB3, KsC3, KsD3.	Surface layer—good: thin. Subsoil—poor: clayey; plastic.	Unsuitable	Subsoil and substratum—high shrink-swell potential; low bearing capacity.

See footnote at end of table.

interpretations for specified uses—Continued

Soil features affecting—Continued	Limitations for sewage disposal systems	Corrosion potential of soil for—	
Foundations for low buildings [1]		Uncoated steel	Concrete
Low compressibility; fair shear strength; moderately high bearing capacity.	Slight; moderate permeability	Low	Low.
High bearing capacity; good shear strength; low compressibility.	Severe: seasonal high water table	Moderate	Low.
Moderate shrink-swell potential; fair shear strength; moderate compressibility.	Severe: seasonal high water table	High	Low.
Low compressibility; good shear strength; low shrink-swell potential.	Slight: moderately permeable; well drained.	Low	Low.
Very low compressibility; low shrink-swell potential; good shear strength.	Moderate: moderately permeable subsoil; rapidly permeable substratum; danger of contamination of ground water.	Low	Low.
Low compressibility; fair shear strength	Slight: moderately permeable	Moderate	Low.
Very low stability: very low bearing capacity; high water table.	Very severe: high water table	High	High where pH is less than 5.5.
Low compressibility; low shrink-swell potential; good shear strength.	Severe: seasonal high water table	Moderate	Low.
Upper part of substratum—low compressibility; low shrink-swell potential. Lower part of substratum—moderate shrink-swell potential; low compressibility.	Severe: seasonal high water table	Moderate	Low.
Upper part of substratum—low compressibility; low shrink-swell potential; good shear strength. Lower part of substratum—high shrink-swell potential; fair shear strength; moderate compressibility.	Severe: seasonal high water table	Moderate	Low.
Low compressibility; liquefies easily; fair shear strength.	Severe: seasonal high water table	Low	Low.
High water table; low shrink-swell potential; low compressibility.	Very severe: high water table	High	Low.
High shrink-swell potential; fair shear strength; moderate compressibility.	Severe: moderately slowly permeable subsoil and slowly permeable substratum.	Moderate	Low.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability as a source of—		Soil features affecting—
	Topsoil	Sand and gravel	Highway location [1]
Kewaunee, moderately shallow variant: KtB.	Surface layer—good: thin. Subsoil—poor: clayey.	Unsuitable	Subsoil and upper part of substratum—high shrink-swell potential; low bearing capacity. Lower part of substratum—limestone bedrock.
Kibbie: KuA	Surface layer—good. Subsoil—fair.	Poor: contains fine sand and silt.	Subsoil—moderate shrink-swell potential; low bearing capacity. Substratum—relatively unstable.
Knowles: KwA KwB, KwC2, KwE2	Surface layer—good. Subsoil—fair: thin over bedrock.	Unsuitable	Subsoil—moderate shrink-swell potential; low bearing capacity. Substratum—limestone bedrock.
Lamartine: LmA, LmB	Surface layer—good. Subsoil—poor: clay loam and silty clay loam.	Unsuitable	Subsoil—moderate shrink-swell potential; low bearing capacity. Substratum—low shrink-swell potential; medium stability.
LeRoy: LrB2, LrC2, LrD, LrD2, LrE, LtC3, LtD3.	Surface layer—good. Subsoil—fair to poor: silty clay loam.	Unsuitable	Subsoil—moderate shrink-swell potential; moderate bearing capacity.
Lomira: LvA, LvB, LvB2, LvC, LvC2, LvC3, LvD, LvD2, LvD3, LwA, LwB, LwB2, LwC2. (For properties of Knowles component of LwA, LwB, LwB2, and LwC2, see Knowles series.)	Surface layer—good. Subsoil—poor to unsuitable: silty clay loam and clay loam.	Unsuitable	Subsoil—moderate shrink-swell potential; low bearing capacity. Substratum—high stability; low shrink-swell potential.
Manawa: MaA, MaB, McA, McB	Surface layer—good. Subsoil—poor: clayey; plastic.	Unsuitable	Subsoil and substratum—high shrink-swell potential; low bearing capacity.
Markesan: MdB, MdB2, MdC2, MdC3, MdD2, MdD3.	Surface layer—good: dark colored. Subsoil—fair: clayey.	Unsuitable	Subsoil—moderate shrink-swell potential; low bearing capacity. Substratum—high stability; low shrink-swell potential.
Marsh: Mf	Unsuitable	Unsuitable	Extremely wet
Martinton: MmA, MmB	Surface layer—good. Subsoil—poor: silty clay loam; low stability.	Unsuitable	Subsoil—high plasticity; high shrink-swell potential; elastic. Substratum—moderate shrink-swell potential; low bearing capacity.
Mayville: MoA, MoB	Surface layer—good. Subsoil—poor to unsuitable: silty clay loam.	Unsuitable	Subsoil—moderate shrink-swell potential; low bearing capacity. Substratum—low shrink-swell potential; medium stability.
Mendota: MsA, MsB, MsB2, MsC2	Surface layer—good: dark colored; thick. Subsoil—fair: silty clay loam, clay loam.	Unsuitable	Subsoil—moderate shrink-swell potential; low bearing capacity. Substratum—high stability.
Milton: MzaA, MzaB2, MzaD2	Surface layer—good. Subsoil—poor: clayey.	Unsuitable	Subsoil and substratum—high shrink-swell potential; low bearing capacity. Lower part of substratum is limestone bedrock.
Morley: MzdB, MzdB2, MzdC2, MzdD2, MzeC3, MzeD3.	Surface layer—good. Subsoil—poor: silty clay loam.	Unsuitable	Subsoil and substratum—moderate to high shrink-swell potential; low bearing capacity.

See footnote at end of table.

interpretations for specified uses—Continued

Soil features affecting—Continued	Limitations for sewage disposal systems	Corrosion potential of soil for—	
Foundations for low buildings [1]		Uncoated steel	Concrete
High shrink-swell potential; fair shear strength, moderate compressibility. Lower part of substratum—limestone bedrock.	Severe: moderately slowly permeable subsoil and substratum.	Moderate	Low.
Liquefies easily; subject to frost heaving; low bearing capacity.	Severe: seasonal high water table.	High	Low.
Limestone bedrock	Severe: probable contamination of ground water.	Moderate	Low.
Low compressibility; fair shear strength; moderate bearing capacity.	Severe: seasonal high water table	High	Low.
Low compressibility; high bearing capacity; good shear strength.	Slight: moderate permeability	Moderate	Low.
Low compressibility; fair shear strength; moderate bearing capacity.	Slight: moderate permeability	Moderate	Low.
High shrink-swell potential; fair shear strength; moderate compressibility.	Severe: seasonal high water table; slow permeability.	High	Low.
High bearing capacity; good shear strength; low compressibility.	Slight: moderate permeability	Low	Low.
Extremely wet	Very severe: high water table	High	High where pH is below 5.5.
Moderate shrink-swell potential; fair shear strength; moderate compressibility; low bearing capacity.	Very severe: seasonal high water table; moderately slow permeability in subsoil and substratum.	High	Low.
Low compressibility; high bearing capacity; good to fair shear strength.	Moderate: seasonal high water table.	Low to moderate	Low.
High bearing capacity; good shear strength; low compressibility.	Slight: moderate permeability	Moderate	Low.
High shrink-swell potential; fair shear strength; moderate compressibility. Lower part of substratum is limestone bedrock.	Severe: moderately slow permeability; shallow to bedrock.	Moderate	Low.
Moderate shrink-swell potential; fair shear strength; moderate compressibility.	Severe: moderately slow permeability.	Moderate	Low.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability as a source of—		Soil features affecting—
	Topsoil	Sand and gravel	Highway location [1]
Ogden: Od	Poor: erodible: oxidizes rapidly; high water table.	Unsuitable	Low bearing capacity; low stability; high water table.
Old beaches: Oe	Unsuitable	Fair: poorly graded gravel in places.	High stability; low shrink-swell potential.
Oshkosh: OhA, OhB, OkA, OkB	Surface layer—good. Subsoil—unsuitable: clayey.	Unsuitable	Subsoil and substratum—highly plastic; elastic; high shrink-swell potential.
Palms: Pa, Pc	Poor: erodible; oxidizes rapidly; high water table.	Unsuitable	Low bearing capacity; low stability; high water table.
Peebles: PfA, PfB	Surface layer—good: dark colored. Subsoil—unsuitable: clayey.	Unsuitable	Subsoil and substratum—high shrink-swell potential; low bearing capacity.
Pella: PhA, PnA	Surface layer—good: thick, dark colored. Subsoil—poor: silty clay loam, high water table.	Unsuitable	Subsoil and substratum—high water table; high plasticity; moderate shrink-swell potential; elastic.
Plano: PsA, PsB, PsB2	Surface layer—good: dark colored; thick. Subsoil—fair to poor: thick.	Unsuitable	Subsoil—elastic; moderate shrink-swell potential; low bearing capacity. Substratum—high stability; low shrink-swell potential.
Plano, sandy variant: PuB	Surface layer—good: dark colored; thick. Subsoil—fair to poor: thick.	Unsuitable	Subsoil—good bearing capacity. Substratum—moderate shrink-swell potential; low bearing capacity.
Poygan: Py	Surface layer—fair: thin; dark colored. Subsoil—unsuitable: clayey; high water table.	Unsuitable	Subsoil and substratum—high elasticity; high shrink-swell potential.
Rimer: ReB	Surface layer—good. Subsoil—unsuitable: droughty and erodible by wind.	Poor: poorly graded sand. Lower part of substratum unsuitable.	Substratum—low stability; high shrink-swell potential; low bearing capacity; elastic.
Rock land: Rm	Unsuitable	Unsuitable	Extremely rocky
Rodman: RnD2, RnE2, RoD2, RoF2	Surface layer—fair: thin. Subsoil—unsuitable.	Good: poorly graded sand and gravel.	Subsoil—good stability; low shrink-swell potential. Substratum—high stability.
Rollin: Rw	Poor: erodible; oxidizes rapidly; high water table.	Unsuitable	Low bearing capacity; low stability; high water table.
St. Charles: ScA, ScB, SeA, SeB	Surface layer—good: thin. Subsoil—poor: silty clay loam.	Unsuitable	Subsoil—moderate shrink-swell potential; low bearing capacity; Lower part of substratum—low shrink-swell potential; medium stability.
Sebewa: SmA, SmB, SnA	Surface layer—good: dark colored. Subsoil—poor: silty clay loam; high water table.	Good: poorly graded sand and gravel.	Subsoil—low shrink-swell potential; low stability. Substratum—high stability.

See footnote at end of table.

interpretations for specified uses—Continued

Soil features affecting—Continued	Limitations for sewage disposal systems	Corrosion potential of soil for—	
Foundations for low buildings [1]		Uncoated steel	Concrete
High water table; low stability; low bearing capacity.	Very severe: high water table	High	High if acid, low where pH is above 5.5.
High bearing capacity; good shear strength; low compressibility.	Moderate: probable contamination of ground water.	Low	Low.
High shrink-swell potential; high compressibility; poor shear strength.	Severe: slow permeability	Moderate	Low.
Low bearing capacity; low stability; high water table.	Very severe: high water table	High	High if acid, low where pH is above 5.5.
High shrink-swell potential; fair shear strength; moderate compressibility.	Severe: slow permeability	Moderate	Low.
Liquefies easily; high water table; fair shear strength; moderate compressibility.	Very severe: high water table	High	Low.
Good shear strength; low compressibility; good bearing capacity.	Slight: well drained; moderate permeability.	Low	Low.
Moderate shrink-swell potential; fair shear strength; liquefies easily; subject to frost heaving.	Slight: well drained; moderate permeability.	Low	Low.
High shrink-swell potential; poor shear strength; high compressibility.	Very severe: high water table; slow permeability.	High	Low.
High shrink-swell potential; fair shear strength; moderate compressibility.	Severe: seasonal high water table; moderately slow permeability.	High	Low.
Extremely rocky	Very severe: bedrock at or near the surface.	Low: extremely rocky	Low: extremely rocky.
High stability; good shear strength; negligible compressibility; low shrink-swell potential.	Moderate: possible contamination of ground water.	Low	Low.
Low bearing capacity; high water table; low stability.	Very severe: high water table	High	Low.
Low compressibility; fair shear strength; liquefies easily.	Slight: moderate permeability	Low	Low.
High bearing capacity: good shear strength; negligible compressibility; low shrink-swell potential; high water table.	Very severe: high water table	High	Low.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability as a source of—		Soil features affecting—
	Topsoil	Sand and gravel	Highway location [1]
Sebewa, loamy subsoil variant: SpA	Surface layer—good: dark colored. Subsoil—poor: clay loam; high water table.	Fair: poorly graded sand and gravel. Lower part of substratum contains fine sand and silt.	Subsoil—moderate shrink-swell potential; low stability. Upper part of substratum—high stability; lower part of substratum—moderate shrink-swell potential; low stability.
Sisson: SuB2	Surface layer—good. Subsoil—fair: unstable on slopes.	Poor: silt and fine sand.	Subsoil—moderate shrink-swell potential; low bearing capacity. Substratum—relatively low stability.
Sogn: SwB	Surface layer—poor; thin; dark colored; underlain by rock.	Unsuitable	Substratum—limestone bedrock
Theresa: ThA, ThB, ThB2, ThC, ThC2, ThD, ThD2, TrC3, TrD3, TsB2, TsC2, TsD2, TsE2. For properties of Casco component of (TsB2, TsC2, TsD2, and TsE2, see Casco series.)	Surface layer—good. Subsoil—fair: clayey and stony in places.	Unsuitable	Subsoil—moderate shrink-swell potential; low bearing capacity. Substratum—good stability; low shrink-swell potential.
Virgil: VgA, VgB	Surface layer—good. Subsoil—poor: silty clay loam.	Unsuitable	Subsoil—moderate shrink-swell potential; low bearing capacity. Substratum—low shrink-swell potential; medium stability.
Virgil, gravelly substratum: VsA, VsB	Surface layer—good. Subsoil—fair to poor: silty clay loam.	Good: poorly graded sand and gravel.	Subsoil—moderate shrink-swell potential; low bearing capacity. Substratum—high stability; low shrink-swell potential.
Wallkill: Wa	Surface layer—good: thick. Subsoil (organic material)—poor: erodible; oxidizes rapidly; high water table.	Unsuitable	Low bearing capacity; low stability; high water table.
Warsaw: WhB	Surface layer—good: dark colored; thick. Subsoil—fair to poor: clayey and gravelly in places.	Good: poorly graded sand and gravel.	Subsoil—moderate shrink-swell potential; low bearing capacity. Substratum—high stability.
Washtenaw: WsA, WsB	Surface layer—good. Subsoil—poor: thick; high water table.	Unsuitable	Subsoil—elastic: moderate shrink-swell potential; low bearing capacity. Substratum—relatively low stability.
Wauseon: Wt, Wu	Surface layer—good. Subsoil—poor: high water table.	Poor: clayey substratum.	Upper part of subsoil—low stability; low shrink-swell potential. Lower part of subsoil and substratum—moderate shrink-swell potential; low bearing capacity; elastic.

[1] Engineers and others should not apply specific values to the estimates given for bearing capacity of soils.

interpretations for specified uses—Continued

Soil features affecting—Continued	Limitations for sewage disposal systems	Corrosion potential of soil for—	
Foundations for low buildings [1]		Uncoated steel	Concrete
Upper part of substratum—low compressibility; low shrink-swell potential. Lower part of substratum—moderate shrink-swell potential; low compressibility.	Very severe: high water table	High	Low.
Liquefies easily; subject to frost heaving; low bearing capacity.	Slight: moderate permeability	Low	Low.
Limestone bedrock	Severe: very shallow to bedrock; possible contamination of ground water.	Low	Low.
Low compressibility; easy to compact; liquefies easily; fair shear strength.	Slight: moderate permeability	Moderate	Low.
Good to fair shear strength; low compressibility; high bearing capacity; subject to frost heaving; liquefies easily.	Severe: seasonal high water table	High	Low.
Low compressibility; low shrink-swell potential; good shear strength.	Severe: seasonal high water table	Moderate	Low.
Low bearing capacity; low stability; high water table.	Very severe: high water table	High	High if acid, low where pH is above 5.5.
Low compressibility; low shrink-swell potential; good shear strength.	Slight: well drained; moderate permeability.	Low	Low.
Moderate shrink-swell potential; fair shear strength; liquefies easily; subject to frost heaving.	Very severe: high water table	Moderate	Low.
Moderate shrink-swell potential; fair shear strength; moderate compressibility.	Very severe: high water table	Moderate	Low.

TABLE 7.—*Engineering*

Soil and map symbols	Soil features affecting—	
	Farm ponds	
	Reservoir area	Embankments
Adrian: Ak	Pervious; high water table	Pervious; low stability, except in substratum where stability is high; susceptible to piping.
Alluvial land: Am	Pervious; subject to flooding	Pervious; low stability
An	Pervious; subject to flooding	Pervious; low stability
Ashkum: AtA	Semipervious; high water table	Impervious; low stability; high shrink-swell potential.
Beecher: BcA, BcB	Semipervious	Impervious: medium stability; high shrink-swell potential.
Beecher, shaly subsoil variant: BeB	Semipervious; substratum is silty clay loam.	Impervious; medium stability; high shrink-swell potential.
Brookston: BsA, BtA, BuA	Pervious; high water table	Semipervious; subsoil has low stability and moderate shrink-swell potential; substratum has high stability and low shrink-swell potential.
Carbondale: Ca	Pervious; high water table	Pervious; low stability
Casco: CcB, CcC, CeB, CeC2, CeD2, CfB3, CfC3, CfD3, CmB, CmC2, CmD2, CnC3, CnD3, CpC2, CpE, CpE3, CpF. For properties of Hochheim component of CmB, CmC2, CmD2, CnC3, and CnD3, see Hochheim series. For properties of Rodman component of CpC2, CpE, CpE3, and CpF, see Rodman series.	Pervious	Semipervious; subsoil has moderate shrink-swell potential; substratum has low shrink-swell potential and high stability.
Casco, clayey subsoil variant, and Casco, loamy subsoil variant: CgB, ChB.	Pervious in upper part of subsoil; semipervious, clayey and loamy in lower part of subsoil and substratum.	Semipervious; upper part of substratum has high stability and low shrink-swell potential; clayey lower part of substratum has medium stability and moderate to high shrink-swell potential.
DePere: DcA	Semipervious; high water table; subject to flooding	Impervious; medium to low stability; high shrink-swell potential.
Dodge: DdA, DdB, DdB2	Pervious	Semipervious subsoil has medium stability and moderate shrink-swell potential; substratum has high stability and low shrink-swell potential.
Elburn: FhA	Pervious	Semipervious; subsoil has medium stability and moderate shrink-swell potential; substratum has high stability and low shrink-swell potential.
Elliott: EsA, EsB	Semipervious	Impervious; medium stability and moderate shrink-swell potential.
Fox: FmB, FoB, FoB2, FoC2, FsA, FsB, FsB2, FsC2	Pervious	Semipervious; high stability; low shrink-swell potential.

interpretations for farm uses

Soil features affecting—Continued			
Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways
Moderately rapid permeability; less than 24 inches of organic material in places.	Rapid water intake rate; high available water capacity; high water table.	Low stability; highly erodible.	Highly erodible; high water table.
Moderately permeable; subject to flooding.	Moderate water intake rate; high available water capacity.	Subject to flooding	Subject to flooding.
Moderately permeable; subject to flooding.	Moderate water intake rate; high available water capacity.	Subject to flooding	Subject to flooding.
Moderately slow permeability	Moderately slow water intake rate; high available water capacity; high water table.	Low relief; poorly drained	Clayey subsoil; poor tilth.
Moderately slow permeability	Moderate water intake rate; high available water capacity; high water table.	Somewhat poorly drained	Somewhat poorly drained.
Moderately slow permeability	Moderate water intake rate; high available water capacity; high water table.	Somewhat poorly drained	Somewhat poorly drained.
Moderately slow permeability	Moderate water intake rate; high available water capacity; high water table.	High water table; level soil	Poor tilth.
Moderately rapid permeability	Moderately rapid water intake rate; high available water capacity; high water table.	Low stability; highly erodible.	Highly erodible; high water table; 0 to 2 percent slopes.
Present drainage is adequate	Moderate water intake rate; medium available water capacity.	Shallow to gravelly and sandy substratum.	Shallow to sand and gravel.
Present drainage is adequate	Moderate water intake rate; high available water capacity.	Shallow to gravelly and sandy substratum.	Vegetation easily established where slope is less than 12 percent.
Present drainage is adequate	Moderate water intake rate; high available water capacity.	Nearly level soil; clayey subsoil.	Difficult to establish satisfactory seedbed in clayey subsoil.
Present drainage is adequate	Moderate water intake rate; high available water capacity.	No limiting factors	No limiting factors.
Moderate permeability	Moderate water intake rate; high available water capacity; high water table.	No limiting factors	Seasonal high water table.
Moderately slow permeability	Seasonal high water table; moderate water intake rate; high available water capacity.	Seasonal high water table.	Seasonal high water table; clayey subsoil.
Present drainage is adequate	Moderate water intake rate; medium available water capacity.	No limiting factors	Vegetation easily established where slope is less than 12 percent.

TABLE 7.—*Engineering*

Soil and map symbols	Soil features affecting—	
	Farm ponds	
	Reservoir area	Embankments
Hixton: HhE2	Pervious	Semipervious; high stability; low shrink-swell potential; susceptible to piping.
Hochheim: HmB, HmB2, HmC, HmC2, HmD, HmD2, HmE, HoB3, HoC3, HoD3, HoE3.	Pervious	Semipervious; subsoil has medium stability and moderate shrink-swell potential; substratum has high stability and low shrink-swell potential.
Houghton: Hu	Pervious; high water table	Pervious; low stability
Ionia: InA, IoA, IoB	Pervious	Pervious; high stability; low shrink-swell potential.
Ionia, loamy subsoil variant: IrA	Subsoil pervious; substratum is semipervious loam.	Semipervious; lower part of subsoil has high stability and low shrink-swell potential; substratum has low stability and low shrink-swell potential; highly erodible.
Ionia, clayey subsoil variant: IsB	Subsoil pervious; substratum is semipervious clay and silty clay.	Semipervious; lower part of subsoil has high stability and low shrink-swell potential; clayey substratum has medium stability and high shrink-swell potential.
Juneau: JuA, JuB	Pervious	Semipervious; medium stability; low shrink-swell potential.
Keowns: Km	Pervious; high water table	Semipervious; very low stability; low shrink-swell potential; susceptible to piping.
Kewaunee: KnA, KnB, KnB2, KnC2, KoA, KoB, KoB2, KoC2, KoD2, KoE2, KsB3, KsC3, KsD3.	Semipervious	Impervious; medium stability; high shrink-swell potential.
Kewaunee, moderately shallow variant: KtB	Semipervious; bedrock at a depth of 24 to 42 inches.	Impervious; medium stability; high shrink-swell potential; bedrock at a depth of 24 to 42 inches.
Kibbie: KuA	Pervious	Semipervious; subsoil has medium stability and moderate shrink-swell potential; substratum has low stability and low shrink-swell potential; susceptible to piping.
Knowles: KwA, KwB, KwC2, KwE2	Pervious; bedrock at a depth of 20 to 42 inches.	Semipervious; subsoil has medium stability and moderate shrink-swell potential; bedrock at a depth of 20 to 42 inches.
Lamartine: LmA, LmB	Pervious	Semipervious; subsoil has medium stability; substratum has high stability and low shrink-swell potential.
LeRoy: LrB2, LrC2, LrD, LrD2, LrE, LtC3, LtD3	Pervious	Semipervious; subsoil has medium stability and moderate shrink-swell potential; substratum has high stability.
Lomira: LvA, LvB, LvB2, LvC, LvC2, LvC3, LvD, LvD2, LvD3, LwA, LwB, LwB2, LwC2. For properties of the Knowles component of LwA, LwB, LwB2, and LwC2, see the Knowles series.	Pervious	Semipervious; subsoil has medium stability and moderate shrink-swell potential; substratum has high stability and low shrink-swell potential.
Manawa: MaA, MaB, McA, McB	Semipervious	Impervious; medium stability; high shrink-swell potential.

interpretations for farm uses—Continued

Soil features affecting—Continued			
Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways
Present drainage is adequate	Moderate water intake rate; medium available water capacity.	Sandy substratum; highly erodible.	Vegetation easily established except where slope is more than 12 percent.
Present drainage is adequate	Moderate water intake rate; high available water capacity.	Stony in places	Stony in places.
Moderately rapid permeability; high water table.	High water table; moderately rapid water intake rate; very high available water capacity.	Nearly level soil; low stability; highly erodible.	High water table; highly erodible.
Moderate permeability	Seasonal high water table; moderate water intake rate; medium available water capacity.	Seasonal high water table	Seasonal high water table.
Moderately slow permeability	Seasonal high water table; moderate water intake rate; high available water capacity.	Seasonal high water table	Seasonal high water table.
Moderate permeability in solum; slow permeability in substratum.	Seasonal high water table; moderate water intake rate; high available water capacity.	Seasonal high water table	Seasonal high water table.
Moderate permeability	Seasonal high water table; moderate water intake rate; high available water capacity.	All features favorable for diversions; terraces not needed.	No limiting factors.
Moderately slow permeability	High water table; moderate water intake rate; high available water capacity.	Nearly level soil; high water table.	Highly erodible; high water table.
Drainage is generally adequate	Moderately slow water intake rate; high available water capacity.	Clayey subsoil	Clayey subsoil.
Present drainage is adequate	Moderately slow water intake rate; medium available water capacity.	Bedrock at a depth of 24 to 42 inches.	Clayey subsoil; bedrock at a depth of 24 to 42 inches.
Moderate permeability	Seasonal high water table; moderate water intake rate; high available water capacity.	Nearly level soil	Seasonal high water table.
Present drainage is adequate	Moderate water intake rate; medium available water capacity; bedrock at a depth of 20 to 42 inches.	Bedrock at a depth of 20 to 42 inches.	Bedrock at a depth of 20 to 42 inches.
Moderately slow permeability	Seasonal high water table; moderate water intake rate; high available water capacity.	Seasonal high water table	Seasonal high water table.
Present drainage is adequate	Moderate water intake rate; high available water capacity.	No limiting factors	No limiting factors.
Present drainage is adequate	Moderate water intake rate; high available water capacity.	Stony in places	Stony in places; some soils have slopes of more than 12 percent.
Slow permeability	Seasonal high water table; moderate water intake rate; very high available water capacity.	Seasonal high water table	Seasonal high water table.

TABLE 7.—*Engineering*

Soil and map symbols	Soil features affecting—	
	Farm ponds	
	Reservoir area	Embankments
Markesan: MdB, MdB2, MdC2, MdC3, MdD2, MdD3.	Pervious	Semipervious; subsoil has medium stability and moderate shrink-swell potential; substratum has high stability and low shrink-swell potential.
Marsh: Mf	Characteristics variable; extremely wet.	Characteristics variable
Martinton: MmA, MmB	Semipervious	Impervious; medium stability; high shrink-swell potential.
Mayville: MoA, MoB	Pervious	Semipervious; subsoil has medium stability and moderate shrink-swell potential; substratum has high stability and low shrink-swell potential.
Mendota: MsA, MsB, MsB2, MsC2	Pervious	Semipervious; subsoil has medium stability and moderate shrink-swell potential; substratum has high stability and low shrink-swell potential.
Milton: MzaA, MzaB2, MzaD2	Semipervious; bedrock at a depth of 30 to 42 inches.	Impervious; low stability and high shrink-swell potential; bedrock at a depth of 30 to 42 inches.
Morley: MzdB, MzdB2, MzdC2, MzdD2, MzeC3, MzeD3.	Semipervious	Impervious; low stability and high shrink-swell potential.
Ogden: Od	Pervious; high water table; semipervious; silty clay at a depth of 24 to 42 inches.	Pervious; organic material has low stability; silty clay at a depth of 24 to 42 inches.
Old beaches: Oe	Pervious	Pervious; high stability; low shrink-swell potential.
Oshkosh: OhA, OhB, OkA, OkB	Semipervious	Impervious; medium to low stability; high shrink-swell potential.
Palms: Pa, Pc	Pervious; high water table; silt loam at a depth of 24 to 42 inches.	Pervious; organic soil has low stability; silt loam at a depth of 24 to 42 inches.
Peebles: PfA, PfB	Semipervious	Impervious; medium stability; high shrink-swell potential.
Pella: PhA, PnA	Pervious; high water table	Semipervious; medium stability and moderate shrink-swell potential; susceptible to piping.
Plano: PsA, PsB, PsB2	Pervious	Semipervious; medium stability and moderate shrink-swell potential.
Plano, sandy variant: PuB	Pervious	Semipervious; medium stability; moderate shrink-swell potential.
Poygan: Py	Semipervious; high water table	Impervious; low stability; high shrink-swell potential.
Rimer: ReB	Pervious; seasonal high water table; clayey subsoil and substratum.	Subsoil pervious; high stability; low shrink-swell potential; substratum has medium stability.
Rock land: Rm	Extremely stony and rocky	Extremely stony and rocky

interpretations for farm uses—Continued

Soil features affecting—Continued			
Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways
Present drainage is adequate	Moderate water intake rate; high available water capacity.	Stony in places	Stony in places; some soils have slopes of more than 12 percent.
High water table; few drainage outlets; very costly to improve drainage.	Extremely wet; rapid water intake rate; very high available water capacity; very costly to improve drainage.	Extremely wet, depressed areas.	Extremely wet.
Moderately slow permeability; subsurface drainage is beneficial.	Seasonal high water table; moderately slow water intake rate; high available water capacity.	Seasonal high water table	Seasonal high water table.
Present drainage is adequate	Moderate water intake rate; high available water capacity.	No limiting factors	No limiting factors.
Present drainage is adequate	Moderate water intake rate; high available water capacity.	No limiting factors	No limiting factors.
Present drainage is adequate	Moderate water intake rate; medium available water capacity; bedrock at a depth of 30 to 42 inches.	Bedrock at a depth of 30 to 42 inches.	Bedrock at a depth of 20 to 42 inches.
Present drainage is adequate	Moderate water intake rate; high available water capacity.	Silty clay loam subsoil	Silty clay loam subsoil.
Moderately rapid permeability in organic material; slow permeability in silty clay at a depth of 24 to 42 inches.	High water table; rapid water intake rate; very high available water capacity; silty clay at a depth of 24 to 42 inches.	High water table; low stability; highly erodible.	High water table; highly erodible.
Drainage is adequate	Rapid water intake rate; very low available water capacity.	Gravelly and cobbly; very difficult to establish vegetation.	Gravelly and cobbly; very difficult to establish vegetation.
Slow permeability	Moderately slow water intake rate; high available water capacity.	Clayey subsoil	Clayey subsoil.
Moderate permeability	High water table; moderately rapid water intake rate; very high available water capacity.	Low stability; highly erodible; nearly level soil.	Highly erodible; high water table.
Slow permeability	Moderately slow water intake rate; high available water capacity.	Clayey subsoil	Clayey subsoil.
Moderate permeability	High water table; moderate water intake rate; high available water capacity.	Nearly level soil; high water table.	High water table.
Present drainage is adequate	Moderate water intake rate; high available water capacity.	No limiting factors	No limiting factors.
Present drainage is adequate	Moderate water intake rate; high available water capacity.	No limiting factors	No limiting factors.
Slow permeability	High water table; moderately slow water intake rate; high available water capacity.	High water table; nearly level soil.	Clayey subsoil.
Moderately slow permeability	Seasonal high water table; rapid water intake rate; high available water capacity.	Seasonal high water table; low stability; high erosion potential.	Difficult to establish and maintain vegetation.
Extremely stony and rocky	Extremely stony and rocky	Extremely stony and rocky	Extremely stony and rocky.

TABLE 7.—*Engineering*

Soil and map symbols	Soil features affecting—	
	Farm ponds	
	Reservoir area	Embankments
Rodman: RnD2, RnE2, RoD2, RoF2	Pervious	Pervious; high stability; low shrink-swell potential.
Rollin: Rw	Pervious; high water table	Pervious; both organic soil and marl have low stability.
St. Charles: ScA, ScB	Pervious	Semipervious; medium stability; moderate shrink-swell potential.
St. Charles, gravelly substratum: SeA, SeB	Pervious	Semipervious: subsoil has medium stability and moderate shrink-swell potential; substratum has high stability and low shrink-swell potential.
Sebewa: SmA, SmB, SnA	Pervious	Semipervious; subsoil has low stability and low shrink-swell potential; substratum has high stability and low shrink-swell potential.
Sebewa, loamy subsoil variant: SpA	Pervious	Semipervious; lower part of subsoil has high stability and low shrink-swell potential; substratum has low stability and low shrink-swell potential.
Sisson: SuB2	Pervious	Semipervious subsoil has medium stability and moderate shrink-swell potential; substratum has low stability and low shrink-swell potential; susceptible to piping.
Sogn: SwB	Pervious	Semipervious; medium stability; low shrink-swell potential, less than 12 inches to bedrock.
Theresa: ThA, ThB, ThB2, ThC, ThC2, ThD, ThD2, TrC3, TrD3, TsB2, TsC2, TsD2, TsE2. For properties of Casco component of TsB2, TsC2, TsD2, and TsE2, see Casco series.	Pervious	Semipervious; medium stability; moderate shrink-swell potential; substratum has high stability and low shrink-swell potential.
Virgil: VgA, VgB	Pervious	Semipervious; medium stability; moderate shrink-swell potential.
Virgil, gravelly substratum: VsA, VsB	Pervious	Semipervious; subsoil has medium stability and moderate shrink-swell potential; substratum has high stability and low shrink-swell potential.
Wallkill: Wa	Pervious	Semipervious; medium stability; low shrink-swell potential; organic material has low stability.
Warsaw: WhB	Pervious	Subsoil is semipervious, has medium stability and moderate shrink-swell potential; substratum has high stability and low shrink-swell potential.
Washtenaw: WsA, WsB	Pervious	Semipervious; medium stability; moderate shrink-swell potential.
Wauseon: Wt, Wu	Subsoil pervious; substratum semipervious; high water table.	Semipervious; subsoil has high stability and low shrink-swell potential; clayey substratum has medium stability and moderate shrink-swell potential.

interpretations for farm uses—Continued

Soil features affecting—Continued			
Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways
Present drainage is excessive	Rapid water intake rate; very low available water capacity.	Gravelly and cobbly	Gravelly and cobbly; very difficult to establish vegetation.
Slow permeability	High water table; moderately rapid water intake rate; high available water capacity.	Low stability; highly erodible; nearly level soil.	High water table.
Present drainage is adequate	Moderate water intake rate; high available water capacity.	No limiting factors	No limiting factors.
Present drainage is adequate	Moderate water intake rate; high available water capacity.	No limiting factors	No limiting factors.
Moderate permeability	High water table; moderate water intake rate; medium available water capacity.	Nearly level soil; high water table.	High water table.
Moderate permeability	Moderate water intake rate; high available water capacity.	Nearly level soil; high water table.	High water table.
Present drainage is adequate	Moderate water intake rate; high available water capacity.	Substratum has low stability and is highly erodible.	No limiting factors.
Present drainage is adequate	Moderate water intake rate; very low available water capacity; very shallow to bedrock.	Very shallow to bedrock	Very shallow to bedrock.
Present drainage is adequate	Moderate water intake rate; high available water capacity.	Stony in places	Stony in places.
Moderate permeability	Seasonal high water table; moderate water intake rate; very high available water capacity.	Seasonal high water table	Seasonal high water table.
Moderate permeability	Seasonal high water table; moderate water intake rate; high available water capacity.	Seasonal high water table	Seasonal high water table.
Moderate permeability	High water table; moderate water intake rate; very high available water capacity.	Nearly level soil; high water table.	High water table.
Present drainage is adequate	Moderate water intake rate; medium available water capacity.	No limitations	No limitations.
Moderately slow permeability	Seasonal high water table; moderate water intake rate; very high available water capacity.	Nearly level soil; seasonal high water table.	Seasonal high water table.
Slow permeability	High water table; moderate water intake rate; high available water capacity.	Nearly level soil; high water table.	High water table.

Descriptions of the Soils

This section describes the soil series and mapping units of Fond du Lac County. The approximate acreage and proportionate extent of each mapping unit are given in table 8.

In the pages that follow, a general description of each soil series is given. Each series description has a detailed description of a profile representative of the series and a brief statement of the range in characteristics of the soils in the series, as mapped in this county. Following the series description, each mapping unit in the series is described individually. Color names and symbols given are for moist soils, unless otherwise indicated. For full information on any one mapping unit, it is necessary to read the description of the soil series as well as the description of the mapping unit. Miscellaneous land types, such as Marsh and Rock land, are described in alphabetic order along with other mapping units.

Following the name of each mapping unit is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. At the end of the description of each mapping unit are listed the capability unit, the woodland suitability group, and the wildlife group in which the mapping unit has been placed. The pages where these groups are described can be learned readily by referring to the "Guide to Mapping Units."

General information about the broad patterns of soils in the county is given in the section "General Soil Map." Many of the terms used in the soil descriptions and other parts of the survey are defined in the Glossary.

Adrian Series

The Adrian series consists of organic soils that developed mainly from reeds and sedges. The organic horizons are underlain by sand at a depth of 12 to 42 inches. These soils occupy old shallow lake basins and depressions, mainly in the Kettle Moraine area.

In a representative profile the surface layer is neutral, black, mucky peat about 16 inches thick. The next layer is mildly alkaline, dark reddish-brown or black mucky peat about 12 inches thick. It is underlain by olive-gray sand and gravel at a depth of about 28 inches.

Adrian soils are high in available water capacity and medium to low in fertility. Excess water is the main limitation to use of these soils. Where drainage is improved, soil blowing and subsidence become hazards.

These soils are mainly under native vegetation. A few small areas are used for permanent pasture.

Representative profile of Adrian mucky peat, uncultivated, SW¼NW¼ sec. 23, T. 13 N., R. 19 E.

1—0 to 16 inches, black (N 2/0) mucky peat; moderate, medium, granular structure; very friable; about 50 percent of the mass is identifiable sedge fragments; neutral; clear, wavy boundary.

2—16 to 28 inches, dark reddish-brown (5YR 2/2) or black (5YR 2/1) mucky peat; weak, medium, granular structure; very friable; less than 50 percent of the mass is identifiable sedge fragments; neutral to mildly alkaline; abrupt, wavy boundary.

IIC—28 to 60 inches, olive (5Y 5/3) to light olive-gray (5Y 6/2) sand and gravel; single grain; loose; neutral.

The color of the surface layer ranges from black (N 2/0) to very dark grayish brown (10YR 3/2). Reaction generally is neutral to mildly alkaline.

Adrian soils are similar to Ogden, Palms, and Rollin soils, except that Adrian soils have a sandy substratum rather than a substratum of clay, loam, or marl. Deep, organic soils generally associated with the Adrian series include soils of the Houghton and Carbondale series.

Adrian mucky peat (Ak).—This soil is in nearly level or depressed areas. In some places Houghton soils that occupy similar areas were included with this soil in mapping. Soils of the Sebewa series were also included.

This soil cannot be used for field crops unless drainage is improved. Undrained areas are well suited to reed canarygrass, and they can be used for trees and wildlife habitat.

Wetness is the main limitation to use of this soil. The water table is high in spring and after periods of heavy rainfall, and the soil is difficult to drain. In most areas where improved drainage has been installed, subsidence has occurred. (Capability unit IVw-7; woodland suitability group 10; wildlife group 5)

Alluvial Land

Alluvial land consists of alluvium recently deposited along major streams. It is generally stratified, varies widely in texture, and is subject to frequent changes resulting from stream overflow.

Alluvial land (Am).—This land type consists of well drained to moderately well drained, nearly level areas along major streams and drainageways. The upper 6 to 10 inches of the soil is very dark brown to very dark grayish-brown silt loam, loam, and in some places, sandy loam. This upper layer has granular structure, is friable when moist, and is neutral to moderately alkaline in reaction. It is underlain by mildly to moderately alkaline strata of dark-brown to brown silt loam, loam, sandy loam, and gravel. Coarse textures are dominant in the underlying material.

Small areas of DePere silty clay loam, 0 to 3 percent slopes, and poorly drained Alluvial land, wet, were included in mapping.

Alluvial land is used mainly for permanent pasture. Some areas large enough to till are suited to corn, grain, and mixed hay, but they are subject to flooding during the growing season. This land is also suited to trees or wildlife habitat.

This soil is high in available water capacity and medium in natural fertility. The water table is at or near the surface during wet periods, and it is within 5 feet of the surface during most of the growing season. (Capability unit IIw–13; woodland suitability group 1; wildlife group 6).

Alluvial land, wet (An).—This land type consists of somewhat poorly drained to poorly drained, nearly level soils on the flood plains of major streams. The upper 6 to 10 inches is black to very dark grayish-brown silt loam, loam, and in places, sandy loam. This layer has granular structure, is friable when moist, and usually is neutral to mildly alkaline. It is underlain by mildly to moderately alkaline strata of silt loam, loam, sandy loam, and gravelly loam. Coarse textures are dominant in this underlying material.

Small areas of DePere silty clay loam, 0 to 3 percent slopes, and of Alluvial land were included in mapping.

This land type is suited to permanent pasture, trees, or wildlife habitat.

TABLE 8.—*Approximate acreage and proportionate extent of the soils*

Soil	Acres	Percent
Adrian mucky peat	2, 337	0. 5
Alluvial land	1, 383	. 3
Alluvial land, wet	750	. 2
Ashkum silty clay loam, 0 to 3 percent slopes	1, 276	. 3
Beecher silt loam, 0 to 2 percent slopes	1, 231	. 3
Beecher silt loam, 2 to 6 percent slopes	5, 827	1. 3
Beecher silt loam, shaly subsoil variant, 2 to 6 percent slopes	76	(1)
Brookston silt loam, 0 to 3 percent slopes	5, 817	1. 3
Brookston stony silt loam, 0 to 3 percent slopes	677	. 1
Brookston silty clay loam, 0 to 3 percent slopes	800	. 2
Carbondale mucky peat	2, 754	. 6
Casco sandy loam, 2 to 6 percent slopes	396	. 1
Casco sandy loam, 6 to 12 percent slopes	154	(1)
Casco loam, 2 to 6 percent slopes	3, 696	. 8
Casco loam, 6 to 12 percent slopes, eroded	2, 649	. 6
Casco loam, 12 to 20 percent slopes, eroded	958	. 2
Casco soils, 2 to 6 percent slopes, severely eroded	112	(1)
Casco soils, 6 to 12 percent slopes, severely eroded	900	. 2
Casco soils, 12 to 20 percent slopes, severely eroded	780	. 2
Casco-Hochheim loams, 2 to 6 percent slopes	108	(1)
Casco-Hochheim loams, 6 to 12 percent slopes, eroded	126	(1)
Casco-Hochheim loams, 12 to 20 percent slopes, eroded	209	(1)
Casco-Hochheim complex, 6 to 12 percent slopes, severely eroded	319	. 1
Casco-Hochheim complex, 12 to 20 percent slopes, severly eroded	164	(1)
Casco-Rodman loams, 6 to 12 percent slopes, eroded	452	. 1
Casco-Rodman loams, 12 to 30 percent slopes	3, 356	. 7
Casco-Rodman loams, 12 to 30 percent slopes, severely eroded	1, 002	. 2
Casco-Rodman loams, 30 to 45 percent slopes	764	. 2
Casco loam, loamy subsoil variant, 0 to 6 percent slopes	124	(1)
Casco loam, clayey subsoil variant, 2 to 6 percent slopes	367	. 1
DePere silty clay loam, 0 to 3 percent slopes	1, 408	. 3
Dodge silt loam, 0 to 2 percent slopes	798	. 2
Dodge silt loam, 2 to 6 percent slopes	2, 929	. 6
Dodge silt loam, 2 to 6 percent slopes, eroded	695	. 1
Elburn silt loam, 0 to 3 percent slopes	2, 810	. 6
Elliott silt loam, 0 to 2 percent slopes	1, 475	. 3
Elliott silt loam, 2 to 6 percent slopes	3, 804	. 8
Fox sandy loam, 2 to 6 percent slopes	130	(1)
Fox loam, 2 to 6 percent slopes	625	. 1
Fox loam, 2 to 6 percent slopes, eroded	576	. 1
Fox loam, 6 to 12 percent slopes, eroded	335	. 1
Fox silt loam, 0 to 2 percent slopes	8, 677	2. 0
Fox silt loam, 2 to 6 percent slopes	6, 724	1. 4
Fox silt loam, 2 to 6 percent slopes, eroded	3, 327	. 7
Fox silt loam, 6 to 12 percent slopes, eroded	608	. 1
Hixton loam, 12 to 30 percent slopes, eroded	41	(1)
Hochheim loam, 2 to 6 percent slopes	445	. 1
Hochheim loam, 2 to 6 percent slopes, eroded	1, 061	. 2
Hochheim loam, 6 to 12 percent slopes	331	. 1
Hochheim loam, 6 to 12 percent slopes, eroded	2, 587	. 6
Hochheim loam, 12 to 20 percent slopes	988	. 2
Hochheim loam, 12 to 20 percent slopes, eroded	1, 857	. 4
Hochheim loam, 20 to 30 percent slopes	742	. 2
Hochheim soils, 2 to 6 percent slopes, severely eroded	399	. 1
Hochheim soils, 6 to 12 percent slopes, severely eroded	2, 614	. 6
Hochheim soils, 12 to 20 percent slopes, severely eroded	4, 364	1. 0
Hochheim soils, 20 to 30 percent slopes, severely eroded	667	. 1
Houghton mucky peat	25, 532	5. 3
Ionia sandy loam, 0 to 3 percent slopes	189	(1)
Ionia silt loam, 0 to 2 percent slopes	4, 564	1. 0
Ionia silt loam, 2 to 6 percent slopes	2, 622	. 6
Ionia silt loam, loamy subsoil variant, 0 to 3 percent slopes	249	. 1
Ionia silt loam, clayey subsoil variant, 2 to 6 percent slopes	319	. 1
Juneau silt loam, 0 to 2 percent slopes	600	. 1
Juneau silt loam, 2 to 6 percent slopes	550	. 1
Keowns silt loam	535	. 1
Kewaunee silt loam, 0 to 2 percent slopes	1, 628	. 4
Kewaunee silt loam, 2 to 6 percent slopes	10, 104	1. 9
Kewaunee silt loam, 2 to 6 percent slopes, eroded	3, 382	. 7
Kewaunee silt loam, 6 to 12 percent slopes, eroded	456	. 1
Kewaunee silty clay loam, 0 to 2 percent slopes	658	. 1
Kewaunee silty clay loam, 2 to 6 percent slopes	1, 694	. 4
Kewaunee silty clay loam, 2 to 6 percent slopes, eroded	6, 996	1. 5
Kewaunee silty clay loam, 6 to 12 percent slopes, eroded	775	. 1
Kewaunee silty clay loam, 12 to 20 percent slopes, eroded	259	. 1
Kewaunee silty clay loam, 20 to 30 percent slopes, eroded	266	. 1
Kewaunee soils, 2 to 6 percent slopes, severely eroded	461	. 1
Kewaunee soils, 6 to 12 percent slopes, severely eroded	350	. 1
Kewaunee soils, 12 to 20 percent slopes, severely eroded	200	(1)
Kewaunee silt loam, moderately shallow variant, 2 to 6 percent slopes	104	(1)
Kibbie silt loam, 0 to 2 percent slopes	301	. 1
Knowles silt loam, 0 to 2 percent slopes	481	. 1
Knowles silt loam, 2 to 6 percent slopes	825	. 2
Knowles silt loam, 6 to 12 percent slopes, eroded	255	. 1
Knowles silt loam, 12 to 30 percent slopes, eroded	97	(1)
Lamartine silt loam, 0 to 2 percent slopes	1, 783	. 4
Lamartine silt loam, 2 to 6 percent slopes	3, 680	. 8
LeRoy silt loam, 2 to 6 percent slopes, eroded	993	. 2
LeRoy silt loam, 6 to 12 percent slopes, eroded	2, 249	. 5
LeRoy silt loam, 12 to 20 percent slopes	382	. 1
LeRoy silt loam, 12 to 20 percent slopes, eroded	177	(1)
LeRoy silt loam, 20 to 30 percent slopes	111	(1)
LeRoy soils, 6 to 12 percent slopes, severely eroded	3, 277	. 7
LeRoy soils, 12 to 20 percent slopes, severely eroded	3, 711	. 8
Lomira silt loam, 0 to 2 percent slopes	958	. 2
Lomira silt loam, 2 to 6 percent slopes	25, 509	5. 3
Lomira silt loam, 2 to 6 percent slopes, eroded	26, 299	5. 4
Lomira silt loam, 6 to 12 percent slopes	1, 007	. 2
Lomira silt loam, 6 to 12 percent slopes, eroded	7, 922	1. 7
Lomira silt loam, 6 to 12 percent slopes, severely eroded	2, 156	. 5
Lomira silt loam, 12 to 20 percent slopes	174	(1)
Lomira silt loam, 12 to 20 percent slopes, eroded	395	. 1
Lomira silt loam, 12 to 20 percent slopes, severely eroded	575	. 1
Lomira-Knowles silt loams, 0 to 2 percent slopes	252	. 1
Lomira-Knowles silt loams, 2 to 6 percent slopes	754	. 2
Lomira-Knowles silt loams, 2 to 6 percent slopes, eroded	406	. 1
Lomira-Knowles silt loams, 6 to 12 percent slopes, eroded	143	(1)
Manawa silt loam, 0 to 2 percent slopes	4, 186	1. 0
Manawa silt loam, 2 to 6 percent slopes	2, 277	. 5

See footnote at end of table.

TABLE 8.—*Approximate acreage and proportionate extent of the soils*—Continued

Soil	Acres	Percent
Manawa silty clay loam, 0 to 2 percent slopes	6, 994	1. 5
Manawa silty clay loam, 2 to 6 percent slopes	2, 457	. 5
Markesan silt loam, 2 to 6 percent slopes	501	. 1
Markesan silt loam, 2 to 6 percent slopes, eroded	1, 322	. 3
Markesan silt loam, 6 to 12 percent slopes, eroded	1, 337	. 3
Markesan silt loam, 6 to 12 percent slopes, severely eroded	273	. 1
Markesan silt loam, 12 to 20 percent slopes, eroded	164	(1)
Markesan silt loam, 12 to 20 percent slopes, severely eroded	195	(1)
Marsh	1, 622	. 4
Martinton silt loam, 0 to 2 percent slopes	411	. 1
Martinton silt loam, 2 to 6 percent slopes	386	. 1
Mayville silt loam, 0 to 2 percent slopes	548	. 1
Mayville silt loam, 2 to 6 percent slopes	3, 059	. 7
Mendota silt loam, 0 to 2 percent slopes	477	. 1
Mendota silt loam, 2 to 6 percent slopes	7, 758	1. 7
Mendota silt loam, 2 to 6 percent slopes, eroded	7, 289	1. 6
Mendota silt loam, 6 to 12 percent slopes, eroded	936	. 2
Milton silt loam, 0 to 2 percent slopes	235	. 1
Milton silt loam 2 to 6 percent slopes, eroded	178	(1)
Milton silt loam, 6 to 20 percent slopes, eroded	84	(1)
Morley silt loam, 2 to 6 percent slopes	1, 243	. 3
Morley silt loam, 2 to 6 percent slopes, eroded	1, 560	. 3
Morley silt loam, 6 to 12 percent slopes, eroded	776	. 2
Morley silt loam, 12 to 20 percent slopes, eroded	160	(1)
Morley soils, 6 to 12 percent slopes, severely eroded	256	. 1
Morley soils, 12 to 20 percent slopes, severely eroded	169	(1)
Ogden mucky peat	589	. 1
Old beaches	120	(1)
Oshkosh silt loam, 0 to 2 percent slopes	548	. 1
Oshkosh silt loam, 2 to 6 percent slopes	563	. 1
Oshkosh silty clay loam, 0 to 2 percent slopes	154	(1)
Oshkosh silty clay loam, 2 to 6 percent slopes	230	(1)
Palms muck	2, 190	. 5
Palms mucky peat	15, 983	3. 7
Peebles silt loam, 0 to 2 percent slopes	1, 253	. 3
Peebles silt loam, 2 to 6 percent slopes	2, 000	. 4
Pella silt loam, 0 to 3 percent slopes	37, 755	8. 1
Pella silty clay loam, 0 to 2 percent slopes	8, 305	1. 8
Plano silt loam, 0 to 2 percent slopes	6, 336	1. 4
Plano silt loam, 2 to 6 percent slopes	10, 503	2. 3
Plano silt loam, 2 to 6 percent slopes, eroded	342	. 1
Plano fine sandy loam, sandy variant, 2 to 6 percent slopes	294	. 1
Poygan silty clay loam	22, 043	5. 0
Rimer loam, 2 to 6 percent slopes	290	. 1
Rock land	603	. 1
Rodman gravelly sand, 6 to 20 percent slopes, eroded	86	(1)
Rodman gravelly sand, 20 to 30 percent slopes, eroded	125	(1)
Rodman gravelly loam, 12 to 20 percent slopes, eroded	836	. 2
Rodman gravelly loam, 20 to 45 percent slopes, eroded	1, 162	. 3
Rollin mucky peat	600	. 1
St. Charles silt loam, 0 to 2 percent slopes	3, 019	. 7
St. Charles silt loam, 2 to 6 percent slopes	5, 152	1. 1
St. Charles silt loam, gravelly substratum, 0 to 2 percent slopes	803	. 2
St. Charles silt loam, gravelly substratum, 2 to 6 percent slopes	1, 058	. 3
Sebewa silt loam, 0 to 2 percent slopes	5, 173	1. 1
Sebewa silt loam, 2 to 6 percent slopes	234	. 1
Sebewa silt loam, deep, 0 to 2 percent slopes	1, 209	. 3
Sebewa silt loam, loamy subsoil variant, 0 to 3 percent slopes	261	. 1
Sisson silt loam, 2 to 6 percent slopes, eroded	193	(1)
Sogn stony silt loam, 0 to 6 percent slopes	205	(1)
Theresa silt loam, 0 to 2 percent slopes	399	. 1
Theresa silt loam, 2 to 6 percent slopes	7, 013	1. 5
Theresa silt loam, 2 to 6 percent slopes, eroded	11, 280	2. 4
Theresa silt loam, 6 to 12 percent slopes	632	. 1
Theresa silt loam, 6 to 12 percent slopes, eroded	5, 219	1. 1
Theresa silt loam, 12 to 20 percent slopes	550	. 1
Theresa silt loam, 12 to 20 percent slopes, eroded	801	. 2
Theresa soils, 6 to 12 percent slopes, severely eroded	962	. 2
Theresa soils, 12 to 20 percent slopes, severely eroded	180	(1)
Theresa-Casco silt loams, 2 to 6 percent slopes, eroded	656	. 1
Theresa-Casco silt loams, 6 to 12 percent slopes, eroded	551	. 1
Theresa-Casco silt loams, 12 to 20 percent slopes, eroded	417	. 1
Theresa-Casco silt loams, 20 to 30 percent slopes, eroded	213	(1)
Virgil silt loam, 0 to 2 percent slopes	10, 432	2. 1
Virgil silt loam, 2 to 6 percent slopes	5, 773	1. 2
Virgil silt loam, gravelly substratum, 0 to 2 percent slopes	649	. 1
Virgil silt loam, gravelly substratum, 2 to 6 percent slopes	165	(1)
Wallkill silt loam	102	(1)
Warsaw silt loam, 2 to 6 percent slopes	135	(1)
Washtenaw silt loam, 0 to 2 percent slopes	1, 212	. 3
Washtenaw silt loam, 2 to 6 percent slopes	482	. 1
Wauseon loam	111	(1)
Wauseon silt loam	410	. 1
Total	463, 360	98. 8

[1] Less than 0.05 percent.

The areas are subject to flooding. The water table is at or near the surface in spring and after periods of heavy rainfall; at other times it is 1 to 3 feet below the surface. Drainage is difficult. (Capability unit Vw–14; woodland suitability group 9; wildlife group 4)

Ashkum Series

The Ashkum series consists of deep, poorly drained soils that developed in calcareous, shaly, silty clay loam glacial till. These soils occupy depressions, drainageways, and level wet areas on uplands.

In a representative profile the surface layer is black and very dark gray, mildly alkaline silty clay loam about 10 inches thick. The subsoil is grayish-brown silty clay loam in the upper part; it is light olive-gray and light brownish-gray silty clay, mottled with yellowish brown, in the lower part. The subsoil, about 20 inches thick, is mildly alkaline and moderately alkaline. The underlying material, at a depth of about 30 to 60 inches, is brown silty clay loam mottled with yellowish brown. It is moderately alkaline and calcareous.

Ashkum soils have moderately slow permeability and high available water capacity. They are medium to high in natural fertility. The organic-matter content of the surface layer is very high.

Drained areas of Ashkum soils are used mainly for crops; undrained areas are used mainly for pasture.

Representative profile of Ashkum silty clay loam, 0 to 3 percent slopes, cultivated, SE¼SW¼ sec. 7, T. 14 N., R. 17 E.

Ap—0 to 8 inches, black (10YR 2/1) silty clay loam; moderate, medium, granular structure; friable; mildly alkaline; abrupt, wavy boundary.

A1—8 to 10 inches, very dark gray (10YR 3/1) silty clay loam; moderate, fine, subangular blocky structure; firm; mildly alkaline; clear, irregular boundary.

B1g—10 to 15 inches, grayish-brown (2.5Y 5/2) silty clay loam; moderate, medium, subangular blocky structure that breaks to moderate, fine, subangular blocky; firm; mildly alkaline; clear, wavy boundary.

B2g—15 to 23 inches, light olive-gray (5Y 6/2) silty clay; common, medium, prominent mottles of yellowish brown (10YR 5/6); moderate, medium, angular blocky structure; very sticky; mildly alkaline; gradual, irregular boundary.

B3g—23 to 30 inches, light brownish-gray (2.5Y 6/2) silty clay; many, medium, prominent mottles of yellowish brown (10YR 5/6); moderate, medium, angular blocky structure; very sticky; some pebbles up to 20 millimeters in diameter; moderately alkaline; calcareous; gradual, irregular boundary.

C—30 to 60 inches, brown (10YR 5/3) silty clay loam; common, coarse, prominent mottles of yellowish brown (10YR 5/6); massive; very sticky; moderately alkaline; calcareous.

The thickness of the solum ranges from 24 to 36 inches. The A horizon ranges from 8 to 12 inches in thickness. Colors of the B horizon center on the 2.5Y hue but range to the 5Y hue. The underlying glacial till generally ranges from silty clay loam to silty clay.

Ashkum soils are associated with the somewhat poorly drained Beecher soils and the well drained and moderately well drained Morley soils. They are also associated with the somewhat poorly drained to well-drained soils developed in shaly till parent material. Soils that also developed in shaly parent material occur on prairies and in wooded areas adjacent to the ledge rock that extends from Lake De Neveu southwest to the county line near the Horicon Marsh.

Ashkum silty clay loam, 0 to 3 percent slopes (AtA).—This dark-colored, nearly level or slightly concave soil is poorly drained. In places an organic layer as much as 10 inches thick covers the mineral part of the profile. This generally occurs near areas of organic soil or in excessively wet drainageways or depressions.

Associated areas of somewhat poorly drained Elliott and Beecher soils were included in mapping. A few undisturbed areas that have a silt loam surface layer were also included.

The use of this soil is limited mainly by wetness. Crops are often drowned out by a perched water table that occurs in spring and after heavy rains. Runoff is very slow. Alfalfa is often winterkilled. Where drainage has been improved, this soil is suited to all crops commonly grown in the county, including alfalfa. (Capability unit IIw–1; woodland suitability group 7; wildlife group 4)

Beecher Series

The Beecher series consists of deep, nearly level and gently sloping, somewhat poorly drained soils on uplands. These soils are underlain by calcareous silty clay loam shaly glacial till.

In a representative profile the surface layer is black silt loam about 8 inches thick. The subsurface layer is grayish-brown silt loam about 4 inches thick. The subsoil extends to a depth of about 30 inches. It is dark-brown and grayish-brown mottled silty clay loam and silty clay. The subsoil is medium acid in the upper part and moderately alkaline in the lower part. The strongly alkaline underlying material, which extends to a depth of about 60 inches, is grayish-brown silty clay loam mottled with yellowish brown.

The soils of this series have moderately slow permeability. The available water capacity is high, and the surface layer has a medium organic-matter content. These soils are moderate in fertility.

Beecher soils are near the Niagara Escarpment in the towns of Byron and Oakfield. The original vegetation was hardwood forest. Now, these soils are used mainly for crops. The main limitation is wetness.

Representative profile of Beecher silt loam, 2 to 6 percent slopes, SE¼NW¼ sec. 16, T. 14 N., R. 17 E.

A1—0 to 8 inches, black (10YR 2/1) silt loam; moderate, medium, granular structure; very friable; slightly acid; clear, irregular boundary.

A2—8 to 12 inches, grayish-brown (10YR 5/2) silt loam; few, fine, prominent mottles of yellowish brown (10YR 5/4); weak, medium, platy structure; very friable; a few pebbles in the lower part; slightly acid; clear, irregular boundary.

B1—12 to 16 inches, dark grayish-brown (10YR 4/2) silty clay loam; common, fine, prominent mottles of yellowish brown (10YR 5/6); moderate, medium, angular blocky structure; firm; medium acid; clear, wavy boundary.

IIB21t—16 to 20 inches, dark-brown (10YR 4/3) silty clay; many, fine, faint mottles of yellowish brown (10YR 5/4 and 5/6) and grayish brown (10YR 5/2) and prominent mottles of yellowish brown (10YR 5/6); strong, medium and fine, angular blocky structure; very firm; clay films and very dark brown (10YR 2/2) organic stains on ped faces; medium acid; clear, wavy boundary.

IIB22t—20 to 25 inches, grayish-brown (10YR 5/2) silty clay; many, medium, prominent mottles of yellowish-brown (10YR 5/6); strong, medium, angular blocky structure; very firm; few very dark brown (10YR 2/2) stains; few pebbles as much as 3 inches in diameter; slightly acid; clear, irregular boundary.

IIB3—25 to 30 inches, grayish-brown (2.5Y 5/2) silty clay loam; many, coarse, prominent mottles of yellowish brown (10YR 5/6); moderate, coarse, angular blocky structure; very firm; moderately alkaline; calcareous; gradual, irregular boundary.

IIC—30 to 60 inches, grayish-brown (2.5Y 5/2) silty clay loam; many, coarse, prominent mottles of yellowish brown (10YR 5/6); massive; very firm; strongly alkaline; calcareous.

The A1 horizon ranges from 6 to about 15 inches in thickness, and the solum ranges from 24 to 36 inches. The B horizon generally is heavy silty clay loam, but in places it is silty clay.

Beecher soils are associated with soils of the Morley and Elliott series. Beecher soils differ from Morley soils in having a darker and thicker A1 horizon and in being somewhat poorly drained. Beecher soils have a thinner A1 horizon than Elliott soils, and they have a light-colored A2 horizon, which is lacking in Elliott soils.

Beecher silt loam, 0 to 2 percent slopes (BcA).—This soil has a surface layer that is 11 to 15 inches thick. The thickness of the combined surface layer and subsoil generally is 24 to 36 inches. In cultivated areas the surface layer is very dark gray to very dark brown. The subsoil is more distinctly mottled than that of the profile representative of the series.

Included with this soil in mapping were small areas of Morley and Ashkum soils. Also included were some places where the weathered shale bedrock occurs at a depth of about 42 inches and some areas where the silt cover is as much as 30 inches thick.

This soil is well suited to corn, small grains, and mixed hay. Alfalfa winterkills except where drainage is improved. Runoff is very slow. (Capability unit IIw–2; woodland suitability group 7; wildlife group 4)

Beecher silt loam, 2 to 6 percent slopes (BcB).—This soil occupies gently sloping drainageways. It has the profile described as typical for the series. In undisturbed areas the surface layer is black; in cultivated areas it is very dark gray or very dark brown.

Included with this soil in mapping were small areas of Morley and Ashkum soils and of Beecher silt loam, shaly subsoil variant, 2 to 6 percent slopes. Some moderately eroded soils also were included, and also some places where the substratum grades to weathered shale bedrock at a depth of 42 inches.

Where artificial drainage is installed, this soil is well suited to all crops commonly grown in the area. Where drainage is not improved, alfalfa winterkills. Wetness is the main limitation to use of this soil. There is also a slight hazard of erosion. Runoff is medium. (Capability unit IIw–2; woodland suitability group 7; wildlife group 4).

Beecher silt loam, shaly subsoil variant, 2 to 6 percent slopes (BeB).—Except that it is underlain by weathered shale at a depth of 25 to 42 inches, this soil has a profile similar to that described as representative of the series. In cultivated areas the surface layer is dark brown, and in undisturbed areas the surface layer is very dark brown.

This soil is associated in many places with gently sloping Beecher silt loam or sloping Morley silt loam. Small areas of these soils were included in mapping.

This soil is on west-facing slopes below the Niagara Escarpment, southwest of Oakfield. It is well suited to all the crops commonly grown in the area. Alfalfa grows well on this soil. The main limitations to farming are excess water and the hazard of erosion. The available water capacity is medium. (Capability unit IIe–6; woodland suitability group 7; wildlife group 4)

Brookston Series

The Brookston series consists of deep, nearly level and gently sloping, poorly drained soils that developed in moderately deep silt and calcareous loam glacial till. These soils occupy depressional areas and drainageways in the uplands.

In a representative profile the surface layer is mildly alkaline, black silt loam about 12 inches thick. The subsurface layer is dark grayish-brown clay loam about 2 inches thick. It is mottled with yellowish brown. The subsoil, which extends to a depth of about 30 inches, is mildly alkaline, dark grayish-brown and grayish-brown clay loam mottled with yellowish brown. The underlying material is olive-gray gravelly loam mottled with yellowish brown to a depth of about 60 inches. It is moderately alkaline.

Brookston soils are moderately slow in permeability, and they have high available water capacity. Wetness is the main limitation to farming. Water may be at or near the surface in spring or after heavy rains.

Representative profile of Brookston silt loam, 0 to 3 percent slopes, NE¼SW¼ sec. 34, T. 16 N., R. 16 E.

A1—0 to 12 inches, black (10YR 2/1) silt loam; moderate, medium, granular structure; very friable; mildly alkaline; clear, wavy boundary.

A3g—12 to 14 inches, dark grayish-brown (2.5Y 4/2) silt loam; common, fine, prominent mottles of yellowish brown (10YR 5/6); weak, fine, subangular blocky structure; slightly sticky; mildly alkaline; clear, irregular boundary.

IIB21tg—14 to 16 inches, dark grayish-brown (2.5Y 4/2) clay loam; many, medium, prominent mottles of yellowish brown (10YR 5/6); weak, fine, subangular blocky structure; thick, continuous clay films; sticky; some pebbles; mildly alkaline; clear, irregular boundary.

IIB22tg—16 to 30 inches, grayish-brown (2.5Y 5/2) clay loam; many, fine, prominent mottles of yellowish brown (10YR 5/8); weak, medium, subangular blocky structure; few patchy clay films; sticky; numerous pebbles; mildly alkaline; clear, irregular boundary.

IICg—30 to 60 inches, olive-gray (5Y 5/2) gravelly heavy loam; many, medium, prominent mottles of yellowish brown (10YR 5/8); sticky; numerous pebbles and stones; moderately alkaline.

The A1 horizon ranges from 8 to 15 inches in thickness, and the solum ranges from 20 to 36 inches. A thin layer of organic soil material covers the A1 horizon in some places. The C horizon contains few to many stones.

Brookston soils have a thicker A1 horizon and are more poorly drained than the well-drained Theresa soils, the moderately well drained Mayville soils, and the somewhat poorly drained Lamartine soils. Brookston soils are similar to Pella soils in natural drainage, but they developed in a thinner silt mantle than those soils.

Brookston silt loam, 0 to 3 percent slopes (BsA).—This soil is generally adjacent to other poorly drained soils and nearly level parts of drainageways. It has the profile described as representative of the series. A few small areas of Lamartine soils were included in mapping.

If drainage is improved, this soil is suited to all crops commonly associated with dairying. Runoff is very slow, and excess water is a limitation to farming this soil. In some places where drainage has not been improved, ponding occurs in spring or after periods of heavy rainfall.

(Capability unit IIw–1; woodland suitability group 7; wildlife group 4)

Brookston stony silt loam, 0 to 3 percent slopes (BtA).—This soil is in drainageways, in shallow depressions, and on wetland borders in the hilly eastern part of the county. It is generally associated with Brookston silt loam. Areas of this associated soil that are too small to be mapped separately were included with this soil in mapping.

This soil is suited to pasture, woodland, or wildlife habitat. The stoniness of the surface layer makes the use of farm machinery difficult and limits the use of the soil for growing crops. This soil is also subject to flooding and wetness. (Capability unit Vw–16; woodland suitability group 7; wildlife group 4)

Brookston silty clay loam, 0 to 3 percent slopes (BuA).—This soil occurs as small depressional areas. It has a combined surface layer and subsoil 20 to 36 inches thick. The surface layer is slightly finer textured throughout than that described in the representative profile.

This soil is wet for long periods, but it is suited to row crops if drainage is improved. Undrained areas are suited to permanent pasture. The silty clay loam surface layer is difficult to work and puddles easily. Runoff is very slow to ponded. (Capability unit IIw–1; woodland suitability group 7; wildlife group 4)

Carbondale Series

The Carbondale series consists of organic soils that formed from sedges and coniferous woody material. These soils occupy depressions that are 1 acre to several hundred acres in size. Most areas of these soils are in the eastern part of the county.

In a representative profile the surface layer is about 30 inches of black muck. The next layer is black peaty muck about 14 inches thick. At a depth below 44 inches, the soil is dark reddish-brown mucky peat.

Carbondale soils have very high available water capacity and are moderately low in natural fertility. They are subject to ponding and have a high water table unless they have been drained. Where drainage is improved, subsidence and soil blowing are serious hazards.

Most Carbondale soils of the county are in woodland. A few areas have been cleared and are used for pasture or hay.

Representative profile of Carbondale mucky peat, uncultivated, NW¼SE¼ sec. 22, T. 15 N., R. 19 E.

1—0 to 30 inches, black (N 2/0) muck; moderate, fine, granular structure; very friable; less than 30 percent of mass is identifiable wood and sedge fragments; neutral; gradual, wavy boundary.

2—30 to 44 inches, black (N 2/0) peaty muck; weak, medium, granular structure; friable; less than 50 percent of mass is identifiable wood and sedge fragments; neutral; gradual, wavy boundary.

3—44 to 60 inches, dark reddish-brown (5YR 2/2) mucky peat; weak, medium, granular structure; more than 50 percent of mass is identifiable wood and sedge fragments; neutral.

Carbondale soils range from neutral to mildly alkaline. They are more than 42 inches deep. The amount of woody material in the soil ranges from a few fragments in some places to large buried logs in others. The surface layer ranges from muck to partly disintegrated peat.

Carbondale soils differ from Houghton soils in having developed partly from woody material rather than entirely from grasses, reeds, and sedges. Carbondale soils are associated with Adrian and Palms soils, which consist of organic layers underlain by sand and loam, respectively. In some places a thin layer of sedimentary peat occurs between the organic soil and the underlying mineral material.

Carbondale mucky peat (Ca).—This organic soil is nearly level and occurs in slightly depressed areas in the eastern part of the county. It is associated with shallow organic soils, such as Palms and Adrian soils, and with mineral soils of the Sebewa and Pella series. Small areas of these associated soils were included with this soil in mapping.

This soil is not suited to field crops, unless drainage is improved. It is well suited to reed canarygrass. Wetness is the main limitation to farming. The water table is high in spring and after periods of heavy rainfall. Drained areas are subject to subsidence and soil blowing. (Capability unit IIIw–9; woodland suitability group 10; wildlife group 5)

Casco Series

The Casco series consists of well-drained, nearly level to steep soils on outwash plains and morainic ridges. These soils developed in thin, loamy outwash that is shallow to stratified calcareous sand and gravel.

In a representative profile the surface layer is very dark grayish-brown loam about 5 inches thick (fig. 8). The subsurface layer is brown silt loam about 3 inches thick. The subsoil is dark-brown silty clay loam and clay

Figure 8.—Profile of Casco loam.

loam that extends to a depth of about 21 inches. The underlying material is brown and yellowish-brown sand and gravel.

Casco soils are moderately permeable, except in the substratum, which is rapidly permeable. The surface layer is medium in organic-matter content. The soil is low in available water capacity. The solum is neutral to mildly alkaline, and the substratum is mildly alkaline to moderately alkaline.

Soils of this series are in the Kettle Moraine parts of Forest, Osceola, and Auburn Townships. They are used mainly for crops and woodland, and the less sloping soils generally are cropped. The main limitation to use of the gently sloping soils is droughtiness, but on steeper soils droughtiness is secondary to the hazard of erosion.

Representative profile of Casco loam, uncultivated, sec. 12, T. 14 N., R. 19 E.

A1—0 to 5 inches, very dark grayish-brown (10YR 3/2) loam; moderate, medium, granular structure; very friable; mildly alkaline; clear, irregular boundary.

A2—5 to 8 inches, brown (10YR 5/3) silt loam; weak, thin, platy structure; very friable; mildly alkaline; clear, wavy boundary.

B1—8 to 13 inches, dark-brown (10YR 4/3) silty clay loam; moderate, fine, subangular blocky structure; firm; very pale brown (10YR 7/3) bleached silt coatings; some coarse sand grains and pebbles, less than 2 millimeters in diameter; slightly acid; gradual, wavy boundary.

B2t—13 to 17 inches, dark-brown (7.5YR 3/4) heavy clay loam; moderate, fine, angular blocky structure; firm; numerous pebbles less than 4 millimeters in diameter; thick, continuous clay films; neutral; clear, wavy boundary.

B3t—17 to 21 inches, dark-brown (7.5YR 3/4) clay loam; weak, medium, subangular blocky structure; firm; numerous pebbles less than 4 millimeters in diameter; thick, continuous clay films; neutral; clear, irregular boundary.

IIC1—21 to 27 inches, yellowish-brown (10YR 5/4) medium sand and gravel; some lighter and darker colored sand grains; single grain; loose; mildly alkaline; calcareous; clear, wavy boundary.

IIC2—27 to 60 inches, brown (10YR 5/3) medium sand and gravel; single grain; loose; mildly alkaline; calcareous.

The A1 horizon is sandy loam and loam. It ranges from very dark brown in undisturbed areas to dark grayish brown in cultivated areas. In many places the A horizon developed in a thin mantle of loess. Where the loess mantle is very thin or is lacking, the B1 horizon generally is lacking and the B2 horizon is more weakly developed than normal. The thickness of the solum ranges from 10 to 24 inches. In places the C horizon contains numerous cobblestones up to 6 or 8 inches in diameter.

Casco soils are similar to Fox soils, but they are underlain by sand and gravel at a depth of less than 24 inches, rather than at a depth of 24 to 40 inches.

Casco sandy loam, 2 to 6 percent slopes (CcB).—This soil occupies outwash plains. Except for the texture of the surface layer, it has a profile similar to that described as representative of the series.

This soil is associated with Fox soils and with other phases of Casco sandy loam soils. Areas of these associated soils were included with this soil in mapping.

Although it is droughty, this soil is suited to crops commonly associated with dairy farming. Extensive crop damage may occur during prolonged dry periods. Erosion and soil blowing are slight hazards if this soil is used for crops. The surface layer is low in organic-matter content and available water capacity. Runoff is very slow because of rapid infiltration. (Capability unit IIIe–3; woodland suitability group 5; wildlife group 1)

Casco sandy loam, 6 to 12 percent slopes (CcC).—This soil is on sandy outwash plains in the eastern and southeastern parts of the county. The surface layer is about 9 inches thick; the combined surface layer and subsoil is about 18 inches thick. The surface layer is much more gritty than that of the representative profile.

In many places this soil is associated with soils of the Fox series, Rodman series, and other phases of the Casco series. Areas of these associated soils were included with this soil in mapping.

This soil is suited to all crops commonly associated with dairy farming, but lower than normal rainfall decreases productivity. Erosion and soil blowing are the main hazards in farming the soil, but droughtiness is also a hazard. Small grains and corn are the first crops to be affected during dry periods. Runoff is medium. (Capability unit IVe–3; woodland suitability group 5; wildlife group 1)

Casco loam, 2 to 6 percent slopes (CeB).—This soil is mainly on outwash plains in the town of Ripon and in the area near the Kettle Moraine. It has the profile described as representative of the series. Included in mapping were small areas of associated Fox and Rodman soils and small areas in the Lake Winnebago Valley that are underlain by reddish silty clay to clay glacial till at a depth of 42 to 60 inches.

This soil is suited to all crops commonly associated with dairy farming. Casco loam is slightly droughty, and erosion is a slight hazard. Runoff is medium. (Capability unit IIIe–3; woodland suitability group 5; wildlife group 1)

Casco loam, 6 to 12 percent slopes, eroded (CeC2).—This soil is on moraines and outwash plains. The surface layer is about 6 inches thick; the combined surface layer and subsoil is about 18 inches thick. The surface layer is somewhat lighter colored than that of the representative profile. Because several inches of the original surface layer have been lost through erosion, the available water capacity and organic-matter content have been reduced.

In many areas this soil is adjacent to Fox and Rodman soils and to other soils of the Casco series. Small areas of these associated soils were included in mapping.

This soil is suited to all crops commonly grown in the area. Erosion and droughtiness are limitations to use of this soil. Management practices that maintain the organic-matter content and fertility of the surface layer are desirable. Runoff is medium to rapid. (Capability unit IVe–3; woodland suitability group 5; wildlife group 1)

Casco loam, 12 to 20 percent slopes, eroded (CeD2).—This soil is most extensive in the Kettle Moraine area. The surface layer generally is less than 5 inches thick, and the solum is less than 16 inches thick. The surface layer is lighter colored than that described in the representative profile because it has been mixed with subsoil material.

This soil is associated with Rodman soils and with other soils of the Casco series. In places small areas of these adjoining soils were included in mapping.

This soil is suited to permanent pasture, woodland, and wildlife habitat. Erosion of the surface layer has reduced the available water capacity. Runoff is rapid. (Capability unit VIe–3; woodland suitability group 5; wildlife group 1)

Casco soils, 2 to 6 percent slopes, severely eroded (CfB3).—These soils are on moraines and outwash plains.

They have a loam to clay loam surface layer that is less than 4 inches thick in most places. The solum generally is less than 16 inches thick. The surface layer is dark brown to brown in areas where subsoil material has been mixed with the surface layer by tillage. These soils generally are associated with Rodman soils or other Casco soils.

These soils have a moderate erosion hazard. The available water capacity is low, and the surface layer is low in organic-matter content. Runoff is medium. (Capability unit IVe–3; woodland suitability group 5; wildlife group 1)

Casco soils, 6 to 12 percent slopes, severely eroded (CfC3).—These soils are on outwash plains and moraines in the eastern and southeastern parts of the county. They have lost much of the original surface layer and part of the subsoil through erosion. In many places the upper part of the subsoil has been mixed with the surface layer by tillage, and in these places the surface layer is lighter colored than that of the representative profile.

These soils are closely associated with Fox and Rodman soils and with other soils of the Casco series. Areas of these associated soils were included in mapping.

These soils are suited to permanent pasture, woodland, and wildlife habitat. Their use is limited by erosion and low available water capacity. Erosion of the original surface layer has reduced the organic-matter content, available water capacity, and infiltration rate. Runoff is rapid. (Capability unit VIe–3; woodland suitability group 5; wildlife group 1)

Casco soils, 12 to 20 percent slopes, severely eroded (CfD3).—These soils have lost most of their surface layer and part of the subsoil through erosion. Although the soils are not suited to cultivation, some of the subsoil has been mixed into the plow layer by tillage, and the present surface layer is dark brown to brown. The texture ranges from loam to clay loam. The solum generally is less than 14 inches thick.

These soils are associated with Rodman soils and with other soils of the Casco series. Areas of these associated soils were included in mapping.

These soils are suited to limited grazing, woodland, or wildlife habitat. They have a severe erosion hazard. The available water capacity and organic-matter content are low. Runoff is very slow. (Capability unit VIIe–3; woodland suitability group 5; wildlife group 1)

Casco-Hochheim loams, 2 to 6 percent slopes (CmB).—This complex consists of about 60 percent Casco soils and 40 percent Hochheim soils, so closely intermingled that they cannot be mapped separately. Included in mapping were some areas where the surface layer is silt loam.

This complex is suited to all crops commonly grown in the county. Permeability is moderate, and the available water capacity is medium. The hazard of erosion is slight. (Capability unit IIIe–3; woodland suitability group 5; wildlife group 1)

Casco-Hochheim loams, 6 to 12 percent slopes, eroded (CmC2).—This complex consists of about 60 percent Casco soils and 40 percent Hochheim soils, so closely intermingled that they cannot be mapped separately. Part of the original surface layer has been removed by erosion. Included in mapping were some areas where the surface layer is silt loam.

This complex is suited to all crops commonly grown in the county. Permeability is moderate, and the available water capacity is medium. The erosion hazard is moderate. (Capability unit IVe–3; woodland suitability group 5; wildlife group 1)

Casco-Hochheim loams, 12 to 20 percent slopes, eroded (CmD2).—This complex consists of about 60 percent Casco soils and 40 percent Hochheim soils, so closely intermingled that they cannot be mapped separately. Part of the original surface layer has been removed by erosion. Included in mapping were some areas where the surface layer is silt loam.

These soils are suited to all crops commonly grown in the county. Permeability is moderate, and the available water capacity is medium. The hazard of erosion is severe. (Capability unit VIe–3; woodland suitability group 5; wildlife group 1)

Casco-Hochheim complex, 6 to 12 percent slopes, severely eroded (CnC3).—This complex consists of about 60 percent Casco soils and 40 percent Hochheim soils, so closely intermingled that they cannot be mapped separately. Most of the original surface layer and part of the subsoil have been removed by erosion. The available water capacity is medium. The hazard of erosion is severe. (Capability unit VIe–3; woodland suitability group 5; wildlife group 1)

Casco-Hochheim complex, 12 to 20 percent slopes, severely eroded (CnD3).—This complex consists of about 60 percent Casco soils and 40 percent Hochheim soils, so closely intermingled that they cannot be mapped separately. Most of the original surface layer and part of the subsoil have been removed by erosion. The available water capacity is medium. The hazard of erosion is severe. (Capability unit VIIe–3; woodland suitability group 5; wildlife group 1)

Casco-Rodman loams, 6 to 12 percent slopes, eroded (CpC2).—This complex consists of about 65 percent Casco soils and 35 percent Rodman soils. The Casco soils are about 16 inches thick over sand and gravel; the Rodman soils are about 5 inches thick over sand and gravel. The surface layer is dark brown to brown in color and it is loam, sandy loam, gravelly loam, and, in a few places, silt loam in texture. Pebbles and cobblestones are scattered over the surface of the Rodman soils.

This complex occupies morainic hills, ridges, kettle holes, and valleys characteristic of the Kettle Moraine area. Included with these soils in mapping were small areas of Fox soils, shallow organic soils overlying loam, areas of gravelly sand, and a few areas of St. Charles soils. Other Casco-Rodman loams border this complex.

These soils are suited to limited grazing, woodland, and wildlife habitat. The available water capacity is low, and runoff is rapid. (Capability unit VIe–3; woodland suitability group 5; wildlife group 1)

Casco-Rodman loams, 12 to 30 percent slopes (CpE).—This complex consists of about 65 percent Casco soils and 35 percent Rodman soils. The soils are slightly or moderately eroded. The surface layer and solum vary widely in thickness. The surface layer is very dark brown to brown in color and is dominantly loam and gravelly loam in texture. Pebbles and cobblestones are on the surface in moderately eroded spots.

In many places this complex is associated with soils of the Fox and Casco series, as well as with other Casco-Rodman complexes. Small areas of these associated soils were included in mapping.

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This complex has a limited use for pasture, but it is better suited to woodland or wildlife habitat. The soils are droughty, and the erosion hazard is severe. The available water capacity is medium to low. (Capability unit VIIe–3; woodland suitability group 5; wildlife group 1)

Casco-Rodman loams, 12 to 30 percent slopes, severely eroded (CpE3).—This complex consists of about 65 percent Casco soils and 35 percent Rodman soils. Most of the original surface layer and some of the subsoil have been removed by erosion. The surface layer is very thin or is lacking. Pebbles and cobblestones are on the surface in most places.

This complex occupies morainic hills and ridges in the Kettle Moraine area. Many of these areas have been cultivated or heavily grazed. Single slopes predominate, but the slopes are complex in places. Also included in mapping were some associated soils that are only slightly or moderately eroded.

This complex has a limited use for pasture, but it is better suited to woodland or wildlife habitat. The available water capacity is very low, and the erosion hazard is severe. (Capability unit VIIe–3; woodland suitability group 5; wildlife group 1)

Casco-Rodman loams, 30 to 45 percent slopes (CpF).—This complex consists of about 70 percent Rodman soils and 30 percent Casco soils. It occupies morainic hills and ridges in the Kettle Moraine area. The areas include slightly eroded, moderately eroded, and severely eroded soils. The surface layer and solum vary widely in thickness. The surface layer ranges from very dark brown in undisturbed areas to brown in severely eroded areas. It is dominantly gravelly loam. Pebbles and cobblestones are on the surface in the severely eroded spots.

Associated soils are steep and moderately steep. In some places small areas of these associated soils were included in mapping.

This complex is suited to woodland or to wildlife habitat. The very low available water capacity and the erosion hazard are the main limitations. (Capability unit VIIs–5; woodland suitability group 6; wildlife group 7)

Casco Series, Loamy Subsoil Variant

The loamy subsoil variant of the Casco series consists of nearly level to gently sloping, loamy soils that developed in sand and gravel underlain by silt and sand. Hardwood trees were the original vegetation.

In a representative profile the surface layer is very dark grayish-brown loam about 4 inches thick. The subsurface layer is brown loam about 3 inches thick. The subsoil extends to a depth of about 20 inches. It is dark yellowish-brown and brown loam in the upper part and dark-brown and brown clay loam at a depth below 12 inches. The underlying material extends to a depth of about 32 inches. It is dark yellowish-brown gravelly sand in the upper part and silt and sand in the lower part.

These soils are moderate in permeability and natural fertility. They are medium in available water capacity and organic-matter content. The surface layer and subsoil are slightly acid to mildly alkaline. The hazard of erosion is slight.

The soils are mainly in the Milwaukee River watershed in the southeastern part of Fond du Lac County. They are used for crops.

Representative profile of Casco loam, loamy subsoil variant, 0 to 6 percent slopes, cultivated, SW¼NW¼ sec. 28, T. 13 N., R. 19 E.

Ap—0 to 4 inches, very dark grayish-brown (10YR 3/2) loam; weak, fine, granular structure; very friable; mildly alkaline; clear, wavy boundary.

A2—4 to 7 inches, brown (10YR 5/3) loam; weak, thin, platy structure; friable; neutral; clear, irregular boundary.

B1—7 to 10 inches, dark yellowish-brown (10YR 4/4) heavy loam, dark brown (10YR 4/3) when crushed; weak, fine, subangular blocky structure; friable; neutral; clear, irregular boundary.

B21t—10 to 12 inches, brown (10YR 4/3) heavy loam; moderate, fine, angular blocky structure; firm; some brown (10YR 5/3) coatings on ped faces; few patchy clay films; neutral; clear, irregular boundary.

B22t—12 to 15 inches, dark-brown (7.5YR 3/2) clay loam; moderate, fine angular blocky structure; firm; thick, patchy clay films; a few small pebbles; slightly acid; clear, wavy boundary.

B3t—15 to 20 inches, brown (7.5YR 4/4) clay loam; weak, medium, subangular blocky structure; firm; few patchy clay films; numerous pebbles; few plant roots; neutral; abrupt, wavy boundary.

IIC1—20 to 32 inches, dark yellowish-brown (10YR 4/4) gravelly sand; single grain; loose; some cobblestones as much as 5 inches in diameter; moderately alkaline; calcareous; abrupt, wavy boundary.

IIIC2—32 to 60 inches, yellow (10YR 7/6) coarse silt and very fine sand; massive, breaking to weak, medium, platy structure; nonsticky; moderately alkaline; calcareous.

The depth to the IIC1 horizon ranges from 15 to 24 inches. In some places this horizon is silt and sand. The depth to the IIIC2 horizon ranges from about 24 to 42 inches.

Casco loam, loamy subsoil variant, 0 to 6 percent slopes (CgB).—This soil occurs on outwash terraces and old beach ridges. In many places it is bordered by nearly level or gently sloping Martinton silt loams. In some places this soil is bordered by Fox soils that have a lake-laid substratum at a depth of more than 42 inches. Areas of these associated soils were included in mapping.

This soil is well suited to all the principal crops grown in the county. There is a slight erosion hazard in cultivated areas. (Capability unit IIe–2; woodland suitability group 1; wildlife group 1)

Casco Series, Clayey Subsoil Variant

The clayey subsoil variant of the Casco series consists of well drained to moderately well drained soils that are moderately deep over silty clay. These soils formed in glacial outwash that is capped by a thin mantle of silt and underlain by reddish-brown glacial till, or they formed in thin outwash deposits on glacial lake beachlines. The original vegetation was hardwoods.

In a representative profile the surface layer is very dark grayish-brown silt loam about 6 inches thick. The subsurface layer is brown loam about 7 inches thick. The subsoil is mottled, dark-brown and dark reddish-brown clay loam to a depth of 21 inches and dark-brown gravelly sandy loam to a depth of 26 inches. The underlying material is gravelly sand in the upper part and silty clay at a depth below 35 inches.

Permeability is moderate in the subsoil and moderately slow in the substratum. The available water capacity is medium in the rooting zone.

These soils are used mainly for crops. The principal limitation to farming is erosion. Some of the larger areas of these soils, where the gravelly sand layer is thicker than that described in the representative profile, have been used as a source of gravel for highway construction.

Representative profile of Casco loam, clayey subsoil variant, cultivated, NE¼SE¼ sec. 31, T. 16 N., R. 17 E.

A1—0 to 6 inches, very dark grayish-brown (10YR 3/2) loam; moderate, medium, granular structure; very friable; a few pebbles less than 10 millimeters in diameter; mildly alkaline; clear, irregular boundary.

A2—6 to 13 inches, brown (7.5YR 4/4) loam; weak, medium, platy structure; very friable; a few pebbles less than 10 millimeters in diameter; mildly alkaline; clear, irregular boundary.

B1—13 to 16 inches, dark-brown (7.5YR 4/4) light clay loam; moderate, fine, subangular blocky structure; friable; a few pebbles less than 10 millimeters in diameter; mildly alkaline; clear, wavy boundary.

B2t—16 to 21 inches, dark reddish-brown (5YR 3/4) clay loam; a few, fine, very faint mottles in lower part; moderate, medium, subangular blocky structure; firm; a few clay films on all ped faces; a few pebbles less than 10 millimeters in diameter; a few iron concretions; mildly alkaline; clear, wavy boundary.

IIB3—21 to 26 inches, dark-brown (7.5YR 4/4 to 3/4) gravelly sandy loam; few, fine, distinct, reddish-brown (5YR 4/4) mottles; weak subangular blocky structure; loose; strong-brown (7.5YR 5/8) coatings around weathered dolomite fragments; mildly alkaline; clear, irregular boundary.

IIC1—26 to 35 inches, yellowish-brown (10YR 5/4) gravelly sand; few, fine, distinct mottles of strong brown (7.5YR 5/6); single grain; loose; pebbles up to 1 inch in diameter; moderately alkaline; calcareous; abrupt, wavy boundary.

IIIC2—35 to 60 inches, reddish-brown (5YR 4/3) silty clay till; massive; very firm; abundant pebbles and stones; moderately alkaline; calcareous.

The depth to the IIIB3 horizon ranges from 14 to 24 inches. The depth to the IIIC2 horizon ranges from 24 to 42 inches.

Casco loam, clayey subsoil variant, 2 to 6 percent slopes (ChB).—This soil has a surface layer 9 to 12 inches thick and a combined surface layer and subsoil 18 to 24 inches thick. It generally is associated with the somewhat poorly drained Ionia silt loam, clayey subsoil variant, 2 to 6 percent slopes, which is on adjoining foot slopes.

Included with this soil in mapping were a few areas that have a darker surface layer and small areas of Casco loam, 2 to 6 percent slopes. Also included were some areas where the surface layer is silt loam. Some included areas have thin layers of silty clay or silt in the IIB3 and IIC1 horizons.

This soil is well suited to crops generally grown for dairy farming. The hazard of erosion is slight. (Capability unit IIe–6; woodland suitability group 2; wildlife group 1).

DePere Series

The DePere series consists of well drained and moderately well drained, fine-textured soils that formed in alluvium washed mainly from red clay in the glacial drift areas. These soils are on the flood plains of principal streams. The native vegetation was shrubs and trees, such as elm and thornapple.

In a representative profile the surface layer is black silty clay loam about 9 inches thick. The underlying material is moderately alkaline, dark reddish-brown silty clay to a depth of 43 inches and strongly alkaline, reddish-brown silty clay below that depth.

DePere soils have moderately slow permeability and high available water capacity. They are mildly alkaline and moderately alkaline.

These soils are in the towns of Calumet, Taycheedah, Fond du Lac, Friendship, and Eldorado. They are used mainly for pasture. Occasional flooding is the main limitation to farming.

Representative profile of DePere silty clay loam, 0 to 3 percent slopes, uncultivated, NW¼SE¼ sec. 33, T. 15 N., R. 17 E.

A—0 to 9 inches, black (10YR 2/1) silty clay loam; moderate, fine, granular structure; friable; mildly alkaline; gradual, wavy boundary.

C1—9 to 19 inches, dark reddish-brown (5YR 3/3) silty clay; moderate, fine, angular blocky structure; firm; moderately alkaline; gradual, wavy boundary.

C2—19 to 43 inches, dark reddish-brown (5YR 3/4) silty clay; moderate, medium, angular blocky structure; very firm; moderately alkaline; calcareous; clear, wavy boundary.

C3—43 to 48 inches, reddish-brown (5YR 4/3) silty clay; common, fine, prominent mottles of yellowish red (5YR 5/6); weak, fine, subangular blocky structure; very firm; 1- to 6-inch layer contains numerous snail shells and small clam shells, 2 to 15 millimeters in size; strongly alkaline; calcareous; clear, wavy boundary.

C4—48 to 60 inches, reddish-brown (2.5YR 4/4) silty clay; weak, medium, subangular blocky structure; very firm; few limestone fragments, mostly less than 20 millimeters in diameter; strongly alkaline; calcareous.

A wide range of texture occurs at a depth below 30 inches. In places there are layers of sand, gravel, or cobblestones. These coarse layers contain numerous shells of snails and small clams. In places the silty clay loam alluvial deposits are 48 to 60 inches in thickness. Horizonation is moderate to weak. In some places there has been enough clay movement to form a weak, clay-enriched horizon.

DePere silty clay loam, 0 to 3 percent slopes (DcA).—This soil is on flood plains. Included with this soil in mapping were some areas where the surface layer is silt loam, some abandoned stream channels, and some oxbows that are wetter than adjoining areas.

This soil is suited to crops if it is protected from flooding or if drainage is improved. It is subject to occasional flooding during periods of high water in spring and after periods of heavy rainfall. (Capability unit IIw–11; woodland suitability group 1; wildlife group 6)

Dodge Series

The Dodge series consists of nearly level and gently sloping, deep, well-drained soils on uplands. These soils formed in a moderately deep silt mantle and in calcareous loam glacial till.

In a representative profile the surface layer is very dark grayish-brown silt loam about 5 inches thick (fig. 9). The subsurface layer is grayish-brown silt loam 6 inches thick. The subsoil extends to a depth of about 37 inches. It is slightly acid to medium acid, brown silt loam and dark yellowish-brown silty clay loam that is gritty in the lower part. The underlying material is brown loam that contains fragments of dolomite.

Dodge soils are moderately permeable in the subsoil and substratum. The subsoil is neutral, and the substratum is calcareous. The available water capacity is high. These

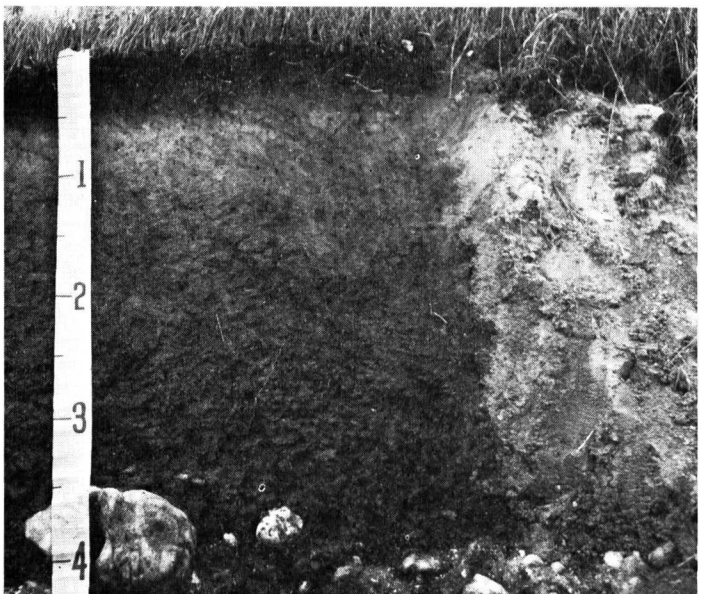

Figure 9.—**Profile of Dodge silt loam.**

soils are moderately fertile, and the organic-matter content of the surface layer is medium.

The most extensive areas of Dodge soils are in the west-central part of the county, in the towns of Rosendale, Springvale, Lamartine, Waupun, and Byron. Nearly all of the acreage has been cleared and is used for crops. Erosion is the main hazard to farming.

Representative profile of Dodge silt loam, 2 to 6 percent slopes, cultivated, NE¼SW¼ sec. 5, T. 15 N., R. 16 E.

Ap—0 to 5 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, fine, granular structure; very friable; neutral; abrupt, smooth boundary.

A2—5 to 11 inches, grayish-brown (10YR 5/2) silt loam; weak, medium, platy structure; friable; some soil from the Ap horizon mixed in by earthworm activity; neutral; clear, wavy boundary.

B1—11 to 19 inches, brown (10YR 4/3) heavy silt loam; moderate subangular blocky structure; firm; light brownish-gray (10YR 6/2) coatings on peds; slightly acid; clear, wavy boundary.

B21t—19 to 24 inches, dark yellowish-brown (10YR 3/4) silty clay loam; moderate, medium, angular blocky structure; very firm; light brownish-gray (10YR 6/2) coatings on peds; thick, continuous clay films; medium acid; clear, wavy boundary.

B22t—24 to 30 inches, dark yellowish-brown (10YR 3/4) silty clay loam; moderate, medium, angular blocky structure; very firm; thick, continuous clay films; medium acid; clear, wavy boundary.

IIB23t—30 to 37 inches, dark yellowish-brown (10YR 3/4) gritty silty clay loam; moderate, coarse, angular blocky structure; very firm; few thin clay films; numerous pebbles; slightly acid; clear, irregular boundary.

IIC—37 to 60 inches, brown (10YR 5/3) loam; massive; friable; numerous dolomite fragments; pockets of laminated silt; mildly alkaline; calcareous.

The A1 or Ap horizon is very dark grayish brown or dark grayish brown and is 5 inches or less thick. The thickness of the solum ranges from 30 to 40 inches, and the thickness of the silt mantle ranges from 20 to 36 inches. In most places the solum developed in silty material. Dodge soils that formed under maple and basswood trees are less acid than Dodge soils that formed under oak and hickory trees, and they have a thinner and darker A1 horizon.

Dodge soils are associated with St. Charles and Mayville soils, the somewhat poorly drained Virgil and Lamartine soils, and the poorly drained Pella soils.

Dodge soils are similar to Lomira soils, except that the lower part of the B horizon is medium acid and slightly acid in the Dodge soils and neutral to mildly alkaline in the Lomira soils. Dodge soils have a less abrupt boundary between the B and C horizons than the Lomira soils. The calcium carbonate equivalent of the substratum ranges from 20 to 40 percent in the Dodge soils and from 60 to 90 percent in the Lomira soils. Dodge soils developed in a thicker silt mantle than Theresa, Hochheim, and LeRoy soils.

Dodge silt loam, 0 to 2 percent slopes (DdA).—This soil has a surface layer 30 to 36 inches thick. The thickness of the combined surface layer and subsoil ranges from 36 to 42 inches. The solum developed mainly in silt.

This soil is on broad areas between gently sloping to sloping ridges and hills. The adjacent soils are other soils of the Dodge series and soils of the Hochheim series. Small areas of Hochheim loam, 0 to 2 percent slopes, were included in mapping.

This soil is well suited to all crops commonly grown in a dairy farming area and to crops used for canning. There are few limitations to farming. (Capability unit I–1; woodland suitability group 1; wildlife group 1)

Dodge silt loam, 2 to 6 percent slopes (DdB).—This soil is on drumlins in the eastern part of the county, and it is on gentle slopes in the west-central part of the county and in the southern part of Byron Township. It has the profile described as representative of the series. It is associated with Dodge silt loam, 0 to 2 percent slopes, and Hochheim loam, 2 to 6 percent slopes. Small areas of these associated soils were included in mapping. (Capability unit IIe–1; woodland suitability group 1; wildlife group 1)

Dodge silt loam, 2 to 6 percent slopes, eroded (DdB2).—This soil is on low ridges and irregularly shaped hills in the west-central part of the county, on drumlins in the east-central part of the county, and in small areas of Byron Township. The surface layer has been eroded to a thickness of only 4 to 7 inches, and the combined surface layer and subsoil is about 30 to 36 inches thick. Scattered light-brown areas occur where the upper part of the subsoil has been exposed by plowing.

This soil is suited to crops. The available water capacity is adequate for normal crop needs. The organic-matter content of the surface layer is somewhat low. (Capability unit IIe–1; woodland suitability group 1; wildlife group 1)

Elburn Series

The Elburn series consists of nearly level and gently sloping, deep, somewhat poorly drained soils on uplands. These soils developed in moderately deep silt and calcareous loam glacial till. The original vegetation was prairie grasses.

In a representative profile the surface layer is black silt loam about 18 inches thick. The subsoil is about 30 inches thick. The first 6 inches is dark grayish-brown silt loam, the next 13 inches is dark-brown silt loam, the next 8 inches is slightly acid, brown silt loam, and the last 3 inches is mildly alkaline brown loam. The underlying material is moderately alkaline, yellowish-brown gravelly loam.

Elburn soils are moderately permeable in the subsoil and substratum. The available water capacity is high, and natural fertility is moderate. The organic-matter content

of the surface layer is high. The surface layer and subsoil are medium acid to mildly alkaline, and the substratum is moderately alkaline.

These soils are on prairies in the western third of the county. Most of the acreage is used for crops. Wetness is the most serious limitation to farming.

Representative profile of Elburn silt loam, 0 to 3 percent slopes, cultivated, SE¼NW¼ sec. 34, T. 16 N., R. 14 E.

Ap—0 to 12 inches, black (10YR 2/1) silt loam; strong, medium, granular structure; very friable; mildly alkaline; clear, wavy boundary.

A1—12 to 18 inches, black (10YR 2/1) silt loam; moderate, medium, granular structure; very friable; slightly acid; clear, irregular boundary.

B1—18 to 24 inches, dark grayish-brown (10YR 4/2) heavy silt loam; few, fine, prominent mottles of yellowish brown (10YR 5/6); weak, fine, subangular blocky structure; friable; medium acid; clear, irregular boundary.

B21t—24 to 31 inches, dark-brown (10YR 4/3) heavy silt loam; common, fine, prominent mottles of yellowish brown (10YR 5/6); moderate, medium, subangular blocky structure; thin, patchy clay films; friable; medium acid; clear, irregular boundary.

B22t—31 to 37 inches, dark-brown (10YR 4/3) heavy silt loam; many, medium, prominent mottles of yellowish-brown (10YR 5/6); moderate, medium, subangular blocky structure; thin, patchy clay films; friable; slightly acid; clear, wavy boundary.

B31—37 to 45 inches, brown (10YR 5/3) silt loam; common, fine, prominent mottles of yellowish brown (10YR 5/6); weak, medium, subangular blocky structure; friable; slightly acid; clear, irregular boundary.

IIB32—45 to 48 inches, brown (10YR 4/3) heavy loam; common, fine, prominent mottles of yellowish brown (10YR 5/6); weak, medium, subangular blocky structure; firm; mildly alkaline; abrupt, irregular boundary.

IIC—48 to 60 inches, yellowish-brown (10YR 5/6) gravelly loam; massive; friable; moderately alkaline; calcareous.

The solum ranges from 45 to 60 inches in thickness. In most places it developed in a silt mantle 36 to 56 inches thick. The IIB32 horizon ranges from loam to clay loam in texture.

Elburn soils are closely associated with the poorly drained Pella soils and the well-drained Plano and Mendota soils; they occupy intermediate positions on the landscape. Elburn soils have thicker A1 and Ap horizons than Virgil soils; they lack the light-colored A2 horizon of those soils.

Elburn silt loam, 0 to 3 percent slopes (EbA).—This soil occupies broad areas between gently sloping low ridges and hills. The adjoining areas generally are slightly to moderately eroded soils of the Plano and Mendota series. Small areas of these associated soils were included in mapping.

If drainage has been improved, this soil is suited to all crops commonly grown in the county. The main limitations to use of this soil are excess water and a seasonal high water table. Alfalfa is subject to winterkill. Runoff is slow. (Capability unit IIw-2; woodland suitability group 12; wildlife group 4)

Elliott Series

The Elliott series consists of deep, somewhat poorly drained, nearly level and gently sloping soils. These soils developed in a thin silt mantle and in shaly glacial till that consists of calcareous silty clay loam.

In a representative profile the surface layer is mildly alkaline and neutral silt loam 17 inches thick. It is black in the upper 12 inches and dark gray in the lower part (fig. 10). The subsoil is slightly acid, mottled dark grayish-brown and brown silty clay 11 inches thick. The underlying material is grayish-brown silty clay loam mottled with yellowish brown.

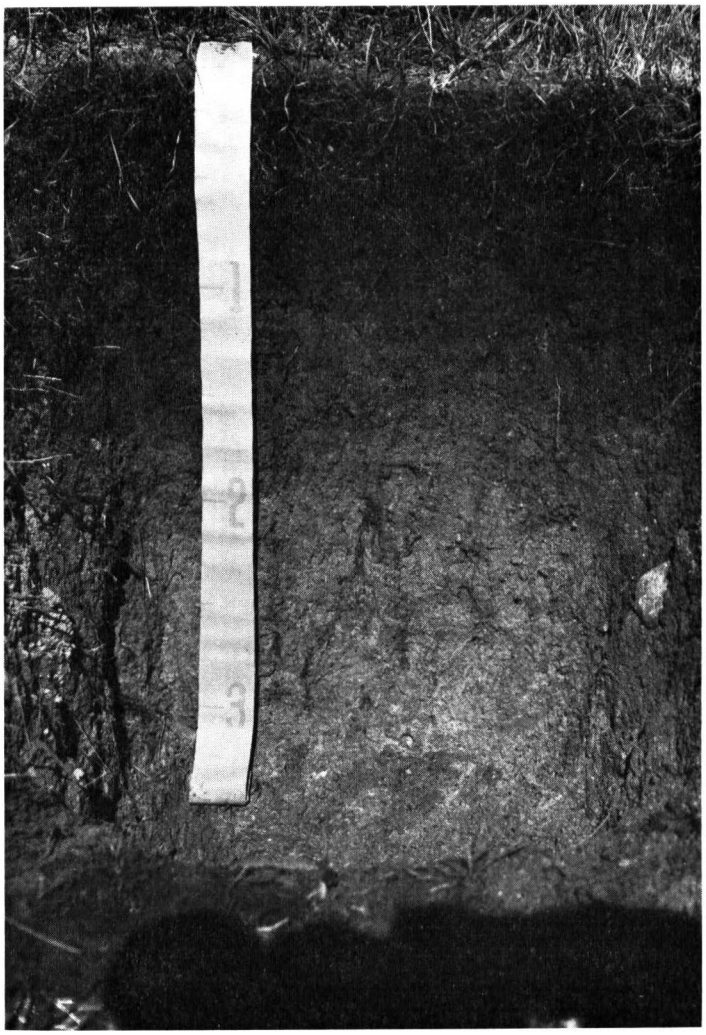

Figure 10.—**Profile of Elliott silt loam.**

Elliott soils have moderately slow permeability in the subsoil and substratum. They are moderately fertile. These soils are high in available water capacity and in organic-matter content of the surface layer. They have a seasonal high water table.

These soils are most extensive in Oakfield and Byron Townships. They are used mainly for crops. The main limitation to use is excess water.

Representative profile of Elliott silt loam, 0 to 2 percent slopes, uncultivated, NE¼SW¼ sec. 5, T. 14 N., R. 17 E.

A1—0 to 12 inches, black (10YR 2/1) silt loam; moderate, fine, granular structure; very friable; mildly alkaline; clear, irregular boundary.

A3—12 to 17 inches, very dark gray (10YR 3/1) heavy silt loam; moderate, fine, granular structure; very friable; neutral; clear, irregular boundary.

IIB2t—17 to 22 inches, dark grayish-brown (10YR 4/2) silty clay; common, fine, prominent mottles of yellowish brown (10YR 5/8); moderate, fine, angular blocky structure; very firm; thin, patchy clay films; some pebbles, mostly less than 10 millimeters in diameter; slightly acid; clear, irregular boundary.

IIB3—22 to 28 inches, brown (10YR 5/3) silty clay; many fine mottles of yellowish brown (10YR 5/8); moderate, medium, angular blocky structure; very firm; some pebbles, mostly less than 10 millimeters in diameter; mildly alkaline; gradual, irregular boundary.

IIC—28 to 60 inches, grayish-brown (10YR 5/2) silty clay loam; common, medium, prominent mottles of yellowish brown (10YR 5/6); weak, medium, prismatic structure and moderate, medium, angular blocky; firm; some pebbles, mostly less than 20 millimeters in diameter; moderately alkaline, calcareous.

The A horizon ranges from a few inches to 20 inches in thickness. The solum ranges from 20 to 36 inches in thickness.

Elliott soils are generally associated with the well drained and moderately well drained Morley soils, the somewhat poorly drained Beecher soils, and the poorly drained Ashkum soils. They are saturated with water for longer periods than Morley soils, and they have a darker, thicker A horizon than those soils. Elliott soils formed in a thinner silt mantle than Plano soils.

Elliott silt loam, 0 to 2 percent slopes (EsA).—This soil is on broad plains. It has the profile described as representative of the series. Poorly drained Ashkum soils and gently sloping Elliott soils are adjacent to this soil in many places. Small areas of these associated soils were included in mapping. Also included were some areas where the glacial till substratum is underlain by weathered shale bedrock at a depth of 42 to 60 inches.

This soil can be used for crops if artificial drainage is installed. A perched seasonal water table at or near the surface is the main limitation to farming this soil. Because of its level position and moderately slow permeability, this soil stays wet longer than more sloping soils. Runoff is slow to very slow. Alfalfa often winterkills. (Capability unit IIw–2; woodland suitability group 12; wildlife group 4)

Elliott silt loam, 2 to 6 percent slopes (EsB).—This soil is on side slopes of low, broad hills and ridges in Oakfield and Eden Townships. The surface layer is 10 to 16 inches thick. The combined surface layer and subsoil is 20 to 34 inches thick. In many places this soil is adjacent to the poorly drained Ashkum soils and to other soils of the Elliott series. Small areas of these associated soils were included with this soil in mapping. Also included were some areas where the substratum grades to weathered shale bedrock at a depth of 42 to 60 inches.

Slight wetness is the main limitation to farming the soil. Alfalfa tends to winterkill where drainage has not been improved. Runoff is slow to medium. (Capability unit IIw–2; woodland suitability group 12; wildlife group 4)

Fox Series

The Fox series consists of nearly level to sloping, well-drained soils on outwash plains. These soils are underlain by loamy outwash or calcareous sand and gravel at a depth of 20 to 40 inches. The original vegetation was hardwood trees.

In a representative profile the surface layer is dark grayish-brown silt loam about 7 inches thick. The subsurface layer is brown silt loam about 3 inches thick (fig. 11). The subsoil extends to a depth of about 35 inches. It is mainly dark-brown silty clay loam, but the uppermost 4 inches is dark yellowish-brown silt loam and the lower 3 inches is dark-brown gravelly loam. The underlying material is yellowish-brown gravel.

Fox soils are moderately permeable in the subsoil and rapidly permeable in the substratum. The available water capacity is medium, and the organic-matter content of the surface layer is medium. These soils are moderately fertile and slightly droughty. They are neutral to slightly acid in the uppermost 30 inches and mildly alkaline below.

Figure 11.—**Profile of Fox silt loam.**

Fox soils occur most extensively in the towns of Marshfield, Forest, Osceola, and Eden; they are also in Ashford, Auburn, and Ripon Townships. Almost all of the acreage is used for crops. The main limitation to use of these soils for farming is droughtiness on level to nearly level soils and erosion on sloping soils.

Representative profile of Fox silt loam, 0 to 2 percent slopes, undisturbed, SE¼SE¼ sec. 10, T. 16 N., R. 19 E.

A1—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; very friable; neutral; abrupt, smooth boundary.

A2—7 to 10 inches, brown (10YR 5/3) silt loam; moderate, thin, platy structure; friable; neutral; clear, wavy boundary.

B11—10 to 14 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, fine, subangular blocky structure; friable; neutral; gradual, wavy boundary.

B12—14 to 20 inches, brown (7.5YR 4/4) silty clay loam; moderate, fine and medium, angular blocky structure; firm; slightly acid; gradual, wavy boundary.

B21t—20 to 29 inches, dark-brown (7.5YR 4/4 to 3/4) silty clay loam; moderate, medium, subangular blocky structure; firm; thick, continuous clay films; slightly acid; clear, wavy boundary.

IIB22t—29 to 32 inches, dark reddish-brown (5YR 3/4) heavy clay loam; moderate, medium, subangular blocky structure; firm; a few pebbles and small cobblestones; mildly alkaline; clear, irregular boundary.

IIB3—32 to 35 inches, dark-brown (7.5YR 4/4) gravelly loam; structureless; loose; cobblestones up to 6 inches in diameter; moderately alkaline; clear, irregular boundary.

IIC—35 to 60 inches, yellowish-brown (10YR 5/4) gravel; single grain; loose; cobblestones up to 6 inches in diameter; moderately alkaline; calcareous.

The loess covering on Fox loam and silt loam soils ranges from a few inches to about 30 inches in thickness. In Fox silt loam, only the lower part of the B horizon developed in sand and gravel. Fox sandy loam developed mainly in loamy outwash. It ranges from sandy clay loam to clay loam in the B horizon.

Fox soils are associated with the somewhat poorly drained Ionia soils and the poorly drained Sebewa soils. They are similar to Casco soils, except that the depth to the sand and gravel substratum is 24 to 40 inches, rather than 10 to 24 inches. In St. Charles, gravelly substratum soils, the depth to sand and gravel is more than 40 inches.

Fox sandy loam, 2 to 6 percent slopes (FmB).—This soil is on the gentle slopes of outwash plains. The surface layer is 10 to 15 inches thick. The depth to sand and gravel ranges from 24 to 36 inches.

This soil generally is associated with Casco soils and with other soils of the Fox series. Areas of these associated soils were included with this soil in mapping.

This soil is suited to all crops commonly grown in the county. Medium available water capacity is the main limitation to use of this soil; minor limitations are soil blowing and water erosion. The organic-matter content of the surface layer is low, and the available water capacity is medium. Runoff is very slow because of moderately rapid permeability and infiltration. (Capability unit IIIs–4; woodland suitability group 3; wildlife group 1)

Fox loam, 2 to 6 percent slopes (FoB).—This soil is mainly on outwash plains; a few small areas are on morainic plateaus. The thickness of the combined surface layer and subsoil ranges from 26 to 36 inches. In many places this soil is adjacent to other soils of the Fox series. Areas of these adjoining soils were included in mapping.

This soil is suited to all crops commonly grown in dairy farming. The available water capacity is medium, and there is a slight hazard of erosion. Runoff is medium; much of the surface water enters the soil. (Capability unit IIe–2; woodland suitability group 1; wildlife group 1)

Fox loam, 2 to 6 percent slopes, eroded (FoB2).—This soil is on broad outwash plains and, in a few places, on moraines. One-third to two-thirds of the original surface layer has been lost through erosion, and the remaining soil is dark brown. The surface layer ranges from 5 to 8 inches in thickness. The combined surface layer and subsoil is about 26 inches thick.

In many places this soil is adjacent to other loam and silt loam soils of the Fox series. Small areas of these associated soils and soils that are severely eroded were included in mapping.

The soil is suited to all the main crops grown on dairy farms. There is a slight hazard of erosion. The available water capacity is medium. Runoff is medium. (Capability unit IIe–2; woodland suitability group 1; wildlife group 1)

Fox loam, 6 to 12 percent slopes, eroded (FoC2).—This soil is on broad outwash plains and moraines. About one-fourth to one-half of the original surface layer has been removed by erosion. In places the upper part of the subsoil has been mixed with the surface layer through tillage. This mixing results in a light-colored surface layer.

This soil is closely associated with other soils of the Fox series. Small areas of these associated soils and some severely eroded soils were included with this soil in mapping.

This soil is suited to most crops commonly grown in dairy farming. Row crops can be grown where erosion is controlled. Erosion is the main hazard in farming this soil. The available water capacity is medium. Runoff is medium. (Capability unit IIIe–2; woodland suitability group 1; wildlife group 1)

Fox silt loam, 0 to 2 percent slopes (FsA).—This soil occurs mainly on the broad outwash plains in the eastern and southeastern parts of the county. It has the profile described as representative of the series. This soil is adjacent to the gravelly substratum variant of the St. Charles series and to other soils of the Fox series. Small areas of these adjoining soils were included in mapping.

This soil is well suited to all the crops commonly grown on dairy farms. Droughtiness is the main limitation. Runoff is slow, and there is no erosion hazard. (Capability unit IIs–1; woodland suitability group 1; wildlife group 1)

Fox silt loam, 2 to 6 percent slopes (FsB).—This soil is on broad outwash plains in the eastern and southeastern parts of the county. The surface layer ranges from 7 to 10 inches in thickness. The depth to gravel ranges from 24 to 36 inches.

This soil is closely associated with Casco soils and with other soils of the Fox series. Areas of these associated soils were included with this soil in mapping.

The main limitation to use of this soil is erosion. The available water capacity is medium. Runoff is medium. (Capability unit IIe–2; woodland suitability group 1; wildlife group 1)

Fox silt loam, 2 to 6 percent slopes, eroded (FsB2).—This soil is on the gentle slopes of broad outwash plains. Because of erosion, the surface layer is less than 6 inches thick and is dark brown in color. In some places the upper part of the subsoil has been mixed with the surface layer by tillage. The depth to gravel generally is less than 30 inches.

This soil is associated with Casco soils and with other soils of the Fox series. Small areas of these associated soils were included in mapping.

This soil is suited to all the crops commonly grown on dairy farms. The available water capacity is medium, but erosion is the main limitation to use for farming. The organic-matter content of the surface layer and the available water capacity have been reduced by loss of soil material. Runoff is medium. (Capability unit IIe–2; woodland suitability group 1; wildlife group 1)

Fox silt loam, 6 to 12 percent slopes, eroded (FsC2).—This soil is on broad outwash plains and moraines. About 3 inches of the original surface layer has been lost through erosion. In some places the upper part of the subsoil has been mixed into the plow layer by tillage, and the resultant surface layer is dark brown to brown.

This soil is associated with Casco soils and with other soils of the Fox series. In places areas of these associated soils were included with this soil in mapping.

This soil is suited to all crops commonly grown on a dairy farm. Although it is droughty at times, erosion is the main limitation to use of this soil for farming. Erosion

control practices are needed where this soil is used for crops. Erosion has decreased the organic-matter content of the surface layer and has reduced the available water capacity. Runoff is medium to rapid. (Capability unit IIIe–2; woodland suitability group 1; wildlife group 1)

Hixton Series

The Hixton series consists of moderately steep and steep, moderately deep, well-drained soils on sandstone escarpments. These soils developed in loamy material underlain by acid, weathered sandstone. The sandstone contains a few pebbles and stones that suggest a glacial influence. The original vegetation was hardwood trees.

In a representative profile the surface layer is very dark grayish-brown loam 5 inches thick. The subsurface layer is yellowish-brown fine sandy loam 2 inches thick. The subsoil is strongly acid and 22 inches thick. It is yellowish-brown fine sandy loam in the upper part, dark-brown loam in the middle part, and strong-brown sandy loam in the lower part. The underlying material is reddish-yellow sand that is strongly acid to medium acid.

Hixton soils are moderately permeable in the subsoil and rapidly permeable in the substratum. They are low in natural fertility and in organic-matter content of the surface layer. The available water capacity is medium. Sandstone bedrock limits root growth in some areas.

These soils occur mainly west and northwest of the city of Ripon. They are used mainly for trees or permanent pasture. They are seldom used for crops, because they are droughty and subject to severe erosion.

Representative profile of Hixton loam, 12 to 30 percent slopes, eroded, uncultivated, NW¼NW¼ sec. 5, T. 16 N., R. 14 E.

A1—0 to 5 inches, very dark grayish-brown (10YR 3/2) loam; moderate, medium, granular structure; very friable; neutral; clear, irregular boundary.

A2—5 to 7 inches, yellowish-brown (10YR 5/4) fine sandy loam; weak, medium, subangular blocky structure; very friable; slightly acid; clear, irregular boundary.

B1—7 to 12 inches, yellowish-brown (10YR 5/4) fine sandy loam; weak, medium, subangular blocky structure; very friable; strongly acid; clear, irregular boundary.

B2—12 to 20 inches, dark-brown (7.5YR 4/4) loam; weak, fine, subangular blocky structure; friable; thin, patchy clay films; strongly acid; clear, irregular boundary.

B3—20 to 29 inches, strong-brown (7.5YR 4/6) sandy loam; weak, medium, subangular blocky structure; very friable; few dark igneous pebbles; strongly acid; gradual, irregular boundary.

C—29 to 60 inches, reddish-yellow (7.5YR 6/6) sand; single grain; loose; few sandstone fragments at a depth of 36 to 60 inches; strongly acid at a depth of 36 inches to medium acid at a depth of 60 inches.

The solum ranges from 20 to 36 inches in thickness. The A1 horizon ranges from very dark grayish brown to dark brown in color. Few to common dark-colored glacial pebbles occur throughout the profile. Sandstone bedrock is at a depth of more than 40 inches.

Hixton loam, 12 to 30 percent slopes, eroded (HhE2).—This soil is on steep sandstone escarpments in the western part of Ripon Township. The surface layer generally is less than 8 inches thick, and the depth to underlying sand is less than 36 inches. Included with this soil in mapping were areas of gritty silt loam and fine sandy loam, as well as soils in all stages of erosion.

This soil is suited to limited grazing, trees, or wildlife habitat. The available water capacity is low. (Capability unit VIe–1; woodland suitability group 3; wildlife group 1)

Hochheim Series

The Hochheim series consists of deep, well-drained soils on uplands. These soils developed in calcareous glacial loam till. The original vegetation was hardwood trees.

In a representative profile the surface layer is very dark grayish-brown and dark-brown loam 9 inches thick (fig. 12). The subsoil is mildly alkaline, dark-brown clay loam 8 inches thick. The underlying material is moderately alkaline, yellowish-brown gravelly loam.

Hochheim soils are moderately permeable in the subsoil and substratum. The undisturbed surface layer is neutral to mildly alkaline. These soils are high in available water capacity and natural fertility. The organic-matter content of the surface layer is medium.

These soils occur in most townships, but they are common in the drumlin area in the eastern third of the county. Many of the gently sloping to sloping soils are used for crops; steeper areas are used mainly for trees or permanent pasture. The erosion hazard is the main limitation to use of these soils for farming.

Representative profile of Hochheim loam, 2 to 6 percent slopes, uncultivated, SE¼SW¼ sec. 26, T. 15 N., R. 18 E.

A1—0 to 7 inches, very dark grayish-brown (10YR 3/2) loam; moderate, medium, granular structure; very friable; mildly alkaline; clear, irregular boundary.

Figure 12.—**Profile of Hochheim loam.**

A3—7 to 9 inches, dark-brown (10YR 4/3) loam; weak, thin, platy structure; very friable; some of this horizon has been mixed into the A1 horizon by earthworms; neutral; clear, irregular boundary.

B2t—9 to 15 inches, dark-brown (7.5YR 3/2 to 3/4) clay loam; moderate, fine, subangular blocky structure; firm; thick, continuous clay films; mildly alkaline; clear, wavy boundary.

B3t—15 to 17 inches, dark-brown (7.5YR 4/4) clay loam; weak, medium, subangular blocky structure; firm; thin, patchy clay films; mildly alkaline; clear, irregular boundary.

C—17 to 60 inches, yellowish-brown (10YR 5/4) gravelly loam; massive; friable; moderately alkaline; calcareous.

The thickness of the solum ranges from 10 to 24 inches. The A1 horizon ranges from very dark brown in the virgin soils to dark yellowish brown where the soil has been farmed and part of the original A horizon has been lost through erosion. In some places the C horizon is channery loam till.

Hochheim soils have a thinner, less acid solum than the associated Theresa soils. In Hochheim soils, the proportion of the B horizon that developed in till is larger than that of the B horizon of LeRoy soils. The C horizon of Hochheim soils has a calcium carbonate equivalent of 40 to 60 percent, as compared with 60 to 90 percent for LeRoy soils.

Hochheim loam, 2 to 6 percent slopes (HmB).—This soil occupies the narrow crests and, in places, the base slopes of drumlins and hills in the eastern part of the county, as well as the side slopes of ridges and knobs in the western part of the county. It has the profile described as representative of the series. The surface layer ranges from 9 to 12 inches in thickness. The combined surface layer and subsoil is 16 to 24 inches thick over glacial till.

This soil is associated with Theresa and Dodge soils. Small areas of these associated soils were included in mapping.

This soil is well suited to all the principal crops commonly grown on a dairy farm. There is a slight hazard of erosion. (Capability unit IIe–1; woodland suitability group 1; wildlife group 1)

Hochheim loam, 2 to 6 percent slopes, eroded (HmB2).—This soil is mainly on the side slopes of low drumlins and the upper slopes of larger drumlins and hills in the eastern part of the county. A few small areas are on the side slopes of low ridges and hills in the western part of the county. The surface layer is dark brown to brown and ranges from 5 to 9 inches in thickness. The thickness of the combined surface layer and subsoil ranges from 15 to 22 inches.

This soil generally is associated with soils of the Theresa and Dodge series. Small areas of these associated soils were included in mapping.

This soil is well suited to all the main crops commonly grown in the county. Erosion is the main limitation to use. (Capability unit IIe–1; woodland suitability group 1; wildlife group 1)

Hochheim loam, 6 to 12 percent slopes (HmC).—This soil is on short side slopes of drumlins and hills in the eastern part of the county and, to a lesser extent, on short side slopes of ridges and knobs in the western part of the county. The surface layer ranges from 7 to 10 inches in thickness. It is very dark brown in undisturbed areas and dark brown to brown where cultivated. The thickness of the combined surface layer and subsoil ranges from 14 to 22 inches.

This soil generally is associated with other soils in the Hochheim series. Small areas of these associated soils were included in mapping.

Runoff is more rapid than on the more gently sloping Hochheim soils. (Capability unit IIIe–1; woodland suitability group 1; wildlife group 1)

Hochheim loam, 6 to 12 percent slopes, eroded (HmC2).—This soil is on short side slopes of drumlins and hills in the eastern part of the county; there are a few scattered areas in the western part. Erosion has reduced the original surface layer to a thickness of 4 to 8 inches. It is dark brown to brown. The combined surface layer and subsoil generally is less than 22 inches thick.

This soil has a moderate erosion hazard. The surface layer has a lower organic-matter content than is typical for the series. Runoff is medium. (Capability unit IIIe–1; woodland suitability group 1; wildlife group 1)

Hochheim loam, 12 to 20 percent slopes (HmD).—This soil is on the side slopes of drumlins and hills in the eastern part of the county. In many places it is adjacent to soils of the Theresa series. Small areas of these adjacent soils, as well as other soils of the Hochheim series, were included with this soil in mapping. Also included were areas where the substratum has pockets of layered gravel, sand, and in places, silt.

The erosion hazard is severe. (Capability unit IVe–1; woodland suitability group 1; wildlife group 1)

Hochheim loam, 12 to 20 percent slopes, eroded (HmD2).—This soil is on the side slopes of drumlins and hills in the eastern part of the county. All but 3 to 6 inches of the original surface layer has been lost through erosion. The remaining surface layer is dark brown to brown. The thickness of the combined surface layer and subsoil is less than 20 inches.

This soil is adjacent to the Casco-Hochheim complex and to other soils of the Hochheim series. Areas of these associated soils that are too small to map separately were included with this soil in mapping. Also included were areas where the substratum contains pockets or strata of fine sand, medium sand, and gravel.

Erosion is a severe limitation to use of this soil. (Capability unit IVe–1; woodland suitability group 1; wildlife group 1)

Hochheim loam, 20 to 30 percent slopes (HmE).—This soil is on the steep side slopes of drumlins and hills in the eastern and southeastern parts of the county. The surface layer generally is less than 8 inches thick, and the combined surface layer and subsoil is less than 21 inches thick.

In many places this soil is adjacent to the Casco-Hochheim complex and to other soils of the Hochheim series. Small areas of these associated soils were included in mapping. Also included were some areas where the substratum contains pockets or layers of silt, very fine sand, sand, and gravel.

This soil is suited to limited grazing, trees, or wildlife habitat. Because of the severe erosion hazard and steep slopes, it is not suited to crops. Runoff is rapid. (Capability unit VIe–1; woodland suitability group 1; wildlife group 1)

Hochheim soils, 2 to 6 percent slopes, severely eroded (HoB3).—These soils are mainly on the upper slopes of oval-shaped drumlins and low ridges in the eastern part of the county, but some areas are on hills in the western part of the country. They are associated with other soils of the Hochheim series. Erosion is so severe that the surface layer or plow layer is made up mainly of subsoil material.

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The thickness of the combined surface layer and subsoil ranges from 12 to 20 inches. The surface layer is brown clay loam in areas where the subsoil has been mixed into the plow layer by tillage.

Erosion is the main limitation to use of these soils. The organic-matter content of the surface layer is low. The rate of infiltration is slow, and runoff is moderate. (Capability unit IIIe–1; woodland suitability group 1; wildlife group 1)

Hochheim soils, 6 to 12 percent slopes, severely eroded (HoC3).—These soils are mainly on side slopes of drumlins and hills in the eastern part of the county, but a few areas are on ridges and hills in the western part. The surface layer consists mainly of subsoil material. It is brown clay loam in areas where the upper part of the subsoil has been mixed with the surface layer through tillage. In places so much of the subsoil has been eroded away that scattered pebbles and small stones are on the surface. The thickness of the combined surface layer and subsoil ranges from 10 to 20 inches.

Included with these soils in mapping were small areas of other Hochheim soils.

The organic-matter content of the surface layer is low. Runoff is rapid, and the rate of infiltration is slow. (Capability unit IVe–1; woodland suitability group 1; wildlife group 1)

Hochheim soils, 12 to 20 percent slopes, severely eroded (HoD3).—These soils generally occupy the side slopes of oval-shape drumlins and hills in the eastern part of the county. Many individual drumlins are made up entirely of these soils. The surface layer consists mainly of subsoil material. It is brown to light-brown clay loam in areas where the subsoil has been mixed with the surface layer through tillage. In places a large part of the subsoil is also eroded away, and scattered pebbles and small stones are on the surface.

These soils are associated with other soils of the Hochheim series. Small areas of these associated soils were included in mapping.

These soils are suited to pasture, trees, and wildlife habitat. The erosion hazard is severe, and the organic-matter content of the surface layer is very low. Runoff is rapid, and the rate of infiltration is slow. (Capability unit VIe–1; woodland suitability group 1; wildlife group 1)

Hochheim soils, 20 to 30 percent slopes, severely eroded (HoE3).—These soils are on drumlins in the eastern part of the county, especially in the towns of Empire, Eden, and Ashford. The thickness of the combined surface layer and subsoil generally is less than 18 inches. In places so much of the subsoil is eroded away that scattered pebbles and stones are on the surface.

These soils are associated with Theresa soils, 12 to 20 percent slopes, severely eroded. Small areas of the associated soils were included in mapping.

These soils are suited to pasture, trees, and wildlife habitat. The organic-matter content of the surface layer is very low. Runoff is very rapid, and the infiltration rate is very slow. (Capability unit VIIe–1; woodland suitability group 1; wildlife group 1)

Houghton Series

The Houghton series consists of organic soils that formed in the remains of such fibrous plants as grasses, sedges, reeds, and other nonwoody plants. These soils occupy small depressions a few acres in size or entire valley bottoms that cover several hundred acres.

In a representative profile the surface layer is black mucky peat 16 inches thick. Below this, to a depth of about 60 inches, is dark reddish-brown and dark-brown distintegrated and finely divided sedge peat.

The Houghton soils are neutral to mildly alkaline. The available water capacity is very high, and the water table is high. Natural fertility is moderately low.

Soils of the Houghton series, the most extensive of the organic soils in this county, occur throughout the county. They are primarily under a cover of native vegetation. Some areas are used for permanent pasture, but scattered areas have been drained and are used for crops. These soils are subject to ponding. Where they have been drained, subsidence and soil blowing are serious hazards. Many areas that are not cropped at present represent an important farm potential.

Representative profile of Houghton mucky peat, cultivated, SW¼NE¼ sec. 14, T. 15 N., R. 18 E.

1—0 to 8 inches, black (7.5YR N 2/0) mucky peat; moderate, fine, granular structure; very friable; many, fine, fibrous roots of reed canarygrass; mildly alkaline; clear, smooth boundary.

2—8 to 16 inches, black (10YR 2/1) mucky peat; moderate, fine, subangular blocky structure; friable; many, fine, fibrous roots of reed canarygrass; mildly alkaline; clear, wavy boundary.

3—16 to 24 inches, dark reddish-brown (5YR 3/3) disintegrated sedge peat; weak, coarse, subangular blocky structure; friable; more than 50 percent of mass is identifiable sedge, grass, and rush fibers; mildly alkaline; gradual, wavy boundary.

4—24 to 60 inches, dark-brown (7.5YR 3/2) finely divided sedge peat; weak, thick, platy structure; friable; mildly alkaline.

In some areas the soil contains a small amount of woody material. In places a layer of sedimentary peat occurs immediately above the mineral horizon. The depth to the mineral horizon ranges from 42 inches to about 10 feet.

Houghton soils are similar to Carbondale soils, except that they developed from fibrous plants rather than from mixed fibrous and woody plants. Shallow organic soils commonly associated with Houghton soils are the Ogden, Palms, Adrian, and Rollin soils. These soils consist of 12 to 42 inches of organic material over clay, loam, sand, and marl.

Houghton mucky peat (Hu).—This organic soil occurs as nearly level or slightly depressed areas. Generally, more than 50 percent of the soil mass is identifiable as nonwoody plant remains. This soil is associated with soils of the Palms, Adrian, Rollin, and Carbondale series. In places small areas of these associated soils were included in mapping.

Wetness is the main limitation to the use of this soil for farming. In drained areas, subsidence and soil blowing are serious hazards. (Capability unit IIIw–9; woodland suitability group 10; wildlife group 5)

Ionia Series

The Ionia series consists of nearly level and gently sloping, moderately well drained soils on outwash plains. These soils formed in a moderately deep silt mantle and calcareous, stratified sand and gravel. The original vegetation was hardwoods.

In a representative profile the surface layer is dark grayish-brown silt loam 6 inches thick. The subsurface

layer is yellowish-brown silt loam 3 inches thick. The subsoil extends to a depth of about 29 inches. It is mainly dark-brown silty clay loam and clay loam to a depth of 24 inches and brown gravelly clay loam below. The underlying material is calcareous sand and gravel.

Ionia soils are moderately permeable in the subsoil and rapidly permeable in the substratum. The available water capacity is medium, except in Ionia sandy loam, 0 to 3 percent slopes. These soils are moderately fertile. The organic-matter content of the surface layer is medium. The surface layer and subsoil are neutral to mildly alkaline, and the substratum is moderately alkaline.

Ionia soils occur mainly in the towns of Marshfield, Forest, Osceola, Eden, Auburn, and Ashford. Most areas have been cleared and are used for crops and pasture. The use of these soils is limited mainly by the hazard of erosion and a fluctuating water table. In spring and during periods of prolonged rainfall, the water table is at or near the surface.

Representative profile of Ionia silt loam, 0 to 2 percent slopes, cultivated, SE¼NW¼ sec. 14, T. 16 N., R. 19 E.

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium and fine, granular structure; friable; mildly alkaline; abrupt, wavy boundary.

A2—6 to 9 inches, yellowish-brown (10YR 5/4) silt loam; few, fine, distinct mottles of strong brown (7.5YR 5/6); weak, thin, platy structure; friable; some mixing by earthworms with material from the Ap horizon; mildly alkaline; clear, wavy boundary.

B1—9 to 12 inches, dark-brown (7.5YR 4/4) heavy silt loam; common, fine, distinct mottles of strong brown (7.5YR 5/6); weak, medium, subangular blocky structure; firm; neutral; clear, irregular boundary.

B21t—12 to 19 inches, dark-brown (7.5YR 4/4) silty clay loam; common, fine, distinct mottles of strong brown (7.5YR 5/6); moderate, fine, angular blocky structure; firm; few, thin, patchy clay films; mildly alkaline; clear, irregular boundary.

B22t—19 to 24 inches, dark-brown (10YR 4/3) clay loam; many, medium, prominent mottles of strong brown (7.5YR 5/6); moderate, very fine, subangular blocky structure; firm; thin, patchy clay films; mildly alkaline; clear, irregular boundary.

IIB3—24 to 29 inches, brown (10YR 4/3) gravelly loam; many, medium, distinct mottles of strong brown (7.5YR 5/6); weak, medium, subangular blocky structure; friable; mildly alkaline; gradual, irregular boundary.

IIC—29 to 60 inches, dark yellowish-brown (10YR 4/4) sand and gravel; single grain; loose; moderately alkaline; calcareous.

The thickness of the solum ranges from 20 to 40 inches. The A1 horizon, where present, generally is very dark brown (10YR 2/2), and the Ap horizon is dark grayish-brown (10YR 4/2). The size of particles in the IIC horizon ranges from that of medium sand to cobblestones 8 inches in diameter.

Ionia soils are closely associated with the well-drained Fox soils and the poorly drained Sebewa soils. Ionia soils are similar to Virgil soils, except that they are underlain by sand and gravel at a depth of 40 inches or more.

Ionia sandy loam, 0 to 3 percent slopes (InA).—This soil is on terraces and outwash plains in the Kettle Moraine area. The surface layer generally is about 10 inches thick. The combined surface layer and subsoil ranges from 24 to 30 inches in thickness.

In many places this soil is associated with other Ionia soils. Small areas of these associated soils were included in mapping.

Where drainage is not improved, this soil is suited to limited grazing, small grains, trees, or wildlife habitat. The main limitation to use of this soil is wetness. In spring and after heavy rains the water table is at or near the surface. The available water capacity is medium, and runoff is slow. Alfalfa stands are winterkilled. The surface layer has a low content of organic matter. (Capability unit IIIs–4; woodland suitability group 3; wildlife group 1)

Ionia silt loam, 0 to 2 percent slopes (IoA).—This soil is in drainageways and broad wetland areas. It has the profile described as representative of the series. The silt mantle over the sand and gravel substratum generally ranges from 20 to 36 inches in thickness.

This soil is associated with Fox and Sebewa soils. Areas of these associated soils were included with this soil in mapping. Also included were some soils that developed in a thicker mantle of silt.

Where adequately drained, this soil is suited to all the crops commonly grown in the county. Alfalfa stands are often winterkilled. Use of this soil is limited by wetness. In spring and after heavy rains the water table is at or near the surface. Runoff is slow. (Capability unit IIs–1; woodland suitability group 3; wildlife group 1)

Ionia silt loam, 2 to 6 percent slopes (IoB).—This soil is in narrow wetland areas adjacent to wet soils and river valleys. The surface layer and subsoil are somewhat thinner than described as typical. Little or no mottling occurs in the lower part of the surface layer, and the upper part of the subsoil is more weakly defined than is typical.

This soil is associated with Fox and Sebewa soils. Areas of these associated soils were included in mapping. Also included in a few places were soils that developed in silt, more than 36 inches thick, that is underlain by layered sand and gravel.

Where drainage has been improved, this soil is suited to all the principal crops grown in the county. Wetness caused by the fluctuating water table is the main limitation to farming this soil. Seepage from adjacent higher lying soils contributes to this wetness. Runoff is medium. The erosion hazard is slight. (Capability unit IIe–2; woodland suitability group 3; wildlife group 1)

Ionia Series, Loamy Subsoil Variant

The loamy subsoil variant of the Ionia series consists of well-drained, nearly level to gently sloping soils. These soils formed in loamy outwash material underlain by lake-laid sand and silt. The original vegetation was hardwoods.

In a representative profile the surface layer is dark grayish-brown silt loam 8 inches thick. The subsoil is 19 inches thick. It is brown and dark-brown clay loam in the upper part and brown sandy loam in the lower part. The underlying material is layered, light-gray and very pale brown sand, silt, and silty clay loam.

These soils are used mainly for crops. They are moderately slowly permeable and have high available water capacity.

Representative profile of Ionia silt loam, loamy subsoil variant, 0 to 3 percent slopes, cultivated, SW¼NE¼ sec. 34, T. 13 N., R. 19 E.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium, subangular blocky structure; friable; neutral; abrupt, wavy boundary.

B21t—8 to 13 inches, brown (10YR 4/3) clay loam; common, fine, faint mottles of yellowish brown (10YR 5/4); moderate, medium, subangular blocky structure; firm; thin, patchy clay, films; neutral; clear, wavy boundary.

B22t—13 to 18 inches, dark-brown (10YR 3/3) clay loam; many, medium, prominent mottles of strong brown (7.5YR 5/6); weak, medium, subangular blocky structure; friable; thin, patchy clay films; few pebbles less than 5 millimeters in diameter; neutral; clear, irregular boundary.

B3—18 to 27 inches, brown (10YR 5/3) sandy loam; many, medium, prominent mottles of yellowish brown (10YR 5/6); weak, fine, subangular blocky structure; very friable; abundant pebbles less than 15 millimeters in diameter; neutral; abrupt, wavy boundary.

IIC—27 to 60 inches, light-gray (10YR 7/2) and very pale brown (10YR 7/3) layers of very fine sand, silt, and silty clay loam; many, medium, prominent mottles of yellowish brown (10YR 5/6); massive; loose; moderately alkaline.

The depth to the IIC horizon is about 20 to 42 inches. These soils are generally associated with soils of the Casco series.

Ionia silt loam, loamy subsoil variant, 0 to 3 percent slopes (IrA).—This soil occupies the foot slopes of a glacial lake beachline that extends through the townships of Calumet, Taycheedah, Fond du Lac, and Friendship. Areas of Casco loam, loamy subsoil variant, 0 to 6 percent slopes, were included with this soil in mapping. West of Lake Winnebago, some profiles have a darker surface color than that of the representative profile.

Except for alfalfa, all crops commonly grown in the county grow well on this soil. In spring or during rainy seasons, a perched water table is near the surface in many places. (Capability unit IIs–1; woodland suitability group 2; wildlife group 1)

Ionia Series, Clayey Subsoil Variant

The clayey subsoil variant of the Ionia series consists of moderately dark colored, moderately well drained, loamy soils. These soils formed in loamy material and water-laid sand and gravel, underlain by silty clay glacial till. The native vegetation was hardwoods.

In a representative profile the surface layer is very dark grayish-brown loam 5 inches thick. The subsurface layer is dark grayish-brown loam 3 inches thick. The subsoil is 10 inches thick; it is dark-brown clay loam in the upper part and brown loam in the lower part. The underlying material is sand and gravel in the upper part and reddish-brown silty clay in the lower part.

These soils are used mainly for crops. The surface layer is medium in organic-matter content. The rooting zone has high available water capacity. Permeability is moderate, except in the lower part of the substratum, where it is slow.

Representative profile of Ionia silt loam, clayey subsoil variant, 2 to 6 percent slopes, cultivated, NE¼SE¼ sec. 31, T. 16 N., R. 17 E.

Ap—0 to 5 inches, very dark grayish-brown (10YR 3/2) loam; moderate, medium, granular structure; very friable; neutral; clear, irregular boundary.

A2—5 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium, platy structure; very friable; worm casts; neutral; clear, irregular boundary.

B2—8 to 16 inches, dark-brown (7.5YR 4/3) clay loam; few, medium, prominent mottles of strong brown (7.5YR 5/6); moderate, medium, subangular blocky structure; firm; thick, continuous clay films; worm casts; neutral; clear, irregular boundary.

B3—16 to 18 inches, brown (7.5YR 5/4) loam; common medium, distinct mottles of strong brown (7.5YR 5/6); weak, medium, subangular blocky structure; friable; a few weathered dolomite fragments; neutral; clear, irregular boundary.

IIC1—18 to 26 inches, brown (10YR 5/3) coarse sand and gravel that has thin seams of reddish-brown (5YR 4/4) fine sand; single grain; loose; moderately alkaline; calcareous; abrupt, wavy boundary.

IIC2—26 to 60 inches, reddish-brown (5YR 4/3) silty clay; massive; very firm; some pebbles; moderately alkaline; calcareous.

The A horizon ranges from 6 to 10 inches in thickness. The depth to the IIC1 horizon ranges from 16 to 24 inches. The depth to the IIC2 horizon ranges from 24 to 42 inches.

The glacial lake beach deposits, from which these soils formed, occur as a low intermittent ridge that roughly parallels the present shoreline of Lake Winnebago. This ridge is at an elevation of 800 feet.

Ionia silt loam, clayey subsoil variant, 2 to 6 percent slopes (IsB).—This soil is on short slopes in Calumet, Taycheedah, Fond du Lac, and Friendship Townships. In most places it is associated with the well-drained Casco soils. Areas of these associated soils, as well as of other Ionia soils, were included with this soil. West of Lake Winnebago, soils were included that have a darker surface layer. In other places soils were included that have a 1- to 4-inch band of silt to silty clay in the lower part of the solum or upper part of the substratum.

This soil is well suited to most crops grown in dairy farming. Alfalfa stands in depressions or gently sloping waterways are winterkilled. In spring or during rainy seasons, a perched water table above the clayey substratum saturates this soil. The erosion hazard is slight. (Capability unit IIe-2; woodland suitability group 2; wildlife group 1)

Juneau Series

The Juneau series consists of deep, nearly level and gently sloping, well drained and moderately well drained, silty alluvial soils. These soils are underlain by moderately well drained and somewhat poorly drained, buried soils at a depth of 12 to 36 inches. They occupy low valleys, small depressions, and drainageways on uplands.

In a representative profile the surface layer is very dark grayish-brown alluvial silt loam in the upper 28 inches and brown silt loam to a depth of 33 inches. The subsoil is 27 inches thick; it is dark yellowish-brown silt loam in the upper part and dark-brown silty clay loam and clay loam in the lower part. Pebbles occur at the boundary between this layer and the underlying material. The underlying material is yellowish-brown loam.

Juneau soils are moderately permeable and have high available water capacity. They are neutral in the surface layer and slightly acid to mildly alkaline in the underlying layers. The surface layer is medium in organic-matter content. These soils are moderately fertile.

These soils are in the drumlin area in the eastern part of the county, where they occur in association with steep soils of the LeRoy, Lomira, and Theresa series. They generally are cultivated. Unless they are protected from erosion, these soils are subject to continued deposition during periods of heavy rainfall.

Representative profile of Juneau silt loam, 0 to 2 percent slopes, cultivated, NE¼NE¼ sec. 13., T. 15 N., R. 18 E.

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, medium, granular structure; very friable; neutral; abrupt, wavy boundary.

A1—8 to 28 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, fine granular structure; very friable; neutral; abrupt, wavy boundary.
A2b—28 to 33 inches, brown (10YR 5/3) silt loam; weak, medium, platy structure; very friable; neutral; clear, irregular boundary.
B1b—33 to 36 inches, dark yellowish-brown (10YR 4/4) heavy silt loam; weak, fine, subangular blocky structure; firm; neutral; clear, irregular boundary.
B21b—36 to 52 inches, dark-brown (10YR 4/3) silty clay loam; moderate, medium, subangular blocky structure; firm; neutral; clear, irregular boundary.
IIB22b—52 to 60 inches, dark-brown (7.5YR 3/2) clay loam; few, fine, distinct mottles of strong brown (7.5YR 5/6); weak, medium, subangular blocky structure; firm; abundant pebbles; slightly acid; clear, irregular boundary.
IIC—60 to 72 inches, yellowish-brown (10YR 5/4) loam; massive; friable; moderately alkaline; calcareous.

The thickness of the silty alluvium ranges from 12 to 36 inches. In some places the alluvium contains some gritty or loamy material washed from adjacent severely eroded soils. In a few places dolomite bedrock occurs at a depth of about 4 feet.

Juneau soils are similar to Washtenaw soils, except that Juneau soils are well drained to moderately well drained and Washtenaw soils are poorly drained. The alluvial horizons of Wallkill soils are similar to those of the Juneau soils, except that they are underlain by organic material.

Juneau silt loam, 0 to 2 percent slopes (JuA).—This soil occupies narrow drainageways and fairly broad foot slopes throughout the county. It has the profile described as representative of the series. In many places this soil is adjacent to moderately eroded and severely eroded Hochheim and Dodge soils. Included with this soil in mapping were small areas where the alluvial deposits are less than 12 inches thick.

This soil is well suited to all crops commonly grown on a dairy farm. The main hazard to use of this soil is overwash that carries soil from adjacent slopes. (Capability unit I-1; woodland suitability group 2; wildlife group 6)

Juneau silt loam, 2 to 6 percent slopes (JuB).—The silty alluvial part of this soil generally is less than 24 inches thick. The alluvial layers have very little mottling. This soil occupies short, gentle slopes at the base of more strongly sloping, moderately and severely eroded soils. Dodge and Hochheim soils are on many of the adjacent slopes. Small areas of these associated soils were included in mapping. Also included were small areas where the alluvium is less than 12 inches thick.

The main limitation to use of this soil is overwash and deposition from adjacent hills. (Capability unit IIe-1; woodland suitability group 2; wildlife group 6)

Keowns Series

The Keowns series consists of deep, poorly drained soils that formed in a thin silt mantle and in lake-laid calcareous silt and fine sand. Keowns soils occupy depressions and drainageways on old glacial lake plains. The original vegetation was water-tolerant trees, shrubs, and grass.

In a representative profile the surface layer is black silt loam 10 inches thick. The subsurface layer is mottled, dark grayish-brown silt loam 6 inches thick. The subsoil is slightly calcareous, light brownish-gray fine sandy loam 8 inches thick. The underlying material is mottled, light brownish-gray, slightly calcareous silt and fine sand.

Permeability is moderate, except in the substratum, where it is moderately slow. The available water capacity is high, and fertility is moderate to high. The organic-matter content of the surface layer is high. The solum is mildly alkaline, and the underlying material is moderately alkaline.

Keowns soils occupy a small acreage in Fond du Lac and North Fond du Lac and the Kettle Moraine area. They are used for permanent pasture and for crops if drainage has been improved. Water is at or near the surface most of the year.

Representative profile of a Keowns silt loam, uncultivated, SW¼SE¼ sec. 4, T. 15 N., R. 17 E.

A1—0 to 10 inches, black (10YR 2/1) silt loam; moderate, medium, granular structure; very friable; mildly alkaline; clear, irregular boundary.
A3g—10 to 16 inches, dark grayish-brown (10YR 4/2) silt loam; few light yellowish-brown (10YR 6/4) mottles; weak, medium, subangular blocky structure; friable; mildly alkaline; clear, irregular boundary.
B2g—16 to 24 inches, light brownish-gray (2.5Y 6/2) fine sandy loam; few, fine, distinct mottles of brownish yellow (10YR 6/8) and light yellowish brown (10YR 6/4); weak, medium, subangular blocky structure; friable; mildly alkaline; calcareous; clear, irregular boundary.
Cg—24 to 60 inches, light brownish-gray (10YR 6/2) silt and fine sand; many, coarse, distinct mottles of brownish yellow (10YR 6/8) and yellowish brown (10YR 5/4); structureless; friable; moderately alkaline; calcareous.

The solum ranges from 20 to 36 inches in thickness. In some areas the C horizon contains thin lenses of reddish-brown silty clay, silty clay loam, or clay loam.

Keowns soils resemble Pella soils in natural drainage, but they developed in a thinner silt mantle than Pella soils and have underlying layers of silt and fine sand, rather than glacial till. The poorly drained Wauseon soils consist of fine and medium sand underlain by reddish silty clay glacial till at a depth of 20 to 40 inches.

Keowns silt loam (Km).—This soil is in nearly level areas and depressions. In Taycheedah, Fond du Lac, and Friendship Townships, this soil occupies an old glacial lake plain adjacent to and less than 10 feet above the elevation of Lake Winnebago. Here, it is associated with nearly level Poygan silty clay loam. Keowns silt loam also occupies widely spaced depressions, mostly near or on the Kettle Moraine in the southeastern part of the county. In this area, it is associated with Hochheim and Casco soils, which have a wide range in slope.

Small areas where the loamy soil is less than 18 inches thick were included with this soil in mapping.

Wetness is the primary limitation to the use of this soil for farming. (Capability unit IIIw-3; woodland group 7; wildlife group 4)

Kewaunee Series

The Kewaunee series consists of deep, nearly level to very steep, well-drained soils on uplands. These soils developed in a thin silt mantle and calcareous, fine-textured, reddish-brown glacial till. The original vegetation was hardwoods.

In a representative profile the surface layer is very dark gray silt loam about 3 inches thick. The subsurface layer is grayish-brown silt loam 4 inches thick. The subsoil extends to a depth of about 28 inches. It is reddish-brown silty clay loam in the upper 3 inches and dark reddish-brown and reddish-brown clay in the lower part. The lower part of the subsoil is neutral to mildly alkaline. The

underlying material is reddish-brown clay to a depth of 36 inches and silty clay below. Spots of lime occur in this layer.

Permeability is moderately slow in the subsoil and slow in the underlying material. The available water capacity is high. The subsoil is medium acid to mildly alkaline. These soils are moderately fertile. The organic-matter content of the surface layer is medium.

Kewaunee soils are important to the economy of the county. With related soils, they occupy a 2- to 6-mile-wide strip of land adjacent to Lake Winnebago. Nearly all the acreage has been cleared and is used for crops. These soils are easily puddled if they are worked or grazed when too wet.

Representative profile of a Kewaunee silt loam, 2 to 6 percent slopes, undisturbed, NE¼NE¼ sec. 4, T. 16 N., R. 16 E.

A1—0 to 3 inches, very dark gray (10YR 3/1) silt loam; medium and coarse, granular structure; friable; neutral; clear, wavy boundary.

A2—3 to 7 inches, grayish-brown (10YR 5/2) silt loam; weak, thin, platy structure; friable; slightly acid; clear, irregular boundary.

B1—7 to 10 inches, reddish-brown (5YR 5/3) silty clay loam; fine subangular blocky structure; firm; pinkish-gray (5YR 7/2, dry) coatings; medium acid; clear, irregular boundary.

B21t—10 to 16 inches, dark reddish-brown (2.5YR 3/4) clay; moderate, medium, subangular blocky structure; very firm; clay films on all ped faces; neutral; clear, irregular boundary.

B22t—16 to 21 inches, reddish-brown (2.5YR 4/4) clay; moderate, medium, subangular blocky structure; very firm; thick patchy clay films; mildly alkaline; clear, irregular boundary.

B3—21 to 28 inches, reddish-brown (5YR 4/4) clay; moderate, medium, angular blocky structure; very firm; band of pebbles that are less than 8 millimeters in diameter in lower part; mildly alkaline; calcareous; clear, irregular boundary.

C1—28 to 36 inches, reddish-brown (5YR 4/3) clay; weak, medium, subangular blocky structure; very firm; spots of pinkish-gray (5YR 7/2), soft, segregated lime; moderately alkaline; calcareous; gradual, irregular boundary.

C2—36 to 60 inches, reddish-brown (2.5YR 4/4) silty clay; weak, medium, subangular blocky structure; very firm; spots of pinkish-gray (5YR 7/2), soft, segregated lime; moderately alkaline; calcareous.

The solum ranges from 20 to 36 inches in thickness. The slope is dominantly 2 to 6 percent. The A horizon is loam, silt loam, and silty clay loam. It is dark reddish brown (5YR 3/3) where material from the B horizon has been mixed with that of the A horizon through tillage. The C horizon is clay loam, silty clay, and clay.

Kewaunee soils are associated with the somewhat poorly drained Manawa soils and the poorly drained Poygan soils. Oshkosh soils are similar to Kewaunee soils, but they are faintly mottled and they formed in fine-textured, reddish-brown lacustrine deposits, rather than in glacial till.

Kewaunee silt loam, 0 to 2 percent slopes (KnA).—This soil is on broad ridge crests. The surface layer is 6 to 9 inches thick, and it is very dark grayish brown in many places. The combined surface layer and subsoil ranges from 28 to 36 inches in thickness.

This soil is associated with the somewhat poorly drained Manawa soils and the poorly drained Poygan soils in shallow drainageways. Included in mapping were some small areas that are moderately well drained. In the northeastern part of Friendship, some soils were included that are underlain by brown to pale-brown loam at a depth of 32 to 48 inches and have stones on the surface.

This soil is well suited to corn, small grains, alfalfa, and mixed hay. There are few limitations to farming. This soil is slightly wet in spring and after heavy rains. Runoff is very slow, and erosion is not a hazard. (Capability unit IIs–7; woodland suitability group 2; wildlife group 3)

Kewaunee silt loam, 2 to 6 percent slopes (KnB).—This soil has the profile described as representative of the series. East of Lake Winnebago, this soil generally is on ridgetops. South and west of Lake Winnebago, it occurs in large areas dissected by drainageways that contain somewhat poorly drained Manawa soils or poorly drained Poygan soils. Small areas of these associated soils were included in mapping. Also included, in the northeastern part of Friendship, were soils that have stones on the surface and that are underlain by brown to pale-brown loam at a depth of 32 to 48 inches.

This soil is well suited to crops commonly grown on dairy farms. Erosion is a slight hazard. In spring and after heavy rains, this soil dries more slowly than other gently sloping soils. (Capability unit IIe–6; woodland suitability group 2; wildlife group 3)

Kewaunee silt loam, 2 to 6 percent slopes, eroded (KnB2).—This soil is on ridge crests east of Lake Winnebago and on some of the sloping areas west of the lake. The surface layer is 3 to 6 inches thick, and it is redder than that described as representative. The thickness of the combined surface layer and subsoil ranges from 24 to 28 inches.

This soil is associated with Kewaunee silt loam, 0 to 2 percent slopes, and with Manawa and Poygan soils. Small areas of these associated soils were included in mapping. Also included, in the northeastern part of Friendship, was a soil that has stones on the surface and that is underlain by brown and pale-brown loam at a depth of 32 to 48 inches.

Corn, oats, barley, alfalfa, and mixed hay grow well on this soil. Erosion is a moderate limitation to farming. Runoff is more rapid than on the uneroded soil. (Capability unit IIe–6; woodland suitability group 2; wildlife group 3)

Kewaunee silt loam, 6 to 12 percent slopes, eroded (KnC2).—This soil is on west-facing slopes near the Niagara Escarpment in Taycheedah and Calumet Townships. Because it is eroded, the surface layer is 3 to 6 inches thick and is redder than that described as representative. The thickness of the combined surface layer and subsoil ranges from 20 to 28 inches.

This soil generally is associated with other soils of the Kewaunee series. Small areas of these associated soils were included in mapping. Also included, below the Niagara Escarpment in Taycheedah, were soils underlain by loam, gravelly loam, and loamy sand at a depth of 42 to 60 inches.

This soil is suited to corn, oats, barley, mixed hay, and alfalfa hay. Erosion is a severe limitation to its use. (Capability unit IIIe–6; woodland suitability group 2; wildlife group 3)

Kewaunee silty clay loam, 0 to 2 percent slopes (KoA).—This soil is on ridgetops in glaciated areas. The surface layer is slightly finer textured than that described as representative, but it is about the same in thickness. This soil is closely associated with soils of the Manawa and Poygan series.

Erosion is not a hazard. Runoff is very slow. (Capability unit IIs–7; woodland suitability group 2; wildlife group 3)

Kewaunee silty clay loam, 2 to 6 percent slopes, (KoB).—This soil is mostly on the end ridge of a moraine that crosses the town of Fond du Lac. Included with this soil in mapping were small areas of slightly eroded and severely eroded soils.

Erosion is a slight hazard. Permeability of the subsoil is moderately slow. Good tilth is difficult to maintain. Shrinkage cracks are common during periods of dry weather. (Capability unit IIe–6; woodland suitability group 2; wildlife group 3)

Kewaunee silty clay loam, 2 to 6 percent slopes, eroded (KoB2).—This soil is on long, west-facing slopes below the Niagara Escarpment in Taycheedah and Calumet Townships and on east- and west-facing slopes along an end moraine ridge in Eldorado and Fond du Lac Townships. The surface layer is less than 6 inches thick. It is reddish-brown in color and clayey in texture where part of the subsoil has been mixed with the surface layer through tillage. The depth to the underlying material is 20 to 28 inches.

This soil generally is dissected by shallow drainageways occupied by Manawa soils. Included with this soil in mapping were small areas of Kewaunee silt loam, 2 to 6 percent slopes.

This soil is suited to all crops commonly grown in dairy farming. The alkalinity of the subsoil and substratum is favorable to the growth of alfalfa hay. The erosion hazard is moderate. This soil will puddle and dry into hard, angular clods if worked when wet. The higher percentage of clay in the surface layer results in a slower rate of infiltration, more rapid runoff, and a lower organic-matter content than is typical for the series. (Capability unit IIe–6; woodland suitability group 2; wildlife group 3)

Kewaunee silty clay loam, 6 to 12 percent slopes, eroded (KoC2).—This soil is on long, west-facing slopes in Taycheedah and Calumet and on the end ridge of a moraine that extends through Eldorado and Fond du Lac Townships. The thickness of the combined surface layer and subsoil is 20 to 24 inches. The surface layer generally is less than 6 inches thick. It is reddish brown and clayey, because part of the subsoil has been mixed with the surface layer through tillage.

This soil generally is dissected by shallow drainageways occupied by the somewhat poorly drained Manawa soils. Included with this soil in mapping were small areas that are underlain by loam to loamy sand at a depth of 42 to 60 inches. This underlying material is used for highway construction.

Erosion is a severe hazard. If worked when wet, this soil tends to puddle and dry into hard, angular clods. Because of the high percentage of clay in the surface layer, the infiltration rate is slower than is typical for the series and runoff is more rapid. The organic-matter content is low. (Capability unit IIIe–6; woodland suitability group 2; wildlife group 3)

Kewaunee silty clay loam, 12 to 20 percent slopes, eroded (KoD2).—This soil is on west-facing slopes in Taycheedah Township, between the Niagara Escarpment and U.S. Highway 151. It is also on valley side slopes of the East and West Branches of the Fond du Lac River. The surface layer generally is less than 6 inches thick. The surface layer is reddish and clayey because part of the subsoil has been mixed with it through tillage.

This soil is associated with other Kewaunee silty clay loam and silt loam soils. Small areas that are underlain by loam or loamy sand at a depth of 42 to 60 inches were included with this soil in mapping. This underlying sandy material is used for highway construction.

This soil is suited to all the crops commonly grown in dairy farming. It is well suited to alfalfa. The hazard of erosion is severe. Because of the high percentage of clay, this soil has a slow rate of infiltration and rapid runoff. Shrinkage cracks are common during prolonged dry spells. (Capability unit IVe–6; woodland suitability group 2; wildlife group 3)

Kewaunee silty clay loam, 20 to 30 percent slopes, eroded (KoE2).—This soil generally is on vegetated side slopes. A small acreage is in Taycheedah and Calumet Townships. This soil has a thinner surface layer and combined surface layer and subsoil than those described as representative. It is also more alkaline throughout the profile.

This soil is suited to limited grazing, trees, and wildlife habitat. Erosion is a serious hazard. The rate of infiltration is slow, and runoff is very rapid. Shrinkage cracks are common during dry weather. (Capability unit VIe–6; woodland suitability group 2; wildlife group 3)

Kewaunee soils, 2 to 6 percent slopes, severely eroded (KsB3).—These soils are on west-facing slopes in Taycheedah, between the Niagara Escarpment and U.S. Highway 151. They are also on the end ridge of a moraine that extends through Eldorado and Fond du Lac. The surface layer is less than 4 inches thick. It is red and clayey as a result of mixing part of the subsoil with the surface layer.

These soils are associated with Kewaunee silty clay loam, 2 to 6 percent slopes, eroded, and with the somewhat poorly drained Manawa soils in adjoining drainageways.

These soils are suited to all crops generally grown on dairy farms. Alfalfa hay is especially well suited. Erosion of the surface layer results in poor tilth. The soils should be worked only under favorable moisture conditions. The organic-matter content is very low. The infiltration rate is very slow, and runoff is rapid. Shrinkage cracks appear during dry spells. (Capability unit IIIe–6; woodland suitability group 2; wildlife group 3)

Kewaunee soils, 6 to 12 percent slopes, severely eroded (KsC3).—These soils have a surface layer less than 4 inches thick and a thin combined surface layer and subsoil. The surface layer is distinctly reddish and clayey. This is caused by erosion and subsequent mixing of the surface layer with subsoil material through tillage.

These soils can be used for an occasional crop, but they are better suited to pasture or woodland. The organic-matter content is very low. Runoff is rapid to very rapid, and the rate of infiltration is very slow. Shrinkage cracks appear during prolonged dry spells. (Capability unit IVe–6; woodland suitability group 2; wildlife group 3)

Kewaunee soils, 12 to 20 percent slopes, severely eroded (KsD3).—These soils are on west-facing slopes in Calumet and Taycheedah Townships. The surface layer is less than 4 inches thick, and the combined surface layer and subsoil ranges from 14 to 20 inches in thickness. The surface layer is distinctly red and clayey because much of the original soil material has been lost through erosion.

These soils are associated with Kewaunee silty clay loam, 12 to 20 percent slopes, eroded. Included with these soils in mapping were some areas that are underlain by loam to loamy sand at a depth of 42 to 60 inches. This underlying sandy material is used for highway construction.

These soils are suited to limited grazing, trees, and plantings for wildlife. The organic-matter content of the surface layer is very low. The infiltration rate is very slow, and runoff is very rapid. Shrinkage cracks are common during dry periods. (Capability unit VIe–6; woodland suitability group 2, wildlife group 3)

Kewaunee Series, Moderately Shallow Variant

The moderately shallow variant of the Kewaunee series consists of well-drained soils that are mainly gently sloping. These soils formed in a silt mantle over fine-textured glacial till. The glacial till is underlain by dolomite at a depth of about 3 feet. The original vegetation was hardwoods.

In a representative profile the surface layer is very dark gray silt loam about 5 inches thick. The subsurface layer is dark grayish-brown silt loam 3 inches thick. The subsoil is 17 inches thick. It is reddish-brown silty clay loam in the upper 3 inches and reddish-brown clay below. The underlying material is reddish-brown silty clay. Dolomite bedrock is at a depth of about 3 feet.

Permeability is moderately slow. The available water capacity is low. These soils are mildly alkaline to slightly acid in the surface layer, medium acid to mildly alkaline in the subsoil, and moderately alkaline in the substratum. They are moderately fertile. The organic-matter content of the surface layer is medium. These soils tend to puddle if worked or grazed when wet.

Representative profile of Kewaunee silt loam, moderately shallow variant, 2 to 6 percent slopes, uncultivated, center of sec. 3, T. 16 N., R. 18 E.

A1—0 to 5 inches, very dark gray (10YR 3/1) silt loam; moderate, fine, subangular blocky structure; friable; mildly alkaline; clear, irregular boundary.

A2—5 to 8 inches, dark grayish-brown (10YR 4/2) heavy silt loam; very weak, thick, platy structure; friable; numerous worm casts; mildly alkaline; clear, irregular boundary.

B1—8 to 11 inches, reddish-brown (5YR 4/3) silty clay loam; moderate, fine and medium, subangular blocky structure; firm; dark grayish-brown (10YR 4/2) coatings on ped faces; numerous worm casts; medium acid; clear, wavy boundary.

B2t—11 to 18 inches, reddish-brown (2.5YR 4/4) clay; moderate, fine, subangular blocky structure; firm; thick, continuous clay films; slightly acid; gradual, irregular boundary.

B3t—18 to 25 inches, reddish-brown (5YR 4/3) clay; moderate, medium, subangular blocky structure; firm; thin, patchy clay films; numerous pebbles, mostly less than 10 millimeters in diameter; mildly alkaline; gradual, irregular boundary.

C—25 to 37 inches, reddish-brown (5YR 4/3) silty clay; massive; firm; numerous pebbles, mostly less than 10 millimeters in diameter; moderately alkaline; calcareous; abrupt, irregular boundary.

IIR—37 to 60 inches, dolomite; the upper 2 to 6 inches is fractured.

The solum is 24 to 42 inches thick; it is underlain by dolomite bedrock. The A horizon is silt loam, except on some convex slopes where the surface soil has been removed. The A horizon ranges from very dark gray to dark grayish brown and reddish brown. The B horizon ranges from heavy clay loam to clay or silty clay.

Kewaunee silt loam, moderately shallow variant, 2 to 6 percent slopes (KtB).—This soil is on back slopes in Taycheedah Township. It is adjacent to the Niagara Escarpment. This soil is associated with Rock land on the western part of the escarpment and with Kewaunee soils at lower elevations on the eastern part of the escarpment. Small areas of Kewaunee silt loam, 2 to 6 percent slopes, were included in mapping.

This soil is well suited to crops commonly grown in dairy farming. During dry periods, use of this soil is limited by drought. (Capability unit IIe–2; woodland suitability group 2; wildlife group 3)

Kibbie Series

The Kibbie series consists of deep, nearly level, medium-textured soils that are somewhat poorly drained. These soils developed in a moderately deep silt mantle underlain by lake-laid silt and fine sand sediments. The original vegetation was hardwoods.

In a representative profile the surface layer is very dark gray silt loam 9 inches thick. The subsurface layer is grayish-brown silt loam 5 inches thick. The subsoil extends to a depth of 32 inches and is mainly silty clay loam mottled with dark-brown. It is neutral. The underlying material is pale-brown silt and very fine sand.

Permeability is moderate, and the available water capacity is high. These soils are moderately fertile. The surface layer is high in organic-matter content. The surface layer and subsoil are mildly alkaline to neutral, and the underlying material is mildly alkaline to moderately alkaline.

The Kibbie soils occupy depressions and low areas in or near the glacial moraines in the eastern part of the county. They are used mainly for crops. Wetness is the main limitation to use of these soils for farming.

Representative profile of Kibbie silt loam, 0 to 2 percent slopes, uncultivated, NE¼NE¼ sec. 10, T. 16 N., R. 19 E.

A1—0 to 9 inches, very dark gray (10YR 3/1) silt loam; moderate, medium, granular structure; very friable; mildly alkaline; abrupt, wavy boundary.

A2—9 to 14 inches, grayish-brown (10YR 5/2) silt loam; weak, medium, platy structure; very friable; neutral; clear, wavy boundary.

B1—14 to 17 inches, dark grayish-brown (10YR 4/2) silt loam; few, fine, prominent mottles of yellowish brown (10YR 5/6); weak, fine, subangular blocky structure; friable; neutral; clear, wavy boundary.

B21tg—17 to 22 inches, dark-brown (10YR 3/3) silty clay loam; few, fine, distinct mottles of yellowish brown (10YR 5/6) and faint mottles of dark grayish brown (10YR 4/2); moderate, fine and medium, angular blocky structure; few, thin, patchy clay films; firm; neutral; clear, wavy boundary.

B22t—22 to 27 inches, dark-brown (10YR 3/3) silty clay loam; common, medium, prominent mottles of yellowish brown (10YR 5/6) and faint mottles of dark grayish brown (10YR 4/2); moderate, medium, angular blocky structure; firm; few, thin, patchy clay films; neutral; clear, irregular boundary.

B3—27 to 32 inches, dark-brown (10YR 4/3) silty clay loam; common, medium, prominent mottles of yellowish brown (10YR 5/6); weak to moderate, medium, angular blocky structure; firm; neutral; clear, irregular boundary.

C—32 to 60 inches, pale-brown (10YR 6/3) silt and very fine sand; many, coarse, prominent mottles of yellowish brown (10YR 5/8); massive; moderately alkaline; calcareous.

The solum is 20 to 36 inches thick. The B2t horizon is heavy silt loam to silty clay loam 6 to 8 inches thick. Although the C horizon is dominantly silt, very fine sand, and fine sand, thin strata of silty clay loam occur in places.

Kibbie soils are associated with the well drained and moderately well drained Sisson soils. They are similar to Martinton soils in natural drainage, but they formed in silt and fine sand, rather than in lacustrine silt and clay.

Kibbie silt loam, 0 to 2 percent slopes (KuA).—This soil occupies small lacustrine basins. It is surrounded by gently rolling to steep soils developed in morainic outwash or by the margins of broad lacustrine areas of poorly drained soils that have similar substrata. Soils of the Martinton series were included with this soil. A few small areas that have loam glacial till at a depth of 30 to 42 inches were also included.

This soil is suited to all crops generally grown on dairy farms. Runoff is slow. (Capability unit IIw–2; woodland suitability group 7; wildlife group 4)

Knowles Series

The Knowles series consists of nearly level to steep, moderately deep, well-drained soils on uplands. These soils developed in a loess mantle and in glacial till underlain by dolomite bedrock at a depth of 20 to 42 inches. The original vegetation was hardwood forest.

In a representative profile the surface layer is very dark grayish-brown silt loam 6 inches thick. The subsurface layer is brown silt loam 5 inches thick. The upper part of the subsoil, to a depth of 21 inches, is dark-brown silty clay loam; the lower part, to a depth of 36 inches, is dark-brown and dark yellowish-brown clay loam. The underlying material is dolomite.

Knowles soils are moderately permeable. They have medium available water capacity and moderate natural fertility. The organic-matter content of the surface layer is medium. Knowles soils are slightly acid to moderately alkaline.

Most of these soils are in the townships of Eden, Byron, Oakfield, and Waupun, but a few widely spaced areas occur throughout the county. Knowles soils are used mainly for crops. Erosion is the main limitation to use, but the rooting zone is limited by shallowness to bedrock.

Representative profile of Knowles silt loam, 2 to 6 percent slopes, uncultivated, SE¼SW¼ sec. 11, T. 14 N., R. 17 E.

A1—0 to 6 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, medium, granular structure; very friable; mildly alkaline; clear, wavy boundary.

A2—6 to 11 inches, brown (10YR 5/3) silt loam; weak, thin, platy structure; very friable; few worm casts; neutral; clear, wavy boundary.

B1—11 to 15 inches, dark-brown (10YR 4/3) silty clay loam; moderate, fine, subangular blocky structure; firm; brown (10YR 5/3) coatings on ped faces; few pebbles in lower part of horizon; neutral; clear, irregular boundary.

B21t—15 to 21 inches, dark-brown (7.5YR 4/4) silty clay loam; moderate, medium, subangular blocky structure; firm; thick, continuous clay films; numerous pebbles; slightly acid; clear, irregular boundary.

IIB22t—21 to 28 inches, dark-brown (10YR 4/3) clay loam; moderate, medium, subangular blocky structure; firm; thin, patchy clay films; numerous pebbles, brownish-yellow (10YR 6/8) fragments of weathered dolomite; mildly alkaline; clear, irregular boundary.

IIB23—28 to 36 inches, dark yellowish-brown (10YR 4/4) light clay loam; weak, medium, subangular blocky structure; friable; moderately alkaline; abrupt, wavy boundary.

IIR—36 to 40 inches, dolomite bedrock.

The depth to bedrock ranges from 20 to 42 inches. In some places there is a layer of fractured bedrock, 4 to 10 inches thick, immediately above the consolidated bedrock.

In places Knowles soils occur with Lomira soils. They are underlain by bedrock at a depth of less than 42 inches; Lomira soils are underlain by bedrock at a depth ranging from 42 inches to many feet.

Knowles silt loam, 0 to 2 percent slopes (KwA).—This soil is on plateaus. The surface layer is about 10 inches thick, and the combined surface layer and subsoil is about 27 inches thick. In cultivated areas the surface layer is dark brown to brown.

In places this soil is associated with Theresa or Dodge soils. Areas of associated Dodge and Hochheim soils, too small to map separately, were included with this soil in mapping.

This soil is well suited to all the principal crops generally grown on dairy farms. It is well drained, and runoff is slow. (Capability units IIs-1; woodland suitability group 5; wildlife group 1)

Knowles silt loam, 2 to 6 percent slopes (KwB).—This soil is on plateaulike positions on the landscape. It has the profile described as representative of the series. Included with this soil in mapping were small areas of eroded Knowles soils and small areas of Dodge and Hochheim soils.

This soil is used mainly for crops. It is slightly droughty and is subject to moderate erosion. Stripcropping and terracing help to control erosion. Runoff is moderate. (Capability unit IIe–2; woodland suitability group 5; wildlife group 1)

Knowles silt loam, 6 to 12 percent slopes, eroded (KwC2).—This soil is on silt-covered escarpments that are mainly in the south-central and western parts of the county. The surface layer is dark brown to brown and ranges from 4 to 8 inches in thickness. The thickness of the combined surface layer and subsoil is generally less than 24 inches. Bedrock is at a depth of 20 to 42 inches.

In many places this soil is adjacent to Knowles silt loam, 2 to 6 percent slopes. Small areas of this associated soil were included in mapping.

This soil is well suited to the principal crops grown in dairy farming. Erosion is the main limitation to use, but this soil is somewhat droughty. Erosion of the original surface layer has increased the rate of runoff and decreased the infiltration rate. (Capability unit IIIe–2; woodland suitability group 5; wildlife group 1)

Knowles silt loam, 12 to 30 percent slopes, eroded (KwE2).—This soil is on silt-covered dolomite escarpments in Byron and Oakfield. Erosion has reduced the original surface layer to a thickness of 4 to 8 inches. It is commonly dark brown to brown.

This soil generally is associated with sloping Knowles silt loam, and in places it is associated with Rock land. Small areas of these associated soils were included in mapping.

This soil is highly susceptible to erosion, and it is slightly droughty. The infiltration rate is slow, and runoff is very rapid. (Capability unit IVe-2; woodland suitability group 5; wildlife group 1)

Lamartine Series

The Lamartine series consists of deep, nearly level and gently sloping, somewhat poorly drained soils in drainageways or wide wetland areas on uplands. These soils developed in a thick silt mantle underlain by calcareous, loamy glacial till. The original vegetation was hardwood forest.

In a representative profile the surface layer is very dark grayish-brown silt loam 8 inches thick. The subsurface layer is dark grayish-brown silt loam 4 inches thick. The subsoil is slightly acid to mildly alkaline, mottled, dark-brown silty clay loam and clay loam that extends to a depth of 33 inches. The underlying material is yellowish-brown loam that contains numerous pebbles and stones.

Lamartine soils are high in available water capacity and moderate in fertility. Permeability is moderately slow. These soils range from slightly acid to mildly alkaline, except in the substratum, which is moderately alkaline. The surface layer is medium in organic-matter content.

Lamartine soils occur mostly in the eastern part of the county. They are used mainly for crops, but small acreages are in trees or pasture. Wetness is the primary limitation to farming.

Representative profile of Lamartine silt loam, 2 to 6 percent slopes, uncultivated, SE¼NW¼ sec. 17, T. 16 N., R. 16 E.

A1—0 to 8 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, fine, granular structure; very friable; neutral; clear, irregular boundary.

A2—8 to 12 inches, dark grayish-brown (10YR 4/2) silt loam; few, fine, prominent mottles of yellowish brown (10YR 5/6); weak, medium, platy structure; very friable; numerous worm casts; neutral; gradual, irregular boundary.

B1t—12 to 21 inches, dark-brown (10YR 4/3) silty clay loam; common, medium, prominent mottles of yellowish brown (10YR 5/6); fine, subangular blocky structure; friable; thin, patchy clay films; slightly acid; clear, irregular boundary.

IIB2t—21 to 25 inches, dark-brown (10YR 3/3) gritty silty clay loam; few, fine, prominent mottles of yellowish brown (10YR 5/6) and grayish brown (10YR 5/2); moderate, fine, angular blocky structure; firm; thick, continuous clay films; slightly acid; clear, irregular boundary.

IIB3—25 to 33 inches, dark-brown (10YR 4/3) clay loam; many, medium, prominent mottles of yellowish brown (10YR 5/8) and light brownish gray (10YR 6/2); weak, medium, subangular blocky structure; firm; mildly alkaline; clear, irregular boundary.

IIC—33 to 60 inches, yellowish-brown (10YR 5/4) loam; many, medium, prominent mottles of yellowish brown (10YR 5/8) and distinct mottles of grayish brown (10YR 5/2); massive; friable; numerous pebbles and stones; moderately alkaline; calcareous.

The solum ranges from 24 to 40 inches in thickness; the A1 horizon is 6 to 12 inches thick. Because the silt mantle is generally more than 24 inches thick, one-half to two-thirds of the solum developed in silt. The color of the A1 horizon ranges from very dark brown to dark brown.

Lamartine soils are associated with the well drained Theresa, Lomira, Dodge, and Hochheim soils; the moderately well drained Mayville soils; and the poorly drained Brookston soils. Lamartine soils formed in a thinner silt mantle than Virgil soils, and their solum is less than 40 inches thick.

Lamartine silt loam, 0 to 2 percent slopes (LmA).—This soil occupies wetland borders and wide areas adjacent to better drained soils. It has the profile described as representative of the series. This soil generally is associated with Lomira and Brookston soils. Small areas of these soils were included in mapping.

This soil is suited to all the principal crops grown on a dairy farm. It dries slowly in spring and after heavy rains. Runoff is slow. (Capability unit IIw–2; woodland suitability group 7; wildlife group 4)

Lamartine silt loam, 2 to 6 percent slopes (LmB).—This soil occupies gently sloping drainageways and wetland borders. The surface layer ranges from 6 to 8 inches in thickness, and the combined surface layer and subsoil ranges from 24 to 30 inches. The dark grayish-brown color of the surface layer is somewhat lighter than that of the profile described as representative of the series. A few yellowish-brown mottles occur at a depth of 11 inches.

In many places this soil is associated with Theresa, Lomira, and Brookston soils. Small areas of these associated soils were included in mapping.

Wetness is the main limitation to farming. During and after wet periods, this soil may be too wet to work. Runoff is medium, and erosion is a slight hazard. (Capability unit IIw–2; woodland suitability group 7; wildlife group 4)

LeRoy Series

The LeRoy series consists of deep, gently sloping to steep, well-drained soils on uplands. These soils developed in a shallow silt mantle and highly calcareous channery loam glacial till. The original vegetation was hardwood forest.

In a representative profile the surface layer is very dark grayish-brown silt loam 5 inches thick. The subsurface layer is brown silt loam 3 inches thick. The subsoil is dark-brown silty clay loam to a depth of 19 inches and dark-brown clay loam to a depth of 23 inches. The underlying material is yellowish-brown, calcareous gravelly loam.

LeRoy soils have high available water capacity and are moderately permeable.

These soils are used mainly for farming. There are few limitations to their use for engineering projects.

Representative profile of LeRoy silt loam, 12 to 20 percent slopes, uncultivated, NW¼NE¼ sec. 2, T. 14 N., R. 14 E.

A1—0 to 5 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, medium, granular structure; very friable; mildly alkaline; clear, wavy boundary.

A2—5 to 8 inches, brown (10YR 5/3) silt loam; weak, medium, platy structure; friable; neutral; clear, irregular boundary.

B1—8 to 12 inches, dark-brown (7.5YR 3/4) silty clay loam; moderate, fine, subangular blocky structure; firm; slightly acid; clear, irregular boundary.

B21t—12 to 19 inches, dark-brown (7.5YR 3/4) silty clay loam; moderate, fine, subangular blocky structure; firm; continuous, thin clay films; slightly acid; clear, wavy boundary.

IIB22t—19 to 23 inches, dark-brown (7.5YR 4/4) clay loam; weak, medium, subangular blocky structure; friable, mildly alkaline; abrupt, irregular boundary.

IIC—23 to 60 inches, yellowish-brown (10YR 5/4) channery gravelly loam; massive; friable; flagstones up to 18 inches in diameter; moderately alkaline; calcareous.

The solum ranges from 14 to 24 inches in thickness. The A1 horizon ranges from very dark grayish brown to brown. Very dark brown coatings occur in the lower part of the B horizon in places. The soils that formed in silt less than 18 inches thick have a darker A1 horizon than that of the representative profile, and they have an A2 horizon.

LeRoy soils are associated with the moderately well drained Mayville soils, the somewhat poorly drained Lamartine soils, and the poorly drained Brookston soils. LeRoy soils have a slightly thicker solum than Hochheim soils. More of their B

horizon formed in silt, and they have a thinner B2 horizon. The calcium carbonate equivalent of the underlying material ranges from 60 to 90 percent in LeRoy soils and from 40 to 60 percent in Hochheim and Lomira soils. LeRoy soils have a thinner solum than Lomira soils, and they formed in a thinner silt mantle.

LeRoy silt loam, 2 to 6 percent slopes, eroded (LrB2).—This soil is on side slopes of low drumlins and crests of larger drumlins and hills in the eastern part of the county. A few small areas are on side slopes of low ridges and hills in the western part of the county. The surface layer is dark brown in color and ranges from 3 to 6 inches in thickness. The combined surface layer and subsoil ranges from 15 to 24 inches in thickness, but it is generally less than 20 inches thick.

This soil is associated with Hochheim soils in most places, and areas of these soils were included in mapping.

This soil is well suited to all crops commonly grown in the county. Use of this soil is mainly limited by erosion. (Capability unit IIe–1; woodland suitability group 1; wildlife group 1)

LeRoy silt loam, 6 to 12 percent slopes, eroded (LrC2).—This soil is on the short side slopes of drumlins and large hills in the eastern part of the county and on ridges and knobs in the western part of the county. In eroded areas the surface layer is dark brown to brown in color and ranges from about 4 to 7 inches in thickness. The thickness of the combined surface layer and subsoil ranges from 15 to 24 inches.

This soil is bordered by Hochheim soils in many places. Small areas of these associated soils were included in mapping.

This soil is suited to all crops commonly grown in the county. The erosion hazard is severe. So much of the original surface layer has been lost through erosion that the organic-matter content is low and runoff is rapid. (Capability unit IIIe–1; woodland suitability group 1; wildlife group 1)

LeRoy silt loam, 12 to 20 percent slopes (LrD).—This soil is on side slopes of drumlins and hills in the eastern part of the county. It has the profile described as representative of the series. Cultivated areas have a slightly thinner, dark-brown to brown surface layer.

This soil is bordered in many places by Hochheim soils, and small areas were included in mapping. Also included were areas that have pockets of stratified gravel, sand, or silt at a depth of 2 to 5 feet.

Most of this soil is in trees or permanent pasture, but some areas have been cleared and improved for crops. The erosion hazard is severe. (Capability unit IVe–1; woodland suitability group 1; wildlife group 1)

LeRoy silt loam, 12 to 20 percent slopes, eroded (LrD2).—This soil is on side slopes of drumlins and large hills in the eastern part of the county. In eroded areas the surface layer is dark brown to brown in color and less than 6 inches in thickness. The thickness of the combined surface layer and subsoil ranges from 15 to 21 inches.

This soil generally is bordered by Hochheim soils and other LeRoy soils. Small areas of these associated soils were included in mapping. Also included were places where the substratum has pockets of gravel, sand, and silt at a depth of 2 to 5 feet.

Erosion control is necessary if this soil is to be farmed. Erosion of the surface layer has caused a decrease of organic-matter content and increased runoff. (Capability unit IVe–1; woodland suitability group 1; wildlife group 1)

LeRoy silt loam, 20 to 30 percent slopes (LrE).—This soil is on side slopes of drumlins and large hills in the eastern and southeastern parts of the county. The surface layer generally is less than 7 inches thick, and the combined surface layer and subsoil is less than 21 inches thick.

This soil is adjacent to Hochheim soils in many places. Boulders are on the surface in some areas. Small areas of moderately eroded LeRoy soils were included in mapping.

This soil is used mainly for trees or permanent pasture. It is suited to limited use for grazing, woodland, or wildlife habitat. The erosion hazard is severe. (Capability unit VIe–1; woodland suitability group 1; wildlife group 1)

LeRoy soils, 6 to 12 percent slopes, severely eroded (LtC3).—The surface layer of these soils is brown and dark-brown silt loam and silty clay loam. It consists of a mixture of the original surface layer and the upper part of the subsoil. In some places all of the original surface layer has been lost through erosion. Small areas of less eroded soils were included in mapping.

The erosion hazard is severe. These soils have a lower available water capacity than the less eroded soils in the series. (Capability unit IVe–1; woodland suitability group 1; wildlife group 1)

LeRoy soils, 12 to 20 percent slopes, severely eroded (LtD3).—These soils have lost most of the original surface layer and part of the subsoil through erosion. The present surface layer is a mixture of the original surface layer and the upper part of the subsoil. It is dark brown and brown. Small areas of less eroded soils were included in mapping.

These soils have lower available water capacity than the less eroded LeRoy soils, and they are more difficult to till. The erosion hazard is very severe. (Capability unit VIe–1; woodland suitability group 1; wildlife group 1)

Lomira Series

The Lomira series consists of deep, nearly level to moderately steep, well-drained, silty soils that are underlain by calcareous channery loam glacial till. The original vegetation was hardwood forest. The nearly level and gently sloping areas generally are at the base of drumlins and low ridges or on their wide crests. The sloping and moderately steep areas generally are on the sides of drumlins and large hills.

In a representative profile the surface layer is very dark grayish-brown silt loam 5 inches thick. The subsurface layer is brown silt loam 4 inches thick. The subsoil extends to a depth of 34 inches. It is mainly dark-brown and brown silty clay loam, but the lower 9 inches is dark-brown clay loam that has a few fragments of dolomite. The underlying material is moderately alkaline, yellowish-brown loam.

Lomira soils are high in available water capacity and natural fertility. They are moderately permeable. In undisturbed areas the surface layer is neutral to mildly alkaline silt loam and is medium in organic-matter content. In eroded areas the surface layer is silty clay loam and the organic-matter content is low. The subsoil of Lomira soils is slightly acid to mildly alkaline.

Lomira soils are among the most extensive farming soils in Fond du Lac County. They occur in most of the townships in the western part of the county. Most of the acreage is used for crops.

Representative profile of Lomira silt loam, uncultivated, SE¼SE¼ sec. 11, T. 15 N., R. 19 E.

A1—0 to 5 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, medium, granular structure; very friable; mildly alkaline; clear, irregular boundary.

A2—5 to 9 inches, brown (10YR 5/3) silt loam; weak, medium, platy structure; very friable; neutral; clear, wavy boundary.

B1—9 to 15 inches, dark-brown (10YR 4/3) heavy silt loam; weak, fine, subangular blocky structure; friable; pale-brown (10YR 6/3) coatings on ped faces; slightly acid; clear, irregular boundary.

B21t—15 to 22 inches, dark-brown (10YR 4/3) silty clay loam; moderate, fine, subangular blocky structure; firm; few patchy clay films; slightly acid; clear, wavy boundary.

B22t—22 to 29 inches, brown (7.5YR 4/4) silty clay loam; moderate, medium, subangular blocky structure; firm; thick, continuous clay films; some very dark grayish-brown (10YR 3/2) stains on ped faces; neutral; abrupt, irregular boundary.

IIB3t—29 to 34 inches, dark-brown (7.5YR 4/4) clay loam; weak, coarse, subangular blocky structure; friable; many pebbles, cobblestones, and dolomite fragments up to 10 inches in diameter but mostly less than 3 inches in diameter; neutral; abrupt, irregular boundary.

IIC—34 to 60 inches, yellowish-brown (10YR 5/4) loam; massive; friable; pockets of dark reddish-gray (5YR 4/2) loam that are less than 12 inches in diameter; moderately alkaline; calcareous.

These soils formed in a silt mantle 20 to 36 inches thick. Most of the solum developed in silt. The solum ranges from 20 to 40 inches in thickness and from slightly acid to mildly alkaline in reaction. The A1 horizon is very dark gray or very dark grayish brown.

Lomira soils are associated with the well-drained St. Charles soils, the somewhat poorly drained Virgil soils, and the poorly drained Pella soils. They are neutral to mildly alkaline in the lower part of the B horizon, unlike Dodge soils, which are medium acid and slightly acid. They have dark coatings in the B3 horizon, which are lacking in Dodge soils. The calcium carbonate equivalent of the underlying material ranges from 60 to 90 percent in Lomira soils and is less than 60 percent in Dodge soils. Lomira soils differ from LeRoy soils in having a silt mantle 20 inches or more thick and a solum more than 24 inches thick.

Lomira silt loam, 0 to 2 percent slopes (LvA).—This soil has a surface layer that is 11 inches or more thick. The thickness of the combined surface layer and subsoil is 30 inches or more. In some places there are a few yellowish-brown mottles in the lower part of the subsoil.

This soil occupies the broad areas between drumlins, hills, and ridges. It generally is adjacent to Lomira silt loam, 2 to 6 percent slopes, and in places small areas of this soil were included in mapping.

This soil is well suited to corn, small grains, mixed hay, and alfalfa hay, and to special crops, such as sweet corn, peas, and beets. Runoff is very slow. There are few limitations to farming. (Capability unit I–1; woodland suitability group 1; wildlife group 1)

Lomira silt loam, 2 to 6 percent slopes (LvB).—This soil is on low ridges and knobs west of the Niagara Escarpment. It has the profile described as representative of the series. Included with this soil in mapping were small areas of Lomira silt loam, 2 to 6 percent slopes, eroded, and of Lomira silt loam, 6 to 12 percent slopes, eroded.

This soil is well suited to all the principal crops grown in a dairy farming region. It is also suited to canning crops, such as sweet corn, peas, and beets. Erosion is the main limitation to intensive use. (Capability unit IIe–1; woodland suitability group 1; wildlife group 1)

Lomira silt loam, 2 to 6 percent slopes, eroded (LvB2).—This soil has lost several inches of its original surface layer through erosion. The present surface layer is about 4 to 8 inches thick and is dark grayish brown to brown in color. The combined surface layer and subsoil is about 25 to 32 inches thick.

This soil commonly is associated with Hochheim loam, 2 to 6 percent slopes, and Hochheim loam, 6 to 12 percent slopes, eroded. Very small areas of these associated soils were included in mapping.

Corn, oats, barley, alfalfa, and mixed hay grow well on this soil. The chief limitation to farming is a moderate erosion hazard. Because of the eroded condition of this soil, runoff is rapid and organic-matter content of the surface layer is relatively low. (Capability unit IIe-1; woodland suitability group 1; wildlife group 1)

Lomira silt loam, 6 to 12 percent slopes (LvC).—This soil has a thinner surface layer than Lomira silt loam, 2 to 6 percent slopes, and the thickness of the combined surface layer and subsoil generally is less. The surface layer is generally less than 10 inches thick, and the combined surface layer and subsoil less than 30 inches. Included with this soil in mapping were small areas of other Lomira soils.

This soil is well suited to all the principal crops grown in the county. The erosion hazard is moderate. (Capability unit IIIe-1; woodland suitability group 1; wildlife group 1)

Lomira silt loam, 6 to 12 percent slopes, eroded (LvC2).—Because of erosion, the surface layer of this soil is only 4 to 8 inches thick. It is dark grayish brown. The thickness of the combined surface layer and subsoil is less than 30 inches.

Small areas of associated Lomira soils were included with this soil in mapping. The erosion hazard is severe. Runoff is rapid, and the organic-matter content is low. (Capability unit IIIe-1; woodland suitability group 1; wildlife group 1)

Lomira silt loam, 6 to 12 percent slopes, severely eroded (LvC3).—This soil has lost 8 to 10 inches of its original surface layer and part of its subsoil through erosion. The present surface layer is brown to dark grayish brown. The thickness of the combined surface layer and subsoil is 20 to 27 inches. The content of lime is higher than that of uneroded Lomira soils.

Small areas of associated Lomira soils were included with this soil in mapping.

Runoff is rapid, and the erosion hazard is severe. The organic-matter content is low. Tilth is poor. (Capability unit IVe-1; woodland suitability group 1; wildlife group 1)

Lomira silt loam, 12 to 20 percent slopes (LvD).—This soil is on side slopes of drumlins and hills. The thickness of the combined surface layer and subsoil generally is less than 28 inches. Included with this soil in mapping were small areas of other Lomira soils. Also included were some areas that have pockets or layers of sand, gravel, and silt in the substratum at a depth of 24 to 60 inches.

Most of the acreage is in woodlots or permanent pasture. Runoff is rapid, and the erosion hazard is severe. (Capability unit IVe–1; woodland suitability group 1; wildlife group 1)

Lomira silt loam, 12 to 20 percent slopes, eroded (LvD2).—Because of erosion, the surface layer of this soil is less than 8 inches thick. It is dark grayish brown to brown. The combined surface layer and subsoil is 24 to 30 inches thick. Included with this soil in mapping were small areas of other Lomira soils. Also included were small areas that have pockets or layers of sand, gravel, and silt at a depth of 24 to 60 inches.

The erosion hazard is severe. Runoff is more rapid than on the uneroded soils. Also, the organic-matter content is lower. (Capability unit IVe–1; woodland suitability group 1; wildlife group 1)

Lomira silt loam, 12 to 20 percent slopes, severely eroded (LvD3).—This soil has lost 8 to 10 inches of its original surface layer and part of the subsurface layer through erosion. The combined surface layer and subsoil is only 20 to 27 inches thick. The surface layer is brown to dark grayish brown. Included with this soil in mapping were small areas where the substratum includes pockets or layers of gravel, sand, or silt at a depth of 24 to 60 inches.

This soil is suited to limited pasture, woodland, or wildlife habitat. It is more alkaline than the less severely eroded Lomira soils. Runoff is rapid, and the organic-matter content is low. (Capability unit VIe–1; woodland suitability group 1; wildlife group 1)

Lomira-Knowles silt loams, 0 to 2 percent slopes (LwA).—This mapping unit is about 65 percent Lomira soils and 35 percent Knowles soils. These soils occur on wide ridgetops underlain by dolomite, or in broad valleys. Lomira soils have a thicker layer of silt loam and glacial till than Knowles soils. Knowles soils generally are on the wide, low ridges.

The erosion hazard is very slight. (Capability unit I–1; woodland suitability group 1; wildlife group 1)

Lomira-Knowles silt loams, 2 to 6 percent slopes (LwB).—This mapping unit is about 55 percent Lomira soils and 45 percent Knowles soils. It occurs in areas where glacial till is underlain by dolomite. In some places the depth to dolomite is as little as 20 inches. The Lomira soils have thicker glacial deposits over bedrock than the Knowles soils.

The hazard of erosion is slight. (Capability unit IIe–1; woodland suitability group 1; wildlife group 1)

Lomira-Knowles silt loams, 2 to 6 percent slopes, eroded (LwB2).—This mapping unit is about 55 percent Lomira silt loams, and 45 percent Knowles silt loams. Both soils are underlain by dolomite, but the depth to bedrock is greater in Lomira soils than in Knowles soils. Knowles soils are on gently sloping crests of low ridges; Lomira soils are at the base of slopes.

These soils have a slight erosion hazard, and part of the surface layer has been removed by erosion. (Capability unit IIe–1; woodland suitability group 1; wildlife group 1)

Lomira-Knowles silt loams, 6 to 12 percent slopes, eroded (LwC2).—This mapping unit is about 50 percent Lomira silt loams and 50 percent Knowles silt loams. Both soils are underlain by dolomite, but Lomira soils are deeper to bedrock than Knowles soils. Lomira soils generally are at the base of slopes; Knowles soils are on crests and side slopes of drumlins and low ridges.

These soils have a moderate erosion hazard. About 50 to 75 percent of the original surface layer has been removed by erosion. (Capability unit IIIe–1; woodland suitability group 1; wildlife group 1)

Manawa Series

The Manawa series consists of deep, nearly level and gently sloping, somewhat poorly drained soils on uplands. These soils developed in a thin silt mantle and calcareous, fine-textured, reddish-brown glacial till or lacustrine sediments. They are adjacent to wetlands, shallow drainageways, and small depressions. The original vegetation was hardwood forest.

In a representative profile the surface layer is black silt loam 5 inches thick. The subsurface layer is dark-gray silt loam 4 inches thick. The subsoil is mottled, reddish-brown silty clay that extends to a depth of 28 inches. The underlying material is reddish-brown silty clay that contains segregated lime between the cleavage planes.

Manawa soils have high available water capacity. They are moderately slowly permeable in the subsoil and slowly permeable in the substratum. The surface layer is neutral, the subsoil is slightly acid to neutral, and the substratum is alkaline. These soils are moderately fertile, and the surface layer is medium in organic-matter content.

Manawa soils are important, especially in the Lake Winnebago Valley. They occur in a 2- to 6-mile-wide strip adjacent to the lake. Most areas have been cleared and are used for crops, but a few areas are in woodlots or wooded pasture. Wetness is the main limitation to farming. These soils are easily puddled if worked or grazed when wet.

Representative profile of Manawa silt loam, 0 to 2 percent slopes, undisturbed, NW¼SE¼ sec. 25, T. 16 N., R. 16 E.

A1—0 to 5 inches, black (10YR 2/1) silt loam; moderate, fine, granular structure; friable; mildly alkaline; clear, wavy boundary.

A2—5 to 9 inches, dark-gray (10YR 4/1) silt loam; few, fine, distinct mottles of dark brown (10YR 4/3); moderate, thin, platy structure; neutral; clear; wavy boundary.

B1—9 to 11 inches, reddish-brown (5YR 4/3) silty clay loam; few, fine, faint, mottles of reddish brown (5YR 5/4); moderate, medium, subangular blocky structure; firm; vesicular; ped coatings of very dark gray (10YR 3/1); slightly acid; clear, irregular boundary.

IIB21t—11 to 17 inches, reddish-brown (5YR 4/3) silty clay; common, fine prominent mottles of yellowish red (5YR 5/6) and reddish gray (5YR 5/2); moderate, medium, subangular blocky structure; very firm; dark reddish-brown (5YR 3/2) ped coatings; slightly acid; clear, irregular boundary.

IIB22t—17 to 20 inches, reddish-brown (5YR 4/3) silty clay; common, fine, faint mottles of brown (7.5YR 5/2); moderate, medium, subangular blocky structure; very firm; mildly alkaline; clear, irregular boundary.

IIB3—20 to 28 inches, reddish-brown (5YR 4/3) silty clay; moderate, medium, prismatic structure; very firm; numerous pebbles, mostly less than 10 millimeters in diameter; mildly alkaline; calcareous; gradual, irregular boundary.

IIC—28 to 60 inches, reddish-brown (5YR 5/4) silty clay; few, fine, distinct mottles of strong brown (5YR 5/6); weak, coarse, prismatic structure; very firm; pinkish-gray (5YR 7/2) segregated lime between cleavage planes; numerous pebbles, mostly less than 10 millimeters in diameter; moderately alkaline; calcareous.

Undisturbed sites have a silt mantle 7 to 11 inches thick. Where tillage has mixed some of the underlying silty clay loam or silty clay with the A horizon, the texture of the present A horizon ranges from silt loam to silty clay loam. The B2t and B3 horizons range from silty clay to clay, and the C horizon ranges from clay loam to clay. The solum ranges from 20 to 30

inches in thickness. In some areas the A2 horizon is not continuous.

Manawa soils are associated with the well drained Kewaunee soils, the moderately well drained and well drained Oshkosh soils, and the poorly drained Poygan soils.

Manawa silt loam, 0 to 2 percent slopes (MaA).—This soil occupies shallow drainageways and small depressions adjacent to wetlands. It has the profile described as representative of the series. This soil is generally between the gently sloping Kewaunee soils and the poorly drained Poygan soils. Areas of associated Oshkosh and Kewaunee soils were included with this soil.

The main limitation to use of this soil is excessive wetness. The infiltration rate is slow, and in spring or during rainy seasons, water is held in the upper part of the soil. (Capability unit IIw–2; woodland suitability group 7; wildlife group 4)

Manawa silt loam, 2 to 6 percent slopes (MaB).—This soil occupies drainageways that dissect the well-drained Kewaunee soils, slopes adjacent to wide areas of poorly drained Poygan soils, and a few seepy areas below the Niagara Escarpment in Taycheedah Township. The surface layer is 7 to 10 inches thick, and the underlying glacial till is generally at a depth of less than 24 inches. The mottling in the upper part of the subsoil is somewhat less conspicuous than that in the representative profile. Small areas of eroded Manawa silt loam were included in mapping.

Excessive wetness is the main limitation to use of this soil. The rate of infiltration is slow, and water is held in the upper part of the soil in spring and after heavy rains. Runoff from adjoining slopes adds to the wetness. (Capability unit IIw–2; woodland suitability group 7; wildlife group 4)

Manawa silty clay loam, 0 to 2 percent slopes (McA).—This soil occupies shallow drainageways, small depressions, and areas adjacent to wetlands. The surface layer generally is less than 9 inches thick, and the combined surface layer and subsoil is less than 24 inches thick. The surface layer has a higher percentage of clay than that of the representative profile. This is a result of mixing some of the clayey subsoil material with the surface layer through tillage.

This soil occupies a position on the landscape between the gently sloping Kewaunee soils and the poorly drained Poygan soils. Small areas of associated Kewaunee and Oshkosh soils were included in mapping.

Excessive wetness is the main limitation to farming this soil. The infiltration rate is slow, and water is held in the upper part of the soil in spring and during extremely wet periods. This soil also receives runoff from adjoining slopes. (Capability unit IIw–2; woodland suitability group 7; wildlife group 4)

Manawa silty clay loam, 2 to 6 percent slopes (McB).—This soil occupies drainageways that dissect Kewaunee soils, as well as broad areas adjacent to the poorly drained Poygan soils. The surface layer generally is less than 9 inches thick, and the combined surface layer and subsoil is less than 24 inches thick. The texture of the surface layer is a result of mixing the original surface layer with some of the subsoil through tillage. Small areas of eroded Manawa soils were included in mapping.

Excessive wetness is the main limitation to farming this soil. The infiltration rate is slow, and water is held in the upper part of the soil in spring and after heavy rains. This soil also receives runoff from adjacent slopes. (Capability unit IIw–2; woodland suitability group 7; wildlife group 4)

Markesan Series

The Markesan series consists of deep, gently sloping to moderately steep, well-drained soils on uplands. These soils developed in a thin silt mantle and in calcareous, loamy glacial till. The original vegetation was prairie grass.

In a representative profile the surface layer is silt loam 15 inches thick. It is very dark gray in the upper part and dark brown in the lower part. The subsoil is dark yellowish-brown silty clay loam and clay loam 7 inches thick. The underlying material is yellowish-brown loam.

These soils are high in available water capacity, and they are moderately permeable. They are moderately fertile and have a high organic-matter content. They are medium acid to neutral in the upper part and mildly alkaline to moderately alkaline in the substratum.

Markesan soils are in the nine western townships of Fond du Lac County. The gently sloping and sloping soils are used mainly for crops; the steeper soils are used for permanent pasture or are idle. Erosion is the principal hazard.

Representative profile of Markesan silt loam, 2 to 6 percent slopes, uncultivated, SW¼NW¼ sec. 5, T. 15 N., R. 14 E.

A1—0 to 12 inches, very dark gray (10YR 3/1) silt loam; weak, medium, subangular blocky structure; very friable; neutral; gradual, irregular boundary.

A3—12 to 15 inches, dark-brown (10YR 3/3) silt loam; weak, medium, subangular blocky structure; very friable; slightly acid; clear, irregular boundary.

B21t—15 to 18 inches, dark yellowish-brown (10YR 3/4) silty clay loam; moderate, medium, subangular blocky structure; firm; thin, patchy clay films; neutral; clear, irregular boundary.

IIB22t—18 to 22 inches, dark yellowish-brown (10YR 3/4) clay loam; moderate, medium, subangular blocky structure; firm; thick, continuous clay films; neutral; clear, irregular boundary.

IIC—22 to 60 inches, yellowish-brown (10YR 5/4) loam; massive; friable; mildly alkaline; calcareous.

The solum ranges from 15 to 24 inches in thickness. The A1 horizon is very dark gray or black. The B21t and B22t horizons are dark yellowish brown and dark brown. The lower part of the solum is in the underlying till. Fragments of dolomite in the IIC horizon generally are less than 6 inches in diameter, but some are up to 3 feet in diameter. Where substrata contain large stones, the soils are generally near a dolomite outcrop.

Markesan soils are similar to Mendota soils, except that they formed in less than 20 inches of silt; Mendota soils formed in 20 to 36 inches of silt.

Markesan silt loam, 2 to 6 percent slopes (MdB).—This soil is on low hills, ridges, and isolated knobs in prairie areas in the western part of the county. It has the profile described as representative of the series. In many places this soil is adjacent to Mendota soils or moderately eroded Markesan soils. Areas of these associated soils that are too small to map separately were included with this soil in mapping.

This soil is well suited to all the principal crops grown in this county. It is also suited to such canning crops as peas, beets, and sweet corn. The erosion hazard is slight. (Capability unit IIe–1; woodland suitability group 12; wildlife group 2)

Markesan silt loam, 2 to 6 percent slopes, eroded (MdB2).—This soil is on low ridges and hills in prairie areas in the western part of the county. The surface layer is about 6 to 10 inches thick. It is very dark grayish brown and brown and has a lower organic-matter content than that of the profile representative of the series. The depth to underlying till ranges from 16 to 20 inches. This soil generally is associated with other Markesan soils. Small areas of these associated soils were included in mapping.

This soil is suited to all the principal crops of the county, as well as to such canning crops as beets, sweet corn, and peas. The infiltration rate is moderate. Runoff is moderate, and the erosion hazard is slight. (Capability unit IIe–1; woodland suitability group 12; wildlife group 2)

Markesan silt loam, 6 to 12 percent slopes, eroded (MdC2).—This soil is on short side slopes of ridges and hills. Because of erosion, the surface layer is less than 10 inches thick and the combined surface layer and subsoil is less than 18 inches thick. The surface layer is dark brown and has a lower organic-matter content than that of the profile representative of the series.

This soil generally is adjacent to gently sloping Mendota soils and to Markesan silt loam, 2 to 6 percent slopes. Small areas of these soils were included in mapping.

Erosion is the main limitation to use of this soil. Runoff is moderate. (Capability unit IIIe–1; woodland suitability group 12; wildlife group 2)

Markesan silt loam, 6 to 12 percent slopes, severely eroded (MdC3).—This soil is on short side slopes of hills and ridges in the prairie areas in the western part of the county. Most of the original surface layer has been lost through erosion. The present surface layer is dark brown. The combined surface layer and subsoil is generally 15 inches thick, but it is thinner in some places. Angular pebbles and stones are on the surface in places. This soil is more alkaline and has a lower organic-matter content than the soil described as representative of the series.

In many places this soil is adjacent to moderately eroded soils of the Markesan and Hochheim series. Areas of these associated soils were included with this soil in mapping.

Erosion is the main limitation to use of this soil. (Capability unit IVe–1; woodland suitability group 12; wildlife group 2)

Markesan silt loam, 12 to 20 percent slopes, eroded (MdD2).—This soil is on single side slopes of ridges and hills. The surface layer is less than 10 inches thick, and the thickness of the combined surface layer and subsoil generally is less than 18 inches. This soil is associated with moderately and severely eroded Markesan soils that are less strongly sloping and with Mendota soils. Small areas of these associated soils were included in mapping.

Runoff is rapid, and the erosion hazard is severe. (Capability unit IVe–1; woodland suitability group 12; wildlife group 2)

Markesan silt loam, 12 to 20 percent slopes, severely eroded (MdD3).—This soil is on hills, knobs, and ridges in the prairie areas in the western part of the county. Most of the original surface layer and part of the subsurface layer have been lost through erosion. Because of this soil loss, the surface layer is much lower in organic-matter content than that of the profile representative of the series, and the solum is lower in available water capacity. The surface layer is dark brown to brown.

This soil is associated with Mendota soils and other Markesan soils. Small areas of these associated soils were included in mapping.

This soil is suited to pasture, woodland, or wildlife habitat. Runoff is rapid, and the erosion hazard is severe. (Capability unit VIe–1; woodland suitability group 12; wildlife group 2)

Marsh

Marsh (Mf) consists of wet, periodically flooded areas covered mainly by sedges, cattails, rushes, and water-tolerant trees. Marsh areas that lie adjacent to lakes or ponds are mainly organic or a mixture of organic and mineral material. Other areas of Marsh occur along streams. They consist of alluvial material that is covered by water most of the year.

Where Marsh consists of organic material, it has a black to very dark brown surface layer. Seams or layers of marl are common. This material has very high available water capacity and is low in natural fertility. It ranges from neutral to moderately alkaline. Where alluvial marshes consist of mineral soil, they have a black to very dark brown surface layer and a dark-gray subsurface layer. This kind of marsh is moderately fertile and has high available water capacity. It is neutral to moderately alkaline.

The largest acreage of Marsh is adjacent to Lake Winnebago. This land type is suited to wildlife habitat. It is not suited to cultivation and provides very poor pasture. Drainage generally is not feasible. (Capability unit VIIIw–15; woodland suitability group 11; wildlife group 4)

Martinton Series

The Martinton series consists of deep, nearly level to gently sloping, somewhat poorly drained soils in glacial lake basins. These soils developed in a thin silt mantle underlain by lake-laid, calcareous silt and clay sediments. The original vegetation was hardwood forest and prairie grasses.

In a representative profile the surface layer is very dark brown silt loam in the upper 6 inches and very dark grayish-brown silt loam in the lower 3 inches. The subsoil is about 18 inches thick and mottled. It is dark yellowish-brown silt loam in the upper 4 inches and dark-brown silty clay loam below. The underlying material is brown silty clay loam.

Martinton soils have high available water capacity and moderately slow permeability. They are moderately fertile. The organic-matter content of the surface layer is medium. These soils are neutral in the upper part and moderately alkaline in the substratum.

Martinton soils are not extensive. They occur in the towns of Eldorado, Rosendale, Oakfield, and Fond du Lac. Most of the acreage has been cleared and is cropped. Wetness is the main limitation.

Representative profile of Martinton silt loam, 0 to 2 percent slopes, uncultivated, SW¼SW¼ sec. 31, T. 16 N., R. 16 E.

A1—0 to 6 inches, very dark brown (10YR 2/2) silt loam; moderate, medium, granular structure; very friable; neutral; clear, irregular boundary.

A3—6 to 9 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, medium, platy structure; very friable; neutral; clear, irregular boundary.

B1—9 to 13 inches, dark yellowish-brown (10YR 4/4) silt loam; few, medium, distinct mottles of dark grayish brown (10YR 4/2); moderate, fine, subangular blocky structure; friable; grayish-brown (10YR 5/2) coatings on ped faces; neutral; clear, irregular boundary.

B21t—13 to 18 inches, dark-brown (10YR 4/3) silty clay loam; common, medium, prominent mottles of yellowish brown (10YR 4/2); moderate, fine, angular blocky structure; friable; thin, patchy clay films; neutral; clear, wavy boundary.

IIB22t—18 to 24 inches, dark-brown (10YR 4/3) silty clay loam; common, medium, prominent mottles of yellowish brown (10YR 5/8) and faint mottles of dark grayish brown (10YR 4/2); moderate, medium, angular blocky structure; firm; thin, patchy clay films; small amount of very fine sand; neutral; clear, wavy boundary.

IIB3—24 to 27 inches, dark-brown (10YR 4/3) silty clay loam; common, medium, prominent mottles of yellowish brown (10YR 5/8) and faint mottles of dark grayish brown (10YR 4/2); weak, medium, angular blocky structure; firm; small amount of very fine sand; neutral; clear, irregular boundary.

IIC—27 to 60 inches, brown (10YR 5/3) silty clay loam grading to weakly stratified silty clay loam and silt with few thin strata of fine sand; common, medium, prominent mottles of yellowish brown (10YR 5/8) and faint mottles of dark grayish brown (10YR 4/2); weak, fine, angular blocky structure; friable; moderately alkaline; calcareous.

The solum ranges from 20 to 40 inches in thickness, and the silt mantle ranges from 10 to 24 inches. In a few places these soils have a thin covering of sand and gravel over the lacustrine sediments. Coarse-textured deposits occur in places at a depth of 36 inches or more.

Martinton soils are associated with the poorly drained Pella soils. They are similar to Virgil and Kibbie soils, except that Martinton soils formed in lake-laid silt and clay, Virgil soils formed in deep silt, and Kibbie soils formed in silt and fine sand lacustrine sediments.

Martinton silt loam, 0 to 2 percent slopes (MmA).—This soil is on glacial lake plains that range from a few acres to about 40 acres in size. It has the profile described as representative of the series. Small areas of Martinton silt loam, 2 to 6 percent slopes, were included in mapping. In some areas the Martinton soils are surrounded by gently sloping to steep glacial till or cobbly outwash.

Wetness is the main limitation to farming this soil. Water infiltrates the soil so slowly that a perched water table occurs in spring and after heavy rains. (Capability unit IIw-2; woodland suitability group 7; wildlife group 4)

Martinton silt loam, 2 to 6 percent slopes (MmB).—This soil is on low ridges or mounds on glacial lake plains. The surface layer is less than 9 inches thick, and the combined surface layer and subsoil is less than 30 inches thick. This soil is less mottled than the one described as representative.

Small areas of Martinton silt loam, 0 to 2 percent slopes, were included in mapping. Also included were areas where the lower part of the profile contains a thin layer of sand and gravel.

Wetness is the main limitation to use of this soil, but there is also a slight erosion hazard. (Capability unit IIw-2; woodland suitability group 7; wildlife group 4)

Mayville Series

The Mayville series consists of deep, nearly level and gently sloping, moderately well drained soils on uplands. These soils are underlain by calcareous, loamy glacial till. The original vegetation was hardwood forest.

In a representative profile the surface layer is very dark grayish-brown silt loam 6 inches thick. The subsurface layer is dark-brown silt loam 4 inches thick. The subsoil is about 22 inches thick. It is mainly dark-brown and dark yellowish-brown heavy silt loam and silty clay loam. The lower 8 inches consists of yellowish-brown loam that contains dolomite fragments. The underlying material is yellowish-brown loam.

Mayville soils have high available water capacity and moderate permeability. They are moderately well drained and moderately fertile. The surface layer is medium to high in organic-matter content; the Bt horizon is mottled.

Mayville soils are moderately important to the farm economy. They occur in nearly all townships, but are common in the eastern and northeastern parts of the county. Most of the acreage is used for crops. A few isolated areas are used for woodlots. Erosion is the main hazard to use of these soils.

Representative profile of Mayville silt loam, 2 to 6 percent slopes, uncultivated, SW¼SW¼ sec. 6, T. 15 N., R. 15 E.

A1—0 to 6 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, fine, granular structure; very friable; mildly alkaline; clear, wavy boundary.

A2—6 to 10 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium, platy structure; friable; considerable earthworm activity; mildly alkaline; clear, wavy boundary.

B1—10 to 13 inches, dark-brown (7.5YR 4/4) heavy silt loam; weak, medium, subangular blocky structure; friable; neutral; gradual, wavy boundary.

B21t—13 to 19 inches, dark yellowish-brown (10YR 4/4) silty clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/6); weak, medium, subangular blocky structure; firm; thick, continuous clay films and some organic stains; mildly alkaline; clear, wavy boundary.

B22t—19 to 24 inches, dark yellowish-brown (10YR 4/4) heavy silt loam; common, medium, distinct mottles of yellowish brown (10YR 5/6); weak, medium, subangular blocky structure; firm; thin, patchy clay films; mildly alkaline; abrupt, wavy boundary.

IIB3—24 to 32 inches, yellowish-brown (10YR 5/4) heavy loam; common, medium, prominent mottles of brownish yellow (10YR 6/8); weak, medium, subangular blocky structure; friable; numerous dolomite fragments; moderately alkaline; clear, irregular boundary.

IIC—32 to 60 inches, yellowish-brown (10YR 5/4) loam; many, medium, distinct mottles of strong brown (7.5YR 5/6); massive; friable; numerous dolomite fragments; moderately alkaline; calcareous.

The loess mantle ranges from 20 to 36 inches in thickness. The solum ranges from 24 to 40 inches in thickness; as much as half of the solum is in the underlying glacial till. In undisturbed areas, the A1 horizon is very dark grayish brown or very dark brown; in cultivated areas, the surface layer is dark brown to brown.

The Mayville soils are associated with the well-drained Theresa and Dodge soils, the somewhat poorly drained Lamartine soils, and the poorly drained Brookston and Pella soils. Mayville soils are similar to St. Charles soils, except that they have a thinner silt mantle and a thinner solum than the St. Charles soils.

Mayville silt loam, 0 to 2 percent slopes (MoA).—The surface layer is 10 to 15 inches thick, and the combined

surface layer and subsoil is 28 to 36 inches thick. This soil generally is adjacent to gently sloping Dodge soils. In places it is adjacent to the somewhat poorly drained Lamartine soils and the poorly drained Brookston soils in depressions and waterways. Small areas of Hochheim and Lamartine soils were included with this soil in mapping.

Although there is little runoff, ponding is not a problem, because the moderately permeable subsoil permits water to move through the profile. (Capability unit I–1; woodland suitability group 1; wildlife group 1)

Mayville silt loam, 2 to 6 percent slopes (MoB).—This soil is on foot slopes of hills, ridges, and drumlins in the eastern and northeastern parts of the county. It has the profile described as representative of the series. This soil is adjacent to the steeper Hochheim and Theresa soils, and to Lamartine and Brookston soils in depressions and waterways. Areas of these associated soils were included with this soil in mapping.

This soil is well suited to the principal crops of the county. Canning crops also grow well. Erosion is the main hazard to use of this soil. (Capability unit IIe–1; woodland suitability group 1; wildlife group 1)

Mendota Series

The Mendota series consists of deep, nearly level to sloping, well-drained soils on uplands. These soils formed in a moderately deep silt mantle underlain by calcareous channery loam glacial till. The original vegetation was prairie grasses.

In a representative profile the surface layer is 16 inches thick. It is very dark brown silt loam in the upper part and dark yellowish-brown silt loam in the lower part. The subsoil is dark-brown silty clay loam and clay loam about 17 inches thick. The underlying material is yellowish-brown loam.

Mendota soils are high in available water capacity and natural fertility. They are moderately permeable. The surface layer is high in organic-matter content. The subsoil is slightly acid to mildly alkaline, and the substratum is moderately alkaline.

Mendota soils are among the most important to the farm economy of the county. They occur in the nine western townships. They are used mainly for crops, but some of the thinner, sloping soils are used for trees or permanent pasture.

Representative profile of Mendota silt loam, 2 to 6 percent slopes, uncultivated, NW¼SE¼ sec. 29, T. 15 N., R. 16 E.

A1—0 to 10 inches, very dark brown (10YR 2/2) silt loam; moderate, fine, granular structure; very friable; mildly alkaline; clear, wavy boundary.

A3—10 to 16 inches, dark yellowish-brown (10YR 3/4) silt loam; weak, fine, subangular blocky structure; very friable; slightly acid; clear, irregular boundary.

B21t—16 to 22 inches, dark-brown (7.5YR 4/4) silty clay loam; moderate, fine, subangular blocky structure; firm, thick, continuous clay films; slightly acid; gradual, irregular boundary.

B22t—22 to 27 inches, dark-brown (7.5YR 4/4) silty clay loam; weak, medium, subangular blocky structure; firm; thick, continuous clay films; slightly acid; clear, irregular boundary.

IIB3—27 to 33 inches, dark-brown (7.5YR 4/4) clay loam; weak, medium, subangular blocky structure; friable; numerous pebbles and partly weathered fragments of dolomite up to 2 inches in diameter; neutral; abrupt, irregular boundary.

IIC—33 to 60 inches, yellowish-brown (10YR 5/4) loam; massive; friable; numerous dolomite fragments and flagstones, mostly less than 6 inches in diameter; moderately alkaline; calcareous.

The solum ranges from 24 to 40 inches in thickness. In places bedrock occurs at a depth of 42 to 60 inches. In places the IIC horizon contains numerous dolomite slabs 2 to 3 feet in diameter. Substrata that contain large slabs occur near exposures of dolomite bedrock.

Mendota soils generally are associated with the somewhat poorly drained Elburn soils and the poorly drained Pella soils. These associated soils formed in deep silt overlying glacial till. Mendota soils are similar to Markesan soils, except that they developed in 20 to 36 inches of silt, and Markesan soils developed in less than 20 inches of silt.

Mendota silt loam, 0 to 2 percent slopes (MsA).—This soil is on broad plains. The surface layer ranges from 12 to 18 inches in thickness, and the combined surface layer and subsoil ranges from 27 to 36 inches. This soil generally is adjacent to Mendota silt loam, 2 to 6 percent slopes. Areas of this soil were included with this soil in mapping.

This soil is suited to all the principal crops grown in the county, as well as to such canning crops as beets, sweet corn, and peas. There are few limitations to farming. In some areas erosion is a minor hazard. Although runoff is slow, water readily moves downward in the profile. (Capability unit I–1; woodland suitability group 12; wildlife group 2)

Mendota silt loam, 2 to 6 percent slopes (MsB).—This soil is on low hills and ridges. It has the profile described as representative of the series. Adjoining soils include other soils of the Mendota series. Areas of these soils were included in mapping.

This soil is well suited to all the crops commonly grown in the county, as well as to such canning crops as beets, peas, and sweet corn. Erosion is the main hazard in farming this soil. Runoff is slow to medium. (Capability unit IIe–1; woodland suitability group 12; wildlife group 2)

Mendota silt loam, 2 to 6 percent slopes, eroded (MsB2).—This soil is on low hills and ridges where the slope is 4 or 5 percent in most places. The surface layer is dark brown to very dark grayish brown and, because of erosion, it is only 6 to 10 inches thick. It has a lower organic-matter content than that of the profile representative of the series. The thickness of the combined surface layer and subsoil ranges from about 24 to 30 inches.

In many places this soil is adjacent to other Mendota soils. Small areas of these soils were included in mapping.

Corn, oats, barley, alfalfa, and mixed hay are well suited to this soil. Such canning crops as sweet corn, beets, and peas are also suited. Runoff is moderate. (Capability unit IIe-1; woodland suitability group 12; wildlife group 2)

Mendota silt loam, 6 to 12 percent slopes, eroded (MsC2).—This soil is on side slopes of low ridges, hills, and knobs in the prairie areas in the western part of the county. As a result of erosion, the surface layer is only 6 to 10 inches thick. It is dark brown and has a lower organic-matter content than that of the profile representative of the series. The combined surface layer and subsoil is less than 30 inches thick.

Slightly eroded Mendota soils generally are adjacent to this soil. Areas of these soils were included with this soil.

This soil is suited to the principal crops grown in the county. Erosion is a severe hazard. Runoff is medium to rapid. (Capability unit IIIe-1; woodland suitability group 12; wildlife group 2)

Milton Series

The Milton series consists of nearly level to sloping, well-drained soils. These soils formed in a silt mantle and in clayey glacial till underlain by dolomite bedrock at a depth of 24 to 42 inches. The original vegetation was hardwood forest.

In a representative profile the surface layer is very dark gray silt loam 9 inches thick. The subsurface layer is dark grayish-brown silt loam 3 inches thick. The subsoil extends to a depth of 36 inches. It is dark yellowish-brown silty clay loam and silty clay in the upper part and dark-brown and yellowish-brown loam and clay loam in the lower part. The underlying material is dolomite bedrock.

Milton soils have medium available water capacity and moderately slow permeability. They are neutral to mildly alkaline.

These soils are used mainly for crops.

Representative profile of Milton silt loam, 0 to 2 percent slopes, cultivated, NW¼NW¼ sec. 24, T. 14 N., R. 16 E.

Ap—0 to 9 inches, very dark gray (10YR 3/1) silt loam; weak; medium, subangular blocky structure; very friable; mildly alkaline; clear, wavy boundary.

A2—9 to 12 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium, platy structure; very friable; numerous worm casts; neutral; clear, wavy boundary.

B1—12 to 16 inches, dark yellowish-brown (10YR 4/4) silty clay loam; moderate, fine, subangular blocky structure; firm; very pale brown (10YR 8/3, dry) coatings on ped faces; a few pebbles up to 3 millimeters in diameter; neutral; clear, irregular boundary.

IIB21t—16 to 21 inches, dark yellowish-brown (10YR 3/4) silty clay; a few faint mottles; moderate, fine, subangular blocky structure; very firm; thick, continuous clay films; numerous pebbles up to 25 millimeters in diameter; neutral; clear, irregular boundary.

IIB22t—21 to 27 inches, dark-brown (10YR 3/3) loam; few, fine, distinct mottles of yellowish brown (10YR 5/8); moderate, medium, subangular blocky structure; very firm; few, thin, patchy clay films; numerous pebbles and fragments; mildly alkaline; clear, irregular boundary.

IIB3t—27 to 36 inches, yellowish-brown (10YR 5/4) light clay loam; common, fine, faint mottles of yellowish brown (10YR 5/8); weak, medium, subangular blocky structure; firm; thin, patchy clay films; numerous pebbles and fragments; mildly alkaline; abrupt, wavy boundary.

IIIR—36 to 60 inches, shattered bedrock grading to consolidated bedrock.

The A horizon ranges from very dark grayish brown to very dark gray. The IIB22t horizon ranges from silty clay loam to loam. In some areas the IIB22t and IIB3t horizons are not mottled.

Milton soils are associated mainly with Morley soils.

Milton silt loam, 0 to 2 percent slopes (MzaA).—This soil is on wide ridgetops that are underlain by dolomite bedrock at a depth of about 3 feet. It has the profile described as representative of the series. This soil is suited to most crops commonly grown in the county. There is no erosion hazard. (Capability unit IIs–7; woodland suitability group 1; wildlife group 3)

Milton silt loam, 2 to 6 percent slopes, eroded (MzaB2).—This soil has lost about one-fourth to one-half of its original surface layer through erosion. The present surface layer is very dark grayish brown and is only about 6 inches thick. There is less mottling than in the representative profile. The depth to bedrock ranges from 24 to 36 inches.

This soil is suited to all the principal crops grown in the county. The erosion hazard is slight. The available water capacity is lower than that of the soil described as representative of the series. (Capability unit IIe–6; woodland suitability group 1; wildlife group 3)

Milton silt loam, 6 to 20 percent slopes, eroded (MzaD2).—This soil is sloping in most places, but about 20 percent of the acreage is moderately steep. The surface layer is dark grayish brown and about 6 inches thick. About half of the original surface layer has been lost through erosion. Bedrock is at a depth of 24 to 36 inches.

The erosion hazard is moderate to severe. (Capability unit IIIe–6; woodland suitability group 1; wildlife group 3)

Morley Series

The Morley series consists of deep, nearly level to moderately steep, well drained and moderately well drained soils on uplands. These soils formed in a silt mantle and calcareous silty clay loam glacial till that has a high content of shale. The original vegetation was hardwood forest.

In a representative profile the surface layer is very dark grayish-brown silt loam 3 inches thick. The subsurface layer is brown silt loam 6 inches thick. The subsoil is dark-brown and brown silt loam and silty clay loam to a depth of about 27 inches and yellowish-brown silty clay loam to a depth of about 33 inches. The underlying material is moderately alkaline, brown silty clay loam.

Morley soils are high in available water capacity and moderately slow in permeability. The organic-matter content of the surface layer is medium. These soils are slightly acid to mildly alkaline in the upper part and moderately alkaline in the substratum. They are moderately fertile.

These soils are near the Niagara Escarpment in an area extending from Lake De Neveu to the Fond du Lac-Dodge County line southwest of Oakfield. Morley soils are moderately important for farming, and they are used mainly for crops. The main limitation to use of these soils is erosion.

Representative profile of Morley silt loam, 2 to 6 percent slopes, uncultivated, NW¼NW¼ sec. 33, T. 14 N., R. 17 E.

O2—½ inch to 0, partly decomposed organic debris.

A1—0 to 3 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, fine, granular structure; friable; mildly alkaline; abrupt, wavy boundary.

A2—3 to 9 inches, brown (10YR 5/3) silt loam; moderate, medium, platy structure; friable; grayish-brown (10YR 5/2) ped coatings; neutral; clear, wavy boundary.

B1—9 to 14 inches, dark-brown (10YR 4/3) heavy silt loam; moderate, fine, subangular blocky structure; friable; grayish-brown (10YR 5/2) ped coatings; slightly acid; clear, irregular boundary.

B21t—14 to 21 inches, dark-brown (10YR 4/3) silty clay loam; strong, medium, angular blocky structure; firm; thick, continuous clay films; dark-brown (10YR 3/3) ped coatings; organic stains; slightly acid; clear, irregular boundary.

IIB22t—21 to 27 inches, brown (10YR 5/3) gritty silty clay loam; many, medium, faint mottles of light brownish gray (10YR 6/2); moderate, fine, angular blocky structure; very firm; grayish-brown (10YR 5/2) ped coatings; thick, continuous clay films; dark-brown (10YR 3/3) organic stains; mildly alkaline; clear, irregular boundary.

IIB3—27 to 33 inches, yellowish-brown (10YR 5/4) silty clay loam; many, moderate, distinct mottles of light brownish gray (10YR 6/2); moderate, medium, angular blocky structure; very firm; thin, patchy clay films; organic stains; mildly alkaline; clear, irregular boundary.

IIC—33 to 60 inches, brown (10YR 5/3) silty clay loam; many, medium, prominent mottles of yellowish brown (10YR 5/6); massive; very firm; moderately alkaline; calcareous.

The loess covering ranges from 10 to 24 inches in thickness, and the solum from 20 to 40 inches. In some places Morley soils lack mottling in the IIB3 horizon.

Morley soils are associated with the somewhat poorly drained Beecher soils and the poorly drained Ashkum soils. They differ from Theresa soils in having formed in silty clay loam to clay loam glacial till, rather than in loam glacial till.

Morley silt loam, 2 to 6 percent slopes (MzdB).—This soil is on side slopes of low hills and ridges. It has the profile described as representative of the series. In cultivated areas the surface layer is dark brown or brown.

This soil is dissected by shallow drainageways occupied by gently sloping Beecher silt loam. In many places it is adjacent to Ashkum soils in small depressions. Areas of these soils were included with this soil in mapping. Also included were areas where the glacial till substratum grades to weathered shale bedrock at a depth of about 42 inches. In places the upper part of the substratum contains thin layers of sand or gravel.

This soil is well suited to all the principal crops grown in the county, as well as to special canning crops, such as peas, beets, and sweet corn. Erosion is the main hazard. (Capability unit IIe–6; woodland suitability group 1; wildlife group 3)

Morley silt loam, 2 to 6 percent slopes, eroded (MzdB2).—This soil is on low ridges and hills. The surface layer is brown and ranges from 4 to 7 inches in thickness. The depth to the underlying glacial till is 24 to 30 inches.

This soil is dissected by shallow drainageways occupied by Beecher soils. Small depressional areas occupied by poorly drained Ashkum soils are scattered throughout this mapping unit. Also included were places where the substratum contains layers or pockets of sand and gravel. In other places the glacial till of the substratum grades to weathered shale bedrock at a depth of 42 inches or more.

This soil is suited to all the crops commonly grown in the county. Because of erosion, the organic-matter content of the surface layer is medium to low. Runoff is medium. (Capability unit IIe–6; woodland suitability group 1; wildlife group 3)

Morley silt loam, 6 to 12 percent slopes, eroded (MzdC2).—This soil is on ridges and hills. The surface layer is dark brown to brown in color and is only 4 to 7 inches thick. The thickness of the combined surface layer and subsoil ranges from 20 to 27 inches. This soil has lower available water capacity than that of the soil described as representative of the series.

This soil is closely associated with the somewhat poorly drained Beecher soils in shallow drainageways and with the poorly drained Ashkum soils in depressions. Small areas of these associated soils were included in mapping. Also included were areas where the substratum contains layers or pockets of sand and gravel.

This soil is well suited to all the principal crops of the county. Erosion has caused a decrease in the organic-matter content of the surface layer, and the erosion hazard is the most serious limitation to use of this soil. Runoff is medium to rapid. (Capability unit IIIe–6; woodland suitability group 1; wildlife group 3)

Morley silt loam, 12 to 20 percent slopes, eroded (MzdD2).—This soil is on hills and ridges in the shaly glacial till area of the county. Much of the original soil material has been lost through erosion, and the present surface layer is only 4 to 7 inches thick. The dark-brown to brown color of the surface layer reflects a loss of organic matter. This soil generally is less than 25 inches deep to unweathered till.

This soil is associated with other Morley soils in most places and with Ashkum soils in a few small depressions. Areas of these associated soils were included with this soil.

This soil occupies a small acreage. Runoff is rapid, and the erosion hazard is severe. (Capability unit IVe–6; woodland suitability group 1; wildlife group 3)

Morley soils, 6 to 12 percent slopes, severely eroded (MzeC3).—These soils are on ridges and hills. They have lost 6 inches or more of the original surface layer through erosion. The surface layer is dark brown to brown and has a much lower organic-matter content than that of the representative profile. In places where the subsoil has been mixed with the surface layer through tillage, the remaining surface layer has blocky structure and firm consistence when moist. The thickness of the combined surface layer and subsoil generally is less than 25 inches.

These soils are associated with other Morley soils, with Beecher soils in drainageways, and with Ashkum soils in shallow depressions. Areas of these associated soils were included with these soils. Also included were areas where the substratum contains pockets or layers of sand and gravel.

If erosion is controlled, these soils are suited to the crops commonly grown in the county. Erosion is a severe hazard. Loss of soil material from the surface layer has caused increased runoff and has decreased the amount of water that enters the soil. (Capability unit IVe–6; woodland suitability group 1; wildlife group 3)

Morley soils, 12 to 20 percent slopes, severely eroded (MzeD3).—These soils are on hills and ridges in the shale glacial till area of the county. They have lost 6 inches or more of the original surface layer and part of the subsoil through erosion. The present surface layer is dark brown to brown and is low in organic-matter content. In many places, where the subsoil has been mixed with the surface layer through tillage, the present surface layer ranges from silt loam to silty clay loam. It tends to have blocky structure and firm consistence when moist. The combined surface layer and subsoil generally is less than 24 inches thick.

These soils generally are adjacent to Morley silt loam, 12 to 20 percent slopes, eroded. Small areas of this soil were included in the areas mapped.

These soils are suited to limited grazing, woodland, or wildlife habitat. The hazard of erosion is severe, and runoff is rapid. (Capability unit VIe–6; woodland suitability group 1; wildlife group 3)

Ogden Series

The Ogden series consists of organic soils that developed in disintegrated fibrous reeds and sedges, underlain by clay at a depth of 12 to 42 inches. These soils occupy

shallow depressions, generally less than 10 acres in size, in the Valders drift area of the county.

The surface layer is black mucky peat 8 inches thick. The next layer is dark-brown mucky peat about 17 inches thick. The underlying material is dark-gray and reddish-gray silty clay.

Organic horizons of Ogden soils contain varying amounts of identifiable plant remains. In most places 40 to 50 percent of the mass can be readily identified as fragments of nonwoody plants. Ogden soils are neutral to mildly alkaline in the surface layer and subsoil and moderately alkaline in the substratum. They are very high in available water capacity and low in natural fertility.

In most places soils of the Ogden series are under native vegetation. Some small areas are in permanent pasture, and a few areas have been drained to be used for crops. These soils are subject to ponding. Wetness is a hazard. In drained areas soil blowing and subsidence are severe hazards.

Representative profile of Ogden mucky peat, cultivated, SW¼SW¼ sec. 26, T. 15 N., R. 17 E.

1—0 to 8 inches, black (10YR 2/1) mucky peat; moderate, fine, granular structure; very friable; contains fibrous plant remains; neutral; clear, wavy boundary.
2—8 to 25 inches, dark-brown (7.5YR 3/2) mucky peat; moderate, medium, granular structure; friable; less than 50 percent identifiable sedge fragments; mildly alkaline; abrupt, wavy boundary.
IIC1g—25 to 32 inches, dark-gray (5Y 4/1) silty clay; common, fine, prominent mottles of dark yellowish brown (10YR 4/4); massive; very firm; moderately alkaline; diffuse, irregular boundary.
IIC2—32 to 60 inches, reddish-gray (5YR 5/2) silty clay; massive; very firm; moderately alkaline.

The surface layer ranges from black to very dark grayish brown. The organic horizons include varying amounts of plant remains, but in most profiles less than 50 percent of the mass is identifiable. The organic horizons range from neutral to mildly alkaline.

Ogden soils differ from Adrian, Palms, and Rollin soils mainly in the nature of the mineral horizon underlying the organic layers. The Ogden soils are underlain by silty clay, the Adrian soils by sand, the Palms soils by loam, and the Rollin soils by marl. The Houghton soils differ from Ogden soils in having formed in fibrous organic material more than 42 inches thick.

Ogden mucky peat (0 to 2 percent slopes) (Od).—This soil generally is associated with the deep, organic Houghton soils and the poorly drained Poygan soils. Areas of Poygan soils were included in mapping. These soils are at a slightly higher elevation than the Ogden soil.

Reed canarygrass grows well on this soil. Field crops are not suited, unless artificial drainage is installed. Drained areas are suited to corn and small grains and well suited to truck crops. The main limitation to farming is wetness that results from a high water table. (Capability unit IIIw–9; woodland suitability group 10; wildlife group 5)

Old Beaches

Old beaches (Oe) occurs near the southeastern shore of Lake Winnebago. This land type is a gently sloping beach ridge that formed during a period when the waters were 5 to 6 feet higher than the present level of the lake. Old beaches consists of coarse gravel and cobblestones 3 to 8 inches in diameter. There is very little surface soil material. It is neutral to moderately alkaline.

This land type is not suited to crops, and it provides poor pasture. It is suited to wildlife habitat. Although this land type is droughty, it supports trees and bushes that are capable of sending roots deep enough to reach the water table. (Capability unit VIs–5; woodland suitability group 11; wildlife group 7)

Oshkosh Series

The Oshkosh series consists of deep, nearly level and gently sloping, moderately well drained and well drained soils. These soils formed in a very shallow silt mantle and calcareous, fine-textured, lake-laid sediments that are reddish brown in color. The original vegetation was hardwood forest.

In a representative profile the surface layer is very dark grayish-brown silt loam 7 inches thick. The subsurface layer is grayish-brown silt loam 5 inches thick. The subsoil is dark-brown, dark reddish-brown, and reddish-brown silty clay and clay about 13 inches thick. The underlying material is moderately alkaline, reddish-brown clay.

Oshkosh soils have high available water capacity and are moderately fertile. Permeability is moderately slow in the subsoil and slow in the substratum. These soils are neutral to moderately alkaline.

These soils are in the southern part of the town of Fond du Lac and the eastern part of the town of Lamartine. Most areas have been cleared and are used for crops. The soils puddle easily if worked or grazed when wet.

Representative profile of Oshkosh silt loam, 0 to 2 percent slopes, uncultivated, NE¼NE¼ sec. 25, T. 15 N., R. 16 E.

A1—0 to 7 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, medium, granular structure; very friable; neutral; abrupt, wavy boundary.
A2—7 to 12 inches, grayish-brown (10YR 5/2) silt loam; weak, medium, platy structure; very friable; neutral; clear, irregular boundary.
B1—12 to 14 inches, dark-brown (7.5YR 4/2) silty clay; common, fine, prominent mottles of strong brown (7.5YR 5/6); moderate, very fine, subangular blocky structure; firm; mildly alkaline; clear, wavy boundary.
B2t—14 to 19 inches, dark reddish-brown (5YR 3/2) clay; moderate, fine, subangular blocky structure; very firm; thick, continuous clay films; reddish-brown (5YR 4/4) ped interiors; mildly alkaline; gradual, wavy boundary.
B3—19 to 25 inches, reddish-brown (5YR 4/3) clay; weak, medium, prismatic structure and medium, angular blocky; very firm; organic stains on vertical ped faces; moderately alkaline; gradual, irregular boundary.
C—25 to 60 inches, reddish-brown (5YR 4/4) clay; weak, medium, prismatic structure; very firm; few lime concretions; moderately alkaline; calcareous.

The silt mantle ranges from a few inches to 12 inches in thickness. Where erosion has taken place or the silt mantle is thin and the soil has been plowed, parts of the clayey B horizon have been mixed into the A horizon. The A1 horizon ranges from very dark brown to dark reddish gray. The thickness of the solum ranges from 20 to 27 inches.

Oshkosh soils are closely associated with the somewhat poorly drained Manawa soils and the poorly drained Poygan soils. They resemble Kewaunee soils in natural drainage, but they formed in fine-textured lacustrine sediments, rather than in fine-textured glacial till that contains numerous pebbles and stones.

Oshkosh silt loam, 0 to 2 percent slopes (OhA).—This soil is on a broad lacustrine plain dissected by shallow drainageways and a few steep-sided watercourses. This

soil has the profile described as representative of the series. It occupies undisturbed sites and has lost only a little of the original surface layer.

Manawa soils generally are adjacent to this soil. Areas of these and other soils were included with this soil in mapping. Also included, along the De Neveu Creek, were areas where the soil is underlain by a limy, grayish-brown, shaly glacial till at a depth of 30 inches or more.

Tillage operations may be delayed because this soil dries out slowly in spring and after heavy rains. Runoff is very slow. (Capability unit IIs–7; woodland suitability group 2; wildlife group 3)

Oshkosh silt loam, 2 to 6 percent slopes (OhB).—This soil is on broad lacustrine areas in the southern part of Fond du Lac Township. These areas are dissected by shallow drainageways and a few steep-sided watercourses. The surface layer generally is only 7 to 10 inches thick. The combined surface layer and subsoil generally is no more than 24 inches thick.

This soil generally is associated with Oshkosh silt loam, 0 to 2 percent slopes, or Manawa silt loam, 0 to 2 percent slopes. Included with this soil in mapping were small areas along the De Neveu Creek where the soil is underlain by a limy, grayish-brown, shaly silty clay loam glacial till.

This soil is well suited to all the crops commonly grown on dairy farms. Use of this soil is limited by the hazard of erosion and the moderately slow permeability in the subsoil. (Capability unit IIe–6; woodland suitability group 2; wildlife group 3)

Oshkosh silty clay loam, 0 to 2 percent slopes (OkA).—This soil is on broad lacustrine areas in the southern part of Fond du Lac Township. Tillage has brought some of the upper part of the subsoil into the surface layer, and the present surface layer is clayey.

This soil is dissected by shallow drainageways occupied by Manawa silt loam, 0 to 2 percent slopes. Small areas of Oshkosh silt loam, 0 to 2 percent slopes, were included in mapping.

Most of the acreage has been farmed, but tillage operations are often delayed because the soil dries out slowly in spring and after heavy rains. Good seedbeds are difficult to prepare. If this soil is worked when it is wet, puddling results and hard clods form. The surface layer cracks during prolonged periods of dry weather. (Capability unit IIs–7; woodland suitability group 2; wildlife group 3)

Oshkosh silty clay loam, 2 to 6 percent slopes (OkB).—This soil occupies a wide area of lacustrine deposits in the southern part of Fond du Lac Township. The surface layer is less than 7 inches thick, and the depth to unweathered underlying material is less than 27 inches. Tillage operations have mixed some of the subsoil with the surface layer.

This soil is associated with Manawa soils in shallow drainageways and with DePere soils along steep-sided creeks or on river flood plains. It is also associated with Oshkosh silty clay loam, 0 to 2 percent slopes, and nearly level to gently sloping areas of Manawa silt loam.

A moderate erosion hazard and moderately slow permeability are the main limitations to use of this soil. This soil puddles if it is worked when wet. As it dries, it breaks into hard, angular clods that make preparation of seedbeds difficult. Shrinkage cracks occur in the surface layer during prolonged dry spells. Runoff is more rapid on this soil than on the soil described as representative of the series, and infiltration is slower. (Capability unit IIe–6; woodland suitability group 2; wildlife group 3)

Palms Series

The Palms series consists of organic soils that developed in disintegrated muck and mucky peat composed largely of fibrous reeds and sedges. The organic layers are underlain by loamy mineral horizons at a depth of 12 to 42 inches. These soils occupy shallow depressions that are generally less than 75 acres in size.

In a representative profile the surface layer, about 26 inches thick, is black mucky peat. The next layer, to a depth of about 35 inches, is very dark grayish-brown mucky peat. The underlying material is black silt loam in the upper part and gray heavy silt loam in the lower part.

Palms soils are neutral to moderately alkaline. They have a very high available water capacity and moderate to low natural fertility.

Most areas of Palms soils are in native vegetation. Numerous areas are used for permanent pasture, and a few areas have been drained and are used for crops. Wetness is the main limitation to farming.

Areas of Palms soils are widely scattered throughout most parts of the county. Although they are not important to the farm economy at present, they represent a significant cropland potential.

Representative profile of Palms mucky peat, uncultivated, SE¼SE¼ sec. 16, T. 14 N., R. 15 E.

1—0 to 10 inches, black (N 2/0) mucky peat; weak, coarse, granular structure; very friable; less than 50 percent of mass is identifiable fibers and sedge remains; mildly alkaline; clear, smooth boundary.

2—10 to 26 inches, black (10YR 2/1) mucky peat; weak, medium, subangular blocky structure; friable; about 50 percent of mass is identifiable sedge remains, soft and easily rubbed to mucky consistence; neutral; clear, smooth boundary.

3—26 to 35 inches, very dark grayish-brown (10YR 3/2) mucky peat; weak, thick, platy structure; friable; more than 50 percent of mass is identifiable sedge remains, soft and easily rubbed to mucky consistence; neutral; abrupt, smooth boundary.

IIC1—35 to 42 inches, black (10YR 2/1) silt loam; weak, medium, granular structure; friable; high organic-matter content; neutral; abrupt, wavy boundary.

IIC2—42 to 60 inches, gray (5Y 5/1) heavy silt loam; massive; firm; moderately alkaline.

The organic horizons contain varying amounts of plant remains, but generally less than 50 percent of the mass is identifiable. The surface layer ranges from black to very dark gray. Reaction ranges from neutral to mildly alkaline. In some places woody fragments occur throughout the organic horizons. A layer of sedimentary peat commonly occurs immediately above the mineral soil.

Palms soils are similar to Ogden, Adrian, and Rollin soils, except that Palms soils are underlain by loam and the other soils are underlain by clay, sand, or marl, respectively. Houghton soils developed in similar organic material, but their mineral horizons are more than 42 inches thick.

Palms muck (0 to 2 percent slopes) (Pa).—The organic horizons of this soil are disintegrated to a greater degree than those of the soil described as representative of the series. Generally, less than 40 percent of the organic mass can be identified readily as nonwoody plant remains. This soil is associated with Palms mucky peat and Houghton soils, and small areas of those soils were included in mapping.

This soil is well suited to reed canarygrass. Wetness limits the use of this soil for farming, but drained areas are well suited to corn, small grains, and truck crops. In the drained areas, however, the soil is subject to subsidence, and there is a severe hazard of soil blowing. (Capability unit IIw–8; woodland suitability group 10; wildlife group 5)

Palms mucky peat (0 to 2 percent slopes) (Pc).—This soil consists of 40 to 60 percent identifiable nonwoody plant remains. It has the profile described as representative of the series. This soil is associated with Houghton soils, and small areas of those soils were included in mapping.

This soil is well suited to reed canarygrass. Wetness limits the use of this soil for farming, but drained areas are suited to corn and small grains and are well suited to truck crops. In the drained areas, however, the soil is subject to subsidence, and there is a severe hazard of soil blowing. (Capability unit IIw–8; woodland suitability group 10; wildlife group 5)

Peebles Series

The Peebles series consists of deep, level and gently sloping, moderately well drained soils on uplands. These soils developed in less than 12 inches of loess over calcareous, fine-textured, reddish glacial till. The original vegetation was prairie grasses.

In a representative profile the surface layer is very dark gray silt loam about 11 inches thick. The subsoil is reddish-gray and reddish-brown clay about 14 inches thick. The underlying material is moderately alkaline. In the upper part it is reddish-brown clay that has pockets of soft lime nodules, and in the lower part it is reddish-brown silty clay.

Peebles soils have high available water capacity and moderately slow permeability. They are slightly acid to medium acid in the surface layer and moderately alkaline in the substratum. Fertility is high, and the organic-matter content of the surface layer is high.

Peebles soils are important in the western part of Calumet Township and the central part of Fond du Lac Township. They are mostly used for crops. These soils are easily puddled if worked or grazed when too wet. Upon drying, they form hard, angular clods that are difficult to work into a good seedbed.

Representative profile of Peebles silt loam, 0 to 2 percent slopes, cultivated, SE¼SW¼ sec. 29, T. 15 N., R. 17 E.

Ap—0 to 8 inches, very dark gray (10YR 3/1) heavy silt loam; weak, medium, granular structure; friable; slightly acid; abrupt, smooth boundary.

A1—8 to 11 inches, very dark gray (10YR 3/1) heavy silt loam; moderate, very fine, subangular blocky structure; firm; slightly acid; clear, irregular boundary.

B1—11 to 16 inches, reddish-gray (5YR 5/2) clay; common, fine, prominent mottles of yellowish red (5YR 5/6); some dark reddish-brown (5YR 3/2) organic stains; moderate, fine, subangular blocky structure; very firm; mildly alkaline; clear, wavy boundary.

B2t—16 to 20 inches, dark reddish-gray (5YR 4/2) clay, reddish brown (5YR 5/3) when crushed; few faint mottles in upper 2 inches of horizon; weak, medium, prismatic structure and strong, medium, angular blocky; very firm; some organic stains and clay films; mildly alkaline; clear, irregular boundary.

B3—20 to 25 inches, reddish-brown (5YR 4/3) clay, reddish brown (5YR 5/3) when crushed; weak, medium, prismatic structure and medium, angular blocky; very firm; few organic stains; some segregated lime; moderately alkaline; gradual, irregular boundary.

C1ca—25 to 31 inches, reddish-brown (5YR 5/3) clay that has pockets of soft, pinkish-gray (5YR 7/2) lime; weak, medium, prismatic structure and weak, medium, angular blocky; very firm; moderately alkaline; calcareous; gradual, irregular boundary.

C2—31 to 60 inches, reddish-brown (5YR 5/3 to 4/3) silty clay that has light brownish-gray (2.5Y 6/2) coatings along horizontal and vertical cleavage faces; coatings are less distinct with depth; moderate, medium, prismatic structure and moderate, medium, angular blocky; massive in the lower part; very firm; moderately alkaline; calcareous.

The solum ranges from 20 to 30 inches in thickness. The A horizon ranges from heavy silt loam to silty clay loam, depending on how much of the silty clay or clay from the B horizon has been brought upward through tillage.

Peebles soils are part of a drainage sequence with the somewhat poorly drained Manawa soils and the poorly drained Poygan soils. They have a thicker and darker colored surface layer than Kewaunee soils.

Peebles silt loam, 0 to 2 percent slopes (PfA).—This soil has a combined surface layer and subsoil that ranges from 24 to 30 inches in thickness. It has the profile described as representative of the series.

In many places this soil is adjacent to Peebles silt loam, 2 to 6 percent slopes. It is also associated with Manawa soils in dissected shallow drainageways and with Poygan soils in saucer-shaped depressions. Areas of Manawa and Poygan soils were included with this soil in mapping.

This soil is well suited to corn, small grains, mixed hay, and alfalfa hay. Runoff is very slow. (Capability unit IIs–7; woodland suitability group 12; wildlife group 3)

Peebles silt loam, 2 to 6 percent slopes (PfB).—This soil generally occupies low ridges throughout Calumet and Fond du Lac Townships. It lies above Peebles silt loam, 0 to 2 percent slopes, on the landscape.

This soil is suited to corn, small grains, mixed hay, and alfalfa hay. Erosion is the main hazard in farming. (Capability unit IIe–6; woodland suitability group 12; wildlife group 3)

Pella Series

The Pella series consists of deep, nearly level, poorly drained soils that developed in silt. In most places these soils are underlain by calcareous loam glacial till, and they occupy depressions and valleys in the uplands. In some places Pella soils are underlain by fine-textured lacustrine sediments and occupy broad plains and valley bottoms. The original vegetation was water-tolerant trees, shrubs, and grasses.

In a representative profile the surface layer is black silt loam 12 inches thick. The subsoil is about 30 inches thick. It is olive-gray and yellowish-brown light silty clay loam and silt loam mottled with brownish yellow. The underlying material is brown silty clay loam.

Pella soils have high available water capacity, fertility, and organic-matter content. They are moderately permeable. These soils are neutral to mildly alkaline in the surface layer and subsoil and moderately alkaline in the substratum.

Pella soils occur in nearly all townships in Fond du Lac County and are important for farming. Undrained areas

of these soils are mainly in permanant pasture or woodland; drained areas are suited to most of the common crops. Wetness is the main limitation to farming these soils. Excess water is at or near the surface during most of the year.

Representative profile of Pella silt loam, 0 to 3 percent slopes, cultivated, NW¼SW¼ sec. 16, T. 14 N., R. 16 E.

Ap—0 to 12 inches, black (10YR 2/1) silt loam; weak, medium, subangular blocky structure; firm; neutral; abrupt, smooth boundary.

B21g—12 to 20 inches, olive-gray (5Y 5/2) light silty clay loam; few, fine, prominent mottles of yellowish brown (10YR 5/6); moderate, medium, subangular blocky structure; firm; neutral; clear, irregular boundary.

B22g—20 to 36 inches, yellowish-brown (10YR 5/4) light silty clay loam; many, medium, distinct mottles of brownish yellow (10YR 6/6); weak, medium, subangular blocky structure; firm; mildly alkaline; clear, irregular boundary.

B3g—36 to 42 inches, yellowish-brown (10YR 5/4) silt loam; many, medium, distinct mottles of brownish yellow (10YR 6/6); weak, medium, subangular blocky structure; firm; mildly alkaline; gradual, irregular boundary.

C3g—42 to 60 inches, brown (10YR 5/3) silty clay loam; massive; firm; texture grades to fine silt at a depth of 48 to 52 inches; moderately alkaline.

The thickness of the silt mantle ranges from 30 inches to more than 4 feet. The solum ranges from 30 to 46 inches in thickness; it generally developed in the silty part of the parent material.

Soils of the Pella series are associated with the well-drained Dodge and St. Charles soils and the somewhat poorly drained Virgil soils.

Pella soils resemble Brookston soils in natural drainage, but they lack a Bt horizon and their parent material was more than 30 inches of silt overlying glacial till. Pella soils have less prominent mottling throughout most of the B horizon than the poorly drained Ashkum soils, and they have a lower content of clay in the B horizon. Ashkum soils developed in less than 30 inches of loess underlain by clay loam glacial till derived partly from shale.

Pella silt loam, 0 to 3 percent slopes (PhA).—This soil occupies broad valleys, depressions, and areas adjacent to other wetland. It has the profile described as representative of the series. Where the surface layer is undisturbed, it is covered by a thin organic layer; where it is plowed, the organic layer is mixed with the underlying mineral soil.

This soil generally is associated with shallow organic soils at lower elevations and with Virgil soils at higher elevations. Areas of these soils were included with this soil in mapping. This soil is also associated with Martinton and Poygan soils in the southern part of Fond du Lac Township and the northern part of Oakfield Township.

Wetness is the main limitation to farming this soil. Runoff is very slow or ponded. Where drainage has not been improved, alfalfa winterkills. (Capability unit IIw–1; woodland suitability group 7; wildlife group 4)

Pella silty clay loam, 0 to 2 percent slopes (PnA).—This soil is in broad valleys and depressions and, in some places, is adjacent to wetland. In places it occupies the wet parts of broad drainageways. Except for the fine texture of the surface layer, this soil has a profile similar to that described as representative of the series.

This soil is adjacent to Virgil soils, and small areas of these soils were included in mapping. Also included were soils in which the glacial loam till is at a depth of less than 2 feet.

Where drainage has been improved, this soil can be used for crops commonly grown on dairy farms. The main limitation to use of this soil is wetness. Excess water is at or near the surface during much of the year, and runoff is very slow to ponded. Shrinkage cracks occur during extremely dry periods. (Capability unit IIw–1; woodland suitability group 7; wildlife group 4)

Plano Series

The Plano series consists of deep, nearly level and gently sloping, well-drained soils on uplands. These soils developed in moderately deep to deep silt over calcareous channery loam glacial till. The original vegetation was prairie grasses.

In a representative profile the surface layer is dark brown and very dark brown silt loam 13 inches thick. The subsoil is mainly dark yellowish-brown heavy silt loam and light silty clay loam about 33 inches thick. The underlying material is yellowish-brown heavy loam.

Plano soils have high available water capacity. They are moderately permeable. They are neutral to medium acid in the surface layer and subsoil and moderately alkaline in the substratum. Fertility is high, and the organic-matter content of the surface layer is high.

Plano soils are important to the farm economy and occur most extensively in Ripon, Metomen, Alto, and Waupun Townships. They are used almost entirely for crops.

Representative profile of Plano silt loam, 2 to 6 percent slopes, cultivated, SW¼SW¼ sec. 8, T. 15 N., R. 14 E.

Ap—0 to 8 inches, very dark brown (10YR 2/2) silt loam; weak, medium, granular structure; friable; neutral; clear, wavy boundary.

A3—8 to 13 inches, dark-brown (10YR 3/3) silt loam; weak, medium, granular structure; friable; slightly acid; clear, wavy boundary.

B1—13 to 24 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, medium, subangular blocky structure; friable; slightly acid; clear, irregular boundary.

B21t—24 to 30 inches, dark yellowish-brown (10YR 4/4) heavy silt loam; weak, medium, subangular blocky structure; friable; thick, continuous clay films; slightly acid; clear, irregular boundary.

B22t—30 to 40 inches, dark yellowish-brown (10YR 4/4) light silty clay loam; moderate, medium, subangular blocky structure; firm; thick, continuous clay films; slightly acid; clear, irregular boundary.

IIB3—40 to 46 inches, dark yellowish-brown (10YR 4/4) gritty heavy silt loam; few faint mottles in lower part; weak, coarse, subangular blocky structure; firm; few, thin, patchy clay films; a few pebbles; neutral; clear, irregular boundary.

IIC—46 to 60 inches, yellowish-brown (10YR 5/4) heavy loam; few, medium, distinct mottles of strong brown (7.5YR 5/6); massive; friable; numerous dolomite pebbles and fragments; moderately alkaline; calcareous.

The thickness of the loess mantle ranges from 36 to 50 inches. The solum ranges from 42 to 60 inches in thickness, and most of it formed in silt. The glacial till IIC horizon contains numerous dolomite fragments and flagstones ranging from less than 3 inches to 3 feet in diameter.

Plano soils are part of a drainage sequence with the somewhat poorly drained Elburn soils and the poorly drained Pella soils. Plano soils differ from Mendota soils in having formed in 36 inches or more of silt. Plano soils are 42 to 60 inches deep, and Mendota soils are 24 to 40 inches deep to unweathered glacial till. Most of the subsoil of Plano soils is silty.

Plano silt loam, 0 to 2 percent slopes (PsA).—This soil occupies broad plains. The surface layer is 12 to 18 inches thick, and the thickness of the combined surface layer and

subsoil ranges from 42 to 48 inches. Areas of the normally associated Plano and Mendota soils were included with this soil in mapping.

This soil is well suited to all crops generally grown on dairy farms. Canning crops are also well suited. This soil has few limitations to use for farming. Runoff is slow. (Capability unit I-1; woodland suitability group 1; wildlife group 2)

Plano silt loam, 2 to 6 percent slopes (PsB).—This soil is on side slopes of low ridges and hills. It has the profile described as representative of the series. The soil is associated with Mendota silt loam, 2 to 6 percent slopes, and with nearly level Plano soils. Areas of these soils were included with this soil in mapping.

This soil is well suited to all the principal crops grown on dairy farms, and to canning crops. There is a slight hazard of erosion. Runoff is slow to medium. (Capability unit IIe-1; woodland suitability group 1; wildlife group 2)

Plano silt loam, 2 to 6 percent slopes, eroded (PsB2).—This soil is on side slopes of low ridges and hills in the western part of the county. The surface layer is very dark grayish brown to dark brown in color and 4 to 8 inches in thickness. The depth to unweathered glacial till is about 42 to 46 inches. Because of erosion, the organic-matter content of the surface layer is lower than that of the surface layer of the profile described as representative of the series.

This soil generally is associated with gently sloping and nearly level Plano and Mendota soils. Areas of these soils were included with this soil in mapping.

This soil is well suited to all principal crops generally grown on dairy farms. Canning crops are also well suited. Runoff is medium. (Capability unit IIe-1; woodland suitability group 1; wildlife group 2)

Plano Series, Sandy Variant

The sandy variant of the Plano series consists of well-drained soils that formed in loamy material overlying silty material. The original vegetation was hardwood forest and prairie grasses.

In a representative profile the surface layer is very dark brown fine sandy loam about 10 inches thick. The subsurface layer is dark yellowish-brown fine sandy loam about 6 inches thick. The subsoil extends to a depth of 38 inches. It is mainly brown fine sandy loam in the upper part and dark-brown sandy clay loam and silt loam in the lower part. The underlying material is yellowish-brown silt loam.

These soils have high available water capacity and moderate permeability. They are used mostly for crops, but the total acreage is small.

Representative profile of Plano fine sandy loam, sandy variant, 2 to 6 percent slopes, cultivated, SW¼NE¼ sec. 6, T. 16 N., R. 14 E.

Ap—0 to 10 inches, very dark brown (10YR 2/2) fine sandy loam; moderate, medium, granular structure; very friable; neutral; abrupt, wavy boundary.

A3—10 to 16 inches, dark yellowish-brown (10YR 3/4) fine sandy loam; moderate, medium, granular structure; very friable; slightly acid; clear, wavy boundary.

B1—16 to 21 inches, dark-brown (7.5YR 4/4) very fine sandy loam; weak, medium, subangular blocky structure; very friable; slightly acid; clear, wavy boundary.

B21t—21 to 29 inches, brown (7.5YR 4/4) fine sandy loam; weak, medium, subangular blocky structure; friable; clay bridging and thin, patchy clay films; slightly acid; clear, irregular boundary.

B22t—29 to 35 inches, dark-brown (7.5YR 4/4) sandy clay loam; weak, fine, subangular blocky structure; friable; thick, continuous clay films; slightly acid; abrupt, wavy boundary.

IIB3t—35 to 38 inches, dark-brown (7.5YR 4/4) silt loam; weak, medium, subangular blocky structure; friable; clay bridging; slightly acid; clear, irregular boundary.

IIC—38 to 60 inches, yellowish-brown (10YR 5/4) silt loam; few, fine, prominent mottles of yellowish red (5YR 5/8) at a depth of 38 to 42 inches; massive; friable; slightly acid to neutral.

The thickness of the solum is 30 to 60 inches. The lower part of the profile formed in silt.

Plano fine sandy loam, sandy variant, 2 to 6 percent slopes (PuB).—This soil is on low ridges and hills in the western part of Ripon Township. In many places it is adjacent to Plano silt loam, 2 to 6 percent slopes, and small areas of this soil were included in mapping. Also included were soils underlain by a reddish-brown sandy loam till at a depth of 42 to 60 inches.

This soil is suited to all the principal crops and canning crops generally grown in the county. It is slightly droughty for shallow-rooted crops. Soil blowing and water erosion are the main limitations to use of this soil. (Capability unit IIe-1; woodland suitability group 3; wildlife group 4)

Poygan Series

The Poygan series consists of deep, nearly level to gently sloping, poorly drained soils on uplands. These soils developed in very shallow silt over calcareous, fine-textured, reddish-brown glacial till or lacustrine sediments. The soils that formed in sediments occupy wide areas of lacustrine material; those that formed in glacial till occupy broad depressions and a few drainageways and seepage spots. The original vegetation was water-tolerant trees, shrubs, and grass.

In a representative profile the surface layer is black silty clay loam 7 inches thick. The subsoil extends to a depth of 27 inches. It is gray and very dark gray silty clay and clay in the upper part and reddish-brown clay in the lower part. The underlying material is reddish-brown silty clay.

Poygan soils have high available water capacity. They are slowly permeable and mildly alkaline in the surface layer and subsoil. Natural fertility is high, and the organic-matter content of the surface layer is high.

These soils occur extensively in the red clay area of the Lake Winnebago Valley. They are used mostly for crops. Drained areas are suited to all crops commonly grown on dairy farms; in undrained areas alfalfa winterkills and other crops often drown out after heavy rains. Wetness is the main limitation to use of these soils, but it is also difficult to maintain good tilth. These soils puddle if worked or grazed when wet.

Representative profile of Poygan silty clay loam, uncultivated, NW¼NE¼ sec. 2, T. 15 N., R. 17 E.

A1—0 to 7 inches, black (10YR 2/1) silty clay loam; moderate, medium, granular structure; friable; mildly alkaline; clear, wavy boundary.

B1g—7 to 13 inches, very dark gray (5Y 3/1) silty clay; moderate, fine, subangular blocky structure; firm; mildly alkaline; clear, irregular boundary.

B2g—13 to 19 inches, gray (5Y 5/1) clay; common, medium, prominent mottles of yellowish brown (10YR 5/6); moderate, fine, subangular blocky structure; firm; mildly alkaline; clear, irregular boundary.

B3—19 to 27 inches, reddish-brown (5YR 5/3) clay; many, coarse, faint mottles of dark brown (7.5 YR 4/4); moderate, medium, angular blocky structure; firm; mildly alkaline; clear, irregular boundary.

C1—27 to 33 inches, reddish-brown (5YR 4/4) silty clay; common, medium, distinct mottles of yellowish red (5YR 5/6); weak, medium, subangular blocky structure; firm; numerous light brownish-gray (10YR 6/2) coatings around root-hair channels; some pebbles and dolomite fragments; moderately alkaline; calcareous; gradual, irregular boundary.

C2—33 to 60 inches, reddish-brown (5YR 4/4) heavy clay loam; massive; firm; pebbles and dolomite fragments; moderately alkaline; calcareous.

The solum ranges from 20 to 30 inches in thickness. The texture of the B horizon ranges from silty clay to clay. In some undisturbed sites, Poygan soils have a mucky organic surface layer that ranges from 1 to 6 inches in thickness. Poygan soils that formed in lacustrine sediments lack the pebbles and dolomite fragments that are normal in glacial till.

Poygan soils differ from Pella soils in having formed in reddish-brown clay loam to clay rather than brown to yellowish-brown silt loam or silty clay loam.

Poygan silty clay loam (0 to 2 percent slopes) (Py).—This soil occupies wide depressions and, in some places, nearly level wet drainageways. It has the profile described as representative of the series. In most areas this soil has been plowed, and the original surface layer has been mixed with some of the silty clay subsoil.

This soil is associated with the well drained Kewaunee soils, the moderately well drained to well drained Oshkosh soils, the moderately well drained Peebles soils, and the somewhat poorly drained Manawa soils. Small areas of Manawa silt loam and silty clay loam were included in mapping. Also included were small areas of Poygan soil where the surface layer is silt loam.

Except for alfalfa, this soil is suited to all crops generally grown in a dairy farming area. Excessive wetness is the main limitation to use of this soil. Water moves through the soil rather slowly and results in the formation of a perched water table, especially in spring and after heavy rains. The surface layer tends to puddle after rains and then dries into hard clods that make the preparation of a good seedbed difficult. (Capability unit IIw–1; woodland suitability group 7; wildlife group 4)

Rimer Series

The Rimer series consists of deep, somewhat poorly drained soils in shallow drainageways and small depressions. These soils formed in sandy lacustrine sediments underlain by calcareous, fine-textured, reddish glacial till. The original vegetation was hardwood forest.

In a representative profile the surface layer is very dark gray loam 10 inches thick. The subsurface layer is yellowish-brown fine sandy loam and grayish-brown fine sand 12 inches thick. The subsoil is reddish-brown silty clay about 8 inches thick, and the underlying material is reddish-brown silty clay.

Rimer soils have high available water capacity in the rooting zone to a depth of 60 inches. Permeability is moderate to rapid in the surface layer and moderately slow in the subsoil and substratum. These soils are neutral to moderately alkaline. The surface layer is medium in organic-matter content.

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Rimer soils are in the townships of Calumet, Taycheedah, Fond du Lac, and Friendship, within 2 miles of Lake Winnebago. They are used mainly for crops. Wetness and the moderately slow permeability of the lower part of the subsoil are the principal limitations to use.

Representative profile of Rimer loam, 2 to 6 percent slopes, cultivated, SW¼NW¼ sec. 20, T. 16 N., R. 18 E.

Ap—0 to 10 inches, very dark gray (10YR 3/1) loam; weak to moderate, medium, granular structure; friable; slightly compacted; mildly alkaline; abrupt, wavy boundary.

A21—10 to 16 inches, light yellowish-brown (10YR 6/4) fine sandy loam; common, medium, prominent mottles of strong brown (7.5YR 5/8); weak, fine, subangular blocky structure; very friable; mildly alkaline; clear, wavy boundary.

A22—16 to 22 inches, grayish-brown (10YR 5/2) fine sand; few, fine, distinct mottles of strong brown (7.5YR 5/8); single grain; loose; numerous rounded limestone cobblestones; moderately alkaline; abrupt, wavy boundary.

IIB2t—22 to 30 inches, reddish-brown (5YR 4/3) silty clay; few, fine, distinct mottles of grayish brown (10YR 5/2); moderate, fine, angular blocky structure; very firm; thick, continuous clay films; moderately alkaline; calcareous; gradual, wavy boundary.

IIC—30 to 60 inches, reddish-brown (5YR 4/3) silty clay; massive; moderately alkaline; calcareous.

The sandy lacustrine sediments range from 18 to 40 inches in thickness. In places a thin gravelly layer that contains an abundance of small snail and clam shells occurs in the sandy material. In some places there are thin layers of silty clay or clay in the sandy part of the profile. Rimer soils form a drainage sequence with the poorly drained Wauseon soils.

Rimer loam, 2 to 6 percent slopes (ReB).—This soil occupies narrow drainageways that dissect Manawa silt loam. It is mainly gently sloping, but small areas are nearly level and sloping. The depth to the clayey part of the soil is generally less than 24 inches. Small areas of fine sandy loam were included in mapping.

The use of this soil is limited by wetness and moderately slow permeability in the lower part of the subsoil. Alfalfa winterkills where drainage has not been improved. (Capability unit IIw–2; woodland suitability group 7; wildlife group 7)

Rock Land

Rock land (Rm) consists of rock outcrop, boulders, and very shallow, sloping to steep soil. Most areas are on or near the Niagara Escarpment between Calumet Township and the central part of Oakfield Township. It seldom produces harvestable vegetation. The soil material between the rock outcrops and boulders is generally silt loam. (Capability unit VIIIs–10; woodland suitability group 11; wildlife group 7)

Rodman Series

The Rodman series consists of shallow, sloping to very steep, excessively drained sandy and loamy soils. The slopes are single and complex. These soils formed in glacial deposits of calcareous morainic outwash. The original vegetation was hardwood forest.

In a representative profile the surface layer is very dark brown gravelly loam 4 inches thick. The next layer is dark-brown gravelly loam about 2 inches thick. The underlying material is brown sand and gravel.

Rodman soils have very low available water capacity. They are rapidly permeable. These soils are low in natural fertility, and they are moderately alkaline throughout. The organic-matter content of the surface layer is medium.

These soils are extensive on the Kettle Moraine, or the southeastern part of the county. They are mainly used for permanent pasture or woodlots, but a few scattered areas, where the slope is less than 12 percent, are used for crops. A very low available water capacity and a severe erosion hazard are the main limitations to use of these soils.

Representative profile of Rodman gravelly loam, uncultivated, NW¼SE¼ sec. 13, T. 13 N., R. 19 E.

AO—½ inch to 0, partly decomposed organic debris.
A1—0 to 4 inches, very dark brown (10YR 2/2) gravelly loam; moderate, medium, granular structure; very friable; moderately alkaline; clear, irregular boundary.
AB—4 to 6 inches, dark-brown (10YR 3/3) gravelly loam; moderate, medium, granular structure; very friable; moderately alkaline; clear, irregular boundary.
C—6 to 60 inches, brown (10YR 4/3) sand and gravel; single grain; loose; most of the gravel is about 1½ inches in diameter; moderately alkaline, calcareous.

The solum ranges from 5 to 10 inches in thickness. In places the A horizon is gravelly sand. The C horizon ranges from medium sand to cobblestones 10 inches in diameter.

Rodman soils are associated with Casco and Fox soils. They are thinner than those soils and lack an argillic B horizon. Rodman soils differ from Hochheim silt loam, channery till variant, in having formed in outwash sand and gravel, rather than in loamy glacial till.

Rodman gravelly sand, 6 to 20 percent slopes, eroded (RnD2).—This soil occurs mainly on the Kettle Moraine. It contains more sand throughout than the soil described as representative of the series. The surface layer is dark brown to yellowish brown. Blowouts occur in many places that have been cultivated or grazed heavily. Small areas of other Rodman soils were included in mapping.

This soil is well suited to woodland or wildlife habitat. Use of this soil is limited mainly by a very low available water capacity and a severe erosion hazard. It is difficult to maintain a good sod cover. (Capability unit VIIs–5; woodland suitability group 6; wildlife group 7)

Rodman gravelly sand, 20 to 30 percent slopes, eroded (RnE2).—This soil occurs mainly on the Kettle Moraine. It contains more sand throughout than the soil described as representative of the series. The surface layer is dark brown to yellowish brown. Small areas of other Rodman soils were included in mapping. There are a few blowouts.

This soil is mainly in permanent pasture or woodland. A very low available water capacity and erosion are the main limitations to use of this soil, and it is difficult to maintain a good sod cover. (Capability unit VIIs–5; woodland suitability group 6; wildlife group 7)

Rodman gravelly loam, 12 to 20 percent slopes, eroded (RoD2).—This soil is on side slopes of morainic ridges, hills, and knobs that are typical of the Kettle Moraine area. It also occupies side slopes of eskers and kames. A representative esker ridge occurs in Springvale Township. The surface layer is 4 to 6 inches thick. It ranges from very dark brown in undisturbed areas to dark brown or brown where it has been plowed. The combined thickness of the surface layer and subsoil ranges from 5 to 10 inches.

In many places this soil is associated with Casco soils and with other Rodman soils. Included in mapping were small areas that are either less eroded or more eroded. Pebbles and cobblestones are on the surface in severely eroded spots.

This soil is well suited to woodland or wildlife habitat. It is low in natural fertility. The available water capacity is very low, and the erosion hazard is severe. This soil needs to be protected from overgrazing. In areas on eskers, it is a source of gravel for highway construction. (Capability unit VIIs–5; woodland suitability group 6; wildlife group 7)

Rodman gravelly loam, 20 to 45 percent slopes, eroded (RoF2).—This soil is on side slopes of ridges, hills, and knobs in the Kettle Moraine area in the southeastern part of the county. It also occupies the side slopes of eskers and kames. This soil has the profile described as representative of the series. The color of the surface layer ranges from very dark brown to brown.

In many places this soil is associated with Casco soils. Included in mapping were soils in all stages of erosion. Pebbles and cobblestones are on the surface in severely eroded spots.

This soil is suited to woodland or wildlife habitat. In areas on eskers, it is a source of gravel for highway construction. This soil is low in natural fertility. The available water capacity is very low, and the erosion hazard is severe. (Capability unit VIIs–5; woodland suitability group 6; wildlife group 7)

Rollin Series

The Rollin series consists of organic soils that formed in disintegrated fibrous reeds and sedges. The organic layers are underlain by marl at a depth of 12 to 42 inches. Rollin soils occupy small depressions and kettle holes that are generally less than 10 acres in size. The original vegetation was water-tolerant shrubs and grasses.

In a representative profile the surface layer is black mucky peat 21 inches thick. The next layer is very dark brown mucky peat 11 inches thick. The underlying material is white marl.

Rollin soils range from neutral to mildly alkaline down to the marl substratum. They have high available water capacity and low natural fertility.

Rollin soils occur throughout the county, but the total acreage is small. Nearly all areas are in native vegetation; a few areas are in permanent pasture. Excess water is the main hazard to use of these soils for farming. Where drainage has been improved, the soils are susceptible to subsidence and soil blowing.

Representative profile of Rollin mucky peat, uncultivated, SW¼SW¼ sec. 6, T. 15 N., R. 15 E.

1—0 to 21 inches, black (N 2/0) mucky peat; moderate, medium, granular structure; very friable; less than 35 percent of the soil mass is identifiable fibrous fragments; mildly alkaline.
2—21 to 32 inches, very dark brown (10YR 2/2) mucky peat; moderate, medium, granular structure; friable; less than 50 percent of mass is identifiable fibrous and sedge fragments; mildly alkaline.
IIC1—32 to 60 inches, white (2.5Y 8/2) marl; common, medium, prominent mottles of brownish yellow (10YR 6/8) and yellowish brown (10YR 5/8); massive; friable; strongly calcareous.

The organic horizons consist of up to 50 percent identifiable plant remains. The surface layer ranges from black to very dark gray. Reaction ranges from neutral to mildly alkaline. In some areas the marl layer is less than 15 inches thick and is underlain by mineral soil material.

Rollin soils differ from Palms, Ogden, and Adrian soils in being underlain by marl rather than by loam, clay, or sand. Houghton soils developed in organic materials similar to that of Rollin soils, but they are underlain by mineral horizons at a depth of 42 inches or more.

Rollin mucky peat (Rw).—This soil consists of less than 35 percent identifiable nonwoody plant remains, including fragments of grasses, reeds, and sedges. It is associated with Palms, Adrian, and Houghton soils, and small areas of these soils were included in mapping.

This soil is suited to woodland or wildlife habitat. Wetness is the main limitation to farming. Where the soil is 36 inches or more thick over marl, it can be drained by open ditches or by tile lines. Where it is drained, this soil is subject to subsidence and soil blowing, but it can be used for corn, small grains, and such truck crops as onions, lettuce, and carrots. (Capability unit IVw–7; woodland suitability group 10; wildlife group 5)

St. Charles Series

The St. Charles series consists of deep, nearly level and gently sloping, well-drained soils on uplands. These soils developed in a moderately deep to deep silt mantle underlain by calcareous, loamy glacial till. The original vegetation was hardwood forest.

In a representative profile the surface layer is very dark gray silt loam about 7 inches thick. The subsurface layer is dark grayish-brown silt loam 5 inches thick. The subsoil extends to a depth of 60 inches. It is dark-brown and brown silty clay loam in the upper 38 inches and brown loam in the lower part. The underlying material is brown loam.

St. Charles soils have high available water capacity and moderate permeability. They are moderate in fertility and in organic-matter content of the surface layer. They are neutral to strongly acid in the subsoil and moderately alkaline in the substratum.

St. Charles soils are in nearly all townships in the county, but they are more common west of the villages of Lamartine and Eldorado. Nearly all the areas are used for crops. A few isolated areas are in woodlots. Erosion is the main limitation to farming.

Representative profile of St. Charles silt loam, 0 to 2 percent slopes, uncultivated, NE¼NE¼ sec. 5, T. 15 N., R. 15 E.

A1—0 to 7 inches, very dark gray (10YR 3/1) silt loam; moderate, fine, granular structure; very friable; mildly alkaline; clear, wavy boundary.

A2—7 to 12 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium, platy structure; friable; neutral; clear, irregular boundary.

B1—12 to 19 inches, dark-brown (10YR 4/3) silty clay loam; weak, medium, subangular blocky structure; friable; neutral; gradual, irregular boundary.

B21t—19 to 26 inches, brown (10YR 4/3) silty clay loam; moderate, fine, subangular blocky structure; firm; thick, continuous clay films; strongly acid; gradual, irregular boundary.

B22t—26 to 30 inches, brown (10YR 4/3) heavy silty clay loam; few, fine, faint mottles of yellowish brown (10YR 5/4); moderate, medium, subangular blocky structure; firm; thick, continuous clay films; strongly acid; clear, irregular boundary.

B23t—30 to 38 inches, brown (10YR 4/3) silty clay loam; few, fine, faint mottles of yellowish brown (10YR 5/6); moderate, coarse, subangular blocky structure; firm; thick, continuous clay films; strongly acid; gradual, irregular boundary.

B31—38 to 50 inches, yellowish-brown (10YR 5/4) light silty clay loam; few, fine, distinct mottles of yellowish brown (10YR 5/8); weak, coarse, subangular blocky structure; firm, thin, patchy clay films; medium acid; gradual, wavy boundary.

IIB32—50 to 60 inches, brown (7.5YR 5/4) loam; weak, coarse, subangular blocky structure; firm; numerous pebbles; slightly acid; clear, wavy boundary.

IIC—60 to 68 inches, brown (10YR 5/4) loam; massive; friable; abundant pebbles and stones, mostly dolomite; moderately alkaline; calcareous.

St. Charles soils developed in a silt mantle that ranges from 36 to 50 inches in thickness. The solum ranges from 42 to about 60 inches in thickness. Most of the solum developed in silt, and only a part of the B horizon, generally the B3, formed in till. The A horizon is very dark gray where undisturbed and very dark grayish brown to brown where cultivated. Some soils on drumlins have received as much as 10 inches of overwash from adjacent slopes.

St. Charles soils are associated with the somewhat poorly drained Virgil soils and the poorly drained Pella soils. St. Charles soils resemble Mayville soils, except that St. Charles soils developed in 36 inches or more of silt.

St. Charles silt loam, 0 to 2 percent slopes (ScA).—This soil is on gently sloping to sloping hills and ridges. It has the profile described as representative of the series. This soil is adjacent to Hochheim and Dodge soils and to Virgil and Pella soils in depressions and drainageways. Small areas of these soils were included in mapping.

This soil is well suited to corn, small grains, mixed hay, alfalfa hay, and such canning crops as sweet corn and peas. (Capability unit I–1; woodland suitability group 1; wildlife group 1)

St. Charles silt loam, 2 to 6 percent slopes (ScB).—This soil is on foot slopes of sloping to steep hills, ridges, and drumlins. The surface layer is 9 to 12 inches thick, and it is dark grayish brown or brown where cultivated.

The soil is associated with sloping Dodge and Hochheim soils and with Virgil and Pella soils in depressions or drainageways. Areas of these soils were included with this soil in mapping.

There is a slight erosion hazard. Runoff is more rapid than on the soil that is representative of the series. (Capability unit IIe–1; woodland suitability group 1; wildlife group 1)

St. Charles silt loam, gravelly substratum, 0 to 2 percent slopes (SeA).—This soil is on wide outwash plains. Except that it is underlain by sand and gravel at a depth of 42 to 60 inches, this soil has a profile similar to that described as representative of the series. It is associated with Fox soils and with more gently sloping St. Charles soils. Small areas of those soils were included in mapping.

This soil is well suited to all the principal crops grown on dairy farms. There are few limitations to farming this soil. Runoff is very slow, and water enters and moves through the soil at a moderate rate. (Capability unit I–1; woodland suitability group 1; wildlife group 1)

St. Charles silt loam, gravelly substratum, 2 to 6 percent slopes (SeB).—This soil is on outwash plains. It is underlain by sand and gravel at a depth of 42 to 50 inches, and the thickness of the surface layer ranges from 8 to 12 inches. This soil is associated with Fox soils and with more gently sloping St. Charles soils. Small areas of those soils were included in mapping.

This soil is well suited to all the principal crops grown in dairy farming. The erosion hazard is slight. Runoff is

very slow, but water enters and moves through the soil at a moderate rate. (Capability unit IIe–1; woodland suitability group 1; wildlife group 1)

Sebewa Series

The Sebewa series consists of nearly level and gently sloping, poorly drained soils on outwash plains. These soils developed in moderately deep silt underlain by calcareous, stratified sand and gravel. The original vegetation was water-tolerant trees and shrubs.

In a representative profile the surface layer is black silt loam 10 inches thick. The subsoil extends to a depth of about 27 inches. It is mottled, gray and olive-gray silty clay loam to a depth of about 21 inches and mottled gray clay loam in the lower part. The underlying material is mottled olive-gray loamy sand in the upper part and grayish-brown sand in the lower part.

Sebewa soils have medium available water capacity. Permeability is moderate in the subsoil and rapid in the substratum. The surface layer and subsoil are neutral to mildly alkaline, and the substratum is moderately alkaline. These soils are moderately fertile, and the organic-matter content of the surface layer is high.

Sebewa soils are used mainly for crops, but some areas are in woodlots or permanent pasture. Wetness is the main limitation to use of these soils for farming.

Representative profile of Sebewa silt loam, 0 to 2 percent slopes, undisturbed, NE¼SE¼ sec. 20, T. 16 N., R. 19 E.

A1—0 to 10 inches, black (10YR 2/1) silt loam; moderate, medium, granular structure; very friable; mildly alkaline; clear, wavy boundary.

B1g—10 to 13 inches, dark-gray (5Y 4/1) silty clay loam; many, moderate, prominent mottles of yellowish brown (10YR 5/8); moderate, fine, granular structure; friable; many worm casts; mildly alkaline; clear, irregular boundary.

B2tg—13 to 21 inches, olive-gray (5Y 5/2) gritty silty clay loam; many, moderate, prominent mottles of yellowish brown (10YR 5/8); moderate, very fine, subangular blocky structure; firm; thick, continuous clay films; mildly alkaline; clear, irregular boundary.

IIB3tg—21 to 27 inches, gray (5Y 5/1) clay loam; common, medium, prominent mottles of yellowish brown (10YR 5/8); weak, fine, subangular blocky structure; firm; few patchy clay films; mildly alkaline; abrupt, wavy boundary.

IIC1—27 to 34 inches, olive-gray (5Y 5/2) loamy sand; few, moderate, prominent mottles of yellowish brown (10YR 5/8); single grain; loose; few pebbles up to 20 millimeters in diameter; moderately alkaline; abrupt, wavy boundary.

IIC2—34 to 60 inches, grayish-brown (2.5Y 5/2) and light brownish-gray (2.5Y 6/2) fine and medium sand; single grain; loose; moderately alkaline; strongly calcareous.

The solum ranges from 20 to 50 inches in thickness. The size of particles in the IIC horizon ranges from medium sand to cobblestones up to 6 inches in diameter. Medium and coarse sand is dominant.

Sebewa soils form a drainage sequence with the well-drained Fox soils and the moderately well drained Ionia soils.

Sebewa silt loam, 0 to 2 percent slopes (SmA).—This soil occupies depressions, wide drainageways, and areas adjacent to wetlands in the eastern part of the county. The largest acreage is near Wolf Lake in Marshfield Township. This soil has the profile described as representative of the series.

This soil generally lies between organic deposits and nearly level Ionia soils. Areas of associated soils were included with this soil in mapping.

This soil is not suited to crops, unless it is drained. Under natural conditions, regular crops occasionally are drowned out and alfalfa winterkills. Wetness is the main limitation to use of this soil. A high water table is at or near the surface in spring and following periods of heavy rainfall. (Capability unit IIw–5; woodland suitability group 7; wildlife group 4)

Sebewa silt loam, 2 to 6 percent slopes (SmB).—This soil occupies small depressions, drainageways, and areas adjacent to wetlands. The largest acreage is near Wolf Lake in the town of Marshfield, and other areas are in the southeastern part of the county. Mottling in the subsoil is less distinct than in the profile representative of the series. The underlying sand is at a depth of only 24 to 30 inches.

This soil is generally adjacent to organic soils and to soils of the Ionia series. Areas of these soils were included with this soil in mapping.

Where this soil has been drained, it can be used for most farm crops. Excess water is the main limitation to farming. The water table is high in spring and after heavy rains. (Capability unit IIw–5; woodland suitability group 7; wildlife group 4)

Sebewa silt loam, deep, 0 to 2 percent slopes (SnA).—This soil occupies wide depressions and areas adjacent to wetlands in the eastern and southeastern parts of the county. Except that it is underlain by sand at a depth of 40 to 50 inches, the profile of this soil is similar to that representative of the series.

This soil is adjacent to organic soils and nearly level Ionia soils in many places. In some places it is adjacent to other Sebewa soils. Small areas of these associated soils were included in mapping.

This soil is not suited to crops, unless it has been drained. Normally, regular crops drown out and alfalfa winterkills. Wetness is the main limitation to use of this soil. The water table is high in spring and immediately following periods of heavy rainfall. (Capability unit IIw–1; woodland suitability group 7; wildlife group 4)

Sebewa Series, Loamy Subsoil Variant

The loamy subsoil variant of the Sebewa series consists of poorly drained, silty soils underlain by silt and very fine sand at a depth of about 24 to 40 inches. The original vegetation was water-tolerant trees and shrubs.

In a representative profile the surface layer is very dark gray and very dark grayish-brown silt loam about 10 inches thick. The subsoil extends to a depth of 27 inches. It is very dark grayish-brown silty clay loam in the upper part and dark grayish-brown and gray clay loam in the lower part. The underlying material is pale-brown, stratified silt and sand.

These soils have high available water capacity and moderate permeability. Natural fertility is moderate.

These soils are mostly in the Milwaukee River watershed, but a few small areas are in the towns of Friendship and Fond du Lac. Where drained, these soils are used mainly for crops. Wetness is the principal limitation to use.

Representative profile of Sebewa silt loam, loamy subsoil variant, 0 to 3 percent slopes, uncultivated, NW¼ NE¼ sec. 30, T. 13 N., R. 19 E.

A11—0 to 8 inches, very dark gray (10YR 3/1) silt loam; moderate, medium, granular structure; very friable; mildly alkaline; clear, wavy boundary.

A12g—8 to 10 inches, very dark grayish-brown (2.5Y 3/2) silt loam; weak, medium, platy structure; friable; mildly alkaline; clear, irregular boundary.

B21tg—10 to 14 inches, very dark grayish-brown (10YR 3/2) silty clay loam; common, medium, distinct mottles of dark yellowish brown (10YR 4/4); fine, subangular blocky structure; firm; thick, continuous clay films; moderately alkaline; clear, irregular boundary.

IIB22tg—14 to 20 inches, dark grayish-brown (10YR 4/2) clay loam; many, medium, prominent mottles of yellowish brown (10YR 5/6); weak, medium, subangular blocky structure; firm; a few weathered fragments of dolomite, numerous pebbles up to 15 millimeters in diameter; mildly alkaline; gradual, irregular boundary.

IIB3g—20 to 27 inches, gray (5Y 5/1) clay loam; many, medium, prominent mottles of yellowish brown (10YR 5/6); weak, medium, subangular blocky structure; firm; numerous pebbles, mostly 2 to 5 millimeters in diameter, some up to 15 millimeters in diameter; mildly alkaline; clear, wavy boundary.

IIIC—27 to 60 inches, pale-brown (10YR 6/3), stratified silt and very fine sand; many, coarse, prominent mottles of brownish yellow (10YR 6/8); massive; loose; moderately alkaline; calcareous.

The B horizon is very dark grayish brown, gray, dark gray and dark grayish brown. The IIIC horizon ranges from brown to pale brown.

Sebewa silt loam, loamy subsoil variant, 0 to 3 percent slopes (SpA).—This soil occupies depressions on outwash terraces near the Milwaukee River in the southeastern part of the county. It is associated with Fox, Ionia, Kibbie, and Sisson soils. Areas of Kibbie and Sisson soils were included with this soil in mapping.

Where it has been drained, this soil can be used for all crops commonly grown in the county, including alfalfa. Where drainage has not been improved, alfalfa winterkills and ponding occurs in spring and after heavy rains. Excess water is the main limitation to use of this soil. Runoff is very slow. (Capability unit IIw-1; woodland suitability group 7; wildlife group 4)

Sisson Series

The Sisson series consists of deep, gently sloping, well drained and moderately well drained soils on lacustrine plains. These soils formed in a moderately deep silt mantle over lake-laid sediments of silt and fine sand. The original vegetation was hardwood forest.

In a representative profile the surface layer is dark grayish-brown silt loam 8 inches thick. The subsoil, 16 inches thick, is dark-brown light silty clay loam in the upper part and yellowish-brown loam in the lower part. The underlying material is light yellowish-brown silt and very fine sand.

Sisson soils have high available water capacity and moderate permeability. They are moderate in natural fertility and medium in organic-matter content of the surface layer. The solum is neutral to mildly alkaline.

Sisson soils are not extensive. They are generally in the eastern part of the county. These soils are used mainly for crops. Erosion is the main hazard.

Representative profile of Sisson silt loam, 2 to 6 percent slopes, eroded, cultivated, SW¼NW¼ sec. 32, T. 13 N., R. 19 E.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; very friable; mildly alkaline; clear, wavy boundary.

B1—8 to 10 inches, dark-brown (7.5YR 4/4) light silty clay loam; moderate, medium, angular blocky structure; firm; pale-brown (10YR 6/3) coatings on ped faces; mildly alkaline; clear, irregular boundary.

B2t—10 to 17 inches, dark-brown (7.5YR 4/4) light silty clay loam; moderate, fine, angular blocky structure; firm; thick, continuous clay films; mildly alkaline; clear, irregular boundary.

B3t—17 to 24 inches, yellowish-brown (10YR 5/4) loam; few, fine, prominent mottles of strong brown (7.5YR 5/8); weak, fine, subangular blocky structure; friable; thin, patchy clay films; mildly alkaline; clear, irregular boundary.

C—24 to 60 inches, light yellowish-brown (10YR 6/4) silt and very fine sand; many, medium, distinct mottles of brownish yellow (10YR 6/6); weakly stratified; friable; moderately alkaline; calcareous.

The solum ranges from 20 to 30 inches in thickness. Although the C horizon is dominantly silt and fine sand, thin layers of silty clay loam and silty clay sediments are common. In places the lacustrine sediments are underlain by glacial till or sand and gravel at a depth of 42 inches or more.

Sisson soils form a drainage sequence with the somewhat poorly drained Kibbie soils. They are similar to the somewhat poorly drained Martinton soils, except that Sisson soils are better drained and formed in silt and fine sand, rather than in silt and clay.

Sisson silt loam, 2 to 6 percent slopes, eroded (SuB2).—This soil is in small, isolated basins, generally surrounded by steeper soils that are underlain by glacial till or sand and gravel. Part of the original surface layer has been lost through erosion. The present surface layer is dark grayish brown to dark brown in color and is 6 to 8 inches thick. The depth to the underlying silt and sand is less than 30 inches.

This soil is associated with Casco and Hochheim soils, and small areas of these soils were included in mapping. Also included were areas that have a loam surface layer, as well as areas of moderately eroded soils.

The erosion hazard is slight. (Capability unit IIe–1; woodland suitability group 1; wildlife group 1)

Sogn Series

The Sogn series consists of very shallow, nearly level and gently sloping, well-drained soils underlain by dolomite bedrock. The original vegetation was grass and widely spaced hardwood trees.

In a representative profile the surface layer is very dark brown silt loam about 5 inches thick. The subsoil is dark-brown silt loam about 5 inches thick. The underlying material is fractured dolomite.

Sogn soils have very low available water capacity and low natural fertility. They are moderately permeable. The surface layer is medium in organic-matter content. These soils are neutral to mildly alkaline throughout.

These soils are not extensive. They occur mainly near the Niagara Escarpment that extends from the village of Pipe to the vicinity of the Horicon Marsh.

Representative profile of Sogn stony silt loam, 0 to 6 percent slopes, uncultivated, SW¼SW¼ sec. 27, T. 14 N., R. 16 E.

A1—0 to 5 inches, very dark brown (10YR 2/2) silt loam; moderate, medium, granular structure; very friable; neutral; clear, irregular boundary.
B—5 to 10 inches, dark-brown (7.5YR 4/4) silt loam; weak, fine, subangular blocky structure; friable; neutral; abrupt, wavy boundary.
IIR—10 inches +, fractured dolomite.

The depth to bedrock ranges from a few inches to 12 inches. Scattered pebbles or stones in the profile and dark igneous stones on the surface indicate some influence of glaciation. Stones on the surface range from few to many.

Sogn soils differ from Knowles soils in having bedrock at a depth of less than 12 inches. Sogn soils also have a thicker and darker colored A1 horizon than Knowles soils, and they lack a Bt horizon.

Sogn stony silt loam, 0 to 6 percent slopes (SwB).—This soil is on a plateau near the Niagara Escarpment. It developed in less than 12 inches of silt over dolomite bedrock. This soil is associated with Rock land and with Knowles soils. Areas of these associated soils were included with this soil in mapping.

This soil is suited to forage, woodland, or wildlife habitat. Because this soil is shallow to bedrock, the rooting zone is severely restricted. (Capability unit VIs–5; woodland suitability group 12; wildlife group 7)

Theresa Series

The Theresa series consists of deep, nearly level to moderately steep, well-drained soils. These soils developed in a thin silt mantle over calcareous loam glacial till. The original vegetation was hardwood forest.

In a representative profile the surface layer is very dark brown silt loam 5 inches thick. The subsurface layer is dark grayish-brown silt loam 5 inches thick. The subsoil, about 22 inches thick, is dark-brown silty clay loam in the upper part and dark-brown clay loam in the lower part. The underlying material is brown loam (fig. 13).

Theresa soils have high available water capacity and moderate permeability. They are neutral to medium acid to a depth of about 32 inches and calcareous in the underlying material.

These soils occur mainly in the eastern part of Fond du Lac County.

Representative profile of Theresa silt loam, 2 to 6 percent slopes, uncultivated, SW¼SE¼ sec. 15, T. 15 N., R. 18 E.

O2—¼ inch to 0, partly decomposed organic debris.
A1—0 to 5 inches, very dark brown (10YR 2/2) silt loam; moderate, fine, granular structure; friable; mildly alkaline; abrupt, wavy boundary.
A2—5 to 10 inches, dark grayish-brown (10YR 4/2) silt loam; weak, thin, platy structure; friable; vesicular; slightly acid; clear, irregular boundary.
B1—10 to 20 inches, dark-brown (7.5YR 3/2) light silty clay loam; moderate, fine, subangular blocky structure; firm; light-gray (10YR 7/2) ped coatings; slightly acid; clear, irregular boundary.
IIB21t—20 to 28 inches, dark-brown (7.5YR 3/2) clay loam; moderate, fine, subangular blocky structure; firm; thick, continuous clay films; some pebbles; medium acid; clear, irregular boundary.
IIB22t—28 to 32 inches, dark-brown (7.5YR 3/2) clay loam; moderate, medium, subangular blocky structure; firm; thick, continuous clay films; interiors of peds are dark brown (10YR 4/3); numerous pebbles; neutral; clear, irregular boundary.
IIC—32 to 60 inches, brown (10YR 5/3) light loam; massive; friable; many pebbles and stones, mainly dolomite, up to 6 inches in diameter; moderately alkaline; calcareous.

The solum ranges from 24 to 40 inches in thickness. The silt mantle is generally less than 24 inches thick, and most of the B horizon developed in till. The A1 horizon ranges from very dark brown to brown.

Theresa soils generally are associated with the moderately well drained Mayville soils, the somewhat poorly drained Lamartine soils, and the poorly drained Brookston soils. Theresa soils are similar to Lomira soils, except that most of the B horizon developed in till. In Theresa soils the part of the B horizon that developed in till is also more acid than the rest and the boundary with the C horizon is less abrupt. In Theresa soils the C horizon has a calcium carbonate equivalent of 40 to 60 percent, compared to 60 to 90 percent for LeRoy soils. In Dodge soils, most of the subsoil developed in silt. Some areas of Theresa soils have enough stones on the surface to restrict the use of tillage machinery.

Figure 13.—Profile of Theresa silt loam.

Theresa silt loam, 0 to 2 percent slopes (ThA).—This soil has a surface layer about 12 inches thick. The underlying material is at a depth of about 36 inches. Included with this soil in mapping were small areas of Hochheim soils and other Theresa soils.

This soil is suited to all crops commonly grown in the county. There is no erosion hazard except on the low, convex slopes. Runoff is very slow. (Capability unit I–1; woodland suitability group 1; wildlife group 1)

Theresa silt loam, 2 to 6 percent slopes (ThB).—This soil has the profile described as representative of the series. It is associated mainly with other Theresa soils and also with Hochheim soils. Small areas of these soils were included in mapping.

This soil is suited to all crops commonly grown in the county. The erosion hazard is slight. (Capability unit IIe–1; woodland suitability group 1; wildlife group 1)

Theresa silt loam, 2 to 6 percent slopes, eroded (ThB2).—This soil has lost part of the original surface layer through erosion. The present surface layer is dark brown and about 6 to 8 inches thick. Small areas of normally associated Hochheim soils and other Theresa soils were included in mapping.

The erosion hazard is slight. Although the available water capacity is high, it is slightly lower than is typical of the series because of more rapid runoff. (Capability unit IIe–1; woodland suitability group 1; wildlife group 1)

Theresa silt loam, 6 to 12 percent slopes (ThC).—This soil is mainly on short side slopes of drumlins and hills in the eastern part of the county. The surface layer is slightly thinner than that of the profile described as representative of the series, and the depth to underlying material is about 28 inches. Small areas of other Theresa soils and Hochheim soils were included in mapping.

The erosion hazard is moderate. (Capability unit IIIe–1; woodland suitability group 1; wildlife group 1)

Theresa silt loam, 6 to 12 percent slopes, eroded (ThC2).—This soil has lost part of the original surface layer through erosion. The present surface layer is dark brown, and the subsoil has been mixed with it in some places. Included with this soil in mapping were small areas of severely eroded soils, other Theresa soils, and Hochheim soils.

The erosion hazard is moderate. Because some of the subsoil is exposed, this soil is more difficult to work than the soil that has the profile described as representative of the series. The available water capacity is also lower because runoff is more rapid. (Capability unit IIIe–1; woodland suitability group 1; wildlife group 1)

Theresa silt loam, 12 to 20 percent slopes (ThD).—This soil is on side slopes of drumlins and hills. The surface layer is about 6 inches thick, and the depth to underlying glacial till is about 24 inches.

The erosion hazard is severe. The available water capacity is lower than in the soil that has the representative profile, because runoff is more rapid. The solum is less acid. (Capability unit IVe–1; woodland suitability group 1; wildlife group 1)

Theresa silt loam, 12 to 20 percent slopes, eroded (ThD2).—This soil has lost part of the original surface layer through erosion. The present surface layer is about 6 inches thick. Small areas of normally associated Hochheim soils and other Theresa soils were included in mapping.

The erosion hazard is severe. Runoff is rapid. (Capability unit IVe–1; woodland suitability group 1; wildlife group 1)

Theresa soils, 6 to 12 percent slopes, severely eroded (TrC3).—These soils have lost most of the original surface layer and part of the subsoil through erosion. The present surface layer is a mixture of subsoil material and the original surface layer, and it ranges from silt loam to silty clay loam. Small areas of normally associated Hochheim soils and other Theresa soils were included in mapping.

The erosion hazard is severe because the infiltration rate is slower than in uneroded soils. These soils are difficult to work because the organic-matter content is low, and they puddle easily. (Capability unit IVe–1; woodland suitability group 1; wildlife group 1)

Theresa soils, 12 to 20 percent slopes, severely eroded (TrD3).—These soils have lost most of the original surface layer and part of the subsoil through erosion. The present surface layer is a mixture of a small part of the original surface layer and the subsoil. Small areas of the normally associated Hochheim soils and other Theresa soils were included in mapping. The erosion hazard is severe, and the available water capacity is lower than in uneroded soils because of rapid runoff. These soils are in poor tilth because they have a low organic-matter content and a relatively high clay content. (Capability unit VIe–1; woodland suitability group 1; wildlife group 1)

Theresa-Casco silt loams, 2 to 6 percent slopes, eroded (TsB2).—This complex occurs where glacial till is very closely associated with sand and gravel outwash. It is made up of about 70 percent Theresa silt loam and 30 percent Casco silt loam. In most places the slope is 2 to 4 percent in areas of Theresa soils and 4 to 6 percent in areas of Casco soils. Both slightly eroded and moderately eroded soils were included in mapping.

The erosion hazard is slight. (Capability unit IIe–1; woodland suitability group 1; wildlife group 1)

Theresa-Casco silt loams, 6 to 12 percent slopes, eroded (TsC2).—This complex occurs where glacial till is closely associated with sand and gravel outwash. It consists of about 60 percent Theresa silt loam and 40 percent Casco silt loam. In most places the slope is 6 to 8 percent in areas of Theresa soils and 8 to 12 percent in areas of Casco soils. Both slightly eroded and moderately eroded soils were included in mapping.

The erosion hazard is moderate. (Capability unit IIIe–1; woodland suitability group 1; wildlife group 1)

Theresa-Casco silt loams, 12 to 20 percent slopes, eroded (TsD2).—This complex occurs where glacial till is very closely associated with sand and gravel outwash. It consists of about 45 percent Theresa silt loam and 55 percent Casco silt loam. The Theresa soils are less strongly sloping than the Casco soils. Both slightly eroded soils and moderately eroded soils were included in mapping.

The erosion hazard is severe. (Capability unit IVe–1; woodland suitability group 1; wildlife group 1)

Theresa-Casco silt loams, 20 to 30 percent slopes, eroded (TsE2).—This complex occurs where glacial till is very closely associated with sand and gravel outwash. It consists of about 35 percent Theresa silt loam and 65 percent Casco silt loam. The depth to underlying till is generally about 24 to 26 inches in Theresa soils; Casco soils are generally about 20 inches deep over sand and gravel. Areas of slightly eroded, moderately eroded, and severely eroded soils were included in mapping.

The erosion hazard is very severe. (Capability unit VIe–1; woodland suitability group 1; wildlife group 1)

Virgil Series

The Virgil series consists of nearly level and gently sloping, somewhat poorly drained soils on uplands. These soils developed in a moderately deep to deep silt mantle underlain by calcareous, loamy glacial till. The original vegetation was hardwood forest.

In a representative profile the surface layer is very dark grayish-brown silt loam 8 inches thick. The subsurface layer is brown silt loam 2 inches thick. The subsoil extends to a depth of 48 inches. It is dark yellowish-brown silt loam mottled with grayish brown and yellowish-red in the uppermost 9 inches, mottled dark grayish-brown silty clay loam and silt loam in the next 7 inches, and brown silt loam and loam in the lower part. The underlying material is brown loam glacial till.

Virgil soils have high available water capacity. They are moderate in permeability and natural fertility. They are medium acid to mildly alkaline in the subsoil and moderately alkaline in the substratum. The surface layer is medium in organic-matter content.

These soils are mostly in the western part of the county. They are used mainly for crops generally grown on dairy farms, but a small acreage is in trees or permanent pasture. The main limitation to use of these soils is excess water at or near the surface during wet seasons. These soils dry out more slowly than the more strongly sloping soils.

Representative profile of Virgil silt loam, 0 to 2 percent slopes, cultivated, SW¼SE¼ sec. 23, T. 15 N., R. 15 E.

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, medium, subangular blocky structure; friable; mildly alkaline; abrupt, smooth boundary.

A2—8 to 10 inches, brown (10YR 5/3) silt loam; weak, medium, platy structure; friable; much mixing of soil material by earthworms; mildly alkaline; clear, wavy boundary.

B11—10 to 13 inches, dark yellowish-brown (10YR 4/4) silt loam; distinct mottles of grayish brown (10YR 5/2) are common; fine, subangular blocky structure; friable; mildly alkaline; clear, wavy boundary.

B12t—13 to 19 inches, dark yellowish-brown (10YR 4/4) heavy silt loam; many, fine, prominent mottles of yellowish red (5YR 5/8) and distinct, fine mottles of grayish brown (10YR 5/2); moderate, fine, subangular blocky structure; friable; thin, patchy clay films; mildly alkaline; clear, wavy boundary.

B21tg—19 to 25 inches, dark grayish-brown (2.5Y 4/2) silty clay loam; many, medium, prominent mottles of reddish brown (5YR 4/4); moderate, fine, angular blocky structure; firm; thick, continuous clay films; neutral; clear, wavy boundary.

B22tg—25 to 36 inches, dark grayish-brown (2.5Y 4/2) heavy silt loam; many, medium, prominent mottles of strong brown (7.5YR 5/6); moderate, medium, subangular blocky structure; firm; thick, continuous clay films; medium acid; clear, wavy boundary.

B23tg—36 to 43 inches, brown (10YR 5/3) heavy silt loam; many, medium, prominent mottles of strong brown (7.5YR 5/6) and faint mottles of grayish brown (10YR 5/2); weak, coarse, subangular blocky structure; firm; thick, continuous clay films; neutral; abrupt, wavy boundary.

IIB3—43 to 48 inches, brown (10YR 5/3) heavy loam; weak, coarse, subangular blocky structure; friable; few pebbles; mildly alkaline; abrupt, wavy boundary.

IIC—48 to 60 inches, brown (10YR 5/3) loam glacial till; massive; friable; moderately alkaline; calcareous.

The silt mantle is 36 to 50 inches thick. The solum ranges from 42 to 60 inches in thickness. Nearly all of the solum formed in silt, and only a small part of the B horizon, generally the IIB3, formed in till. The gravelly substratum phase is underlain by sand and gravel at a depth of 40 to 60 inches. Cultivated areas of Virgil soils have a lighter colored A horizon than wooded or undisturbed sites. In the western part of the county, the IIC horizon contains numerous angular fragments of dolomite.

Virgil soils are associated with the well-drained Lomira and St. Charles soils and the poorly drained Pella soils. Virgil soils resemble Lamartine soils in natural drainage, but they formed in a thicker silt mantle.

Virgil silt loam, 0 to 2 percent slopes (VgA).—This soil occupies wide, nearly level areas and areas adjacent to wetlands. It has the profile described as representative of the series. This soil is associated with St. Charles, Pella, and Lamartine soils. Areas of St. Charles and Pella soils were included with this soil in mapping.

This soil is suited to all crops normally grown on dairy farms. The main limitation to farming this soil is excess water. Runoff is slow. (Capability unit IIw–2; woodland suitability group 7; wildlife group 4)

Virgil silt loam, 2 to 6 percent slopes (VgB).—The combined surface layer and subsoil is thinner in this soil than in the profile described as representative of the series. The yellowish-brown mottling in the upper part of the subsoil is also less distinct. The surface layer is 6 to 8 inches thick, and the depth to glacial till is about 42 to 50 inches.

This soil is associated with St. Charles and Pella soils, and small areas of these soils were included in mapping. Lamartine soils were also included in places.

Where drainage has been improved, this soil is well suited to all crops normally grown on dairy farms. Excess water in the rooting zone is the main limitation to use of this soil for farming. Runoff is medium. (Capability unit IIw–2; woodland suitability group 7; wildlife group 4)

Virgil silt loam, gravelly substratum, 0 to 2 percent slopes (VsA).—This soil is on wide outwash plains in the southeastern part of the county. Except that it is underlain by sand and gravel at a depth of 45 to 60 inches, this soil has a profile similar to that described as representative of the series.

In many places this soil is associated with other Virgil soils and with St. Charles and Fox soils. Areas of these soils were included with this soil in mapping.

This soil is suited to all the principal crops of the county. Where drainage is improved, it can be cropped intensively. Excess water is the main limitation to farming this soil. Runoff is slow. (Capability unit IIw–5; woodland suitability group 7; wildlife group 4)

Virgil silt loam, gravelly substratum, 2 to 6 percent slopes (VsB).—This soil is on wide outwash plains in the southeastern part of the county. The surface layer is generally about 8 inches thick, and the depth to sand and gravel ranges from 40 to 50 inches. Mottling in the lower part of the subsoil is less intense than in the profile described as representative of the series.

Adjoining soils include other Virgil soils and St. Charles and Fox soils. Areas of these soils were included with this soil in mapping.

The main limitation to farming this soil is the restricted movement of water through the soil, caused by a seasonal high water table. There is also a slight erosion hazard. (Capability unit IIw–5; woodland suitability group 7; wildlife group 4)

Wallkill Series

The Wallkill series consists of poorly drained silt loam soils underlain by mucky peat. These soils formed in very recent alluvial deposits over organic soils. They occupy depressions and wet areas adjacent to moderately eroded and severely eroded uplands.

In a representative profile the surface layer is stratified very dark gray, grayish-brown, and very dark grayish-brown silt loam about 22 inches thick. The underlying material is black and very dark brown mucky peat.

Wallkill soils have very high available water capacity and moderate natural fertility. Permeability is moderate in the surface layer and moderately rapid in the underlying material. The organic-matter content of the surface layer is high. These soils are mildly alkaline to neutral.

These soils are not extensive, but they occur throughout the county in small areas. They are used mainly for crops and permanent pasture.

Representative profile of Wallkill silt loam, cultivated, SW¼NE¼ sec. 5, T. 15 N., R. 19 E.

A11—0 to 10 inches, very dark gray (10YR 3/1) silt loam; weak, fine, angular blocky structure; friable; mildly alkaline; clear, wavy boundary.

A12—10 to 22 inches, stratified grayish-brown (10YR 5/2) and very dark grayish-brown (10YR 3/2) silt loam; few, fine, prominent mottles of yellowish brown (10YR 5/6); weak, medium, platy structure and weak, fine, subangular blocky; friable; mildly alkaline.

1—22 to 25 inches, black (10YR 2/1) mucky peat; weak, medium, subangular blocky structure; very friable; neutral; clear, wavy boundary.

2—25 to 29 inches, black (10YR 2/1) mucky peat; moderate, medium, subangular blocky structure; friable; less than 30 percent of the soil mass is distinguishable remains of sedges and other plants; neutral; clear, wavy boundary.

3—29 to 60 inches; very dark brown (10YR 2/2) mucky peat; dark reddish-brown (5YR 3/4) sedge stems; weak, medium, platy structure; friable; less than 50 percent of soil mass is distinguishable remains of sedges and other plants; neutral.

The local alluvium ranges from 20 inches to about 40 inches in thickness. The underlying organic layer ranges from 30 inches to several feet in thickness.

Wallkill soils are similar to Washtenaw soils in the upper mineral layer, but the underlying soil consists of organic deposits, rather than poorly drained mineral layers. The local alluvium of Juneau soils is underlain by well-drained to somewhat poorly drained, buried mineral soils.

Wallkill silt loam (0 to 2 percent slopes) (Wa).—This soil occurs between organic and mineral soil areas. It is generally adjacent to Dodge, Lomira, and Theresa soils. Adjacent soils include shallow organic soils over sand, clay, and loam; deep peat; and muck. Small areas of these associated soils were included in mapping.

Where this soil is not protected from flooding, it is suited to woodland or wildlife habitat. It receives runoff from adjacent slopes. (Capability unit IIw–13; woodland suitability group 9; wildlife group 4)

Warsaw Series

The Warsaw series consists of gently sloping and sloping, well-drained soils on outwash plains. These soils formed in a silt mantle 24 to 40 inches thick over calcareous sand and gravel. The original vegetation was grass.

In a representative profile the surface layer is black silt loam about 12 inches thick. The subsurface layer is very dark grayish-brown silt loam about 5 inches thick. The subsoil extends to a depth of about 37 inches. It is dark-brown and dark yellowish-brown silty clay loam in the upper part and dark yellowish-brown gravelly loam in the lower part. The underlying material is calcareous sand and gravel.

Warsaw soils have medium available water capacity and are moderately permeable. The organic-matter content of the surface layer is high. These soils are moderately fertile. They are mildly alkaline to slightly acid in the solum and moderately alkaline in the substratum.

Warsaw soils are mostly in Rosendale and Ripon Townships. They are used mainly for crops and pasture.

Representative profile of Warsaw silt loam, 2 to 6 percent slopes, uncultivated, SW¼NW¼ sec. 18, T. 16 N., R. 14 E.

A1—0 to 12 inches, black (10YR 2/1) silt loam, moderate, medium, granular structure; very friable; mildly alkaline; abrupt, wavy boundary.

A3—12 to 17 inches, very dark grayish-brown (10YR 3/2) heavy silt loam; weak, fine, subangular blocky structure; friable; numerous earthworm casts; mildly alkaline; clear, irregular boundary.

B21t—17 to 22 inches, dark-brown (10YR 3/3) silty clay loam; weak, medium, subangular blocky structure breaking to moderate, fine, subangular blocky; firm; thick, continuous clay films; neutral; clear, irregular boundary.

B22t—22 to 29 inches, dark yellowish-brown (10YR 3/4) silty clay loam; moderate, medium, subangular blocky structure; firm; thick, continuous clay films; slightly acid; clear, irregular boundary.

B31—29 to 31 inches, dark-brown (10YR 4/3) silty clay loam; weak, medium, subangular blocky structure breaking to moderate, fine, subangular blocky; firm; thin, patchy clay films; very dark brown (10YR 2/2) organic stains; neutral; abrupt, wavy boundary.

IIB32—31 to 37 inches, dark yellowish-brown (10YR 4/4) gravelly loam; weak, medium, subangular blocky structure; friable; some cobblestones up to 5 inches in diameter; mildly alkaline; abrupt, irregular boundary.

IIC1—37 to 40 inches, yellowish-brown (10YR 5/4) sandy loam; massive; friable; moderately alkaline; abrupt, wavy boundary.

IIC2—40 to 60 inches, light yellowish-brown (10 YR 6/4), and dark yellowish-brown (10YR 4/4), stratified coarse sand and gravel; single grain; loose; moderately alkaline; calcareous.

Outwash sand and gravel occur at a depth of 24 to 40 inches. This underlying stratified coarse material ranges from medium sand to cobblestones 6 to 8 inches in diameter.

Warsaw soils form a drainage sequence with the poorly drained Sebewa soils. They have a darker colored surface layer than Fox soils. Warsaw soils are similar to Mendota soils, except that Mendota soils are underlain by loamy glacial till.

Warsaw silt loam, 2 to 6 percent slopes (WhB).—This soil is on outwash plains. In some places it is adjacent to Rodman soils on gravel ridges; small areas of these adjacent soils were included in mapping.

This soil is well suited to all crops commonly grown in the county. The main limitation to use of this soil is the hazard of erosion. The available water capacity is medium. (Capability unit IIe–2; woodland suitability group 12; wildlife group 2)

Washtenaw Series

The Washtenaw series consists of deep, nearly level and gently sloping, poorly drained soils underlain by older soils at a depth of 20 inches or more. The buried soils generally are of the poorly drained Brookston and Pella series. Washtenaw soils occupy lower valley slopes, small depressions, and drainageways that adjoin moderately eroded or severely eroded soils.

In a representative profile the surface layer is silt loam. It is dark brown in the uppermost 12 inches, dark grayish brown in the next 10 inches, and very dark gray in the lower 6 inches. This lower part is the surface layer of an older soil that has been buried by recent deposition. The subsoil is dark-gray and dark grayish-brown silty clay loam about 14 inches thick. The underlying material is grayish-brown silt loam.

These soils have high available water capacity and natural fertility. Permeability is moderately slow. The surface layer has medium organic-matter content. The recent alluvium is neutral, and the underlying material is slightly acid to moderately alkaline.

Washtenaw soils are not extensive. They occur mainly in the drumlin areas of the county, generally adjacent to long and relatively steep slopes. These soils generally are used for crops or pasture. They are subject to continued overwash of water and deposition of soil material.

Representative profile of Washtenaw silt loam, 0 to 2 percent slopes, cultivated, SW¼SW¼ sec. 31, T. 15 N., R. 19 E.

A11—0 to 12 inches, dark-brown (10YR 4/3) silt loam; few, fine, prominent mottles of yellowish brown (10YR 5/6); weak, medium, platy structure and fine subangular blocky; friable; neutral; clear, wavy boundary.

A12—12 to 22 inches, dark grayish-brown (10YR 4/2) silt loam; few, fine, prominent mottles of yellowish brown (10YR 5/6); weak, medium, subangular blocky structure; friable; neutral; abrupt, wavy boundary.

A1b—22 to 28 inches, very dark gray (10YR 3/1) silt loam; moderate, fine, subangular blocky structure; very friable; neutral; clear, irregular boundary.

B1gb—28 to 36 inches, dark-gray (5Y 4/1) silty clay loam; few, fine, prominent mottles of yellowish brown (10YR 5/6); moderate, fine, subangular blocky structure; firm; neutral; clear, irregular boundary.

B2gb—36 to 42 inches, dark grayish-brown (2.5Y 4/2) silty clay loam; common, fine, prominent mottles of brownish yellow (10YR 6/8); weak, medium, subangular blocky structure; firm; neutral; gradual, irregular boundary.

C—42 to 60 inches, grayish-brown (10YR 5/2) silt loam; common, fine, prominent mottles of brownish yellow (10YR 6/3); massive; firm; moderately alkaline; calcareous.

The thickness of the recent alluvium in the upper part of the profile ranges from 20 to about 36 inches. In places this layer includes gritty or loamy material eroded from adjoining severely eroded slopes. Dolomite bedrock occurs at a depth of 48 inches or more in a few places.

Washtenaw and Juneau soils formed in a similar manner, but Washtenaw soils are poorly drained and Juneau soils are moderately well drained and well drained. The buried A horizon of Washtenaw soils is slightly darker than that of Juneau soils.

Washtenaw silt loam, 0 to 2 percent slopes (WsA).—This soil occupies small areas at the base of slopes and in narrow drainageways. The areas are scattered throughout the county, but they are most extensive in the drumlin area east of the town of Fond du Lac. This soil has the profile described as representative of the series.

This soil is adjacent to moderately eroded or severely eroded Hochheim soils and to Brookston and Pella soils at lower elevations. Small areas of these soils were included in mapping. Also included were small areas of Wallkill soils.

Where it has been drained, this soil is suited to all crops commonly grown on a dairy farm. Runoff is slow. This soil receives runoff from the adjacent slopes, and the water not only contributes to the wetness hazard in spring and after heavy rains, but also occasionally deposits additional alluvial material. (Capability unit IIw–1; woodland suitability group 9; wildlife group 4)

Washtenaw silt loam, 2 to 6 percent slopes (WsB).—This soil occurs as long, narrow areas at the base of moderately and severely eroded steeper slopes and in drainageways. The layer of recent alluvium is generally 20 to 25 inches thick, and mottling occurs at a greater depth than in the representative profile.

This soil is adjacent to Brookston and Pella soils on lower slopes. Small areas of these soils were included in mapping. In places soils that have only 12 to 20 inches of recent alluvium were included.

This soil is suited to permanent hay, pasture, or wildlife habitat. Drained areas are suited to all crops commonly grown in dairy farming. The main limitations to cropping this soil are wetness and the accumulation of recently deposited alluvium. Runoff is slow to medium. (Capability unit IIw–1; woodland suitability group 9; wildlife group 4)

Wauseon Series

The Wauseon series consists of nearly level, poorly drained soils in wide drainageways and depressions. These soils formed in sandy lacustrine sediments underlain by calcareous, fine-textured, reddish glacial till. The original vegetation was water-tolerant grasses and hardwood trees.

In a representative profile the surface layer is black silt loam 11 inches thick. The subsoil is dark-gray to brown sandy loam and loamy fine sand to a depth of 26 inches and reddish-brown silty clay to a depth of about 30 inches. The underlying material is reddish-brown silty clay.

Wauseon soils have high available water capacity. They are moderately permeable in the surface layer and subsoil and slowly permeable in the substratum. These soils are neutral to mildly alkaline, and the organic-matter content of the surface layer is high.

Wauseon soils occupy a very small acreage. They are mainly in Calumet and Taycheedah Townships on the shores of Lake Winnebago. They are mostly used for pasture; some areas are idle. Wetness is the main limitation to use of these soils.

Representative profile of Wauseon silt loam (0 to 2 percent slopes), SW¼SE¼ sec. 8, T. 16 N., R. 18 E., about 700 feet east of Lake Winnebago.

A1—0 to 11 inches, black (10YR 2/1) silt loam; weak, fine, subangular structure; very friable; mildly alkaline; clear, wavy boundary.

B11g—11 to 15 inches, dark-gray (10YR 4/1) sandy loam; many, medium, prominent mottles of yellowish red (5YR 4/6); weak, medium, subangular blocky structure in the upper part and weak platy structure in the lower part; friable; mildly alkaline; clear, wavy boundary.

B12g—15 to 26 inches, brown (10YR 5/3) loamy fine sand; common, coarse, distinct mottles of gray (10YR 5/1) and yellowish brown; weak, fine, subangular blocky structure; very friable; pebbles in the lower 2 inches; mildly alkaline; abrupt, wavy boundary.

IIB2t—26 to 30 inches, reddish-brown (5YR 4/3) silty clay; common, fine, prominent mottles of dark gray (5Y 4/1) and faint mottles of yellowish red (5YR 5/8); moderate, medium, subangular blocky structure; very firm; thin, patchy clay films; a few small pebbles; mildly alkaline; gradual, wavy boundary.

IIC—30 to 60 inches, reddish-brown (5YR 4/4) silty clay; weak, subangular blocky structure; firm; reddish-gray (5YR 5/2) coatings on ped faces; a few small pebbles; moderately alkaline; calcareous.

The A1 horizon is loam or silt loam. The thickness of the sandy layers ranges from 20 to 40 inches. In places thin layers of gravel in the B11g horizon contain an abundance of small snail and clam shells. In places the B11g horizon also includes thin bands of silty clay or clay sediments. In some places the B horizon contains mollusk shells. Wauseon soils occur in areas 5 to 8 feet above the water level of Lake Winnebago.

Wauseon loam (0 to 2 percent slopes) (Wt).—This soil is in depressions and shallow drainageways. The surface layer is 7 to 11 inches thick. Where this soil occurs in drainageways, it dissects nearly level areas of Manawa

soils. It is also associated with very poorly drained Poygan soils. Small areas of these associated soils, as well as other Wauseon soils, were included in mapping.

This soil is well suited to pasture, meadow, woodland, or wildlife habitat. Where it has been drained it is suited to corn, small grains, and hay. This soil has a high water table. (Capability unit IIw–5; woodland suitability group 7; wildlife group 4)

Wauseon silt loam (0 to 2 percent slopes) (Wu).—This soil is in depressions and shallow drainageways. It has the profile described as representative of the series. It is generally associated with Poygan and Manawa soils, and areas of these soils are included with this soil. Other Wauseon soils were also included in mapping.

This soil is well suited to pasture, meadow, woodland, or wildlife habitat. Drained areas are suited to corn, small grains, and hay. A high water table is the principal limitation to farming this soil. (Capability unit IIw–5; woodland suitability group 7; wildlife group 4)

Formation, Morphology, and Classification of the Soils

This section discusses the factors of soil formation as they relate to the development of the soils of Fond du Lac County, describes important processes in the development of soil horizons, and explains the current system of soil classification.

Factors of Soil Formation

The soils of Fond du Lac County formed through the action of climate and living organisms upon parent material, as conditioned by local factors of relief. The total effect of these four factors depends on the length of time the soil material has been in place. All of these factors come into play in the genesis of every soil, although the relative importance of each differs from place to place. In extreme cases, one factor may dominate the formation of a soil and fix most of its properties. In general, however, the effect of each of these factors—climate, living organisms, parent material, relief, and time—is modified by the effect of the others.

Climate

The climate of Fond du Lac County is of the cool, moist-subhumid, continental type characteristic of the North-Central States. It has a direct effect on soil formation through the weathering of rocks and alteration of parent material. In many places, however, its indirect effect is of equal or greater significance. The clay content of soils, for instance, tends to increase as precipitation increases and as temperature rises. By supplying energy and a suitable environment for growth of organisms, climate also indirectly affects the accumulation of organic matter and increases soil fertility. In Fond du Lac County the indirect influence of climate is evident in soils of the Elliott series and in other soils that formed under a cover of grass.

In Fond du Lac County the effects of climate are modified somewhat by relief. On the steep slopes, in many parts of the county, more of the rainfall is lost through runoff than in areas where slopes are moderate. In these places less water penetrates the surface to furnish moisture for plant growth, microbiological activity, and the disintegration of rock. As a result, soil formation is slowed.

On slopes facing south or west, soils are warmed and dried by the sun and wind more than on slopes facing north or east. The cooler, more humid, north- and east-facing slopes support dense stands of trees. The warmer, less humid, south-facing slopes support a dominantly grassy or sparsely wooded vegetation.

Living organisms

Plants are the principal living organisms that influence the formation of soils in this county, but bacteria, fungi, earthworms, rodents, and man are also important. Two of the chief functions of plant and animal life are to supply organic matter to the soil and to bring plant nutrients from the lower part of the solum to the upper layers.

The influence of vegetation on the characteristics of soils can be seen in the contrast between the dark-colored soils that formed under grass (*8*) and the lighter colored soils that formed under trees.

In cultivated areas, man has been responsible for extensive changes in the soil. These changes include (1) altering the pH value and fertility of acid soils by liming; (2) perpetuating grass by burning over areas that are normally wooded; (3) using cropping practices that cause organic matter to be lost; and (4) accelerating erosion by removing the plant cover on outwash plains and uplands. Man has also changed the soils in many areas by changing the kind of vegetation growing on them. For example, he may have kept one field in permanent pasture and used another for row crops. Although the soils in the two fields were originally similar, their characteristics eventually change, because of the difference in the kind of vegetation growing on them.

Soils of the Juneau and Washtenaw series are examples of soils that reflect changes caused by man. In many places these soils formed in eroded areas where the plant cover has been removed by man. Soil materials washed from the uplands where the vegetation had been removed, and these materials were deposited over moderately well drained to very poorly drained soils at lower elevations.

Parent material

Most of the soils of Fond du Lac County formed in glacial till. In most areas a layer of loess up to 4 feet thick has been deposited over the till (*4*). A few of the soils formed in organic material or in alluvial deposits; some formed in lacustrine deposits.

About 70 percent of the soils of the county developed in drift deposited by the Green Bay lobe (*11*) of the Wisconsin glaciation (fig. 14). Most of this till is calcareous, has a brown to yellowish-brown color, and ranges from loam to heavy sandy loam in texture. In the eastern part of the county the till was derived mainly from dolomite. It has a calcium carbonate equivalent of 40 to 60 percent. Soils of the Theresa and Hochheim series developed in less than 24 inches of loess over this kind of till. In the western part of the county, the till has a calcium carbonate equivalent of 60 to 90 percent and includes numerous flaggy and channery fragments. In Lomira and Plano soils, the lower part of the solum developed in glacial till that has a high content of calcium carbonate.

Figure 14.—Glacial scratches, or straie, on Rock land.

Near Oakfield, the till has a silty clay loam or silty clay texture that results from the incorporation of shale residuum from the underlying shale bedrock. In places this fine-textured till has been pushed over the Niagara Escarpment. Soils of the Beecher, Morley, and Elliott series developed in a thin mantle of loess over shale till (*15*).

Some soils formed in outwash composed of calcareous sand, gravel, and cobblestones. This outwash was transported by water from the till deposits. The coarser gravel and cobbly outwash deposits are near the Kettle Moraine (Auburn and Osceola Townships). Soils of the Fox series and the gravelly substratum variant of the St. Charles series developed in more than 24 inches of loess over sand and gravel outwash. Soils of the Casco and Rodman series developed in the coarser textured outwash on steeper slopes. Mixtures of till and outwash deposits are the parent materials in several intermittent recessional moraines that traverse the county (fig. 15). Casco-Hochheim and Theresa-Casco complexes are mapped in these areas of mixed parent materials.

Lacustrine sediments from glacial drift consist of laminated, brown and reddish-brown, calcareous sand, silt, and silty clay loam. Soils that formed in lacustrine parent materials, such as those of the Sisson and Pella series, are not extensive.

About 20 percent of the land area of the county is underlain by calcareous, reddish-brown silty clay and clay till that contains small fragments of dolomite. Most of this material is in the vicinity of Lake Winnebago. A large part of this area consists of a gently sloping to sloping horseshoe-shape ridge that is about parallel to the shores of Lake Winnebago. This is the terminal moraine of the Valders ice sheet. Soils of the Kewaunee, Manawa, and Poygan series developed in less than 10 inches of loess over the clayey till. Reddish-brown, stonefree, lacustrine clay derived from clayey till occupies several hundred acres at the frontal edge of the terminal moraine. Soils of the Oshkosh series are dominant in this area.

A small area of sandstone residuum in the town of Ripon is the parent material for a small acreage of Hixton soils. The presence of erratics indicates some glacial influence.

Most of the soils that formed in alluvial deposits occur along the Milwaukee River in the southeastern corner of the county. Soils of the Juneau, Washtenaw, and Wallkill series formed in local alluvium in the heads of drainageways, in small upland depressions, and on the foot slopes of eroded uplands.

Organic soils formed mainly in the residue of sedges, grasses, and woody fragments in various stages of decomposition. Houghton is the dominant organic soil in the county. Other organic soils are those of the Adrian, Carbondale, Ogden, Palms, and Rollin series.

Relief

Relief influences the formation of soils by controlling drainage, runoff, and erosion. Differences in elevation are closely related to the differences in drainage, to differences in the thickness and organic-matter content of the A horizon, to differences in the thickness of the solum, and to differences in the degree of horizon differentiation.

Soils of the Theresa, Lomira, and Plano series which formed in sloping till, and soils of the Fox and Casco series, which formed on outwash plains, all lack mottling in the A and B horizons, but in places they are mottled in the C horizon or below.

Moderately well drained, nearly level and gently sloping soils, such as those of the Mayville series, are mottled in the lower part of the B horizon and in the C horizon. Somewhat poorly drained soils, such as those of the Virgil series,

Figure 15.—Morainic deposits, the parent material of Hochheim soils.

commonly are mottled in the B and C horizons. They generally are nearly level or are adjacent to depressed areas.

The poorly drained soils of the Pella series are characterized by a very dark colored, organic-mineral surface layer, generally 6 inches or more thick, underlain by mineral, gleyed horizons. These soils are in small basins or depressions or in nearly level, low areas.

The thickness and organic-matter content of the surface layer are commonly related, directly or indirectly, to relief. In Fond du Lac County the steeper soils usually are light colored, and the gently sloping soils have a darker and thicker surface layer. In areas that have mild slopes, runoff is slower and the soils absorb more moisture than on strong slopes. As a result, the content of moisture in gently sloping soils is more favorable for plant growth and for the accumulation of organic matter.

In areas that have concave relief, the soils are likely to have a high water table. Such soils are better suited to hydrophytic than to mesophytic plants. In these areas microorganisms are less active or die and decompose, and the soils have a very dark brown or black A horizon. In some very poorly drained areas, decomposing plant remains accumulate to a depth of several feet to form organic soils.

Relief also affects the thickness of the solum and the degree of horizon differentiation. Steep soils, such as those of the Sogn series, characteristically are shallow and lack horizon development (fig. 16).

Time

Time is required for the active factors of soil formation to form soils from parent material. Some soils form rapidly; others form slowly. The length of time required for a particular kind of soil to form is dependent on the other factors involved.

When soils begin to form, the soil material has characteristics almost identical to those of the parent material and the soils are said to be immature. An example of immature soils in Fond du Lac County are those of the Juneau series. These soils have little or no genetic differences between horizons.

Generally, a soil is considered mature when it has well-developed profile characteristics and when it is nearly in equilibrium with its present environment. Not all soil components, however, mature at the same rate.

The loess that is now the upper part of most soils in Fond du Lac County was deposited during and after the Wisconsin glaciation. By radiocarbon dating, advance of the latest ice sheet has been set at approximately 11,000 years ago. Well-developed soils, such as those of the Kewaunee series, have a maximum age of eleven centuries.

Radiocarbon tests have placed the age of the older calcareous loam till at 13,000 to 18,000 years. Some evidence indicates an age of about 25,000 years. Most of the soils in Fond du Lac County formed in loess over the older till. Among these are soils of the Theresa, Hochheim, Lomira, Plano, Mendota, St. Charles, Virgil, and Lamartine series.

Morphology and Composition

The differentiation of soil horizons in Fond du Lac County is the result of one or more of the following processes: (1) accumulation of organic matter, (2) leaching of carbonates and salts, (3) removal and subsequent accumulation of silicate clay minerals, and (4) reduction and transfer of iron.

Some organic matter has accumulated to form an A1 horizon in all the soils of the county. Much of the organic matter is in the form of humus. In some soils, such as those of the Casco and Sisson series, the surface layer is comparatively low in organic-matter content. In other soils, such as those of the Plano and Mendota series, the organic-matter content is fairly high in the surface layer.

Although leaching of carbonates and salts has been of limited importance to visible horizon differentiation, it has occurred in most soils of the county. This leaching has permitted the subsequent translocation of silicate clay minerals in some soils. Free carbonates and salts have been carried almost completely out of the profile of most well-drained soils. Even in the wetter soils, some leaching is indicated by the absence of free carbonates and, in some cases, by slightly acid reaction. Leaching of the very wet soils is slow because of slow movement of water through the profile.

The removal and subsequent accumulation of silicate clay minerals has contributed to the development of horizons in most soils of Fond du Lac County. With a few exceptions, soils that have blocky structure show the presence of clay films, though some may be very thin and weakly expressed. The films occur as thin layers on ped faces; the long axes of the clay particles are parallel to the surface in which they are deposited. Where strongly expressed, this translocated clay tends to fill the natural cracks of the soil and jut into crevasses and openings left by plant roots, insects, and earthworms.

The A2 horizon from which clay has been removed is characterized by a bleached, light-colored appearance, friable consistence, and generally platy structure. Nearly structureless soils, such as those of the Juneau series, display little evidence of translocation of clay.

The reduction and transfer of iron has occurred in all the somewhat poorly drained, poorly drained, and very poorly drained soils. This process, called gleying, is important in horizon differentiation. Gleying is most pronounced in poorly drained soils, such as those of the Pella, Sebewa, and Brookston series.

The gray colors in subsurface horizons of wet soils indicate the reduction of iron oxides. This reduction commonly is accompanied by some transfer of iron, which may be local or general in character. After it has been reduced, iron may be removed completely from a horizon, and even from the soil profile. In Fond du Lac County soils, iron has been moved downward a short distance, either in the horizon of its origin or in a nearby horizon. In many places iron is segregated in the solum of moderately well drained and somewhat poorly drained soils and within deeper horizons of some poorly drained soils. Iron segregation forms yellowish-red, strong-brown, or yellowish-brown mottles. Black manganese spots also are common.

Classification of the Soils

Two systems of classifying soils have been used in the United States in recent years. The older system was adopted in 1938 (*2*) and later revised (*9*). The system

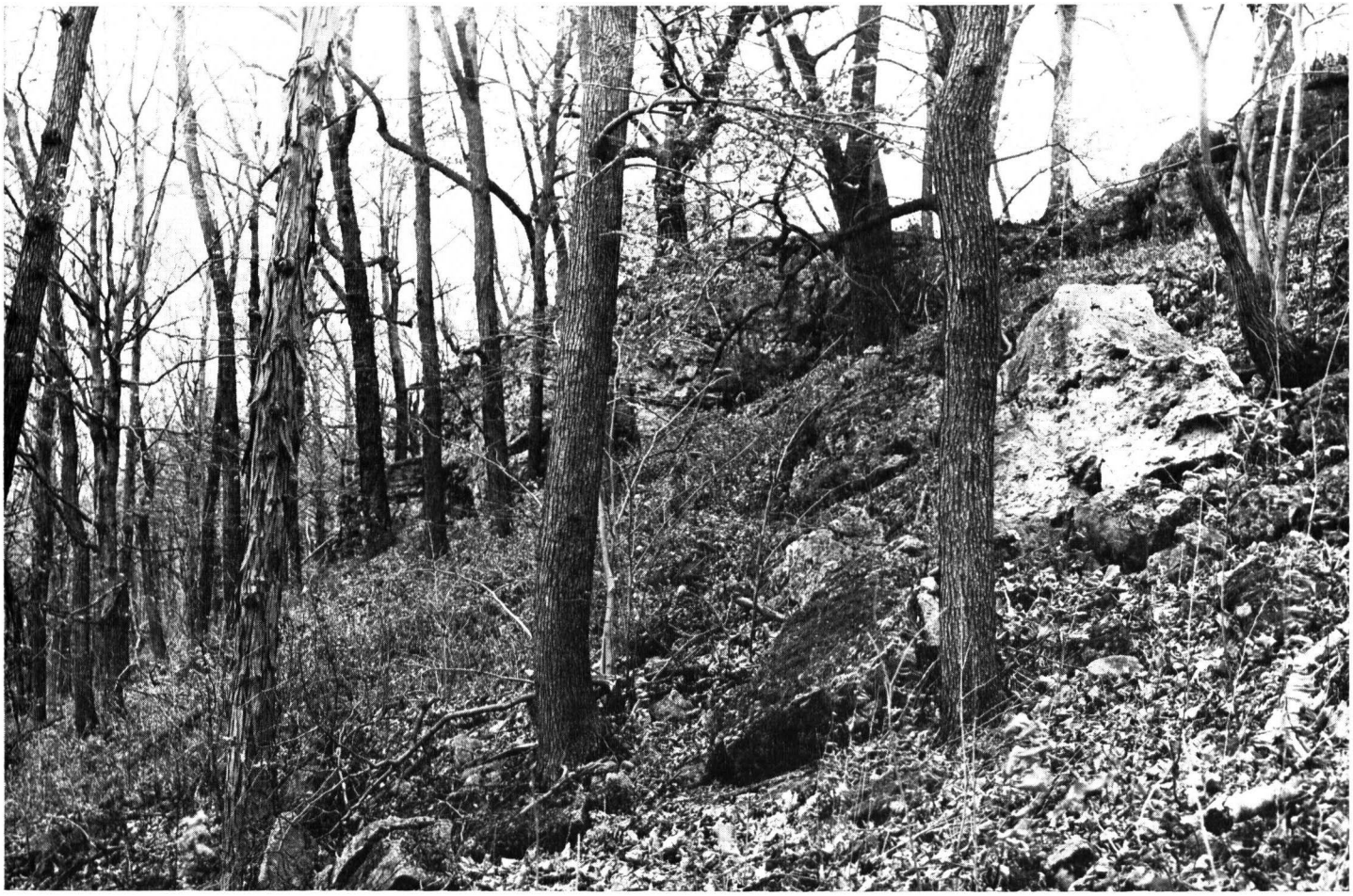

Figure 16.—**The Niagara Escarpment is a conspicuous topographic feature near the eastern shore of Lake Winnebago. The soil is Sogn stony silt loam.**

currently used was adopted for general use by the National Cooperative Soil Survey in 1965 and supplemented in March 1967 and September 1968 (*13*). This system is under continual study, and readers interested in the development of the system should refer to the latest literature available.

Table 9 shows the classification of each of the soil series represented in Fond du Lac County according to the current system.

The current system defines classes in terms of observable or measurable properties of soils (*6*). The properties chosen are primarily those that permit the grouping of soils that are similar in genesis. The classification is designed to encompass all soils. It has six categories. Beginning with the most inclusive, they are the order, the suborder, the great group, the subgroup, the family, and the series. These are briefly defined in the following paragraphs.

ORDER.—Ten soil orders are recognized in the current system: Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The properties used to differentiate the soil orders are those that tend to give broad climatic groupings of soils. Two exceptions, Entisols and Histosols, occur in many different climates. Five of the ten soil orders are represented in Fond du Lac County: Entisols, Inceptisols, Mollisols, Alfisols, and Histosols.

Entisols are recent soils in which there has been no horizon development. This order is represented in Fond du Lac County by soils of the Juneau, De Pere, and Washtenaw series.

Inceptisols occur mostly on young, but not recent, land surfaces. This order is represented by soils of the Keowns and Wallkill series.

Mollisols have a thick, dark-colored surface layer. Most of these soils formed under grass. This order is represented by soils of the Ashkum, Brookston, Elburn, Elliott, Hochheim, Markesan, Martinton, Mendota, Peebles, Pella, Plano, Poygan, Rodman, Sebewa, Sogn, Warsaw, and Wauseon series.

Alfisols are soils that have clay-enriched B horizons, generally high in base saturation. This order is represented by soils of the Beecher, Casco, Dodge, Fox, Hixton, Ionia, Kewaunee, Kibbie, Knowles, Lamartine, LeRoy, Lomira, Manawa, Mayville, Milton, Morley, Oshkosh, Rimer, St. Charles, Sisson, Theresa, and Virgil series.

Histosols are organic soils. This order is represented by soils of the Adrian, Carbondale, Houghton, Ogden, Palms, and Rollin series.

TABLE 9.—*Classification of soil series of Fond du Lac County*

Series	Family	Subgroup	Order
Adrian	Sandy or sandy-skeletal, mixed, euic, mesic	Terric Medisaprists	Histosols.
Ashkum	Fine, mixed, noncalcareous, mesic	Typic Haplaquolls	Mollisols.
Beecher	Fine, illitic, mesic	Udollic Ochraqualfs	Alfisols.
Beecher, shaly subsoil variant	Fine, illitic, mesic	Udollic Ochraqualfs	Alfisols.
Brookston	Fine-loamy, mixed, noncalcareous, mesic	Typic Argiaquolls	Mollisols.
Carbondale	Euic	Hemic Borosaprists	Histosols.
Casco	Fine-loamy over sandy or sandy-skeletal, mixed, mesic.	Typic Hapludalfs	Alfisols.
Casco, loamy subsoil variant	Fine-loamy over sandy or sandy-skeletal, mixed, mesic.	Typic Hapludalfs	Alfisols.
Casco, clayey subsoil variant	Fine-loamy over sandy or sandy-skeletal, mixed, mesic.	Typic Hapludalfs	Alfisols.
DePere	Fine, mixed, nonacid, mesic	Typic Udifluvents	Entisols.
Dodge	Fine-silty, mixed, mesic	Typic Hapludalfs	Alfisols.
Elburn	Fine-silty, mixed, mesic	Aquic Argiudolls	Mollisols.
Elliott	Fine, illitic, mesic	Aquic Argiudolls	Mollisols.
Fox	Fine-loamy over sandy or sandy-skeletal, mixed, mesic.	Typic Hapludalfs	Alfisols.
Hixton	Fine-loamy over sandy or sandy-skeletal, mixed, mesic.	Typic Hapludalfs	Alfisols.
Hochheim	Fine-loamy, mixed, mesic	Typic Argiudolls	Mollisols.
Houghton	Euic, mesic	Typic Medisaprists	Histosols.
Ionia	Fine-loamy over sandy or sandy-skeletal, mixed, mesic.	Typic Hapludalfs	Alfisols.
Ionia, loamy subsoil variant	Fine-loamy over sandy or sandy-skeletal, mixed, mesic.	Typic Hapludalfs	Alfisols.
Ionia, clayey subsoil variant	Fine-loamy over sandy or sandy-skeletal, mixed, mesic.	Typic Hapludalfs	Alfisols.
Juneau	Coarse-silty, mixed, nonacid, mesic	Typic Udifluvents	Entisols.
Keowns	Coarse-loamy, mixed, calcareous, mesic	Mollic Haplaquepts	Inceptisols.
Kewaunee	Fine, mixed, mesic	Typic Hapludalfs	Alfisols.
Kewaunee, moderately shallow variant.	Fine, mixed, mesic	Typic Hapludalfs	Alfisols.
Kibbie	Fine-loamy, mixed, mesic	Aquollic Hapludalfs	Alfisols.
Knowles	Fine-silty, mixed, mesic	Typic Hapludalfs	Alfisols.
Lamartine	Fine-silty, mixed, mesic	Aquollic Hapludalfs	Alfisols.
LeRoy	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols.
Lomira	Fine-silty, mixed, mesic	Typic Hapludalfs	Alfisols.
Manawa	Fine, mixed, mesic	Aquollic Hapludalfs	Alfisols.
Markesan	Fine-loamy, mixed, mesic	Typic Argiudolls	Mollisols.
Martinton	Fine, illitic, mesic	Aquic Argiudolls	Mollisols.
Mayville	Fine-silty, mixed, mesic	Typic Hapludalfs	Alfisols.
Mendota	Fine-silty, mixed, mesic	Typic Argiudolls	Mollisols.
Milton	Fine, illitic, mesic	Typic Hapludalfs	Alfisols.
Morley	Fine, illitic, mesic	Typic Hapludalfs	Alfisols.
Ogden	Clayey, euic, mesic	Terric Medisaprists	Histosols.
Oshkosh	Very fine, mixed, mesic	Typic Hapludalfs	Alfisols.
Palms	Loamy, mixed, euic, mesic	Terric Medisaprists	Histosols.
Peebles	Fine, mixed, mesic	Typic Argiudolls	Mollisols.
Pella	Fine-silty, mixed, noncalcareous, mesic	Typic Haplaquolls	Mollisols.
Plano	Fine-silty, mixed, mesic	Typic Argiudolls	Mollisols.
Plano, sandy variant	Fine-loamy, mixed, mesic	Typic Argiudolls	Mollisols.
Poygan	Fine, mixed, noncalcareous, mesic	Typic Haplaquolls	Mollisols.
Rimer	Clayey, mixed, mesic	Aquic Arenic Hapludalfs	Alfisols.
Rodman	Sandy-skeletal, mixed, mesic	Typic Hapludolls	Mollisols.
Rollin	Marl, euic, mesic	Limnic Medisaprists	Histosols.
St. Charles	Fine-silty, mixed, mesic	Typic Hapludalfs	Alfisols.
Sebewa	Fine-loamy over sandy or sandy-skeletal, mixed, noncalcareous, mesic.	Typic Argiaquolls	Mollisols.
Sebewa, loamy subsoil variant	Fine-loamy over sandy-skeletal, mixed, noncalcareous, mesic.	Typic Argiaquolls	Mollisols.
Sisson	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols.
Sogn	Loamy, mixed, mesic	Lithic Haplustolls	Mollisols.
Theresa	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols.
Virgil	Fine-silty, mixed, mesic	Udollic Ochraqualfs	Alfisols.
Wallkill	Fine-loamy, mixed, nonacid, mesic	Thapto Histic Haplaquepts	Inceptisols.
Warsaw	Fine-loamy over sandy or sandy-skeletal, mixed, mesic.	Typic Argiudolls	Mollisols.
Washtenaw	Fine-loamy, mixed, nonacid, mesic	Typic Haplaquents	Entisols.
Wauseon	Coarse-loamy over clayey, mixed, noncalcareous, mesic.	Typic Haplaquolls	Mollisols.

SUBORDER.—Each order is subdivided into suborders, primarily on the basis of characteristics that seem to produce classes having genetic similarity. Mainly, these are characteristics that reflect either the presence or absence of waterlogging or soil differences resulting from the climate or vegetation. The climatic range is narrower than that of the orders.

GREAT GROUP.—Each order is divided into great groups, on the basis of uniformity in the kinds and sequence of major horizons and similarity of the significant features of corresponding horizons. The horizons considered are those in which clay, iron, or humus have accumulated and those that have pans that interfere with the growth of roots or the movement of water. The features selected are the self-mulching properties of clays, soil temperature, chemical composition (mainly calcium, magnesium, sodium, and potassium), and the like.

SUBGROUP.—Each great group is divided into subgroups, one representing the central (typic) segment of the group, and other groups, called intergrades, that have properties of one great group and also one or more properties of another great group, suborder, or order. Subgroups may also be made in instances where soil properties intergrade outside the range of any other great group, suborder, or order.

FAMILY.—Families are established within a subgroup primarily on the basis of properties that affect the growth of plants or the behavior of soils in engineering use. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence.

SERIES.—The series is a group of soils that have major horizons that, except for texture of the surface layer, are similar in important characteristics and in arrangement in the profile. Each series is given the name of a geographic location near the place where that series was first observed and mapped.

General Nature of the County

Fond du Lac County was established in 1836, but the present boundaries were not set until 1844. In 1850 the entire population of the county was only 14,510, but, as shown in table 10, it grew to more than 75,000 by 1960.

TABLE 10.—*Population growth in Fond du Lac County*

Year	Urban population	Rural population	Total
1850	(1)	(1)	14, 510
1870	(1)	(1)	46, 273
1900	20, 046	27, 543	47, 589
1930	32, 083	27, 800	59, 883
1960	43, 517	31, 568	75, 085

[1] Data not available.

For a number of years, wheat was the principal cash crop grown in the county. When wheat growing declined, dairying became a major industry (fig. 17). One of the first cheese factories in Wisconsin was erected in the town of Springvale in 1864. Since then, Fond du Lac County has been one of the leading dairy counties of the State.

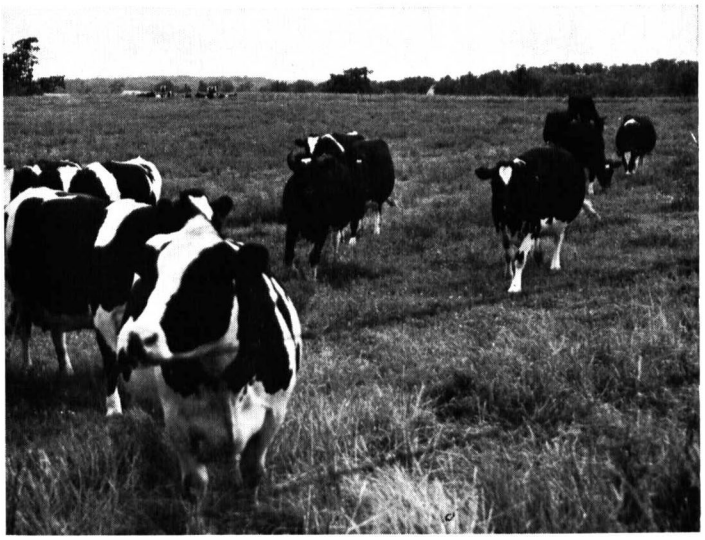

Figure 17.—**High-grade dairy herds are the main source of farm income in Fond du Lac County. The pasture is on Beecher silt loam.**

Lumbering was the main early industry in the county. In 1873 there were eighteen lumber and shingle mills in the city of Fond du Lac alone. Industrial development declined after 1875 but was revived by the establishment of railroad shops in North Fond du Lac about 1900. In 1958, there were 146 industrial concerns in the county. The estimated value of manufactured products was more than $63 million.

Climate [4]

The climate of Fond du Lac County is continental. Winters are long, cold, and snowy; summers are warm and occasionally humid; spring and fall are sometimes of short duration and are periods of transition between summer and winter. In many years the change from spring to summer is gradual, but the change from summer to fall is usually abrupt. The seasons vary greatly from year to year.

In all seasons, storms accompany changes from one air mass to another, particularly from late in fall through the middle of spring, when changes occur every 2 or 3 days. Temperatures in the immediate vicinity of Lake Winnebago are tempered by the lake when it is not frozen over. The lake usually begins to freeze after the middle of November and is safe to walk on by Christmas. The ice begins to break up early in April and is usually gone by the middle of April.

The data in tables 11 and 12 were collected at the weather station in the city of Fond du Lac, not far from Lake Winnebago. The climate of the city is representative of the county as a whole, but daily and annual temperature ranges tend to decrease at the higher elevations and increase at the lower elevations.

[4] By MARVIN W. BURLEY, formerly State climatologist for Wisconsin, United States Weather Bureau.

TABLE 11.—*Means and extremes of temperature and precipitation*

[Based on records, 1930–59, kept at Fond du Lac, elevation 760 feet]

Month	Temperature							Average heating degree days [1]	Precipitation		
	Average			Maximum		Minimum			Average		0.1 inch or more
	Daily maximum	Daily minimum	Monthly	90°F. and above	32°F. and below	32°F. and below	0°F. and below		Total	Snow and sleet	
	°F.	°F.	°F.	*Mean number of days*	*Mean number of days*	*Mean number of days*	*Mean number of days*	*Number*	*Inches*	*Inches*	*Days*
January	28.5	10.7	19.6	0	18	30	7	1,410	1.36	10.8	4
February	31.3	12.6	22.0	0	15	27	6	1,200	1.30	8.3	4
March	40.9	22.4	31.7	0	6	26	1	1,030	1.81	9.8	5
April	57.4	34.8	46.1	0	(2)	13	0	570	2.43	.9	6
May	70.5	45.5	58.0	1	0	2	0	250	3.05	.3	7
June	79.8	55.8	67.8	4	0	(2)	0	70	3.86	0	7
July	84.9	60.0	72.5	7	0	0	0	20	3.34	0	6
August	83.0	58.6	70.8	6	0	0	0	20	3.30	0	6
September	74.3	50.5	62.4	2	0	1	0	140	3.08	(3)	6
October	62.7	40.3	51.5	0	0	7	0	420	2.04	.1	5
November	44.8	27.6	36.2	0	5	21	1	860	2.10	3.2	5
December	31.9	16.1	24.0	0	15	29	5	1,270	1.35	7.1	4
Year	57.5	36.2	46.9	20	59	156	20	7,260	29.02	40.5	65

[1] Base 65° F. [2] Less than half a day. [3] Trace.

TABLE 12.—*Temperature and precipitation probabilities*

Month	Temperature		Precipitation	
	Two years in 10 will have at least 4 days with:		One year in 10 will have:	
	Maximum temperature equal to or higher than—	Minimum temperature equal to or lower than—	Less than—	More than—
	°F.	°F.	*Inches*	*Inches*
January	44	−14	0.33	2.30
February	45	−9	.28	2.31
March	59	0	.83	2.92
April	76	23	1.03	3.82
May	85	32	1.24	6.02
June	91	43	1.93	5.65
July	98	50	.74	7.34
August	95	47	1.25	5.15
September	91	37	1.10	6.07
October	79	27	.43	4.24
November	62	12	.45	4.33
December	46	−6	.73	2.09

Table 11 also gives the average heating degree days by month (7). A degree day is the difference between the average temperature for a given day and 65° F. It is a measure of the amount of heat needed to keep the temperature on a specific day at 65°. For example, on a day having an average temperature of 50°, 15 degree days would be counted. A knowledge of the accumulated degree days for a stated time is helpful in calculating the amount of fuel needed to heat buildings or determine the rate of growth and maturity date of crops.

Temperatures in this county not only vary considerably from season to season, but also from year to year. During the period 1930 to 1959, the number of days when the temperature reached 90° or higher ranged from 51 in 1934 to 3 in 1951. The number of days when the temperature was zero or lower ranged from 39 in 1950 to 3 in 1931.

Approximately 55 percent of the total annual precipitation falls during the 5-month period May through September, when crops are in active growth. The amount of moisture in the soil is usually adequate for the first part of the growing season, but after June the rain comes mainly in the form of thunderstorms and tends to be variable. In summer the probability of receiving 1 inch or more of rain during a 7-day period is greatest during the first part of June and least during the last part of August; the probabilities are 4 times in 10 years and 2 times in 10 years, respectively. During the latter part of August, there is a greater probability that there will be no rain, not even a trace, in any given 7-day period.

About once in 2 years, intensive rainfall occurs at the rate of 1.4 inches in 1 hour, 2.0 inches in 6 hours, or 2.5 inches in 24 hours. An average of 116 days in a year have 0.01 inch or more precipitation, and in 2 years out of 3, the average is 106 to 126 days. The greatest amount of rainfall recorded in the county in a 24-hour period was 5.3 inches at Fond du Lac on August 4, 1924.

The average annual snowfall is 41 inches, but it has ranged from 18 inches in 1958 to 84 inches in 1959. The average date of the first snowfall of 1 inch or more is November 30. Once in 10 years, the first snow of the season falls by November 2, and in 9 years out of 10, it falls by

December 28. The probability of snow cover increases until the middle of February and then decreases rapidly.

Records of windspeed, sunshine, and relative humidity are not available for Fond du Lac County, but data recorded at Appleton and Madison approximate conditions in this county.

Prevailing winds are from the northwest in winter and from the southwest in summer. April and November are the windiest months, when the average windspeed is 13 miles per hour. August is the least windy month, when the average windspeed is only 10 miles per hour. The average windspeed is less than 4 miles per hour about 10 percent of the time, 4 to 12 miles per hour about 50 percent of the time, 13 to 31 miles per hour about 40 percent of the time, and more than 31 miles per hour less than 1 percent of the time. The strongest winds are usually from the southwest, south, and west.

An average of nearly 40 percent of the daylight hours in November and December are sunny, 60 percent or more in May through October, and between 50 and 60 percent during the rest of the year.

The approximate variations in relative humidity for the seasons of the year are given in table 13. The relative humidity is generally higher in winter than in other seasons.

TABLE 13.—*Approximate variations in relative humidity for the seasons of the year*

Relative humidity	Time in winter	Time in spring	Time in summer	Time in fall
	Percent	*Percent*	*Percent*	*Percent*
Less than 50 percent	5	20	15	20
50 to 80 percent	55	50	45	50
More than 80 percent	40	30	40	30

Table 14 gives the probabilities of the last freezing temperatures in spring and the first in fall. The average date of the last freezing temperature in spring is May 11, and the first in fall is October 9. The growing season, defined as the number of days between the last freezing temperature in spring and the first in fall, averages 151 days in Fond du Lac County.

During the growing season, the average number of growing-degree-day units above a threshold temperature of 40° is 4,000. Above a threshold temperature of 45° it is 3,200, and above a threshold temperature of 50° it is 2,500. Growing-degree-days are based on the concept that plant growth and insect development begin at the times certain critical (threshold) temperatures are reached and that the amount of growth is roughly proportional to the number of accumulated growing-degree-days. The number of growing-degree-days equals the threshold temperature minus the daily average temperature.

Physiography, Relief, and Drainage

The topography of Fond du Lac County is controlled mainly by the underlying bedrock, and secondarily by features that result from the glacial drift cover (fig. 18).

The county is divided into two physiographic regions. East of the Niagara Escarpment, which extends from the village of Pipe to the Horicon Marsh, lies the region known as the Eastern Ridges of Wisconsin. This part of the county has been modified by such glacial features as the Kettle Moraine, drumlins, and kames. West of the Niagara Escarpment, the topography is nearly level to sloping and includes some of the best farming soils in the county.

The water that falls east of the Niagara Escarpment drains into Lake Michigan through the Sheboygan and Mullet Rivers, the south branch of the Manitowoc River, or the west, middle, or east branches of the Milwaukee River.

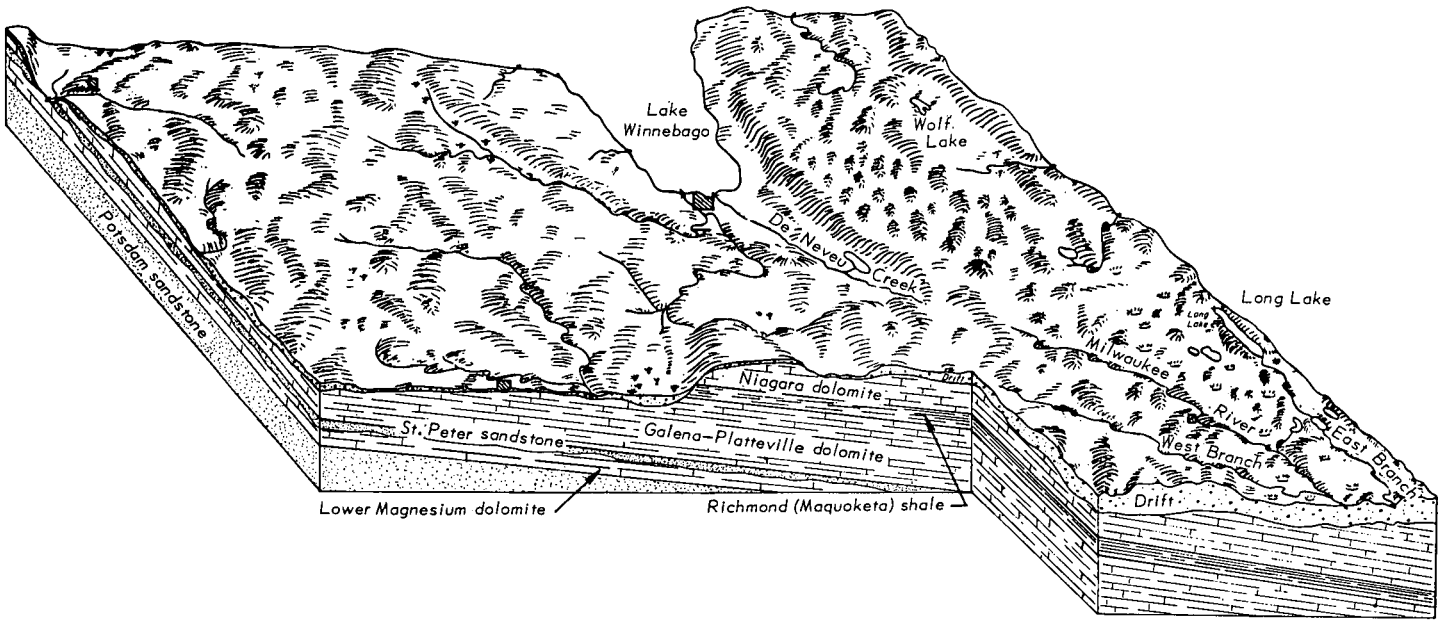

Figure 18.—**Physiography, drainage, and geology of Fond du Lac County, Wisconsin.**

TABLE 14.—*Probabilities of last freezing temperatures in spring and first in fall*

Probability	Dates for given probability and temperature				
	32° F. or lower	28° F. or lower	24° F. or lower	20° F. or lower	16° F. or lower
Spring:					
20 percent chance after	May 20	May 5	April 20	April 11	April 3
40 percent chance after	May 14	April 28	April 13	April 3	March 26
60 percent chance after	May 8	April 22	April 6	March 28	March 20
80 percent chance after	May 1	April 15	March 30	March 20	March 12
Fall:					
20 percent chance before	September 29	October 7	October 20	October 30	November 9
40 percent chance before	October 6	October 15	October 27	November 6	November 17
60 percent chance before	October 12	October 21	November 3	November 13	November 23
80 percent chance before	October 19	October 29	November 11	November 20	December 1

Most of the area west of the Niagara Escarpment is drained by Silver Creek and by the Fond du Lac and Grand Rivers. All these streams empty into Lake Winnebago and drain into Lake Michigan. The southwestern and south-central parts of the county are drained by headwaters of the Rock River, which flows southwesterly to the Mississippi River.

Trends and Potential Development [5]

In the early days a large part of Fond du Lac County was forested, and the lumber industry dominated the economy. Now, most of the forests are gone; sawmills of the portable type satisfy lumbering needs, and the cleared areas are used for pasture and crops.

Grain, mainly barley, was the principal cash crop in the early days. Then more grasses were introduced into the cropping system, and livestock and livestock products became a major part of the farm program. As a result of this trend, Fond du Lac County is now one of the major dairying counties in the nation. It is also a major producer of cheese products.

Through the years, such crops as sugar beets, red beets, sweet corn, peas, onions, carrots, cabbage, and celery have made Fond du Lac County a leader in canning crops.

In the past few years farms have become larger and more mechanized, and they use less manpower. The number of farms has decreased, and there has also been some decrease in cropland acreage. The Fond du Lac County Conservation Needs Inventory indicates an expected 5,000-acre decrease in cropland by 1975. Much of this acreage will be used for urban development, schools, highways, and recreational areas.

The eastern part of Fond du Lac County, especially the Kettle Moraine and Milwaukee River Watershed, lends itself to recreational development. Some of the areas formerly used for crops are being converted to private and public camping areas, summer vacation areas, and public hunting grounds. Conservation clubs also have developed areas for dog trails, bridle paths, and hiking areas. In recent years government cost-sharing has encouraged farmers to construct wildlife ponds on their farms. These ponds provide recreational facilities for the family, and, in some cases, additional income when leased for hunting. Highway improvement in the county is progressing.

Many of the large hills and ridges near the Milwaukee River and its tributaries offer excellent possibilities for the construction of watershed control structures that would create new artificial lakes. This area has a great potential for development, for the construction of homes, and for public recreational facilities.

[5] By J. B. KEATING, district conservationist, Soil Conservation Service.

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Glossary

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as crumbs, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Available water capacity (also termed available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Bottom land. Nearly level land on the bottom of a valley that has a stream flowing through it. Subject to flooding and often referred to as a flood plain.

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.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

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 and brittle; little affected by moistening.

Diversion, or diversion terrace. A ridge of earth, generally a terrace, that is built to divert runoff from its natural course and, thus, to protect areas downslope from the effects of such runoff.

Dolomite. A rock that contains a high proportion of calcium and magnesium carbonates.

Drainage, soil. Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, 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 different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low water-holding capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and have mottling in the lower B and the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and in Podzolic soils commonly have mottlings at depths below 6 to 16 inches, in the lower A horizon and in the B and C horizons.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Drumlin. A long ridge or oval-shaped hill formed by glacial drift.

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

Horizon, soil. A layer of soil approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

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 some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Loess. Geologic deposit of fairly uniform, fine material, mostly silt, presumably transported by wind.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineralogical, and biological properties of the various horizons, and their thickness and arrangement in the soil profile.

Outwash. Cross-bedded gravel, sand, and silt deposited by melt water as it flowed from ice.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

Permeability. The quality of a soil horizon that enables water or air to move through it. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Sand. Individual rock or mineral fragments in a soil that range in diameter from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes 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 characteristic of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. 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 (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically, the part of the soil below the solum.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

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."

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Variant, soil. A soil having properties sufficiently different from those other known soils to suggest establishing a new soil series, but a soil of such limited known area that creation of a new series is not believed to be justified.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. In referring to a capability unit, a woodland group, or a wildlife group, read the introduction to the section it is in for general information about its management. Other information is given in tables as follows:

Predicted yields, table 1, p. 14.
Wildlife habitat, tables 2 and 3, pp. 20 through 24.

Engineering uses of the soils, tables 4, 5, 6, and 7, pp. 26 through 55.
Acreage and extent, table 8, p. 57.

Map symbol	Mapping unit	Described on page	Capability unit		Woodland suitability group		Wildlife group
			Symbol	Page	Number	Page	Number
Ak	Adrian mucky peat	56	IVw-7	12	10	19	5
Am	Alluvial land	56	IIw-13	10	1	18	6
An	Alluvial land, wet	56	Vw-14	12	9	19	4
AtA	Ashkum silty clay loam, 0 to 3 percent slopes	59	IIw-1	9	7	19	4
BcA	Beecher silt loam, 0 to 2 percent slopes	60	IIw-2	9	7	19	4
BcB	Beecher silt loam, 2 to 6 percent slopes	60	IIw-2	9	7	19	4
BeB	Beecher silt loam, shaly subsoil variant, 2 to 6 percent slopes	60	IIe-6	9	7	19	4
BsA	Brookston silt loam, 0 to 3 percent slopes	60	IIw-1	9	7	19	4
BtA	Brookston stony silt loam, 0 to 3 percent slopes	61	Vw-16	12	7	19	4
BuA	Brookston silty clay loam, 0 to 3 percent slopes	61	IIw-1	9	7	19	4
Ca	Carbondale mucky peat	61	IIIw-9	11	10	19	5
CcB	Casco sandy loam, 2 to 6 percent slopes	62	IIIe-3	10	5	19	1
CcC	Casco sandy loam, 6 to 12 percent slopes	62	IVe-3	11	5	19	1
CeB	Casco loam, 2 to 6 percent slopes	62	IIIe-3	10	5	19	1
CeC2	Casco loam, 6 to 12 percent slopes, eroded	62	IVe-3	11	5	19	1
CeD2	Casco loam, 12 to 20 percent slopes, eroded	62	VIe-3	12	5	19	1
CfB3	Casco soils, 2 to 6 percent slopes, severely eroded	62	IVe-3	11	5	19	1
CfC3	Casco soils, 6 to 12 percent slopes, severely eroded	63	VIe-3	12	5	19	1
CfD3	Casco soils, 12 to 20 percent slopes, severely eroded	63	VIIe-3	12	5	19	1
CgB	Casco loam, loamy subsoil variant, 0 to 6 percent slopes	64	IIe-2	8	1	18	1
ChB	Casco loam, clayey subsoil variant, 2 to 6 percent slopes	65	IIe-6	9	2	18	1
CmB	Casco-Hochheim loams, 2 to 6 percent slopes	63	IIIe-3	10	5	19	1
CmC2	Casco-Hochheim loams, 6 to 12 percent slopes, eroded	63	IVe-3	11	5	19	1
CmD2	Casco-Hochheim loams, 12 to 20 percent slopes, eroded	63	VIe-3	12	5	19	1
CnC3	Casco-Hochheim complex, 6 to 12 percent slopes, severely eroded	63	VIe-3	12	5	19	1
CnD3	Casco-Hochheim complex, 12 to 20 percent slopes, severely eroded	63	VIIe-3	12	5	19	1
CpC2	Casco-Rodman loams, 6 to 12 percent slopes, eroded	63	VIe-3	12	5	19	1
CpE	Casco-Rodman loams, 12 to 30 percent slopes	63	VIIe-3	12	5	19	1
CpE3	Casco-Rodman loams, 12 to 30 percent slopes, severely eroded	64	VIIe-3	12	5	19	1
CpF	Casco-Rodman loams, 30 to 45 percent slopes	64	VIIs-5	13	6	19	7
DcA	DePere silty clay loam, 0 to 3 percent slopes	65	IIw-11	9	1	18	6
DdA	Dodge silt loam, 0 to 2 percent slopes	66	I-1	8	1	18	1
DdB	Dodge silt loam, 2 to 6 percent slopes	66	IIe-1	8	1	18	1
DdB2	Dodge silt loam, 2 to 6 percent slopes, eroded	66	IIe-1	8	1	18	1
EbA	Elburn silt loam, 0 to 3 percent slopes	67	IIw-2	9	12	19	4
EsA	Elliott silt loam, 0 to 2 percent slopes	68	IIw-2	9	12	19	4
EsB	Elliott silt loam, 2 to 6 percent slopes	68	IIw-2	9	12	19	4
FmB	Fox sandy loam, 2 to 6 percent slopes	69	IIIs-4	11	3	18	1
FoB	Fox loam, 2 to 6 percent slopes	69	IIe-2	8	1	18	1
FoB2	Fox loam, 2 to 6 percent slopes, eroded	69	IIe-2	8	1	18	1
FoC2	Fox loam, 6 to 12 percent slopes, eroded	69	IIIe-2	10	1	18	1
FsA	Fox silt loam, 0 to 2 percent slopes	69	IIs-1	10	1	18	1
FsB	Fox silt loam, 2 to 6 percent slopes	69	IIe-2	8	1	18	1
FsB2	Fox silt loam, 2 to 6 percent slopes, eroded	69	IIe-2	8	1	18	1
FsC2	Fox silt loam, 6 to 12 percent slopes, eroded	69	IIIe-2	10	1	18	1
HhE2	Hixton loam, 12 to 30 percent slopes, eroded	70	VIe-1	12	3	18	1

Map symbol	Mapping unit	Described on page	Capability unit		Woodland suitability group		Wildlife group
			Symbol	Page	Number	Page	Number
HmB	Hochheim loam, 2 to 6 percent slopes	71	IIe-1	8	1	18	1
HmB2	Hochheim loam, 2 to 6 percent slopes, eroded	71	IIe-1	8	1	18	1
HmC	Hochheim loam, 6 to 12 percent slopes	71	IIIe-1	10	1	18	1
HmC2	Hochheim loam, 6 to 12 percent slopes, eroded	71	IIIe-1	10	1	18	1
HmD	Hochheim loam, 12 to 20 percent slopes	71	IVe-1	11	1	18	1
HmD2	Hochheim loam, 12 to 20 percent slopes, eroded	71	IVe-1	11	1	18	1
HmE	Hochheim loam, 20 to 30 percent slopes	71	VIe-1	12	1	18	1
HoB3	Hochheim soils, 2 to 6 percent slopes, severely eroded	71	IIIe-1	10	1	18	1
HoC3	Hochheim soils, 6 to 12 percent slopes, severely eroded	72	IVe-1	11	1	18	1
HoD3	Hochheim soils, 12 to 20 percent slopes, severely eroded	72	VIe-1	12	1	18	1
HoE3	Hochheim soils, 20 to 30 percent slopes, severely eroded	72	VIIe-1	12	1	18	1
Hu	Houghton mucky peat	72	IIIw-9	11	10	19	5
InA	Ionia sandy loam, 0 to 3 percent slopes	73	IIIs-4	11	3	18	1
IoA	Ionia silt loam; 0 to 2 percent slopes	73	IIs-1	10	3	18	1
IoB	Ionia silt loam, 2 to 6 percent slopes	73	IIe-2	8	3	18	1
IrA	Ionia silt loam, loamy subsoil variant, 0 to 3 percent slopes	74	IIs-1	10	2	18	1
IsB	Ionia silt loam, clayey subsoil variant, 2 to 6 percent slopes	74	IIe-2	8	2	18	1
JuA	Juneau silt loam, 0 to 2 percent slopes	75	I-1	8	2	18	6
JuB	Juneau silt loam, 2 to 6 percent slopes	75	IIe-1	8	2	18	6
Km	Keowns silt loam	75	IIIw-3	11	7	19	4
KnA	Kewaunee silt loam, 0 to 2 percent slopes	76	IIs-7	10	2	18	3
KnB	Kewaunee silt loam, 2 to 6 percent slopes	76	IIe-6	9	2	18	3
KnB2	Kewaunee silt loam, 2 to 6 percent slopes, eroded	76	IIe-6	9	2	18	3
KnC2	Kewaunee silt loam, 6 to 12 percent slopes, eroded	76	IIIe-6	10	2	18	3
KoA	Kewaunee silty clay loam, 0 to 2 percent slopes	76	IIs-7	10	2	18	3
KoB	Kewaunee silty clay loam, 2 to 6 percent slopes	77	IIe-6	9	2	18	3
KoB2	Kewaunee silty clay loam, 2 to 6 percent slopes, eroded	77	IIe-6	9	2	18	3
KoC2	Kewaunee silty clay loam, 6 to 12 percent slopes, eroded	77	IIIe-6	10	2	18	3
KoD2	Kewaunee silty clay loam, 12 to 20 percent slopes, eroded	77	IVe-6	11	2	18	3
KoE2	Kewaunee silty clay loam, 20 to 30 percent slopes, eroded	77	VIe-6	12	2	18	3
KsB3	Kewaunee soils, 2 to 6 percent slopes, severely eroded	77	IIIe-6	10	2	18	3
KsC3	Kewaunee soils, 6 to 12 percent slopes, severely eroded	77	IVe-6	11	2	18	3
KsD3	Kewaunee soils, 12 to 20 percent slopes, severely eroded	77	VIe-6	12	2	18	3
KtB	Kewaunee silt loam, moderately shallow variant, 2 to 6 percent slopes	78	IIe-2	8	2	18	3
KuA	Kibbie silt loam, 0 to 2 percent slopes	79	IIw-2	9	7	19	4
KwA	Knowles silt loam, 0 to 2 percent slopes	79	IIs-1	10	5	19	1
KwB	Knowles silt loam, 2 to 6 percent slopes	79	IIe-2	8	5	19	1
KwC2	Knowles silt loam, 6 to 12 percent slopes, eroded	79	IIIe-2	10	5	19	1
KwE2	Knowles silt loam, 12 to 30 percent slopes, eroded	79	IVe-2	11	5	19	1
LmA	Lamartine silt loam, 0 to 2 percent slopes	80	IIw-2	9	7	19	4
LmB	Lamartine silt loam, 2 to 6 percent slopes	80	IIw-2	9	7	19	4
LrB2	LeRoy silt loam, 2 to 6 percent slopes, eroded	81	IIe-1	8	1	18	1
LrC2	LeRoy silt loam, 6 to 12 percent slopes, eroded	81	IIIe-1	10	1	18	1
LrD	LeRoy silt loam, 12 to 20 percent slopes	81	IVe-1	11	1	18	1
LrD2	LeRoy silt loam, 12 to 20 percent slopes, eroded	81	IVe-1	11	1	18	1
LrE	LeRoy silt loam, 20 to 30 percent slopes	81	VIe-1	12	1	18	1
LtC3	LeRoy soils, 6 to 12 percent slopes, severely eroded	81	IVe-1	11	1	18	1
LtD3	LeRoy soils, 12 to 20 percent slopes, severely eroded	81	VIe-1	12	1	18	1
LvA	Lomira silt loam, 0 to 2 percent slopes	82	I-1	8	1	18	1
LvB	Lomira silt loam, 2 to 6 percent slopes	82	IIe-1	8	1	18	1
LvB2	Lomira silt loam, 2 to 6 percent slopes, eroded	82	IIe-1	8	1	18	1
LvC	Lomira silt loam, 6 to 12 percent slopes	82	IIIe-1	10	1	18	1
LvC2	Lomira silt loam, 6 to 12 percent slopes, eroded	82	IIIe-1	10	1	18	1
LvC3	Lomira silt loam, 6 to 12 percent slopes, severely eroded	82	IVe-1	11	1	18	1
LvD	Lomira silt loam, 12 to 20 percent slopes	82	IVe-1	11	1	18	1
LvD2	Lomira silt loam, 12 to 20 percent slopes, eroded	83	IVe-1	11	1	18	1

Map symbol	Mapping unit	Described on page	Capability unit		Woodland suitability group		Wildlife group
			Symbol	Page	Number	Page	Number
LvD3	Lomira silt loam, 12 to 20 percent slopes, severely eroded	83	VIe-1	12	1	18	1
LwA	Lomira-Knowles silt loams, 0 to 2 percent slopes	83	I-1	8	1	18	1
LwB	Lomira-Knowles silt loams, 2 to 6 percent slopes	83	IIe-1	8	1	18	1
LwB2	Lomira-Knowles silt loams, 2 to 6 percent slopes, eroded	83	IIe-1	8	1	18	1
LwC2	Lomira-Knowles silt loams, 6 to 12 percent slopes, eroded	83	IIIe-1	10	1	18	1
MaA	Manawa silt loam, 0 to 2 percent slopes	84	IIw-2	9	7	19	4
MaB	Manawa silt loam, 2 to 6 percent slopes	84	IIw-2	9	7	19	4
McA	Manawa silty clay loam, 0 to 2 percent slopes	84	IIw-2	9	7	19	4
McB	Manawa silty clay loam, 2 to 6 percent slopes	84	IIw-2	9	7	19	4
MdB	Markesan silt loam, 2 to 6 percent slopes	84	IIe-1	8	12	19	2
MdB2	Markesan silt loam, 2 to 6 percent slopes, eroded	85	IIe-1	8	12	19	2
MdC2	Markesan silt loam, 6 to 12 percent slopes, eroded	85	IIIe-1	10	12	19	2
MdC3	Markesan silt loam, 6 to 12 percent slopes, severely eroded	85	IVe-1	11	12	19	2
MdD2	Markesan silt loam, 12 to 20 percent slopes, eroded	85	IVe-1	11	12	19	2
MdD3	Markesan silt loam, 12 to 20 percent slopes, severely eroded	85	VIe-1	12	12	19	2
Mf	Marsh	85	VIIIw-15	13	11	19	4
MmA	Martinton silt loam, 0 to 2 percent slopes	86	IIw-2	9	7	19	4
MmB	Martinton silt loam, 2 to 6 percent slopes	86	IIw-2	9	7	19	4
MoA	Mayville silt loam, 0 to 2 percent slopes	86	I-1	8	1	18	1
MoB	Mayville silt loam, 2 to 6 percent slopes	87	IIe-1	8	1	18	1
MsA	Mendota silt loam, 0 to 2 percent slopes	87	I-1	8	12	19	2
MsB	Mendota silt loam, 2 to 6 percent slopes	87	IIe-1	8	12	19	2
MsB2	Mendota silt loam, 2 to 6 percent slopes, eroded	87	IIe-1	8	12	19	2
MsC2	Mendota silt loam, 6 to 12 percent slopes, eroded	87	IIIe-1	10	12	19	2
MzaA	Milton silt loam, 0 to 2 percent slopes	88	IIs-7	10	1	18	3
MzaB2	Milton silt loam, 2 to 6 percent slopes, eroded	88	IIe-6	9	1	18	3
MzaD2	Milton silt loam, 6 to 20 percent slopes, eroded	88	IIIe-6	10	1	18	3
MzdB	Morley silt loam, 2 to 6 percent slopes	89	IIe-6	9	1	18	3
MzdB2	Morley silt loam, 2 to 6 percent slopes, eroded	89	IIe-6	9	1	18	3
MzdC2	Morley silt loam, 6 to 12 percent slopes, eroded	89	IIIe-6	10	1	18	3
MzdD2	Morley silt loam, 12 to 20 percent slopes, eroded	89	IVe-6	11	1	18	3
MzeC3	Morley soils, 6 to 12 percent slopes, severely eroded	89	IVe-6	11	1	18	3
MzeD3	Morley soils, 12 to 20 percent slopes, severely eroded	89	VIe-6	12	1	18	3
Od	Ogden mucky peat	90	IIIw-9	11	10	19	5
Oe	Old beaches	90	VIs-5	12	11	19	7
OhA	Oshkosh silt loam, 0 to 2 percent slopes	90	IIs-7	10	2	18	3
OhB	Oshkosh silt loam, 2 to 6 percent slopes	91	IIe-6	9	2	18	3
OkA	Oshkosh silty clay loam, 0 to 2 percent slopes	91	IIs-7	10	2	18	3
OkB	Oshkosh silty clay loam, 2 to 6 percent slopes	91	IIe-6	9	2	18	3
Pa	Palms muck	91	IIw-8	9	10	19	5
Pc	Palms mucky peat	92	IIw-8	9	10	19	5
PfA	Peebles silt loam, 0 to 2 percent slopes	92	IIs-7	10	12	19	3
PfB	Peebles silt loam, 2 to 6 percent slopes	92	IIe-6	9	12	19	3
PhA	Pella silt loam, 0 to 3 percent slopes	93	IIw-1	9	7	19	4
PnA	Pella silty clay loam, 0 to 2 percent slopes	93	IIw-1	9	7	19	4
PsA	Plano silt loam, 0 to 2 percent slopes	93	I-1	8	1	18	2
PsB	Plano silt loam, 2 to 6 percent slopes	94	IIe-1	8	1	18	2
PsB2	Plano silt loam, 2 to 6 percent slopes, eroded	94	IIe-1	8	1	18	2
PuB	Plano fine sandy loam, sandy variant, 2 to 6 percent slopes	94	IIe-1	8	3	18	4
Py	Poygan silty clay loam	95	IIw-1	9	7	19	4
ReB	Rimer loam, 2 to 6 percent slopes	95	IIw-2	9	7	19	7
Rm	Rock land	95	VIIIs-10	13	11	19	7
RnD2	Rodman gravelly sand, 6 to 20 percent slopes, eroded	96	VIIs-5	13	6	19	7
RnE2	Rodman gravelly sand, 20 to 30 percent slopes, eroded	96	VIIs-5	13	6	19	7
RoD2	Rodman gravelly loam, 12 to 20 percent slopes, eroded	96	VIIs-5	13	6	19	7

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Described on page	Capability unit		Woodland suitability group		Wildlife group
			Symbol	Page	Number	Page	Number
RoF2	Rodman gravelly loam, 20 to 45 percent slopes, eroded	96	VIIs-5	13	6	19	7
Rw	Rollin mucky peat	97	IVw-7	12	10	19	5
ScA	St. Charles silt loam, 0 to 2 percent slopes	97	I-1	8	1	18	1
ScB	St. Charles silt loam, 2 to 6 percent slopes	97	IIe-1	8	1	18	1
SeA	St. Charles silt loam, gravelly substratum, 0 to 2 percent slopes	97	I-1	8	1	18	1
SeB	St. Charles silt loam, gravelly substratum, 2 to 6 percent slopes	97	IIe-1	8	1	18	1
SmA	Sebewa silt loam, 0 to 2 percent slopes	98	IIw-5	9	7	19	4
SmB	Sebewa silt loam, 2 to 6 percent slopes	98	IIw-5	9	7	19	4
SnA	Sebewa silt loam, deep, 0 to 2 percent slopes	98	IIw-1	9	7	19	4
SpA	Sebewa silt loam, loamy subsoil variant, 0 to 3 percent slopes	99	IIw-1	9	7	19	4
SuB2	Sisson silt loam, 2 to 6 percent slopes, eroded	99	IIe-1	8	1	18	1
SwB	Sogn stony silt loam, 0 to 6 percent slopes	100	VIs-5	12	12	19	7
ThA	Theresa silt loam, 0 to 2 percent slopes	100	I-1	8	1	18	1
ThB	Theresa silt loam, 2 to 6 percent slopes	100	IIe-1	8	1	18	1
ThB2	Theresa silt loam, 2 to 6 percent slopes, eroded	100	IIe-1	8	1	18	1
ThC	Theresa silt loam, 6 to 12 percent slopes	101	IIIe-1	10	1	18	1
ThC2	Theresa silt loam, 6 to 12 percent slopes, eroded	101	IIIe-1	10	1	18	1
ThD	Theresa silt loam, 12 to 20 percent slopes	101	IVe-1	11	1	18	1
ThD2	Theresa silt loam, 12 to 20 percent slopes, eroded	101	IVe-1	11	1	18	1
TrC3	Theresa soils, 6 to 12 percent slopes, severely eroded	101	IVe-1	11	1	18	1
TrD3	Theresa soils, 12 to 20 percent slopes, severely eroded	101	VIe-1	12	1	18	1
TsB2	Theresa-Casco silt loams, 2 to 6 percent slopes, eroded	101	IIe-1	8	1	18	1
TsC2	Theresa-Casco silt loams, 6 to 12 percent slopes, eroded	101	IIIe-1	10	1	18	1
TsD2	Theresa-Casco silt loams, 12 to 20 percent slopes, eroded	101	IVe-1	11	1	18	1
TsE2	Theresa-Casco silt loams, 20 to 30 percent slopes, eroded	101	VIe-1	12	1	18	1
VgA	Virgil silt loam, 0 to 2 percent slopes	102	IIw-2	9	7	19	4
VgB	Virgil silt loam, 2 to 6 percent slopes	102	IIw-2	9	7	19	4
VsA	Virgil silt loam, gravelly substratum, 0 to 2 percent slopes	102	IIw-5	9	7	19	4
VsB	Virgil silt loam, gravelly substratum, 2 to 6 percent slopes	102	IIw-5	9	7	19	4
Wa	Wallkill silt loam	103	IIw-13	10	9	19	4
WhB	Warsaw silt loam, 2 to 6 percent slopes	103	IIe-2	8	12	19	2
WsA	Washtenaw silt loam, 0 to 2 percent slopes	104	IIw-1	9	9	19	4
WsB	Washtenaw silt loam, 2 to 6 percent slopes	104	IIw-1	9	9	19	4
Wt	Wauseon loam	104	IIw-5	9	7	19	4
Wu	Wauseon silt loam	105	IIw-5	9	7	19	4

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