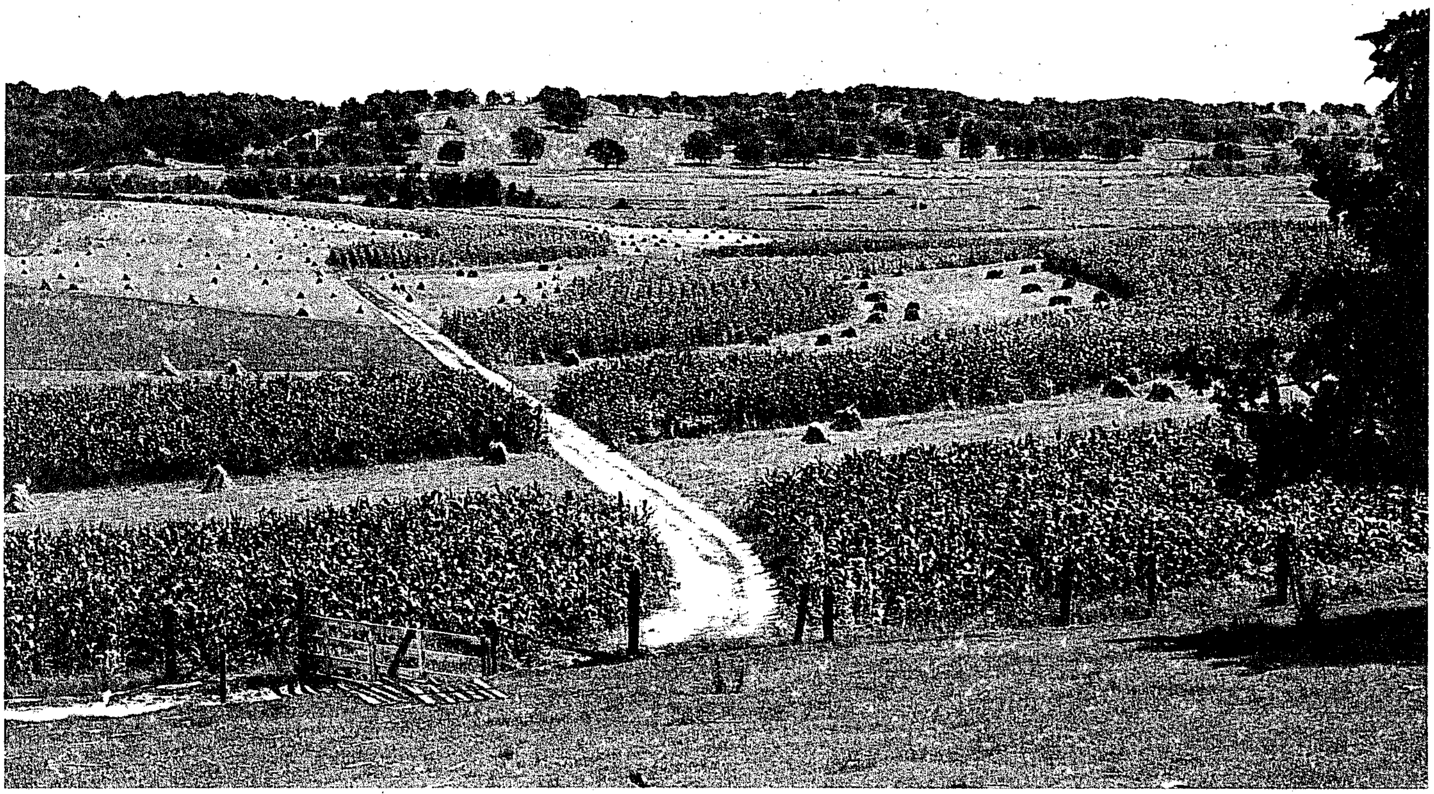
Issued February 1971

SOIL SURVEY

Walworth County, Wisconsin



UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
UNIVERSITY OF WISCONSIN
Wisconsin Geological and Natural History Survey
Soils Department, and
Wisconsin Agricultural Experiment Station

Major fieldwork for this soil survey was done in the period 1959–64. Soil names and descriptions were approved in 1966. Unless otherwise indicated, statements in this publication refer to conditions in the county in 1966. This survey was made cooperatively by the Soil Conservation Service and the Wisconsin Geological and Natural History Survey, Soils Department, and the Wisconsin Agricultural Experiment Station, University of Wisconsin. It is part of the technical assistance furnished to the Walworth County Soil and Water Conservation District.

The fieldwork that is the basis for this soil survey was partly financed by the Southeastern Wisconsin Regional Planning Commission; by a joint planning grant from the State Highway Commission of Wisconsin; by the U.S. Department of Commerce, Bureau of Public Roads; and by the Department of Housing and Urban Development under the provisions of the Federal Aid to Highways legislation and section 701 of the Housing Act of 1954, as amended.

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, U.S. 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 woodlands; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for agriculture, industry, and recreation.

Locating Soils

All the soils of Walworth 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 page where each is described. It also shows the capability unit, woodland group, recreation group, and wildlife group in which each 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.

Foresters and others can refer to the section "Use of the Soils for 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 "Use of the Soils for Wildlife."

Community planners and others can read about soil properties that affect the choice of sites for nonindustrial buildings and for recreation areas in the section "Nonfarm Uses of the Soils."

Engineers and builders can find, under "Use of the Soils in Engineering," tables that contain test data, estimates of soil properties, and engineering interpretations for farm and nonfarm uses.

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

Newcomers in Walworth County will be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may be also interested in the information about the county given at the beginning and end of the publication.

Cover: Contour stripcropping of Miami and McHenry soils. The crops are corn, small grain, and alfalfa. The area in the foreground has been maintained in livestock pasture.

U.S. Government Printing Office 1971

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402

Contents

Issued February 1971

SOIL SURVEY OF WALWORTH COUNTY, WISCONSIN

BY ORVILLE L. HASZEL, SOIL CONSERVATION SERVICE

FIELDWORK BY JOHN M. CAIN, DONALD W. OWEN, DONALD C. KURER, JOSEPH A. STEINGRAEBER, AND ORVILLE L. HASZEL, SOIL CONSERVATION SERVICE

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

WALWORTH COUNTY, in the southeastern part of Wisconsin, occupies 560 square miles (fig. 1). It is about 24 miles wide and 24 miles long. Elkhorn, in about the center of the county, is the county seat. Whitewater, in the northwestern corner, is the largest town.

The county is largely rural; dairying is the main farm enterprise. Corn, oats, hay, and pasture crops, which support the dairy industry, are the principal farm crops. Forest and woodland cover about one-tenth of the county's acreage.

The tourist industry is also important to the county's economy. In summer the many lakes attract water sportsmen, and the many parks attract campers and hikers.

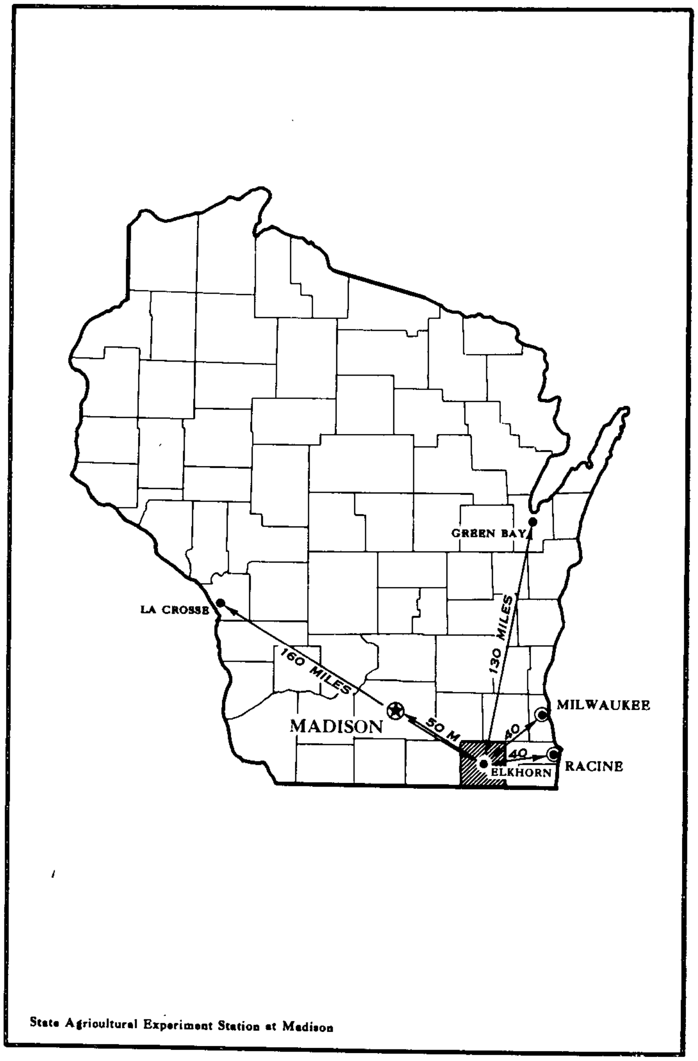


Figure 1.—Location of Walworth County in Wisconsin.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soils are in Walworth 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. As they traveled over the county, they observed steepness, length, and shape of slopes, size and speed of streams, kinds of native plants or crops, 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. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, the major horizons of all the soils of one series 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. McHenry and Miami, for example, are the names of two soil series. All 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 (*7*).[1] The name of a soil phase indicates a feature that affects management. For example, Miami silt loam, 0 to 2 percent slopes, is one of several phases within the Miami 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.

A soil complex consists of areas of two or more soils, so intricately mixed 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. Rodman-Casco complex, 30 to 45 percent slopes, is an example.

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

[1] Italicized numbers in parentheses refer to Literature Cited, p. 106.

General Soil Map

The general soil map shows, in color, the soil associations in Walworth 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 farming or other land use. Such a map is not suitable for planning the management of a farm or field, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect management.

In Walworth County there are nine associations. These are discussed in the following pages.

1. Houghton-Palms association

Very poorly drained organic soils in depressions and on bottom lands

This association consists of narrow bottom lands along streams and of nearly level wetlands that form the headwaters of these streams. It makes up about 9 percent of the county.

The dominant soils are the Houghton soils, which make up about 40 percent of the association, and the Palms soils, which make up about 12 percent. These soils have a black surface layer. They consist of the partly decomposed remains of sedges, reeds, and other water-tolerant plants.

Minor parts of the association consist of soils along the major natural drainageways, formed in water-deposited mineral material washed from the adjoining uplands; of organic soils underlain by sand, loamy material, or marl; of organic soils covered with alluvial overwash; of poorly drained mineral soils that formed from loamy material overlying outwash sand and gravel; and of a poorly drained soil that formed from silty and loamy material over glacial till. The minor soils make up about 48 percent of the acreage. They include Adrian, Rollin, and Wallkill soils, and Wet alluvial land.

All the soils of this association are subject to flooding, and many of them receive deposits of overwash. Nearly all the soils need drainage if used for crops. The organic soils and some of the mineral soils are used for special crops, such as mint, potatoes, onions, and sod. The largest cultivated areas of organic soils are in Turtle Valley and the Troy Marsh.

The major soils of this association have severe limitations for residential and industrial development. A high water table in most areas precludes the use of onsite sewage disposal systems.

2. *Pella-Kendall-Elburn association*

Poorly drained and somewhat poorly drained soils that have a subsoil of silty clay loam; formed in loess and the underlying loam to clay loam glacial till or outwash and lacustrine materials derived from till

This association consists mainly of nearly level and slightly depressional wetlands. It makes up about 5 percent of the county.

The Pella, Kendall, and Elburn soils are dominant in this association. All three have a black or very dark gray surface layer. The Pella soils, which make up about 40 percent of the association, commonly have a dark-gray to olive-gray subsoil; the Kendall soils, which make up about 25 percent, have a dark-brown to grayish-brown subsoil; and the Elburn soils, which make up about 25 percent, have a dark grayish-brown to grayish-brown subsoil. These soils are likely to be ponded after heavy rain, and they are slow to dry out and warm up in spring. Drainage is necessary before the poorly drained soils can be used for cultivated crops. Applications of nitrogen help to get crops started.

Minor parts of this association consist of well-drained, lighter colored soils that can be cropped intensively without artificial drainage. The minor soils make up about 10 percent of the acreage. They include Plano and St. Charles soils.

Most of this association has been drained and is cultivated. The areas where drainage is not practical are used for perennial pasture or meadow.

The major soils have moderate to severe limitations for residential and industrial development but only slight limitations for foundations of low buildings. A moderately high to high water table in most places precludes the use of onsite sewage disposal systems.

3. *Miami-McHenry association*

Well-drained soils that have a subsoil of clay loam and silty clay loam; formed in loess and the underlying sandy loam to loam glacial till, on uplands

This association consists of gently rolling till plains and rolling to steep terminal moraines (fig. 2). The steepest slopes are in the basin of Lake Geneva, and the most nearly level relief is between Lake Geneva and Delavan Lake. The association makes up about 43 percent of the county.

The Miami soils, which make up about 40 percent, are on the till plains; they formed where the loess deposits were less than 18 inches thick over glacial till. The McHenry soils, which make up about 20 percent of the association, are on the terminal moraines; they formed where the deposits of loess were 12 to 24 inches thick over glacial till.

Minor parts of the association consist of shallow, steep soils; of poorly drained soils between hills; of somewhat poorly drained soils between the lowest spots and the uplands; of alluvial soils in narrow drainageways; and of soils that formed where the loess deposits were more than 24 inches thick. Dodge soils make up about 10 percent of the acreage; St. Charles soils make up about 10 percent; and Metea, Hennepin, Juneau, Conover, and Pella soils make up about 20 percent.

Most of the acreage is used for dairy farms and crop farms. All the soils are productive if well managed. Some need drainage and protection against flooding. The more sloping soils need protection from water erosion.

The less sloping areas of the major soils of the association have slight limitations for residential and industrial development.

4. *Plano-Griswold association*

Well-drained soils that have a subsoil of silty clay loam and sandy clay loam; formed in loess and the underlying sandy loam to loam glacial till, on uplands

This association consists of gently rolling till plains. It makes up about 6 percent of the county.

The Plano soils, which make up about 60 percent of the association, commonly have a surface layer of black silt loam; and the Griswold soils, which make up about 25 percent, have a surface layer of very dark brown loam or silt loam. Both have a dark-brown or brown subsoil. The Plano soils formed where the deposits of loess were 36 to 48 inches thick over glacial till. The Griswold soils formed where the loess deposits were less than 15 inches thick over glacial till.

Minor parts of the association consist of somewhat poorly drained soils in slight depressions and in drainageways. The minor soils make up about 15 percent of the acreage. They include Elburn, Kendall, and Pella soils.

Most of this association can be used for cultivated crops. The major soils have no serious limitations and are productive if well managed. Erosion control practices are needed on the stronger slopes. The minor soils in depressions and drainageways have a high water table; they need drainage and protection against flooding.

The major soils have only slight limitations for residential and industrial development.

5. *Flagg-Pecatonica association*

Well-drained soils that have a subsoil of silty clay loam; formed in a thick layer of loess and the underlying sandy loam to loam glacial till, on uplands

This association consists of a gently sloping till plain on which there are numerous low hills. The topography is more gentle than that of the other till plains in the county, and the soils are older and more deeply weathered than those in the rest of the county (fig. 3). The pattern of streams and drainageways is clearly defined. This association makes up about 4 percent of the county.

The major soils have a very dark grayish-brown surface layer. The Flagg soils, which make up about 50 percent of the association, formed where the deposits of loess were 30 to 50 inches thick over glacial till; and the Pecatonica soils, which make up about 30 percent, formed where the deposits were 18 to 30 inches thick over glacial till.

Minor parts of the association consist of alluvial and organic soils in drainageways and of light-colored, well-drained soils at higher elevations. These soils, which make

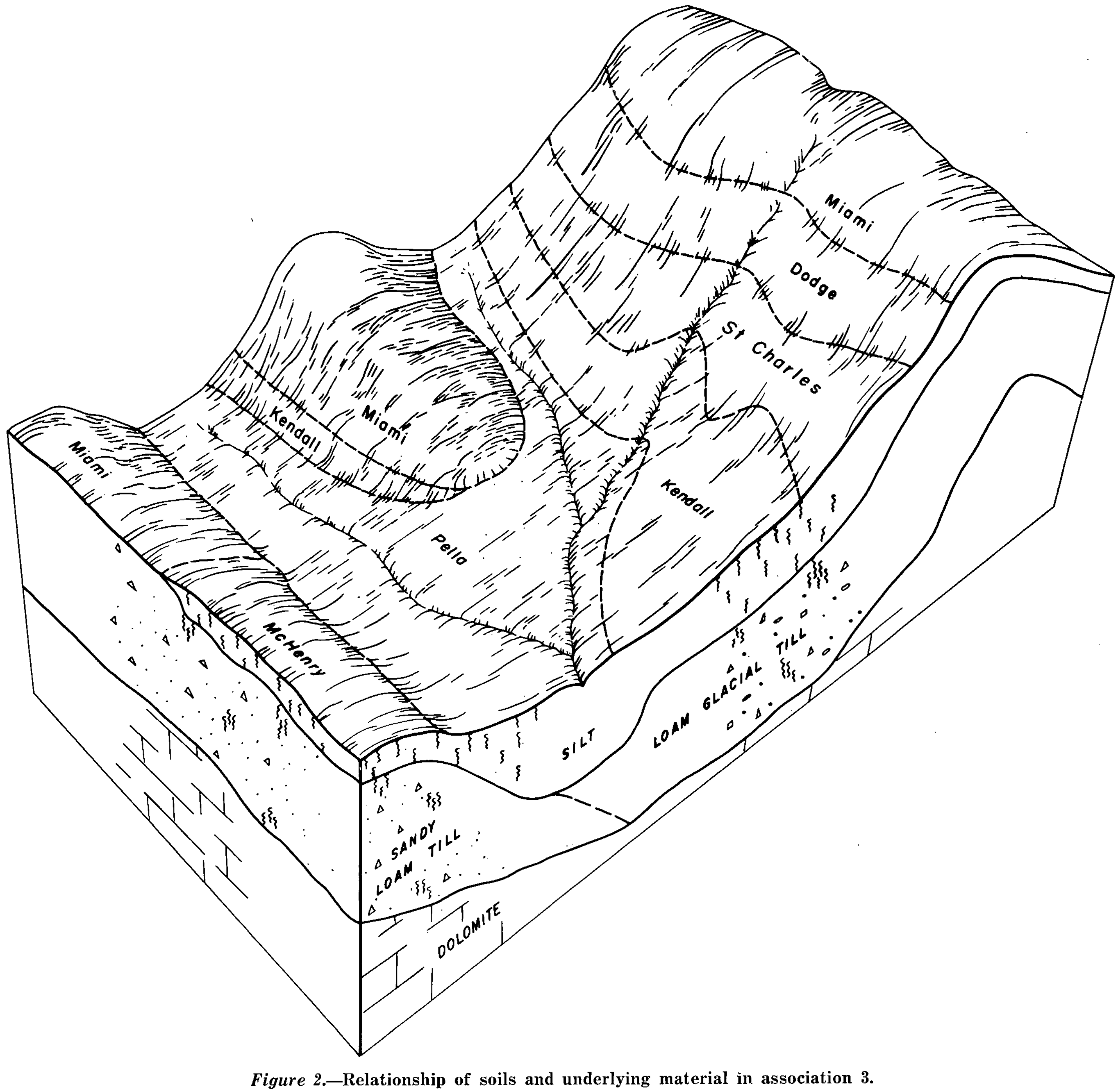


Figure 2.—**Relationship of soils and underlying material in association 3.**

up about 20 percent of the acreage, consist mainly of Pecatonica, Radford, Troxel, and Westville soils.

About 80 percent of this association is well suited to farming. Most of this acreage is in dairy farms, but the acreage used to grow lima beans, peas, and sweet corn has been increasing. Erosion is a hazard, because runoff accumulates on the long slopes. Low, wet areas need to be drained if crops are to be grown.

The major soils have only slight limitations for residential and industrial development.

6. *Casco-Fox association*

Well-drained soils that have a subsoil of clay loam; moderately deep over sand and gravel, on outwash plains and stream terraces

This association consists of glacial outwash plains and stream terraces (fig. 4). The slopes are nearly level to steep. Lakes are numerous. This association makes up about 13 percent of the county.

The Casco soils, which make up about 35 percent of the association, have a dark-brown surface layer; and

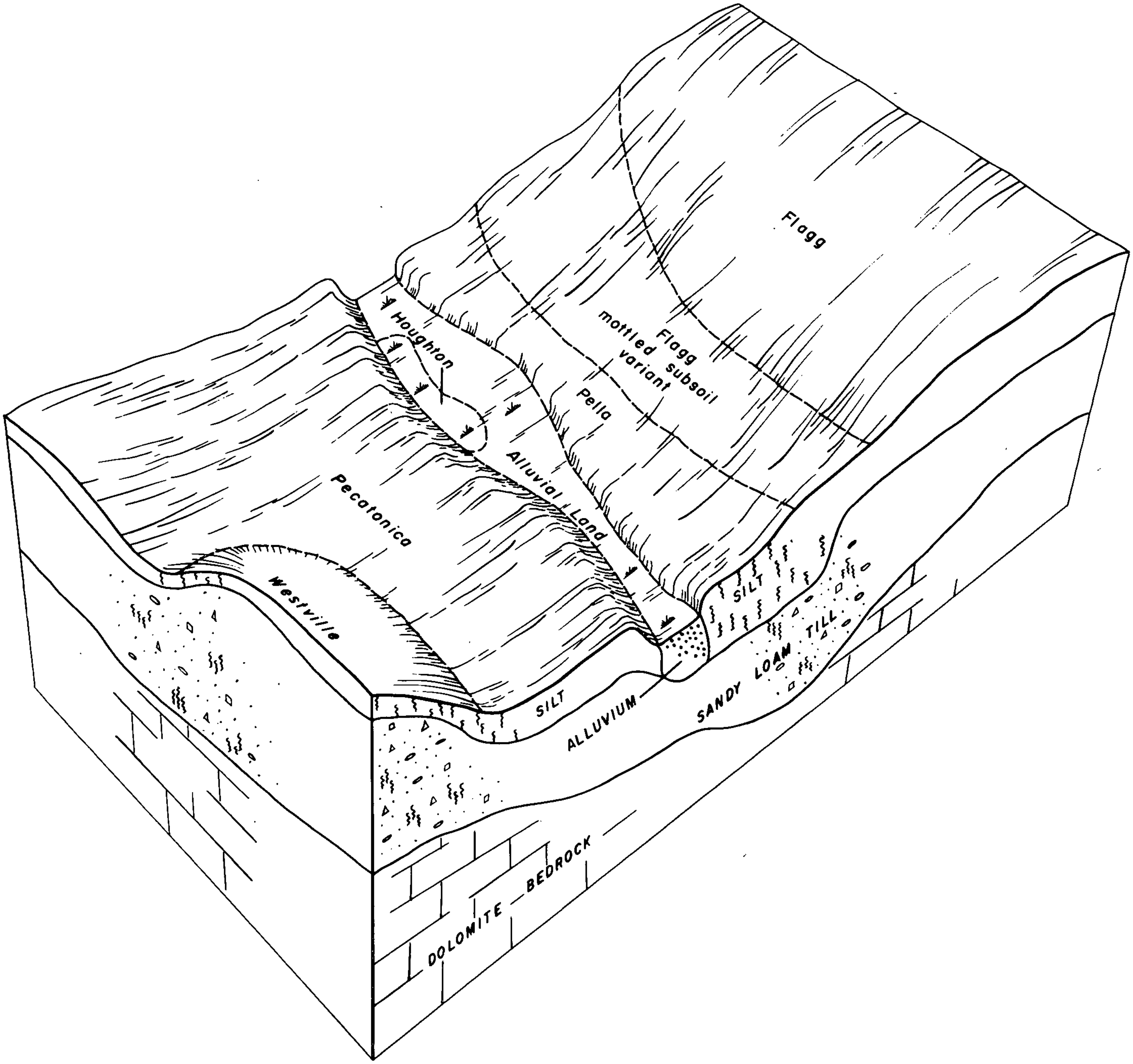


Figure 3.—**Relationship of soils and underlying material in association 5.**

the Fox soils, which make up about 35 percent, have a dark-gray surface layer. The Casco soils formed where the loess deposits were 6 to 18 inches thick, and the Fox soils formed where the loess deposits were 18 to 36 inches thick.

Minor parts of the association consist of well-drained soils that formed in loess more than 36 inches thick; excessively drained soils, less than 12 inches deep over sand and gravel, that formed on knolls, ridges, and moraines in loess deposits less than 12 inches thick; sandy soils that formed in sandy drift over loamy glacial till; and somewhat poorly drained and poorly drained soils in steep-sided depressions, on flood plains, and on low terraces where the water table is at or near the surface in wet weather. The minor soils make up about 30 percent of the acreage. They include Sebewa, Warsaw, Rodman, Lorenzo, Matherton, and Boyer soils.

Nearly all of this association is suitable for cultivation, but the thinner soils do not hold enough water to sustain crops through dry periods of more than 15 days.

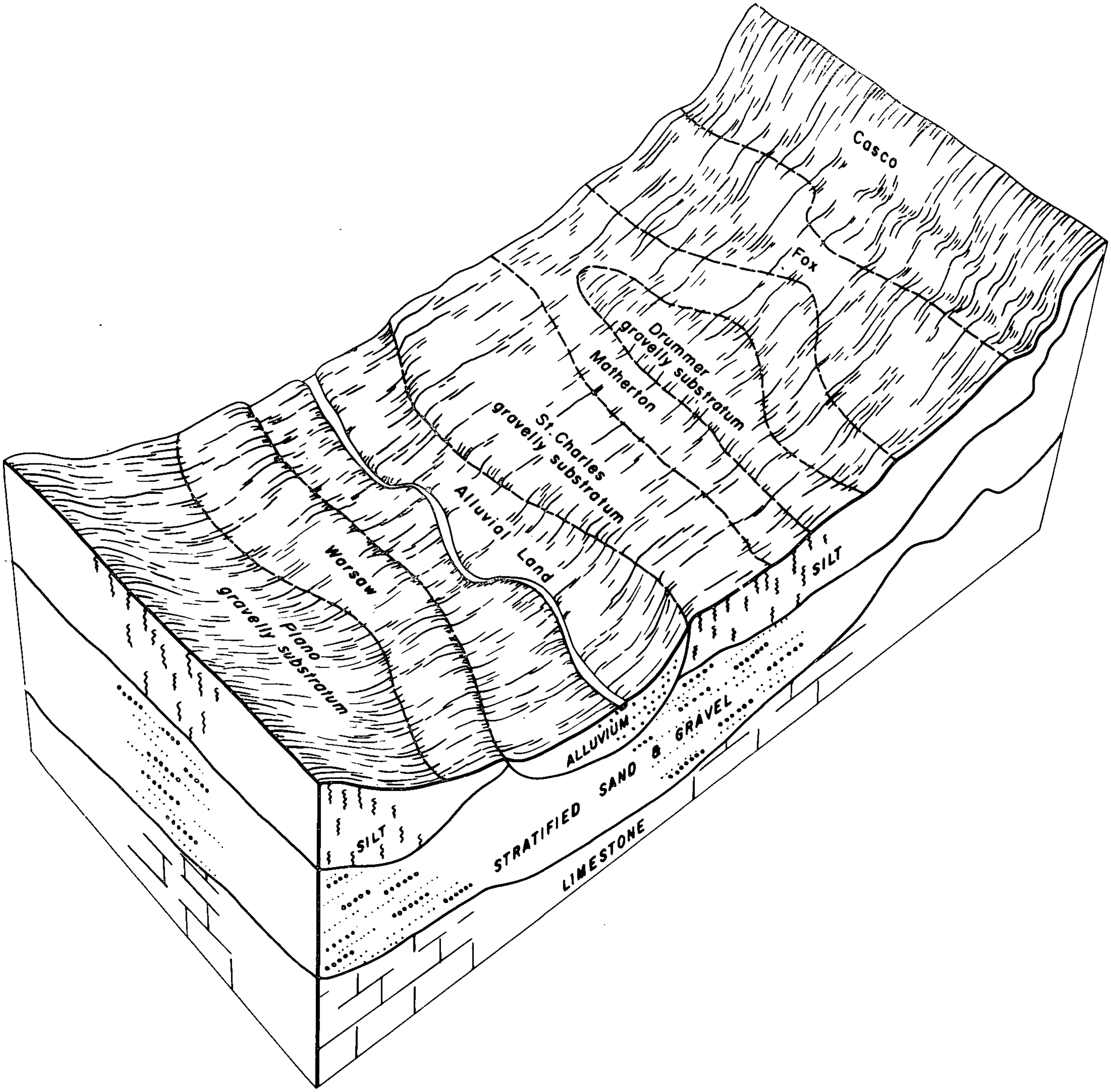


Figure 4.—**Relationship of soils and underlying material in associations 6 and 7.**

The more sloping soils need erosion control practices if cultivated, and the sandy soils are susceptible to wind erosion. The wet soils need both surface and subsurface drainage if used for crops; they are not likely to erode, but they may be flooded by runoff from adjoining areas.

The less sloping areas of the major soils have only slight limitations for residential and industrial development. They are good sources of sand and gravel.

7. *Plano, gravelly substratum-Warsaw association*

Well-drained soils that have a subsoil of silty clay loam and clay loam; moderately deep and deep over sand and gravel, on outwash plains and stream terraces

This association consists of glacial outwash plains and stream terraces (see fig. 4). The slopes are nearly level or gently undulating. This association makes up about 10 percent of the county.

The Plano soils, which make up about 65 percent of the association, have a black surface layer; the Warsaw soils, which make up about 15 percent, have a very dark brown surface layer. These soils formed where the loess deposits were 20 to 48 inches thick. The Plano soils are on outwash plains, and the Warsaw soils are on both outwash plains and stream terraces.

Minor parts of the association consist of well-drained soils that formed in loess less than 20 inches thick; soils that are less than 12 inches thick over sand and gravel and occur on knolls, ridges, terrace escarpments, and sides of deep hollows, where the water table is seasonally high; and somewhat poorly drained and poorly drained soils in low areas on the moraines and in slight depressions on the terraces, where the water table is seasonally high. The minor soils make up about 20 percent of the acreage. They include the gravelly substratum phase of the Elburn soils and Sebewa, Matherton, and Fox soils.

The Plano soils are well suited to cultivation. The Warsaw soils, which are less than 40 inches deep over sand and gravel, do not hold enough water to sustain plants through dry periods of more than 15 days. The minor soils need both surface and subsurface drainage if used for crops; they are not likely to erode, but they may be flooded by runoff from adjoining areas. None of the soils produce timber of commercial value.

The major soils and the other well-drained soils have only slight limitations for residential and industrial development. Good sources of sand and gravel are to be found.

8. *Navan-Pella-Aztalan association*

Poorly drained and somewhat poorly drained soils that have a subsoil of loam to silty clay; over silt and clay sediments, in old lakebeds

This association consists of glacial lakebeds (fig. 5). It makes up about 3 percent of the county.

The major soils of this association have a black surface layer. They formed mainly in outwash and the underlying lacustrine material, but partly in loamy material over glacial till. The Navan and Pella soils are poorly drained, and the Aztalan soils are somewhat poorly drained. Navan soils make up about 30 percent of the association; Pella soils, about 20 percent; and Aztalan soils, about 10 percent.

Minor parts of this association consist of well-drained, somewhat poorly drained and poorly drained soils that formed in lacustrine silt and fine sand and some that formed in silt and clay. A few areas consist of soils underlain by dolomite bedrock. The minor soils make up about 40 percent of the acreage. They include Saylesville, Hebron, Martinton, Radford, and Colwood soils.

Most of the acreage is drained and cultivated. Areas for which drainage is impractical are used for perennial pasture or meadow.

The major soils have moderate to severe limitations for residential and industrial development and for highway construction. Onsite sewage disposal systems will not function. The lacustrine deposits have a lower bearing capacity than glacial till. In some areas bedrock interferes with excavation.

9. *Casco-Rodman association*

Well-drained and somewhat excessively drained soils that have a subsoil of clay loam and gravelly sandy loam; shallow over gravel and sand, on the Kettle Moraine

This association consists of an area of rough, broken topography characterized by kames, eskers, and kettleholes. The landform is locally called the Kettle Moraine (fig. 6). This association makes up about 7 percent of the county.

The Casco soils, which make up about 45 percent of the association, have a dark-brown surface layer; and the Rodman soils, which make up about 30 percent, have a black surface layer. These soils make up the steepest and most broken parts of the county.

Minor parts of the association consist of moderately deep, nearly level to sloping sandy soils. Some of these apparently formed from windblown material of local origin. Organic soils occur in the deep kettleholes. The minor soils make up about 25 percent of the acreage. They include Chelsea, Lorenzo, Fox, and Boyer soils.

The major soils are too steep to be suitable for cultivation, and all of the soils except those in the lowest part of the kettleholes are droughty. Some areas are susceptible to wind erosion as well as to water erosion. The greater part of the acreage is better suited to woodland or to recreational uses and wildlife habitat than to other uses. Most of the acreage is wooded. Pastures would be good in spring and early in summer, but not the rest of the season.

The major soils have severe limitations for residential and industrial development. They are good sources of sand and gravel.

Descriptions of the Soils

This section describes the soil series and mapping units of Walworth County. The approximate acreage and proportionate extent of each mapping unit are given in table 1.

In the pages that follow, a general description of each soil series is given. Each series description has a short narrative description of a typical profile and a much more detailed decsription of the same profile, from which highly technical interpretations can be made. Following the profile is a brief statement of the range in characteristics of the soils in the series, as mapped in this county. Color names and color symbols given are for moist soil, unless otherwise indicated. Following the series description, each mapping unit in the series is described individually. 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 Alluvial land, are described in alphabetic order along with other mapping units.

352-633—71——2

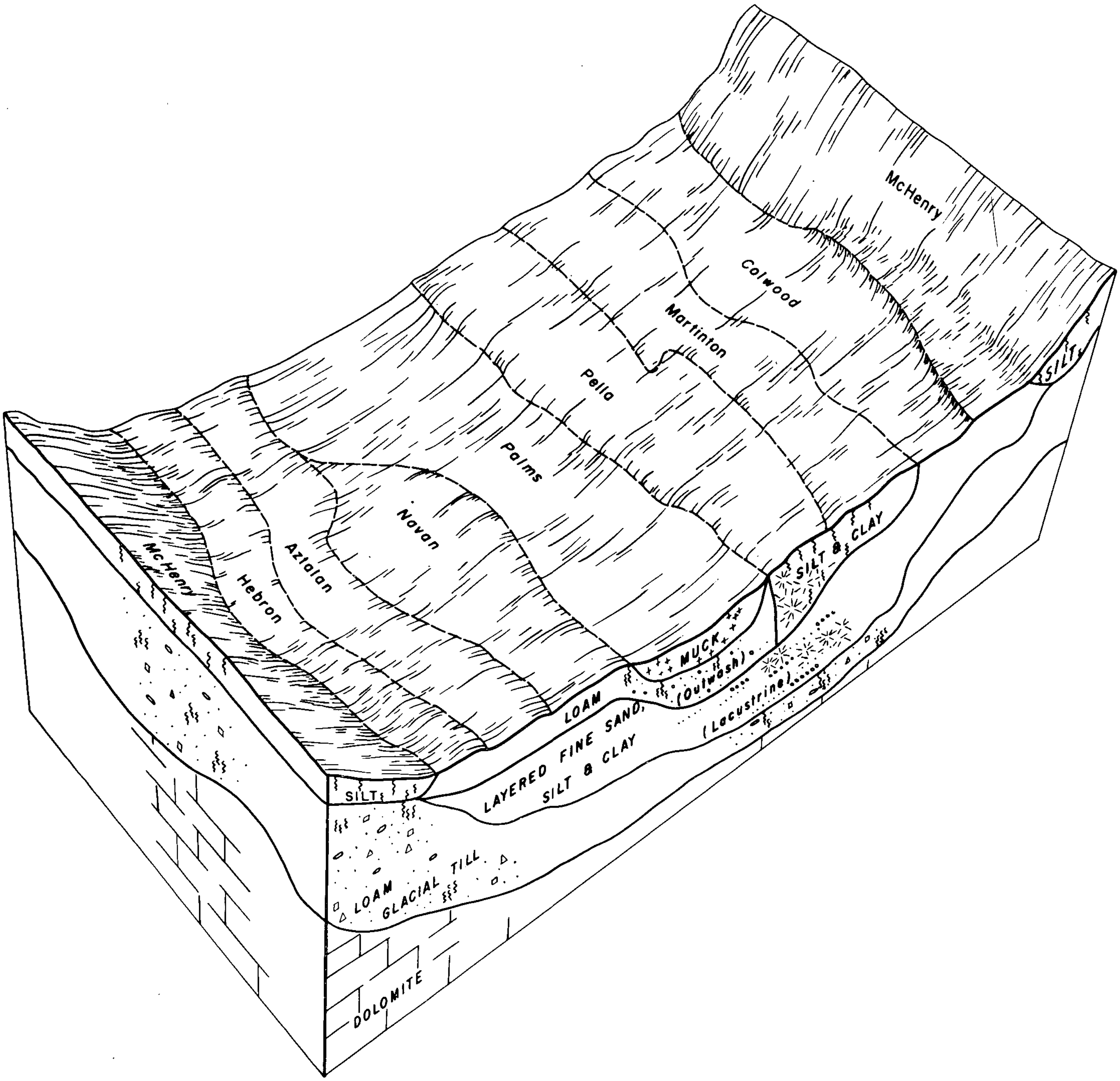


Figure 5.—**Relationship of soils and underlying material in association 8.**

Adrian Series

The Adrian series consists of very poorly drained muck soils underlain by sand or gravel. These soils occur in depressions and on flood plains and low terraces throughout the county. The water table is high at all times, and in wet weather it is at the surface.

In a typical profile the surface layer is mildly alkaline black muck about 29 inches thick. This is underlain by light brownish-gray, loose sand or sand and gravel.

The available moisture capacity is high, permeability is moderate, and the natural fertility is low. The depth of the root zone is limited by the water table.

Typical profile of Adrian muck in a permanent pasture, SE¼NW¼ sec. 26, T. 1 N., R. 17 E.

1—0 to 5 inches, black (N 2/0) muck; some addition of silty alluvium; weak, fine, subangular blocky structure

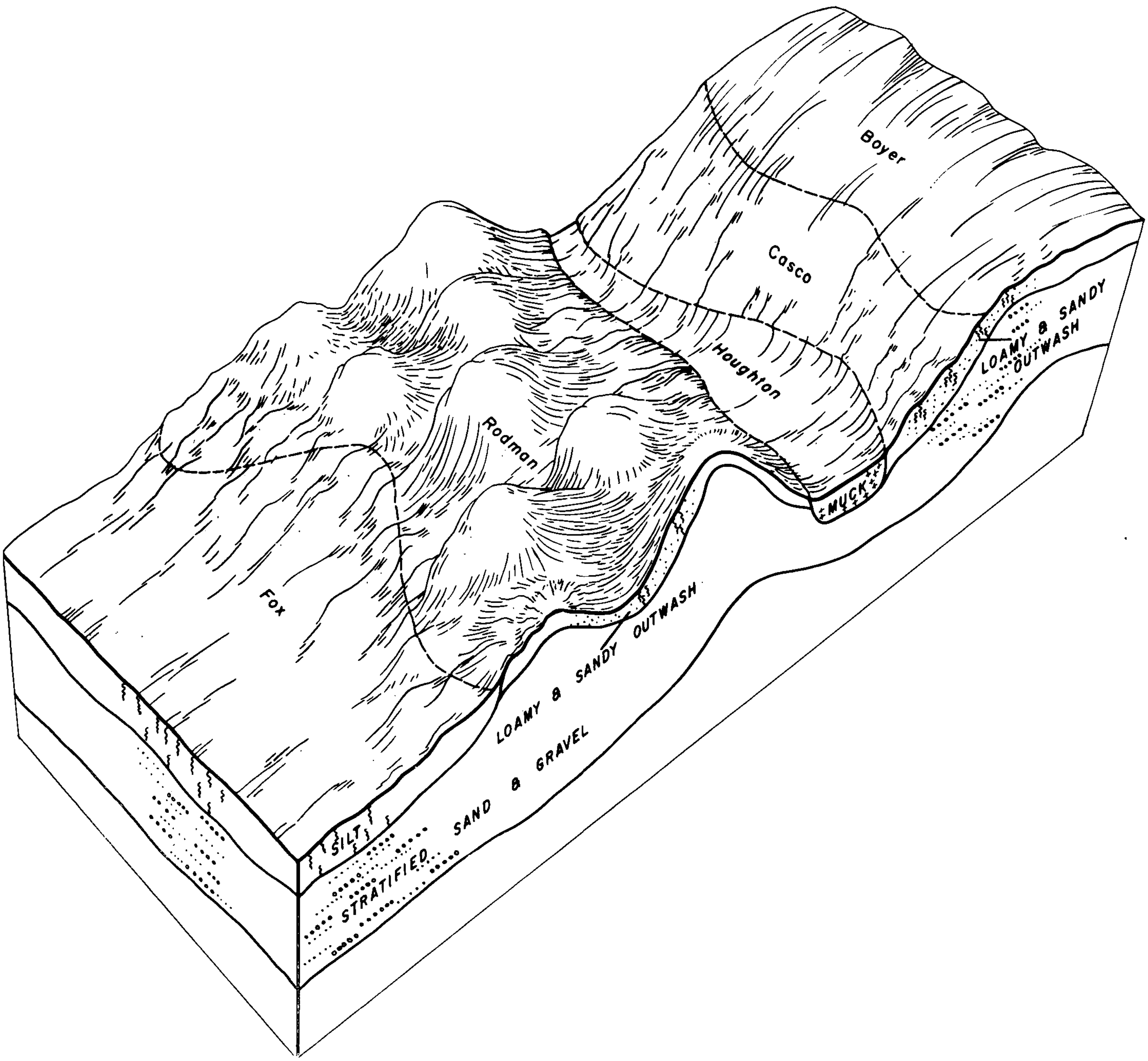


***Figure 6.*—Relationship of soils and underlying material in association 9.**

breaking to weak, fine, crumb; friable; moderately alkaline; clear, wavy boundary.

2—5 to 13 inches, black (N 2/0) muck; weak, fine, subangular blocky structure breaking to moderate, very fine, crumb; very friable; mildly alkaline; clear, smooth boundary.

3—13 to 29 inches, black (N 2/0) muck; weak, thick, platy structure breaking to weak, fine, subangular blocky; very friable; mildly alkaline; clear, smooth boundary.

IIC1—29 to 31 inches, light brownish-gray (10YR 6/2) fine sand; single grain; loose; many streaks of black organic stain; moderately alkaline; clear, wavy boundary.

IIC2—31 to 60 inches +, light brownish-gray (10YR 6/2) sand; single grain; loose; calcareous.

The muck layer ranges from 12 to 42 inches in thickness. In places, 2 to 4 inches of loamy sediment has been deposited on the surface. If cultivated, areas receiving this sediment have a loamy muck texture in the surface layer. In some areas, layers of disintegrated peat a few inches thick occur below a depth of 18 inches. The reaction of Adrian soils generally is slightly acid to moderately alkaline. In some small areas the muck layer is calcareous.

Adrian soils are 12 to 42 inches thick over sand and gravel; Houghton soils are deeper. Adrian soils differ from Palms soils in being underlain by sand and gravel instead of loamy material.

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil	Acres	Percent
Adrian muck	816	0.2
Alluvial land	895	.2
Aztalan loam, 1 to 3 percent slopes	1,130	.3
Boyer complex, 2 to 6 percent slopes	1,115	.3
Boyer complex, 6 to 12 percent slopes, eroded	949	.3
Casco loam, 2 to 6 percent slopes, eroded	851	.2
Casco loam, 6 to 12 percent slopes, eroded	4,270	1.2
Casco loam, 12 to 20 percent slopes, eroded	2,057	.6
Casco soils, 6 to 12 percent slopes, severely eroded	1,020	.3
Casco soils, 12 to 20 percent slopes, severely eroded	408	.1
Casco-Fox loams, 12 to 20 percent slopes, eroded	816	.2
Casco-Fox silt loams, 6 to 12 percent slopes, eroded	1,367	.4
Casco-Rodman complex, 12 to 20 percent slopes, eroded	1,351	.4
Casco-Rodman complex, 20 to 30 percent slopes, eroded	10,628	3.0
Chelsea fine sand, 1 to 6 percent slopes	257	.1
Chelsea fine sand, 6 to 30 percent slopes	1,599	.4
Colwood silt loam	722	.2
Conover silt loam, 1 to 3 percent slopes	2,010	.6
Dodge silt loam, 0 to 2 percent slopes	8,165	2.3
Dodge silt loam, 2 to 6 percent slopes	4,726	1.3
Drummer silt loam, gravelly substratum	6,423	1.8
Elburn silt loam, 1 to 3 percent slopes	4,590	1.3
Elburn silt loam, gravelly substratum, 1 to 3 percent slopes	1,430	.4
Flagg silt loam, 0 to 2 percent slopes	3,878	1.1
Flagg silt loam, 2 to 6 percent slopes	361	.1
Flagg silt loam, mottled subsoil variant, 0 to 3 percent slopes	2,055	.6
Fox sandy loam, 1 to 6 percent slopes	2,336	.7
Fox sandy loam, 6 to 12 percent slopes, eroded	919	3
Fox loam, 2 to 6 percent slopes	1,021	.3
Fox loam, 6 to 12 percent slopes, eroded	534	.2
Fox silt loam, 0 to 2 percent slopes	1,818	.5
Fox silt loam, 2 to 6 percent slopes	8,084	2.3
Fox silt loam, 6 to 12 percent slopes, eroded	1,198	.3
Griswold loam, 2 to 6 percent slopes	900	.3
Griswold loam, 6 to 12 percent slopes, eroded	927	.3
Griswold loam, 12 to 20 percent slopes, eroded	304	.1
Griswold silt loam, mottled subsoil variant, 0 to 3 percent slopes	2,073	.6
Hebron loam, 1 to 6 percent slopes	985	.3
Hennepin-Miami loams, sandy loam substratum, 20 to 35 percent slopes	817	.2
Houghton muck	14,538	4.0
Juneau silt loam, 1 to 3 percent slopes	1,445	.4
Kendall silt loam, 1 to 3 percent slopes	4,131	1.2
Knowles silt loam, 1 to 6 percent slopes	247	.1
Knowles silt loam, mottled subsoil variant, 0 to 2 percent slopes	312	.1
Lorenzo loam, 2 to 6 percent slopes	342	.1
Lorenzo loam, 6 to 12 percent slopes, eroded	867	.2
Lorenzo-Rodman complex, 12 to 20 percent slopes, eroded	519	.1
Marsh	1,288	.4
Martinton silt loam, 1 to 3 percent slopes	2,642	.7
Matherton silt loam, 1 to 3 percent slopes	3,735	1.0
McHenry silt loam, 2 to 6 percent slopes	16,916	4.7
McHenry silt loam, 2 to 6 percent slopes, eroded	3,502	1.0
McHenry silt loam, 6 to 12 percent slopes	4,272	1.2
McHenry silt loam, 6 to 12 percent slopes, eroded	3,494	1.0
Metea loamy fine sand, 0 to 2 percent slopes	678	.2
Metea loamy fine sand, 2 to 6 percent slopes	417	.1
Miami sandy loam, sandy loam substratum, 2 to 6 percent slopes	1,162	.3
Miami loam, 6 to 12 percent slopes, eroded	9,095	2.5
Miami loam, 12 to 20 percent slopes, eroded	5,892	1.6
Miami loam, sandy loam substratum, 2 to 6 percent slopes	1,869	.5
Miami loam, sandy loam substratum, 6 to 12 percent slopes, eroded	6,957	1.9
Miami loam, sandy loam substratum, 12 to 20 percent slopes, eroded	7,017	1.9
Miami loam, sandy loam substratum, 20 to 35 percent slopes, eroded	2,176	.6
Miami silt loam, 0 to 2 percent slopes	3,610	1.0
Miami silt loam, 2 to 6 percent slopes	32,022	8.9
Miami silt loam, 6 to 12 percent slopes	880	.2
Miami silt loam, 6 to 12 percent slopes, eroded	506	.1
Mundelein silt loam, 1 to 3 percent slopes	200	.1
Navan silt loam	3,329	.9
Palms muck	3,016	.9
Pecatonica silt loam, 0 to 2 percent slopes	819	.2
Pecatonica silt loam, 2 to 6 percent slopes	3,783	1.1
Pella silt loam	24,130	6.7
Plano silt loam, 0 to 2 percent slopes	8,054	2.3
Plano silt loam, 2 to 6 percent slopes	11,805	3.3
Plano silt loam, 6 to 12 percent slopes	704	.2
Plano silt loam, gravelly substratum, 0 to 2 percent slopes	30,603	8.5
Plano silt loam, gravelly substratum, 2 to 6 percent slopes	5,627	1.6
Plano silt loam, gravelly substratum, 6 to 12 percent slopes, eroded	182	.1
Radford silt loam, 0 to 3 percent slopes	3,251	.9
Rodman-Casco complex, 30 to 45 percent slopes	4,811	1.3
Rollin muck, deep	480	.1
Rollin muck, shallow	208	.1
St. Charles silt loam, 0 to 2 percent slopes	5,401	1.5
St. Charles silt loam, 2 to 6 percent slopes	4,726	1.3
St. Charles silt loam, gravelly substratum, 0 to 2 percent slopes	7,266	2.0
St. Charles silt loam, gravelly substratum, 2 to 6 percent slopes	5,112	1.4
Sandy lake beaches	110	.1
Saylesville silt loam, 0 to 2 percent slopes	534	.2
Saylesville silt loam, 2 to 6 percent slopes	2,151	.6
Sebewa silt loam	3,163	.9
Troxel silt loam, 0 to 3 percent slopes	503	.1
Wallkill silt loam	330	.1
Warsaw loam, 0 to 2 percent slopes	552	.2
Warsaw silt loam, 0 to 2 percent slopes	887	.2
Warsaw silt loam, 2 to 6 percent slopes	6,459	1.8
Warsaw silt loam, 6 to 12 percent slopes, eroded	456	.1
Westville silt loam, 2 to 6 percent slopes, eroded	427	.1
Westville silt loam, 6 to 12 percent slopes, eroded	383	.1
Wet alluvial land	1,947	.5
Gravel pits	230	.1
Made land	425	.1
Total	358,400	100.0

Adrian muck (0 to 2 percent slopes) (Ac).—The larger areas of this soil are in depressions and in broad flat valleys along major streams. The smaller areas are in pockets along the smaller drainageways and are associated with Alluvial land.

Included in some of the areas mapped are small areas of Houghton, Drummer, and Sebewa soils. Also included are some areas that contain numerous snail shells and are calcareous. If these areas of calcareous soil are cultivated and the surface is dry, the color is dark gray instead of black.

Adrian muck is likely to be ponded in spring and after heavy rain. Surface drainage is needed to dispose of excess water rapidly. Tile drainage is not suitable, because of the sandy underlying material. Cultivated areas are subject to wind erosion and to burning. Organic matter decomposes very rapidly in cultivated areas, and subsidence becomes a problem.

This soil is low in phosphorus and potash. The response to applications of fertilizer containing these nutrients is favorable. A starter fertilizer containing nitrogen is needed for rapid early growth of crops because the soil remains wet late in spring. (Capability unit IVw–7; woodland group 10; recreation group 8; wildlife group 9)

Alluvial Land

Alluvial land (0 to 2 percent slopes) (Am) consists of light- and dark-colored sediments deposited by streams. It occurs throughout the county on flood plains and in narrow valley bottoms, mainly along major streams and their tributaries. The areas are flooded periodically, and the floodwaters leave fresh deposits of sediment as they recede. The soil material is too young to have distinct horizons, and the layering is the result of repeated deposition. The texture is generally loam, but it ranges from silt loam to sandy loam. In some places sand and gravel occur on the surface and as thin layers of the soil material.

This land type is generally well drained to moderately well drained, but most areas contain small depressions that are somewhat poorly drained. Permeability is moderate, and available moisture capacity is moderate.

Alluvial land is suited to corn, small grain, grasses, and legumes if it is protected from flooding. It is also suited to potatoes and peas. The areas are not suitable for residential, commercial, or recreational development, or for highway subgrade. Areas where flooding is frequent and cannot be controlled can be used for forage production, woodland, and wildlife habitat.

This land type occurs with soils of the Juneau, Troxel, and Radford series. It is deeper than those soils, and its texture is more variable. (Capability unit IIIw–12; woodland group 1; recreation group 7; wildlife group 8)

Aztalan Series

The Aztalan series consists of deep, nearly level to gently sloping, somewhat poorly drained, dark-colored soils in glacial lakebeds. These soils are mainly in the northwestern part of the county, but they occur also on broad valley floors of major streams in the eastern part of the county.

In a typical profile the surface layer is black to very dark brown loam about 12 inches thick. The subsurface layer, about 4 inches thick, is friable, very dark grayish-brown loam.

The subsoil is about 27 inches thick. The upper part is neutral, dark yellowish-brown, firm heavy loam that is mottled with grayish brown and yellowish brown. The middle part is mildly alkaline, very firm, brown silty clay loam that is mottled with gray and yellowish brown. The lower part is moderately alkaline, dark-brown, very firm silty clay loam that is mottled with light brownish gray and yellowish brown.

The underlying material is brown and strong-brown silty clay loam that contains thin layers of silt. It is calcareous, is very firm, and is mottled with brown and yellowish brown.

Permeability is moderate in the surface layer and subsoil but slow in the underlying silt and clay. The available moisture capacity is high. Tillage is easy. Roots can readily penetrate to the underlying silt and clay.

Aztalan soils are used mainly for crops. A few small areas are in special crops. These soils are poorly suited to use for building foundations and for highway subgrade.

Typical profile of Aztalan loam in a cultivated field, SW¼SE¼ sec. 1, T. 4 N., R. 15 E.

Ap—0 to 7 inches, black (10YR 2/1) loam; cloddy breaking to weak, fine, granular structure and weak, fine, subangular blocky; friable; neutral; abrupt, smooth boundary.

A1—7 to 12 inches, very dark brown (10YR 2/2) loam; weak, fine and medium, subangular blocky structure; friable; neutral; clear, smooth boundary.

A3—12 to 16 inches, very dark grayish-brown (10YR 3/2) loam; moderate, fine and medium, subangular blocky structure; firm to friable; neutral; clear, smooth boundary.

B21t—16 to 27 inches, dark yellowish-brown (10YR 4/4) heavy loam; common, fine, distinct mottles of grayish brown (10YR 5/2) and yellowish brown (10YR 5/6 and 5/8); weak and moderate, medium, subangular blocky structure; firm; thin, patchy clay films on some vertical and horizontal faces of structural peds; neutral; abrupt, smooth boundary.

IIB22t—27 to 37 inches, brown (10YR 5/3) silty clay loam; many fine, distinct mottles of yellowish brown (10YR 5/6 and 5/8); weak, coarse, prismatic structure breaking to moderate, fine and medium, subangular and angular blocky; slightly plastic when wet, very firm when moist; thin, patchy clay films on all ped faces; mildly alkaline; gradual, smooth boundary.

IIB3—37 to 43 inches, dark-brown (7.5YR 4/4) silty clay loam; common to many, fine and medium, distinct mottles of light brownish gray and yellowish brown (10YR 6/2, 5/6, and 5/8); weak, coarse, prismatic structure breaking to weak, medium, angular blocky; slightly plastic when wet, very firm when moist; few taproots; gray (5Y 5/1) clay films on vertical ped faces; mildly alkaline; gradual, wavy boundary.

IIC—43 to 60 inches, brown (7.5YR 5/4) and strong-brown (7.5YR 5/6) silty clay loam with lenses of silty clay and silt; common, medium, distinct mottles of yellowish brown (10YR 5/6 and 5/8) and common, fine, faint mottles of grayish brown (10YR 5/2); thick platy structure of petrogenic origin; slightly plastic when wet, very firm when moist; calcareous.

The A horizon ranges from black to very dark grayish brown in color and from 10 to 16 inches in thickness. The texture of the A horizon ranges from silt loam to sandy loam. The depth to layered silt and clay ranges from 20 to 48 inches.

Aztalan soils have a darker colored surface layer and more mottling in the subsoil than Hebron soils. They have a finer textured subsoil than Mundelein soils.

Aztalan loam, 1 to 3 percent slopes (AzA).—The larger areas of this soil occur on glacial lakebeds northwest of the Kettle Moraine. They are irregular in shape, and many are more than 40 acres in size. Smaller areas occur on gentle foot slopes between depressions and higher lying, better drained soils.

Included in some of the areas mapped are small areas of Aztalan soils where the surface layer is silt loam or sandy loam. Also included are small areas of Navan silt loam in slightly lower and wetter parts of the landscape and small areas of Hebron loam in higher, better drained positions. Additional inclusions are small areas of Matherton silt loam where the underlying material is clayey, and of Boyer complex where the texture of the surface soil ranges from sandy loam to loamy sand and where the subsoil is mottled.

This soil is subject to ponding after heavy rains. Wetness is caused by slow surface and internal drainage, and by an accumulation of runoff from adjoining areas. It is slow to dry out and warm up in spring, and nitrogen fertilizer is needed for rapid early growth of crops. Surface or tile drainage is necessary for good, dependable crops. (Capability unit IIw–2; woodland group 12; recreation group 5; wildlife group 6)

Boyer Series

The Boyer series consists of deep, somewhat excessively drained, nearly level to sloping soils on uplands.

In a typical profile the surface layer is dark grayish-brown sandy loam about 7 inches thick. The subsoil is about 29 inches thick. Its upper part is medium acid, brown to dark-brown sandy loam, and its lower part is slightly acid to neutral, dark-brown to strong-brown loamy sand. The underlying material is light yellowish-brown, calcareous fine sand.

Permeability is moderately rapid. The available moisture capacity is moderately low where the texture is sandy loam and low where it is loamy sand. The natural fertility is low. Roots can penetrate to the underlying sandy or gravelly material without hindrance.

Boyer soils are used mainly for general farming. They are also suitable for special crops, such as soybeans and potatoes. They are a good source of sand and gravel. There are no serious limitations for residential development, but droughtiness is a problem in places. Lawns and shrubs are difficult to establish and maintain.

Typical profile of Boyer sandy loam in a cultivated field, SW¼NE¼ sec. 13, T. 4 N., R. 15 E.

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) sandy loam; weak, fine, granular structure; friable; slightly acid; abrupt, smooth boundary.

B1—7 to 12 inches, brown (7.5YR 5/4) sandy loam; weak, medium, subangular blocky structure; friable; medium acid; clear, smooth boundary.

B2t—12 to 26 inches, dark-brown (7.5YR 4/4) sandy loam; moderate, medium, subangular blocky structure; friable to firm; thin clay bridging on sand grains; medium acid; gradual, smooth boundary.

B31—26 to 30 inches, dark-brown (7.5YR 4/4) loamy sand; weak, medium, subangular blocky structure; very friable; slightly acid; diffuse, smooth boundary.

B32—30 to 36 inches, strong-brown (7.5YR 5/6) loamy sand; single grain; loose; neutral; clear, smooth boundary.

C—36 to 60 inches, light yellowish-brown (10YR 6/4) fine sand; single grain; loose; calcareous.

The texture of the Ap horizon ranges from sandy loam to loamy sand. The B horizon is neutral to strongly acid. Its texture ranges from loamy sand to loam. The C horizon is generally stratified. Its texture ranges from fine sand to coarse sand and gravel.

Boyer complex, 2 to 6 percent slopes (BpB).—This complex occurs on stream terraces and outwash plains, mainly in the north-central part of the county. The areas on terraces generally occur as narrow strips between stream channels and steeper, higher lying Boyer, Casco, and Fox soils. The areas on outwash plains are irregular in shape and are generally less than 40 acres in size. Boyer loamy sand makes up 65 percent of the acreage; Boyer sandy loam, which has the profile described as typical of the series, makes up 35 percent. Boyer loamy sand has a dark-brown surface layer about 8 inches thick and a sandy loam and loamy sand subsoil about 28 inches thick.

Included in some of the areas mapped are small areas of sandy soils that have a thinner, coarser textured subsoil. Also included are areas of soils that have a dark-colored surface layer and of Boyer soils that are mottled in the lower part of the subsoil.

Runoff is slow to medium, and the erosion hazard is moderate. The soils are somewhat droughty, and management practices that conserve water are needed. Lime and fertilizer are also needed.

Most of the acreage is in crops. Some small areas are in perennial pasture or in woodland. Corn, soybeans, small grain, grasses, and legumes are suitable crops. (Capability unit IVs–3; woodland group 3; recreation group 3; wildlife group 4)

Boyer complex, 6 to 12 percent slopes, eroded (BpC2).—This complex occurs on stream terraces and outwash plains within larger areas of Boyer soils; on narrow side slopes bordering drainageways; and on foot slopes around moraines. About 53 percent of the acreage consists of Boyer sandy loam, and 47 percent of Boyer loamy sand. The Boyer sandy loam in this complex has a dark grayish-brown surface layer about 7 inches thick and a subsoil of sandy loam over loamy sand. The Boyer loamy sand has a dark-brown surface layer about 7 inches thick. The subsoil is sandy loam and loamy sand about 24 inches thick.

Included in some of the areas mapped are small areas of sandy soils that have a thinner, coarser textured subsoil; of soils that have a darker colored surface layer; and of Boyer soils on 12 to 20 percent slopes.

Runoff is medium to rapid, and the erosion hazard is moderate. In places the surface is stony. The soils are somewhat droughty, and management practices that conserve water are needed. Lime and fertilizer are also needed. About half of the acreage has lost 4 to 6 inches of the original surface layer through erosion, and in these places the surface layer is lighter colored.

These soils generally are not suited to cultivated crops, but some of the acreage is cultivated. The rest is used for perennial pasture, woodland, and wildlife habitat, for which the soils are better suited. (Capability unit VIe–9; woodland group 3; recreation group 3; wildlife group 4)

Casco Series

The Casco series consists of gently sloping to steep, well-drained, friable, silty and loamy soils that are shallow over sand and gravel. These soils are on moraines, outwash plains, and stream terraces in most parts of the county.

In a typical profile the surface layer is dark-brown silt loam about 6 inches thick. The subsoil is about 12 inches thick. It consists of strong-brown to dark-brown, firm clay loam. The lower part contains some gravel. The underlying material is calcareous, yellowish-brown to light yellowish-brown sand, gravel, and cobblestones.

Surface runoff is medium to very rapid, permeability is moderate, and the available moisture capacity is moderately low to low.

Casco soils are used mainly for perennial pasture or woodland. Only the more gently sloping soils of the series are used for crops. Some sloping to steep areas are being taken out of pasture and planted to evergreen trees. Casco soils are a good source of sand and gravel. They are suitable for residential development.

Typical profile of Casco silt loam in a cultivated field, SW¼NW¼ sec. 12, T. 3 N., R. 15 E.

Ap—0 to 6 inches, dark-brown (10YR 4/3) silt loam; weak, medium, subangular blocky structure; friable; neutral; abrupt, smooth boundary.

B21t—6 to 10 inches, strong-brown (7.5YR 5/6) light clay loam; moderate, fine, subangular blocky structure; firm; slightly acid; gradual, wavy boundary.

B22t—10 to 15 inches, dark-brown (7.5YR 4/4) clay loam; moderate, fine, subangular blocky structure; firm; reddish-brown (5YR 4/4) clay films on all ped surfaces; pebbles 50 millimeters in diameter are common; slightly acid; gradual, wavy boundary.

B23t—15 to 18 inches, dark-brown (7.5YR 4/4) clay loam; moderate, fine, subangular blocky structure; firm; reddish-brown (5YR 4/4) and dark reddish-brown (5YR 3/4) clay films on all ped faces; pebbles 75 millimeters in diameter are common; strongly alkaline; clear, wavy boundary.

IIC1—18 to 24 inches, yellowish-brown (10YR 5/4) sand, gravel, and cobblestones; single grain; loose; gravel and cobblestones show partial weathering on surfaces; calcareous.

IIC2—24 to 60 inches, light yellowish-brown (10YR 6/4) and very pale brown (10YR 7/4) sand, gravel, and cobblestones; single grain; loose; unweathered; calcareous.

The Ap horizon ranges from yellowish brown to very dark grayish brown in color. It is 4 to 10 inches thick. Undisturbed areas have a very dark brown or black A1 horizon 2 to 5 inches thick and a brown to dark grayish-brown A2 horizon 2 to 4 inches thick. The texture of the A horizon generally is loam or silt loam, but in some areas it is sandy loam. In spots the surface is cobbly. The B horizon is slightly acid to neutral and is 6 to 18 inches thick. In some areas a layer of heavy sandy clay or gravelly clay 2 or 3 inches thick occurs just above the C horizon.

Casco soils have a thicker solum and have more clay in the subsoil than Rodman and Hennepin soils. Like the Fox and Rodman soils, Casco soils overlie sand and gravel. They have a finer textured surface layer than Rodman soils and are shallower over sand and gravel than Fox soils.

Casco loam, 2 to 6 percent slopes, eroded (CeB2).—This soil occurs on outwash plains and stream terraces. The areas on outwash plains are irregular in shape and are generally less than 40 acres in size. The areas on stream terraces are generally long and narrow; they are between flood plains and areas of higher, steeper Casco and Rodman soils. The profile of this Casco soil generally is slightly thicker than the profile described as typical of the series. The surface layer is about 8 inches thick, and the subsoil about 12 inches thick.

Included in mapping were small areas of Casco silt loam, of uneroded Casco loam and silt loam, of Casco sandy loam, and of Rodman gravelly loam. The spots of uneroded Casco soils are in wooded areas and in concave and level areas; they have a thicker, darker colored surface layer than the eroded Casco loam. The areas of Casco sandy loam and of Rodman gravelly loam are on knolls and ridges.

This Casco soil is fairly easy to work. It is droughty, but it responds well to irrigation. Surface runoff is moderate, and there is a slight hazard of water erosion. The areas of Casco sandy loam are slightly susceptible to wind erosion.

Almost all the acreage is in crops. Some small fields are in perennial pasture. Residential, commercial, and recreational development are also suitable. (Capability unit IIIe–4; woodland group 5; recreation group 4; wildlife group 5)

Casco loam, 6 to 12 percent slopes, eroded (CeC2).—This soil occurs on stream terraces and outwash plains, within larger areas of gently sloping Casco and Fox soils. It also occurs on side slopes that border drainageways. The areas are irregular in shape and generally are less than 40 acres in size.

Except for the texture of the surface layer, the profile of this soil is like the one described as typical of the series. As much as 8 inches of the original surface layer has been lost through erosion, and in places the subsoil is exposed. Rills have developed in some areas.

Included in some of the areas mapped are small areas of Casco silt loam, of Casco sandy loam, of Rodman gravelly loam, and of uneroded Casco loam. The uneroded soil occurs where the slope is concave and where the gradient is less than 6 percent; it has a thicker, darker colored surface layer than the eroded soil. Casco sandy loam and Rodman gravelly loam have slopes of more than 12 percent.

This soil is more droughty than Casco loam, 2 to 6 percent slopes, eroded. Surface runoff is rapid, and the hazard of water erosion is moderate. The included areas of Casco sandy loam are slightly susceptible to wind erosion.

Most of the acreage is in crops. A small part is in perennial pasture. Residential, commercial, and recreational development are also suitable uses. (Capability unit IVe–4; woodland group 5; recreation group 4; wildlife group 5)

Casco loam, 12 to 20 percent slopes, eroded (CeD2).—This soil occurs on knolls, ridges, and terrace escarpments as oval or long and narrow areas that are generally less than 40 acres in size. It also occurs on hilly, irregular topography as areas more than 40 acres in size.

The surface layer is dark-brown loam about 6 inches thick. The subsoil is clay loam about 12 inches thick.

Included in some of the areas mapped are small areas of Casco sandy loam and Casco silt loam.

This Casco soil is not suitable for cultivation. Infiltration is moderate to slow, runoff is very rapid, and the erosion hazard is severe.

Meadow, pasture, woodland, and wildlife habitat are suitable uses. Most of the acreage is in pasture. Some areas are in crops, and a few have been planted to evergreen trees. In perennial pasture and in woodland, the soils are only slightly eroded and so have a darker colored surface layer as much as 10 inches thick. (Capability unit VIe–4; woodland group 5; recreation group 4; wildlife group 5)

Casco soils, 6 to 12 percent slopes, severely eroded (CfC3).—These soils adjoin large areas of gently sloping Casco and Fox soils. They occur as mounds and ridges and on side slopes or breaks between terrace levels. They have been cultivated along with the adjoining areas and as a result are severely eroded. About 60 to 70 percent of the acreage is Casco loam, and 30 to 40 percent is Casco silt loam. The subsoil is exposed over much of the area.

The surface layer is dark-brown or yellowish-brown loam or silt loam 4 to 7 inches thick. The subsoil is clay loam or silty clay loam 8 to 12 inches thick.

Included in some of the areas mapped are areas of Casco sandy loam and Rodman gravelly loam less than 3 acres in size. These included soils occur on convex slopes and on crests of mounds and ridges.

These Casco soils are difficult to cultivate. The organic-matter content is low, and fertility is also low. Infiltration is slow, surface runoff is rapid, and the erosion hazard is severe. Where the subsoil is exposed, the surface crusts upon drying and the plow layer becomes cloddy after tillage. Rills appear after heavy rain.

These soils are not suited to cultivated crops, but some of the acreage is so used. The soils are better suited to meadow, pasture, woodland, or wildlife habitat. Small areas once used for crops have been planted to evergreen trees. Residential and commercial development are also suitable uses. (Capability unit VIe–4; woodland group 5; recreation group 4; wildlife group 5)

Casco soils, 12 to 20 percent slopes, severely eroded (CfD3).—These soils occur within larger areas of less sloping Casco and Fox soils. They are on mounds and ridges and on escarpments between terrace levels. They have been cultivated along with adjoining areas and as a result are severely eroded. About 60 to 70 percent of the acreage is Casco loam, and 30 to 40 percent is Casco silt loam.

The surface layer is yellowish-brown loam or silt loam 4 to 6 inches thick. In spots the surface is stony or cobbly. The subsoil is clay loam or silty clay loam 8 to 10 inches thick. Over most of the acreage, some of the subsoil is mixed with the surface layer, and over much of it the subsoil is exposed.

Included in some of the areas mapped are areas of Casco sandy loam and Rodman gravelly loam less than 3 acres in size. These included soils occur on crests of mounds and ridges. Also included are small areas of Fox loam and sandy loam.

These Casco soils are not suitable for cultivation. The organic-matter content is low, and fertility is low. Infiltration is slow, runoff is very rapid, and the hazard of rilling and gullying is severe. Where the subsoil is exposed, the surface crusts upon drying and the plow layer becomes cloddy after tillage.

Much of the acreage is still used for crops, although the soils are better suited to meadow, pasture, woodland, and wildlife habitat. Some areas have been converted to pasture, and some are being planted to evergreen trees. (Capability unit VIIe–4; woodland group 5; recreation group 4; wildlife group 5)

Casco-Fox loams, 12 to 20 percent slopes, eroded (CkD2).—This complex occurs mainly in the north-central part of the county. About 70 percent of the acreage is Casco loam, and about 30 percent is Fox loam. The topography is hilly and irregular.

The Casco soil is on rounded crests of hills and ridges and on side slopes. The Fox soil is in hollows and on the tops of hills and ridges.

Casco loam has a dark-brown surface layer about 6 inches thick and a subsoil of clay loam about 12 inches thick.

Fox loam has a dark grayish-brown surface layer about 10 inches thick. The subsoil is clay loam about 24 inches thick.

Included in some of the areas mapped are areas of Fox sandy loam and Fox silt loam less than 3 acres in size.

This mapping unit is not suitable for cultivation. Infiltration is moderately slow, runoff is very rapid, and the hazard of erosion is severe. In places the surface is stony.

Pasture, woodland, and wildlife are suitable uses. Most of the acreage is in pasture. About a quarter of the acreage is in native hardwood forest. (Capability unit VIe–4; woodland group 5; recreation group 4; wildlife group 5)

Casco-Fox silt loams, 6 to 12 percent slopes, eroded (ClC2).—This complex occurs on outwash plains, mainly in the north-central part of the county. It consists of about equal parts of Casco silt loam and Fox silt loam. The topography is gently rolling.

The Casco soil is on rounded crests of ridges and knolls. The Fox soil is in hollows and on tops of knolls and ridges.

Included in some of the areas mapped are areas of Fox loam, Casco loam, and Rodman gravelly loam less than 3 acres in size.

Runoff is rapid, and the erosion hazard is moderate. Management practices that conserve water and guard against erosion are needed. About two-thirds of the acreage has lost from 4 to 7 inches of the original surface soil through erosion. The complex slopes are not suitable for contour farming or contour stripcropping.

About half of the acreage is in crops. The other half is divided about equally between perennial pasture and native woodland. Wildlife habitat is another suitable use. (Capability unit IVe–4; woodland group 5; recreation group 4; wildlife group 5)

Casco-Rodman complex, 12 to 20 percent slopes, eroded (CrD2).—This complex occurs on knolls, ridges, and terrace escarpments, mainly on and near the Kettle

Moraine. Approximately 30 percent of the acreage consists of Casco silt loam, about 40 percent of Casco loam, and about 30 percent of Rodman gravelly loam. The areas are generally oval or narrow and follow the slopes set by the drainage pattern. They also occur on hilly, irregular topography where the slopes are generally complex and do not conform to a drainage pattern. Erosion has removed 4 to 6 inches of the surface layer from about half the acreage.

The Casco soils are on the less sloping, concave slopes. They have a dark-brown surface layer about 7 inches thick. Their subsoil is dark yellowish-brown clay loam about 12 inches thick.

The Rodman soil has a surface layer of black gravelly loam about 6 inches thick. The subsoil is dark-brown gravelly sandy loam about 5 inches thick.

Included in some of the areas mapped are areas of Fox loam and Fox silt loam less than 3 acres in size. The included areas are at the base of slopes, in hollows, and on hilltops.

Runoff is very rapid, and the erosion hazard is severe if the soils are cultivated.

This complex is not suitable for cultivation, but it can be used for pasture, woodland, and wildlife habitat. Nearly all the acreage is in pasture and woodland. Evergreens are not well suited, because the soils are droughty and erodible and receive too much direct sunlight. Seedling mortality is severe in some places. (Capability unit VIe–4; woodland group 5; recreation group 4; wildlife group 5)

Casco-Rodman complex, 20 to 30 percent slopes, eroded (CrE2).—This complex occurs on knolls, ridges, and terrace escarpments, mainly on and near the Kettle Moraine. Approximately 20 percent of the acreage consists of Casco silt loam, 40 percent of Casco loam, and 40 percent of Rodman gravelly loam. The areas are generally oval or narrow and follow the slopes set by the drainage pattern. They also occur on hilly, irregular topography where the slopes are generally complex and do not conform to a drainage pattern. Erosion has removed 4 to 6 inches of the surface layer from about a third of the acreage.

The Casco soils are on the less sloping, concave slopes. They have a very dark brown surface layer about 5 inches thick. Their subsoil is dark-brown clay loam about 12 inches thick.

The Rodman soil has a black surface layer about 5 inches thick. The subsoil is dark-brown gravelly sandy loam about 5 inches thick.

Included in some of the areas mapped are areas of Fox loam less than 3 acres in size. The included areas are at the base of slopes, in hollows, and on hilltops. Also included are small areas of Lorenzo loam, Lorenzo gravelly loam, and Warsaw sandy loam, as well as small, severely eroded areas where the surface layer is very thin or has been entirely lost.

Runoff is very rapid, and the erosion hazard is severe.

This complex is not suitable for cultivation, but it can be used for pasture, woodland, and wildlife habitat. Nearly all the acreage is in pasture and woodland. The soils are too steep for machinery to be operated safely. Evergreens are not well suited, because the soils are droughty and erodible and receive too much direct sunlight. Seedling mortality is severe in some places. (Capability unit VIIe–4; woodland group 5; recreation group 4; wildlife group 5)

Chelsea Series

The Chelsea series consists of nearly level to steep, excessively drained, sandy soils that developed in thick deposits of windblown sandy outwash. These soils occur on outwash plains and terrace escarpments, mainly in the north-central part of the county.

In a typical profile the surface layer is very dark grayish-brown to dark-brown fine sand about 5 inches thick. The subsurface layer, about 34 inches thick, is medium acid, strong-brown to yellowish-brown, loose fine sand. The subsoil, about 36 inches thick, consists of alternating thin bands of dark-brown, friable loamy very fine sand and yellowish-brown, loose fine sand. It is medium acid. The underlying material is dark yellowish-brown, neutral fine sand.

Permeability is rapid, and the available moisture capacity is very low. Natural fertility is low. The wind erosion hazard is severe. The soils are very droughty and generally are acid to a depth of about 60 inches.

Chelsea soils are used mainly for pasture or woodland. Some areas formerly used for crops have been planted to conifers. These soils have no serious limitations for residential development, but the droughtiness and difficulty of maintaining vegetation detract from their desirability for use as homesites.

Typical profile of Chelsea fine sand in an oak woodlot, NW¼NW¼ sec. 2, T. 4 N., R. 16 E.

A11—0 to 1 inch, very dark grayish-brown (10YR 3/2) fine sand; single grain; loose; mildly alkaline; abrupt, smooth boundary.

A12—1 to 5 inches, dark-brown (10YR 3/3 in the upper part, 7.5YR 4/4 in the lower part) fine sand; single grain; loose; neutral; gradual, smooth boundary.

A21—5 to 15 inches, strong-brown (7.5YR 5/6) fine sand; single grain; loose; medium acid; diffuse, smooth boundary.

A22—15 to 39 inches, yellowish-brown (10YR 5/4) fine sand; single grain; loose; medium acid; abrupt, wavy boundary.

B2&A2—39 to 75 inches, alternating bands of dark-brown (7.5YR 4/4) loamy very fine sand 1 to 3 centimeters thick; massive; friable; and yellowish-brown (10YR 5/4) fine sand 2 to 10 centimeters thick; single grain; loose; medium acid; abrupt, irregular boundary.

C—75 to 85 inches, dark yellowish-brown (10YR 4/4) fine sand; single grain; very weakly cemented or coherent; neutral.

Undisturbed areas have a very dark brown to very dark grayish-brown A1 horizon 1 to 5 inches thick. Disturbed areas have a brown to dark grayish-brown A horizon 6 inches thick, and they have a strong-brown subsurface layer about 34 inches thick. Finer textured bands, ½ inch to 8 inches thick, commonly occur between depths of 40 and 60 inches. The sandy deposits are generally more than 60 inches thick, but in areas adjoining Casco and Rodman soils the gravelly underlying material is closer to the surface.

Chelsea soils have a coarser textured subsoil than Boyer soils.

Chelsea fine sand, 1 to 6 percent slopes (CtB).—This soil generally occurs as areas that are irregular in shape and less than 60 acres in size.

The surface layer is very dark grayish-brown fine sand 6 inches thick. The subsurface layer is yellowish-brown fine sand about 30 inches thick. The subsoil, about 30 inches thick, consists of layers of yellowish-brown fine sand and dark-brown loamy very fine sand.

Included in some of the areas mapped are small areas of Boyer soils; of Chelsea soils that have a darker colored surface layer; and of areas that have a surface layer of loamy sand.

The hazard of wind erosion is severe, and the hazard of water erosion is moderate. The hazard of drought is severe, which causes high seedling mortality, especially on south-facing slopes. Stripcropping and shelterbelts help to control wind erosion. A permanent cover of vegetation is the best way to control water erosion.

Pasture, woodland, and wildlife habitat are suitable uses. The native woodlands produce few wood crops of commercial value. Pine plantations will yield better long-term returns than meadow or pasture. Management practices that conserve water and return organic matter to the soil are needed if this soil is used for crops. A limited acreage is used for corn, soybeans, small grains, grasses, and legumes. (Capability unit IVs–3; woodland group 4; recreation group 9; wildlife group 10)

Chelsea fine sand, 6 to 30 percent slopes (CtE).—Areas of this soil that occur where the slopes are complex are irregular in shape; areas on simple slopes are long and narrow.

This soil has the profile described as typical of the series.

Included in some of the areas mapped are small areas of Boyer soils and of Casco and Fox sandy loams.

The hazard of wind and water erosion is severe. A permanent plant cover is needed to protect this soil from erosion. The hazard of drought is severe, and seedling mortality is high, especially on south-facing slopes.

Only a little of the acreage is used for cultivated crops. Pasture yields are very low, and a good protective sod is difficult to maintain. Pine plantations will yield better long-term returns than meadow or pasture. Machine planting is hazardous on the steeper slopes. This soil supports a sparse cover of native grasses, scrub oak, and other drought-resistant plants. The best use of this soil is in management for esthetic values or wildlife use. (Capability unit VIe–9; woodland group 4; recreation group 9; wildlife group 10)

Colwood Series

The Colwood series consists of deep, nearly level, poorly drained soils in lakebeds. These soils occur mainly in the northwestern part of the county, but also on broad valley floors along major streams in other parts of the county.

In a typical profile the surface layer is black heavy silt loam about 8 inches thick. The subsoil is about 24 inches thick. It is mildly to moderately alkaline and friable to firm. The upper part is dark-gray light silty clay loam that has mottles of olive brown. The middle part is yellowish-brown and dark grayish-brown heavy silt loam that has thin lenses of silt, and the lower part is yellowish-brown and olive-gray silt loam to silt that has lenses of very fine sand. The underlying material is yellowish-brown and light olive-gray stratified silt loam, silt, and very fine sand that is friable and calcareous.

Permeability is moderately slow, and the available moisture capacity is high. Root growth is limited by wetness caused by slow surface and internal drainage.

Colwood soils are used mainly for crops, but surface drainage is needed. Undrained areas are used mainly for perennial pasture. Limitations for residential development are severe or very severe.

Typical profile of Colwood silt loam in a cultivated field, NE¼SE¼ sec. 36, T. 3 N., R. 18 E.

Ap—0 to 8 inches, black (10YR 2/1) heavy silt loam; weak, fine, subangular blocky structure; friable; moderately alkaline; abrupt, smooth boundary.

AB—8 to 11 inches, very dark gray (10YR 3/1) light silty clay loam; weak, fine, subangular blocky structure; friable to firm; common, fine, distinct, very dark grayish-brown (2.5Y 3/2) mottles; mildly alkaline; gradual, smooth boundary.

B21g—11 to 16 inches, dark-gray (10YR 4/1) light silty clay loam; weak to moderate, fine, subangular blocky structure; firm; many, fine, distinct, olive-brown (2.5Y 4/4) mottles; much organic staining on ped faces; mildly alkaline; gradual, smooth boundary.

B22—16 to 22 inches, 60 percent yellowish-brown (10YR 5/6) and 40 percent dark grayish-brown (2.5Y 4/2) heavy silt loam that has thin lenses of silt; weak, coarse, prismatic structure breaking to moderate, medium, subangular blocky; friable; tongues of organic stain penetrate this horizon; olive-gray (5Y 5/2) coats on prism faces; mildly alkaline; gradual, smooth boundary.

B3—22 to 32 inches, equal parts of yellowish-brown (10YR 5/8) and olive-gray (5Y 5/2) silt loam to silt that has lenses of very fine sand; weak, coarse, prismatic structure breaking to weak, medium to coarse, subangular blocky; friable; gray (5Y 6/1) to light-gray (5Y 7/1) silt coatings on prism faces; moderately alkaline; gradual, smooth boundary.

C—32 to 60 inches, 60 percent yellowish-brown (10YR 5/8) and light olive-gray (5Y 6/2) stratified silt loam, silt, and very fine sand; massive, but has weak vertical cleavage planes to a depth of 37 inches; friable; calcareous.

The surface layer is dark gray to black in color and ranges from 6 to 10 inches in thickness. The subsoil is neutral to moderately alkaline and is 12 to 30 inches thick. The texture ranges from silt to light silty clay loam, generally stratified. The underlying material ranges from silt loam to fine sand, and it is stratified in most places. In Walworth County, Colwood soils have more silt in the profile than is common for the series.

Colwood soils are not so fine textured in the lower part of the subsoil and the underlying material as Navan soils. The underlying material is finer textured than that of Sebewa soils.

Colwood silt loam (0 to 2 percent slopes) (Cw).—The larger areas of this soil occur on glacial lakebeds northwest of the Kettle Moraine. They are irregular in shape, and many are more than 40 acres in size. Smaller areas occur in broad valleys in other parts of the county, and in these places the areas are generally long and follow the drainage pattern.

Included in some of the areas mapped are areas where the subsoil is coarser textured than is normal. Also included are small areas of Pella, Navan, and Mundelein soils.

This soil is subject to ponding after heavy rains. Tile drainage is generally not practical, because the underlying material is unstable when saturated. It is also difficult to stabilize ditchbanks in places.

Most areas of this soil are used for general farming. Nitrogen fertilizer is needed for rapid early growth of crops because the soil is slow to dry out and warm up in spring. (Capability unit IIIw-3; woodland group 7; recreation group 6; wildlife group 7)

Conover Series

The Conover series consists of nearly level, somewhat poorly drained soils on till plains throughout the county. These soils developed in silt, as much as 18 inches thick, overlying glacial till.

In a typical profile the surface layer is very dark grayish-brown silt loam about 7 inches thick. The subsurface layer is dark grayish-brown silt loam about 4 inches thick. The subsoil is neutral to medium acid and about 22 inches thick. The upper part is brown, firm heavy silt loam and very firm silty clay loam that is mottled with yellowish brown and light brownish gray, and the lower part is brown, friable loam that is mottled with yellowish brown and light brownish gray. The underlying material is brown and yellowish-brown, friable, calcareous loam that contains many pebbles and small cobblestones.

Permeability is moderately slow, and the available moisture capacity is high. The natural fertility is high.

Most of the acreage is used for crops. If drained, these soils are productive. Corn is the principal crop in drained areas.

Typical profile of Conover silt loam in a cultivated field, NW¼SW¼ sec. 29, T. 3 N., R. 17 E.

Ap—0 to 7 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, fine, subangular blocky structure; friable; neutral; clear, smooth boundary.

A2—7 to 11 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, thin, platy structure; friable; few, fine, distinct, yellowish-brown (10YR 5/4 and 5/6) mottles; slightly acid; clear, smooth boundary.

B1t—11 to 17 inches, brown (10YR 5/3) heavy silt loam; weak, medium, prismatic structure breaking to moderate, fine to medium, subangular blocky; firm; common, fine, distinct, light brownish-gray (10YR 6/2) and yellowish-brown (10YR 5/4 and 5/6) mottles; clay films on vertical faces; medium acid; clear, smooth boundary.

I&IIB21t—17 to 23 inches, brown (10YR 5/3) gritty silty clay loam; moderate, medium, prismatic structure breaking to moderate to strong, medium, angular blocky; very firm; many, medium, distinct, light brownish-gray (10YR 6/2) and yellowish-brown (10YR 5/4 and 5/6) mottles; continuous clay films; neutral; clear, smooth boundary.

IIB22t—23 to 29 inches, brown (10YR 5/3) loam; many pebbles and small cobblestones; moderate, medium, subangular blocky structure; friable; many, medium to coarse, distinct, light brownish-gray (10YR 6/2) and yellowish-brown (10YR 5/6 and 5/8) mottles; patchy clay films; mildly alkaline; gradual, smooth boundary.

IIB3—29 to 33 inches, brown (10YR 5/3) light loam; many pebbles and small cobblestones; weak, coarse, subangular blocky structure; friable; common, medium, distinct, strong-brown (7.5YR 5/6 and 5/8) mottles; calcareous; gradual, smooth boundary.

IIC—33 to 60 inches, brown (10YR 5/3) and yellowish-brown (10YR 5/4) light loam; many pebbles and small cobblestones; massive; friable; calcareous.

The surface and subsurface layers are very dark gray or very dark grayish brown in color. The surface layer ranges from 6 to 8 inches in thickness. The subsurface layer ranges from 2 to 5 inches in thickness. The subsoil ranges from 16 to 24 inches in thickness. It is medium acid to mildly alkaline. The underlying material ranges from loam to sandy loam in texture.

Conover soils have a thinner layer of silt and a thinner subsoil than Kendall soils. They are not so poorly drained as Sebewa soils, and their underlying material is finer textured.

Conover silt loam, 1 to 3 percent slopes (CyA).—This soil occurs on glacial till plains in nearly level areas, slight depressions, and natural drainageways. The nearly level and depressional areas are generally irregular in shape, and many are more than 40 acres in size. The areas in drainageways are narrow and follow the drainage pattern.

Included in some of the areas mapped are areas of Pella silt loam, less than 3 acres in size. These areas occur in slightly lower and wetter parts of the landscape. Also included are small areas of Kendall silt loam and of Griswold silt loam, mottled subsoil variant.

The areas in depressions are subject to ponding after heavy rains. Wetness is caused by slow surface and internal drainage and by accumulation of runoff from adjoining areas.

Drained areas are suitable for corn, small grain, grasses, and legumes. Undrained areas are suitable for pasture. This soil is not suitable for residential development. (Capability unit IIw-2; woodland group 7; recreation group 5; wildlife group 6)

Dodge Series

The Dodge series consists of deep, nearly level to sloping, well-drained, loamy soils (fig. 7) on glacial till plains throughout the county.

In a typical profile the surface layer is dark grayish-brown silt loam about 4 inches thick. The subsurface layer, about 4 inches thick, is brown silt loam. The subsoil is about 34 inches thick. The upper part is medium acid, dark-brown, friable silt loam; the middle part is strongly acid, yellowish-brown, firm light silty clay loam; and the lower part is strongly acid, dark-brown, firm clay loam. The underlying material is brown, friable, calcareous loam.

Permeability is moderate, and the available moisture capacity is moderately high. The root zone extends to a depth of more than 3 feet. These soils are generally acid.

Dodge soils are suitable for farming, and most areas are cultivated. If well managed, they are productive and respond well to applications of lime and fertilizer. They are also suitable for residential development.

Typical profile of Dodge silt loam in a cultivated field, NW¼SE¼ sec. 36, T. 2 N., R. 16 E.

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

A2—4 to 8 inches, brown (10YR 5/3) silt loam; moderate, thin, platy structure; friable; slightly acid; clear, wavy boundary.

B1—8 to 12 inches, dark-brown (10YR 4/3) silt loam; weak, medium, subangular blocky structure; friable; medium acid; gradual, wavy boundary.

B21t—12 to 17 inches, yellowish-brown (10YR 5/4) light silty clay loam; moderate, medium, subangular blocky structure; clay films on vertical ped surfaces; firm; strongly acid; gradual, wavy boundary.

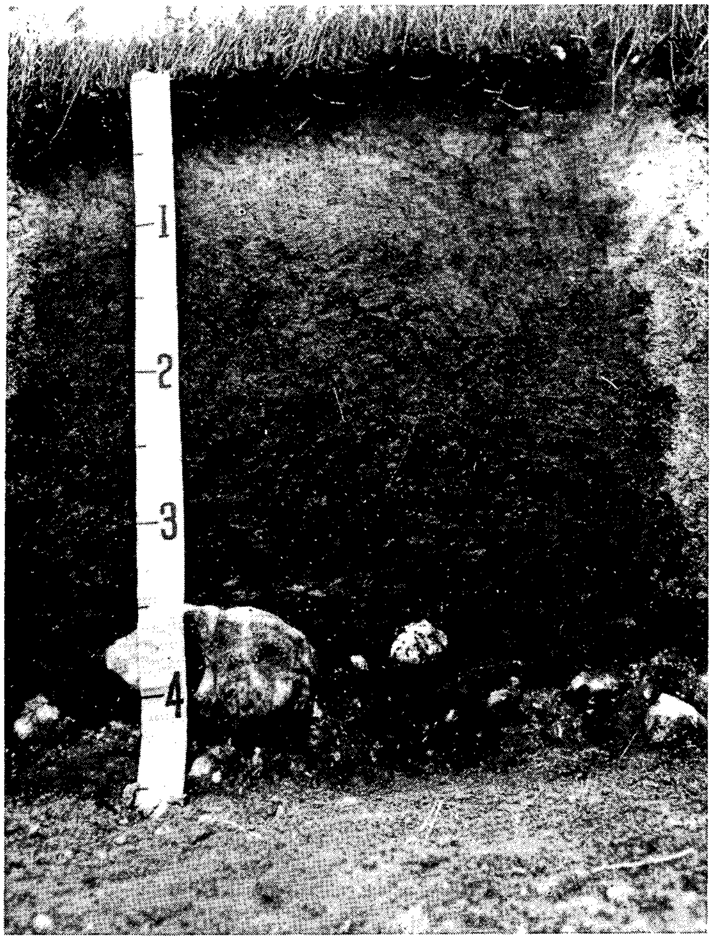


Figure 7.—**Profile of a Dodge silt loam. This soil formed in silt and loamy glacial till.**

B22t—17 to 28 inches, yellowish-brown (10YR 5/4) light silty clay loam; strong, medium, subangular blocky structure; firm; clay films on all ped surfaces; strongly acid; gradual, wavy boundary.

IIB23t—28 to 42 inches, dark-brown (7.5YR 4/4) clay loam; weak, coarse, subangular blocky structure; firm; clay films on all ped surfaces; strongly acid; gradual, wavy boundary.

IIC—42 to 60 inches, brown (7.5YR 4/4) loam till; massive; friable; calcareous.

The A horizon is dark grayish brown to brown in color and is 6 to 8 inches in thickness. The subsurface layer is grayish brown to brown in color and is 2 to 5 inches thick. The subsoil is medium acid to strongly acid and is 20 to 34 inches thick. The silty material is generally 15 to 36 inches thick. The texture of the underlying material ranges from loam to sandy loam.

Dodge soils have a thicker silt cap than Miami and McHenry soils. They differ from St. Charles gravelly substratum soils in having an underlying layer of loamy till rather than sand and gravel outwash.

Dodge silt loam, 0 to 2 percent slopes (DdA).—This soil occurs on till plains, mainly in the central part of the county. The areas are irregular in shape, and most areas are less than 40 acres in size.

This soil has the profile described as typical of the series.

Included in some of the areas mapped are areas of St. Charles and Kendall soils less than 3 acres in size; small areas of Miami and McHenry soils; and small areas of Dodge soils that are underlain by clay loam.

This soil is easy to work. If well managed, it can be cropped intensively. The main consideration in management of this soil is to maintain organic-matter content, fertility, and soil structure. There are no serious limitations. (Capability unit I–1; woodland group 1; recreation group 1; wildlife group 1)

Dodge silt loam, 2 to 6 percent slopes (DdB).—This soil occurs on till plains, mainly in the central part of the county. The areas are irregular in shape, and some areas follow the slopes set by the drainage pattern. Most areas are less than 40 acres in size.

The surface layer is dark grayish-brown silt loam about 7 inches thick. The subsurface layer is dark grayish-brown or brown silt loam about 3 inches thick. The subsoil, about 30 inches thick, consists of silty clay loam grading to clay loam in the lower part.

Included in some of the areas mapped are areas, less than 3 acres in size, of St. Charles and Kendall soils. Also included are small areas of Miami and McHenry soils.

The hazard of water erosion is slight. Management practices to control runoff are needed.

This soil is easy to cultivate. If well managed, it can be cropped fairly intensively. (Capability unit IIe–1; woodland group 1; recreation group 1; wildlife group 1)

Drummer Series

The Drummer series consists of deep, nearly level, poorly drained, loamy soils. These soils occur throughout the county on low terraces and in depressions on outwash plains. They are underlain by stratified sand and gravel.

In a typical profile the upper part of the surface layer is black silt loam about 9 inches thick. The lower part is very dark gray, friable light silty clay loam about 4 inches thick. The subsoil, about 33 inches thick, is firm to very friable and is mildly alkaline. The upper part is dark grayish-brown silty clay loam that has dark-gray coatings on ped surfaces; the middle part is olive-gray light silty clay loam that is mottled with strong brown; and the lower part is grayish-brown silt loam that is mottled with strong brown. The next layer, about 6 inches thick, is brown, calcareous loamy sand that is mottled with yellowish brown. The underlying material is yellowish-brown, calcareous sand and gravel.

Permeability is slow, and the available moisture capacity is high. The depth of the root zone is limited by a high water table.

Most of the large areas are drained and used for crops. Undrained areas are suitable for pasture or meadow. Generally, these soils do not need lime. They have severe limitations for residential and industrial development. They are a good source of sand and gravel.

Typical profile of Drummer silt loam, gravelly substratum, in a cultivated field, NW¼SE¼ sec. 34, T. 2 N., R. 15 E.

Ap—0 to 9 inches, black (N 2/0) silt loam; weak, fine, subangular blocky structure breaking to weak, fine, granular; friable; moderately alkaline; abrupt, smooth boundary.

A12—9 to 13 inches, very dark gray (10YR 3/1) light silty clay loam; weak, fine, subangular blocky structure; friable to firm; mildly alkaline; gradual, smooth boundary.

B1—13 to 17 inches, dark grayish-brown (2.5Y 4/2) silty clay loam; weak, fine, subangular blocky structure; firm; dark-gray (10YR 4/1) coatings on ped faces; mildly alkaline; clear, smooth boundary.

B21t—17 to 21 inches, olive-gray (5Y 4/2) light silty clay loam; weak, coarse, prismatic structure breaking to weak, coarse to medium, subangular blocky; firm; few, fine, prominent, strong-brown (7.5YR 5/6 and 5/8) mottles; few, thin, dark-gray (10YR 4/1) clay films on vertical ped faces; numerous small black (10YR 2/1) krotovinas and a few cherty pebbles; mildly alkaline; clear, smooth boundary.

B22t—21 to 28 inches, olive-gray (5Y 5/2) light silty clay loam; weak, coarse, prismatic structure breaking to moderate, medium, subangular blocky; firm; common, fine, prominent, strong-brown (7.5YR 5/6 and 5/8) mottles; numerous small black (10YR 2/1) krotovinas and a few cherty pebbles; mildly alkaline; clear, wavy boundary.

B31—28 to 40 inches, grayish-brown (2.5Y 5/2) silt loam; weak, coarse, prismatic structure breaking to weak, coarse, subangular blocky: friable; many, medium, prominent, strong-brown (7.5YR 5/6) mottles, dark-gray (10YR 4/1) coatings on prism faces; numerous small black (10YR 2/1) krotovinas and a few cherty pebbles; mildly alkaline; diffuse, wavy boundary.

IIB32—40 to 46 inches, brown (10YR 5/3) loamy sand; weak, medium to coarse, subangular blocky structure; very friable; many, medium, distinct, yellowish-brown (10YR 5/6 and 5/8) mottles; numerous pebbles; calcareous; clear, smooth boundary.

IIC—46 to 60 inches, yellowish-brown (10YR 5/4) sand and gravel; single grain; loose; calcareous.

The surface and subsurface layers are very dark gray, black, or very dark brown in color and ranges from 8 to 15 inches in total thickness. The texture is generally silt loam, but there are also small areas of silty clay loam. The subsoil is neutral to moderately alkaline. Its texture ranges from heavy silt loam or silty clay loam in the upper part to clay loam, sandy clay loam, or sandy loam in the lower part. The depth to the outwash material ranges from 42 to 60 inches.

Drummer soils are deeper over sand and gravel than Sebewa soils. They differ from Pella soils in being underlain by sand and gravel outwash rather than loamy till.

Drummer silt loam, gravelly substratum (0 to 3 percent slopes) (Dt).—This soil occurs mainly on flood plains along drainageways, in depressions on outwash plains, and in low areas bordering lakes. The areas on flood plains are generally long and narrow and follow the pattern set by the drainageways. The areas in depressions are generally circular or irregular in shape and are more than 40 acres in size.

Included in some of the areas mapped are small areas of Matherton and Sebewa soils.

This soil is subject to flooding after heavy rain. Drainage is necessary if cultivated crops are grown. Waterways and diversions are helpful in removing excess surface water rapidly.

If drained, this soil is suitable for most general farm crops. It is slow to dry out and warm up in spring, however, and the farmwork must be delayed. It is not suitable for residential, commercial, or recreational development. (Capability unit IIw-1; woodland group 7; recreation group 6; wildlife group 7)

Elburn Series

The Elburn series consists of deep, nearly level to gently sloping, dark-colored, somewhat poorly drained soils on uplands, mainly in the central part of the county.

In a typical profile the surface layer is black silt loam about 16 inches thick. The subsoil, about 30 inches thick, is slightly acid to mildly alkaline. Its upper part is dark grayish-brown, mainly firm silty clay loam that is mottled with light brownish gray and yellowish brown. The middle part is grayish-brown, firm heavy silt loam mottled with strong brown, and the lower part is grayish-brown, friable loam mottled with strong brown. The underlying material is calcareous, friable, brown loam that is mottled with grayish brown and yellowish brown.

Permeability is moderately slow, and the available moisture capacity is high. Tillage is easy.

Elburn soils dry out and warm up more slowly in spring than better drained soils. Most of the acreage is used for crops, but drainage is needed for dependable yields. Corn is the principal crop.

Typical profile of Elburn silt loam in a cultivated field, SE¼NW¼ sec. 10, T. 2 N., R. 17 E.

Ap—0 to 8 inches, black (10YR 2/1) silt loam; weak, fine, granular and subangular blocky structure; friable; mildly alkaline; abrupt, smooth boundary.

A12—8 to 16 inches, black (10YR 2/1) silt loam; weak, fine, subangular blocky structure; friable; slightly acid; clear, smooth boundary.

B21t—16 to 20 inches, dark grayish-brown (10 YR 4/2) silty clay loam; weak, coarse, prismatic structure breaking to moderate, fine to medium, subangular blocky; firm; few thin clay films on ped faces; few, fine, distinct, light brownish-gray (10YR 6/2) and yellowish-brown (10YR 5/6 and 6/8) mottles; slightly acid; clear, smooth boundary.

B22t—20 to 28 inches, dark grayish-brown (10YR 4/2) silty clay loam; moderate, coarse, prismatic structure breaking to moderate, fine to medium, subangular blocky; firm; clay films prominent on horizontal faces, but less prominent on vertical faces; common, medium, distinct, pinkish-gray (7.5YR 6/2) and strong-brown (7.5YR 5/6) mottles; slightly acid; clear, smooth boundary.

B31—28 to 42 inches, grayish-brown (2.5Y 5/2) heavy silt loam; weak, medium to fine, subangular blocky structure; firm; many, fine, prominent, strong-brown (7.5YR 5/6 and 5/8) mottles; mildly alkaline; clear, smooth boundary.

IIB32—42 to 46 inches, grayish-brown (2.5Y 5/2) loam; weak, thick, platy structure breaking to weak, medium, subangular blocky; friable; many, fine, prominent, strong-brown (7.5YR 5/6 and 5/8) mottles; mildly alkaline; clear, smooth boundary.

IIC—46 to 60 inches, brown (7.5YR 5/4) loam; weak, thick, platy structure to massive; friable; common, medium, distinct, yellowish-brown (10YR 5/8) and grayish-brown (10YR 5/2) mottles; calcareous.

The texture of the surface layer is generally silt loam, but it is loam in some spots. The color of the surface layer ranges from black to very dark brown. The silty layer ranges from 40 to 60 inches in thickness. The subsoil, 24 to 42 inches thick, is medium acid to mildly alkaline. The underlying material is sandy or gravelly loam, heavy loam, or sand and gravel.

Elburn soils are wetter than Plano soils, and mottling occurs higher in the subsoil than in those soils. They are not so wet as Drummer soils, and their subsoil is not so gray.

Elburn silt loam, 1 to 3 percent slopes (EbA).—This soil occurs on glacial till plains in slight depressions, in very gently sloping areas, and in natural drainageways. The nearly level and depressional areas are generally irregular in shape, and many are more than 40 acres in size. The areas in drainageways are narrow and follow the drainage pattern.

This soil has the profile described as typical of the series.

Included in some of the areas mapped are areas, less than 3 acres in size, of Pella silt loam on slightly lower and wetter parts of the landscape. Also included are small areas of Griswold soils (mottled subsoil variant) and of St. Charles silt loam in higher, better drained positions.

The depressional areas are subject to ponding after heavy rains. Surface and internal drainage are slow, and runoff from adjoining soils accumulates in these areas. Drainage is needed if cultivated crops are grown. If drained, this soil is suitable for corn, small grain, grasses, and legumes. Undrained areas are suitable for pasture. (Capability unit IIw–2; woodland group 12; recreation group 5; wildlife group 6)

Elburn silt loam, gravelly substratum, 1 to 3 percent slopes (EgA).—This soil occurs on outwash plains, mainly on low terraces, in broad valleys, and bordering large depressions. The areas are irregular in shape and range from less than 20 acres to more than 80 acres in size. The shape of the areas generally follows the pattern set by the drainageways.

Except that the underlying material is sand and gravel, this soil has a profile similar to that described as typical of the series.

Included in some of the areas mapped are small areas of Sebewa, Drummer, and Matherton soils.

This soil is subject to ponding after heavy rains. Waterways and diversions are needed to dispose of runoff rapidly. Surface or tile drainage is needed to lower the water table and increase the depth of the root zone. If drained, this soil is suitable for most crops. (Capability unit IIw–2; woodland group 12; recreation group 5; wildlife group 6)

Flagg Series

The Flagg series consists of deep, nearly level to gently sloping, well-drained soils on uplands. These soils occur in the southwestern corner of the county, mainly in Sharon Township.

In a typical profile the surface layer is very dark grayish-brown silt loam about 7 inches thick. The subsurface layer is dark-brown, friable silt loam about 4 inches thick. The subsoil, about 60 inches thick, is mildly alkaline to strongly acid. Its upper part is yellowish-brown, friable heavy silt loam; the middle part is dark yellowish-brown grading to dark-brown, firm light silty clay loam; and the lower part is dark-brown, friable sandy clay loam. The underlying material is dark yellowish-brown, moderately alkaline, loose sandy loam that becomes calcareous with depth.

Permeability is moderate, and the available moisture capacity is moderately high. The root zone extends to a depth of more than 4 feet. The soils are generally acid.

Flagg soils are good farming soils, and nearly all the acreage is cultivated. If well managed, they are productive and respond well to applications of lime and fertilizer. They are not extensive, but they are important in the areas where they occur. There are no serious limitations for residential development.

Typical profile of Flagg silt loam in a cultivated field, NW¼NW¼ sec. 21, T. 1 N., R. 15 E.

Ap—0 to 7 inches, very dark grayish-brown (10YR 3/2) silt loam; light brownish gray (10YR 6/2) when dry; weak, fine, subangular blocky structure; friable; mildly alkaline; abrupt, smooth boundary.

A2—7 to 11 inches, dark-brown (10YR 4/3 rubbed) silt loam; moderate, thin, platy structure; friable; mildly alkaline; abrupt, smooth boundary.

B1—11 to 16 inches, yellowish-brown (10YR 5/4 rubbed) heavy silt loam; weak, medium to thick, platy structure breaking to weak, fine, subangular blocky; friable; mildly alkaline; clear, smooth boundary.

B21t—16 to 26 inches, dark yellowish-brown (10YR 4/4) light silty clay loam; strong, medium, subangular blocky structure breaking to moderate, medium, angular blocky; firm; thin clay films on vertical ped surfaces; strongly acid; clear, smooth boundary.

B22t—26 to 39 inches, dark yellowish-brown (10YR 4/4) light silty clay loam; moderate, medium, prismatic structure breaking to moderate, medium, angular blocky; firm; dark-brown (10YR 4/3), thin, continuous clay films on ped surfaces; strongly acid; gradual, smooth boundary.

B31t—39 to 46 inches, dark-brown (7.5YR 4/4) light silty clay loam; weak to moderate, coarse, prismatic structure breaking to weak to moderate, coarse, angular blocky; friable; dark-brown (10YR 4/3), thin, patchy clay films on ped surfaces; strongly acid; gradual, wavy boundary.

IIB32t—46 to 72 inches, dark-brown (7.5YR 4/4) sandy clay loam; weak, coarse, prismatic structure breaking to weak, coarse, angular blocky; friable; few patchy, thin, dark-brown (10YR 4/3) clay films on ped faces; medium acid in upper part of horizon, neutral in lower part.

IIC—72 to 80 inches, dark yellowish-brown (10YR 4/4) sandy loam; single grain; loose; moderately alkaline.

The surface layer is dark grayish brown to very dark grayish brown in color. The subsoil ranges from strongly acid to mildly alkaline. It is 42 to more than 72 inches thick. The silty material ranges from 30 to 50 inches in thickness. The texture of the underlying material ranges from loam to sandy loam.

Flagg soils have a thicker silt cap and a thicker subsoil than Dodge soils. They have an underlying layer of loamy till, unlike the gravelly substratum phases of St. Charles soils, which are underlain by sand and gravel outwash.

Flagg silt loam, 0 to 2 percent slopes (FgA).—This soil occurs on till plains. The areas are irregular in shape, and many are more than 80 acres in size. Some areas are on foot slopes between higher lying and sloping Pecatonica and Westville soils and the lower lying, wetter, mottled subsoil variant of the Flagg soils, which occurs near drainageways. Other areas are on relatively flat uplands.

This soil has the profile described as typical of the series.

Included in some of the areas mapped are areas of Pecatonica silt loam and Flagg silt loam, mottled subsoil variant, that are less than 3 acres in size, and a small acreage of Flagg silt loam that has a darker surface layer.

This soil is easy to work, and if well managed, it can be cropped intensively. The main considerations in management are to maintain organic-matter content, fertility, and soil structure. This soil has no serious limitations. (Capability unit I–1; woodland group 1; recreation group 1; wildlife group 3)

Flagg slit loam, 2 to 6 percent slopes (FgB).—This soil occurs on till plains. Most of the acreage is on foot slopes between higher lying Pecatonica soils and the lower lying mottled subsoil variant of the Flagg soils. These areas are narrow and follow the pattern set by the drainageways. Some areas are in drainageways that extend into the uplands. Most areas are less than 80 acres in size.

The surface layer is dark grayish-brown silt loam about 9 inches thick. The subsurface layer is grayish-brown to dark-brown silt loam about 3 inches thick. The subsoil is dark yellowish-brown silty clay loam to a depth of about 42 inches; it turns to dark-brown sandy clay loam at that depth and continues to a depth of more than 72 inches.

Included in some of the areas mapped are areas, less than 3 acres in size, of Pecatonica silt loam and Flagg silt loam, mottled subsoil variant. Also included are a few areas of Flagg silt loam where the surface layer is darker colored.

This soil is susceptible to sheet erosion and rilling because slopes are long and runoff accumulates during heavy rains. The hazard of water erosion is slight.

If well managed, this soil can be cropped fairly intensively. Management practices that control runoff and maintain soil structure are needed. (Capability unit IIe–1; woodland group 1; recreation group 1; wildlife group 3)

Flagg Series, Mottled Subsoil Variant

The variant from the normal Flagg soils is a deep, somewhat poorly drained, nearly level soil on uplands. This soil occurs in the southwestern corner of the county, mainly in Sharon Township.

In a typical profile the surface layer is very dark grayish-brown silt loam about 8 inches thick. The subsurface layer, about 6 inches thick, is grayish-brown, friable silt loam that is mottled with dark brown. The subsoil, about 34 inches thick, is neutral in reaction. Its upper part is brown, friable silt loam that is mottled with brown and strong brown. The middle part is grayish-brown, firm silty clay loam that is mottled with strong brown, and the lower part is grayish-brown, firm light clay loam that is mottled with strong brown. The underlying material is slightly acid, friable, light brownish-gray sandy loam that is mottled with yellowish brown.

Permeability is moderately slow, and the available moisture capacity is high. These soils dry out slowly and warm up slowly in spring. Drainage is needed if cultivated crops are grown. Rapid disposal of runoff water is also needed. These soils are not extensive, but they are important in the areas where they occur.

Typical profile of Flagg silt loam, mottled subsoil variant, in a cultivated field, SE¼SW¼sec. 32, T. 1 N., R. 15 E.

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) when dry; weak, medium, subangular blocky structure; friable; moderately alkaline; abrupt, smooth boundary.

A1—8 to 10 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium, platy structure; friable; moderately alkaline; abrupt, smooth boundary.

A2—10 to 14 inches, grayish-brown (10YR 5/2) silt loam; weak, thin, platy structure; friable; common, fine, distinct, dark-brown (7.5YR 4/4) and strong-brown (7.5YR 5/6) mottles; neutral; clear, smooth boundary.

B1—14 to 22 inches, brown (10YR 5/3) silt loam; moderate, fine, subangular blocky structure; friable; many, fine, distinct, strong-brown (7.5YR 5/6 and 5/8) mottles and common, fine, faint, brown (7.5YR 5/2) mottles; neutral; clear, smooth boundary.

B21t—22 to 31 inches, grayish-brown (2.5Y 5/2) silty clay loam; moderate, coarse, prismatic structure breaking to moderate, medium, subangular blocky; firm; many, fine, prominent, strong-brown (7.5YR 5/6 and 5/8) mottles; clay films continuous on prism faces and in root channels, patchy on horizontal ped faces; neutral; gradual, smooth boundary.

B22t—31 to 42 inches, grayish-brown (2.5Y 5/2) silty clay loam; moderate, coarse, prismatic structure breaking to moderate, medium, angular blocky; firm; many, fine, prominent, strong-brown (7.5YR 5/6 and 5/8) mottles; clay films continuous on prism faces, patchy on ped faces; neutral; gradual, wavy boundary.

IIB3—42 to 48 inches, grayish-brown (2.5Y 5/2) light clay loam; weak, coarse, prismatic structure breaking to weak, coarse, angular blocky; firm; many, fine, prominent, strong-brown (7.5YR 5/6 and 5/8) mottles; many spots of iron and manganese; neutral; diffuse, wavy boundary.

IIC—48 to 72 inches, light brownish-gray (10YR 6/2) sandy loam; massive; friable; many, fine, prominent, yellowish-brown (10YR 5/6 and 5/8) mottles; slightly acid.

The surface and subsurface layers together range from 10 to 14 inches in thickness and from dark grayish brown to dark brown in color. The subsoil is slightly acid to mildly alkaline and ranges from 30 to 48 inches in thickness. The silty material ranges from 30 to 50 inches in thickness. The underlying material is sandy loam or loam.

The mottled subsoil variant of the Flagg soils is not so wet as the Pella soils, and the subsoil is less grayish. It differs from Matherton soils in having an underlying layer of loamy glacial till, rather than sand and gravel outwash.

Flagg silt loam, mottled subsoil variant, 0 to 3 percent slopes (FlA).—This soil occurs mainly along natural drainageways. It occupies positions between the lower, wetter soils of the drainageways and the higher lying, better drained Pecatonica and Flagg soils. The areas are long and narrow in most places, and they conform to the pattern set by the drainageways. Many of the areas are more than 40 acres in size.

Included in some of the areas mapped are areas, less than 3 acres in size, of Pella soils in slightly lower and wetter parts of the landscape. Also included are small areas of Pecatonica soils and normal Flagg soils.

This soil is subject to ponding after heavy rains. Surface and internal drainage are slow, and runoff from adjoining soils accumulates in these areas. Drainage is needed if cultivated crops are grown. If drained, this soil is suitable for most general farm crops and many special crops. Undrained areas are suited to pasture. (Capability unit IIw–2; woodland group 7; recreation group 5; wildlife group 6)

Fox Series

The Fox series consists of well-drained, medium-textured soils that are moderately deep over stratified sand and gravel. These soils occur on stream terraces and outwash plains, mainly in the northern and eastern parts of the county. They are nearly level to sloping.

In a typical profile the surface layer is dark-gray silt loam about 8 inches thick. The subsurface layer, about 7 inches thick, is friable, strong-brown silt loam. The subsoil, about 23 inches thick, is firm and has blocky to subangular blocky structure. Its upper part is medium acid, dark yellowish-brown gritty silty clay loam; the middle part is medium acid, dark yellowish-brown clay loam; and the lower part is moderately alkaline, dark reddish-brown clay loam. The underlying material is calcareous, layered, very pale brown sand and gravel.

Permeability is moderate, and the available moisture capacity is moderate. The depth of the root zone is limited by sand and gravel outwash. The natural fertility is fairly high in Fox loam and Fox silt loam, but those soils are slightly droughty. The natural fertility is lower in Fox sandy loam, and the soil is more droughty and is subject to wind erosion.

Fox soils are used mainly for crops. They are slightly acid to strongly acid, and they need lime for good crop response. They are extensive and fairly important to farming. The stronger slopes are used for perennial pasture or woodland.

Typical profile of Fox silt loam in a cultivated field, NW¼SE¼ sec. 2, T. 1 N., R. 18 E.

Ap—0 to 8 inches, dark-gray (10YR 4/1) silt loam; weak, very fine, granular structure; friable; slightly acid; clear, wavy boundary.

A2—8 to 15 inches, strong-brown (7.5YR 5/6) silt loam; weak, very fine, granular structure; friable; slightly acid; clear, wavy boundary.

B21t—15 to 26 inches, dark yellowish-brown (10YR 3/4) gritty silty clay loam; weak, fine to medium, angular blocky structure; firm; very dark gray (5Y 3/1) clay films on ped faces; medium acid; clear, wavy boundary.

IIB22t—26 to 31 inches, dark yellowish-brown (10YR 4/4) clay loam; moderate, medium, angular blocky structure; firm; very dark gray (5YR 3/1) clay films on ped faces; medium acid; clear, wavy boundary.

IIB23t—31 to 38 inches, dark reddish-brown (5YR 3/4) clay loam; weak, fine, subangular blocky structure; firm; few very dark gray (5YR 3/1) clay films on ped faces; moderately alkaline; clear, wavy boundary.

IIC—38 to 60 inches +, very pale brown (10YR 7/3) stratified sand and gravel; single grain; loose; calcareous.

The texture of the surface layer is loam, sandy loam, or silt loam. The surface and subsurface layers range from dark brown or dark gray to very dark grayish brown in color and from 10 to 15 inches in total thickness. The depth to the outwash sand and gravel ranges from 24 to 42 inches.

Fox soils are deeper over sand and gravel than Casco soils, but they are not so deep as the gravelly substratum phases of the St. Charles soils. They differ from McHenry soils in having sand and gravel underlying material rather than loamy glacial till.

Fox sandy loam, 1 to 6 percent slopes (FmB).—This soil occurs on stream terraces and outwash plains. The areas on stream terraces occur as narrow strips between drainageways and steeper, higher lying Fox and Casco soils. The areas on outwash plains are generally irregular in shape, and many are more than 40 acres in size.

The surface layer is dark grayish-brown sandy loam about 8 inches thick. The subsurface layer is about 4 inches thick. The subsoil is dark yellowish-brown sandy clay loam about 24 inches thick.

Included in some of the areas mapped are areas, less than 3 acres in size, of Fox loam, Casco loam, and Metea loamy sand. Also included are small areas of Rodman gravelly loam along terrace escarpments.

The available moisture capacity is low, and the natural fertility is moderately low. The water erosion hazard is slight, and the wind erosion hazard is moderate. Stripcropping and maintaining a high organic-matter content help to control wind erosion. Management practices that conserve moisture are needed.

Most of the acreage is used for crops. Some small areas are used for perennial pasture, woodland, and wildlife habitat. This soil is suitable for corn, small grain, soybeans, and grasses. It is well suited to residential and commercial development. (Capability unit IIIs–4; woodland group 3; recreation group 3; wildlife group 4)

Fox sandy loam, 6 to 12 percent slopes, eroded (FmC2).—This soil occurs mainly on outwash plains in the northern part of the county. These areas are generally narrow and adjoin larger, less sloping Fox soils on one side and steeper Casco and Rodman soils on the other. Most areas are less than 40 acres in size.

The surface layer is dark-brown sandy loam about 6 inches thick. The subsurface layer is about 4 inches thick. The subsoil is yellowish-brown sandy clay loam about 22 inches thick.

Included in some areas mapped are small areas of Fox loam, Casco loam, and Rodman gravelly loam. Also included are some small, severely eroded areas.

About three-fourths of the acreage has lost 4 to 8 inches of the original surface layer through erosion. The present surface layer is generally lighter colored because some of the brown subsoil material has been brought to the surface through tillage.

Runoff is rapid, and the available moisture capacity is moderately low. The hazard of wind and water erosion is moderate. The soil is somewhat droughty. Management practices and erosion control measures that conserve water and maintain organic-matter content are needed if the soil is used for row crops.

Most of the acreage has been cultivated along with adjoining, less sloping soils. It is suitable for close-growing crops, such as small grain and forage plants. It is also suitable for trees and for residential, commercial, and recreational development. (Capability unit IIIe–7; woodland group 3; recreation group 3; wildlife group 4)

Fox loam, 2 to 6 percent slopes (FoB).—This soil occurs on stream terraces and outwash plains. The areas on stream terraces generally occur as narrow strips between drainageways and steeper, higher lying Fox and Casco soils. The areas on outwash plains are generally irregular in shape and are less than 40 acres in size.

The surface layer is dark grayish-brown loam about 7 inches thick. The subsurface layer is about 6 inches thick. The subsoil is yellowish-brown clay loam about 28 inches thick.

Included in some of the areas mapped are small areas that have a surface layer of loam or sandy loam and are mottled in the lower part of the subsoil. Also included are small areas of more strongly sloping Casco and Fox soils.

Approximately one-fourth of the acreage has lost 4 to 8 inches of the original surface layer through erosion, and in these places the surface layer is lighter colored. Runoff is moderate, and the hazard of water erosion is slight. The soil is slightly droughty, and management practices that control runoff and conserve moisture are needed. It is well suited to irrigation.

Most of the acreage is used for crops. Some small areas are in perennial pasture. This soil is suitable for all the crops generally grown in the area. (Capability unit IIe-2; woodland group 1; recreation group 2; wildlife group 1)

Fox loam, 6 to 12 percent slopes, eroded (FoC2).—This soil occurs on stream terraces and outwash plains. It occurs as sloping areas within larger, gently sloping areas of Fox soils. The areas are irregular in shape and generally are less than 40 acres in size. This soil also occurs on side slopes of drainageways.

The surface layer is dark-brown loam about 7 inches thick. The subsurface layer is about 4 inches thick. The subsoil is yellowish-brown clay loam about 26 inches thick.

Included in some of the areas mapped are areas, less than 3 acres in size, of Casco loam and Rodman gravelly loam. Also included are small areas of Fox sandy loam and Fox silt loam.

About two-thirds of the acreage has lost 4 to 8 inches of the original surface layer through erosion, and in these places the surface layer is lighter colored. In places rills have formed, and there are spots where the subsoil is exposed.

Infiltration is slower on this soil than on an uneroded soil, and runoff is more rapid. This soil is more droughty than the less sloping, less eroded areas of Fox loam. The erosion hazard is moderate.

Most of the acreage is used for crops. Management practices that control runoff, conserve moisture, and improve soil structure are needed. This soil is not well suited to irrigation, because of the slope. (Capability unit IIIe-2; woodland group 1; recreation group 2; wildlife group 1)

Fox silt loam, 0 to 2 percent slopes (FsA).—This soil occurs on outwash plains and stream terraces. The areas on stream terraces generally occur as long, narrow strips between flood plains and sloping, higher lying Fox and Casco soils. The areas on outwash plains are irregular in shape and generally are less than 40 acres in size.

This soil has the profile described as typical of the series.

Included in some of the areas mapped are small areas of Fox sandy loam and Fox loam, and areas that have a surface layer of loam, sandy loam, and silt loam and a subsoil that is mottled in the lower part.

This soil is slightly droughty. Crop yields are lowered if dry periods are prolonged.

Most of the acreage is used for crops. This soil is suitable for all the crops commonly grown in the area, and also for some special crops, such as sweet corn, lima beans, and peas. It can be cropped intensively under irrigation, but management practices that conserve moisture are needed. (Capability unit IIs-1; woodland group 1; recreation group 1; wildlife group 1)

Fox silt loam, 2 to 6 percent slopes (FsB).—This soil occurs on stream terraces and outwash plains. The areas on stream terraces generally occur as narrow strips between drainageways and steeper, higher lying Fox and Casco soils. The areas on outwash plains are generally irregular in shape, and many are more than 40 acres in size.

The surface layer is dark grayish-brown silt loam about 8 inches thick. The subsurface layer is mixed with the surface layer. The subsoil is dark yellowish-brown silty clay loam about 28 inches thick.

Included in some of the areas mapped are small areas, less than 3 acres in size, of Casco loam, Fox loam, and St. Charles silt loam, gravelly substratum. Also included are areas of Fox soils that are mottled in the lower part of the subsoil.

This soil is slightly droughty. Runoff is moderate, and the hazard of erosion is slight.

This soil is suited to all the crops commonly grown in the area. It is well suited to irrigation. Nearly all the acreage is used for crops, but some small areas are used for perennial pasture or woodland. Management practices that control runoff and conserve moisture are needed. (Capability unit IIe-2; woodland group 1; recreation group 1; wildlife group 1)

Fox silt loam, 6 to 12 percent slopes, eroded (FsC2).—This soil occurs on stream terraces and outwash plains as more strongly sloping areas within larger areas of gently sloping Fox soils. The areas are irregular in shape and generally are less than 40 acres in size. This soil also occurs on side slopes of drainageways.

The surface layer is dark grayish-brown silt loam about 7 inches thick. The subsurface layer is mixed with the surface layer. The subsoil is dark-brown silty clay loam about 24 inches thick.

Included in some of the areas mapped are areas, less than 3 acres in size, of Casco silt loam and Rodman gravelly loam. Also included are small areas of St. Charles, gravelly substratum, soils that have a surface layer of sandy loam or silt loam.

In about two-thirds of the acreage, 4 to 8 inches of the original surface layer has been lost through erosion. In these eroded areas, the surface layer is lighter colored. In places there are rills and spots where the subsoil is exposed.

Infiltration is slower on this soil, and runoff is more rapid than on an uneroded soil. The soil is more droughty than the less sloping, less eroded areas of Fox silt loam. The hazard of erosion is moderate.

Most of the acreage is used for crops. Management practices that control runoff, conserve moisture, and improve soil structure are needed. This soil is not well suited to irrigation, because of the slope. (Capability unit

IIIe-2; woodland group 1; recreation group 1; wildlife group 1)

Griswold Series

The Griswold series consists of dark-colored, well-drained, loamy soils. These soils are nearly level to moderately steep. They occur on till plains throughout the county.

In a typical profile the surface layer is very dark brown loam about 8 inches thick. The subsurface layer, about 3 inches thick, is friable, dark-brown loam. The subsoil is about 18 inches thick. Its upper part is friable, slightly acid, dark-brown heavy loam; the middle part is firm, medium acid, dark-brown sandy clay loam; and the lower part is firm, slightly acid, dark-brown sandy clay loam. The underlying material is calcareous, friable, brown sandy loam.

Permeability is moderate, and the available moisture capacity is moderately high. The natural fertility is moderately high. The root zone is deep. Tillage is easy. Response to lime and fertilizer is good.

Most of the acreage is used for crops. The soils are suitable for all general farm crops and for many special crops. There are no serious limitations.

Typical profile of Griswold loam in a cultivated field, NW¼SW¼ sec. 5, T. 4 N., R. 15 E.

Ap—0 to 8 inches, very dark brown (10YR 2/2) loam; moderate, fine, granular structure; friable; neutral; abrupt, smooth boundary.

A3—8 to 11 inches, dark-brown (10YR 3/3) loam; weak, very fine, subangular blocky structure; friable; neutral; clear, wavy boundary.

B21t—11 to 18 inches, dark-brown (10YR 4/3) heavy loam; moderate, fine, subangular blocky structure; friable; very thin, very dark grayish-brown (10YR 3/2) coatings on all peds; slightly acid; clear, wavy boundary.

B22t—18 to 26 inches, dark-brown (10YR 4/3) sandy clay loam; moderate, fine and medium, subangular blocky structure; firm; very dark grayish-brown (10YR 3/2) clay films on all ped faces; medium acid; clear, wavy boundary.

B23t—26 to 29 inches, dark-brown (10YR 4/3) sandy clay loam; weak, medium, subangular blocky structure; firm; thin, very dark grayish-brown (10YR 3/2) clay films on vertical faces of peds; slightly acid; clear, wavy boundary.

C—29 to 60 inches +, brown (10YR 5/3) sandy loam; massive; friable; calcareous.

The surface and subsurface layers range from very dark brown to black in color and from 8 to 14 inches in total thickness. The texture is generally loam, but there are also small areas of sandy loam. The subsoil is strongly acid to neutral. It ranges from 16 to 26 inches in thickness. The texture of the underlying glacial till ranges from loam to gravelly sandy loam.

Griswold soils are coarser textured than Plano soils; the upper part of Plano soils developed in silt. Griswold soils differ from Warsaw soils in having underlying material of sandy loam till rather than sand and gravel outwash.

Griswold loam, 2 to 6 percent slopes (GsB).—This soil occurs on till plains, mainly in the northwestern corner of the county. It occurs with the well-drained Plano and Miami soils. The areas are irregular in shape, and some areas follow the slopes set by the drainage pattern. In places the areas are more than 40 acres in size.

This soil has the profile described as typical of the series.

Included in some of the areas mapped are small areas where the surface layer is sandy loam. Also included are small areas of Plano and Miami soils.

This soil is easy to work. If well managed, it can be cropped fairly intensively. There is a slight hazard of water erosion, and management practices that control runoff are beneficial. There are no serious limitations. (Capability unit IIe-1; woodland group 12; recreation group 2; wildlife group 2)

Griswold loam, 6 to 12 percent slopes, eroded (GsC2).—This soil occurs mainly on low knolls and ridges within larger, less sloping areas of Plano and Griswold soils. It also occurs on side slopes of drainageways. The areas are generally long and narrow, or they occur as small circular knolls. They are less than 20 acres in size. These areas have been cropped along with deeper, less sloping adjoining soils.

The surface layer is very dark brown loam or silt loam about 8 inches thick. The subsoil is dark-brown clay loam about 16 inches thick.

Included in some of the areas mapped are small areas of Plano soils and small severely eroded areas.

About two-thirds of the acreage has lost 4 to 6 inches of the original surface layer through erosion. In these eroded areas the surface layer is stonier and browner than that of adjoining soils.

The available moisture capacity is moderate to moderately low. Runoff is rapid, and the hazard of erosion is moderate. Management practices that control runoff, conserve moisture, and improve soil structure are needed. Organic matter should be returned to the soil. (Capability unit IIIe-1; woodland group 12; recreation group 2; wildlife group 2)

Griswold loam, 12 to 20 percent slopes, eroded (GsD2).—This moderately steep soil occurs on knolls and ridges within larger, less sloping areas of Plano and Griswold soils. It also occurs on side slopes of drainageways. The areas are generally narrow, or they occur as oval or circular knolls. They are generally less than 10 acres in size. Many have been cropped along with deeper, less sloping adjoining soils.

About two-thirds of the acreage has lost 4 to 6 inches of the original surface layer through erosion. In these eroded spots the surface layer is stonier and browner than that of the adjoining less eroded soil.

The surface layer is very dark brown loam or silt loam about 8 inches thick. Numerous pebbles are on the surface. The subsoil is dark-brown sandy clay loam about 16 inches thick.

Included in some of the areas mapped are small areas of Plano soils, small severely eroded areas, and small areas of Griswold loam where the slope is 20 to 30 percent.

The available moisture capacity is moderate to moderately low. Runoff is very rapid, and the hazard of erosion is severe.

This soil is not suitable for row crops, without erosion control measures and moisture conserving practices. It is better suited to close-growing crops, such as grain and forage crops. (Capability unit IVe-1; woodland group 12; recreation group 2; wildlife group 2)

Griswold Series, Mottled Subsoil Variant

The variants from the normal Griswold soils are moderately deep, dark-colored, somewhat poorly drained soils. These soils occur on uplands, mainly in the central part of the county. They are nearly level to gently sloping.

In a typical profile the surface layer is black silt loam about 12 inches thick. The subsoil is about 14 inches thick. The upper part is mildly alkaline, dark grayish-brown, friable silt loam that is mottled with light olive brown; the middle part is mildly alkaline, dark grayish-brown, firm silty clay loam that is mottled with light olive brown; and the lower part is moderately alkaline, yellowish-brown, firm clay loam that is mottled with strong brown. The underlying material is calcareous, yellowish-brown, friable sandy loam that is mottled with strong brown.

Permeability is moderately slow, and the available moisture capacity is high. The natural fertility is high. Drainage is needed for dependable crops and to increase the depth of the root zone. Tillage is easy.

Most of the acreage is used for crops. Drained areas are productive and are used mainly for corn.

Typical profile of Griswold silt loam, mottled subsoil variant, in a cultivated field, SE¼SE¼ sec. 35, T. 1 N., R. 17 E.

Ap—0 to 8 inches, black (N 2/0) silt loam; weak, fine, granular structure; friable; mildly alkaline; abrupt, smooth boundary.

A1—8 to 12 inches, black (N 2/0) silt loam; moderate, very fine, granular structure; friable; mildly alkaline; clear, smooth boundary.

B1—12 to 15 inches, dark grayish-brown (2.5Y 4/2) silt loam; strong, very fine, subangular blocky structure; friable; few, fine, faint, light olive-brown (2.5Y 5/4) mottles, very dark grayish-brown (2.5Y 3/2) organic stains; mildly alkaline; clear, smooth boundary.

B21t—15 to 19 inches, dark grayish-brown (2.5Y 4/2) silty clay loam; moderate, fine, subangular blocky structure; firm; many, coarse, faint, light olive-brown (2.5Y 5/4) mottles; clay films on all ped faces, thicker on vertical faces; mildly alkaline; clear, smooth boundary.

IIB22t—19 to 26 inches, yellowish-brown (10YR 5/4) clay loam; moderate, fine to medium, subangular blocky structure; firm; common, coarse, distinct, strong-brown (7.5YR 5/6) and brown (7.5YR 5/2) mottles; thin clay films on all ped faces; few pebbles 3 to 5 millimeters in diameter; moderately alkaline; clear, smooth boundary.

IIC—26 to 60 inches, yellowish-brown (10YR 5/4) sandy loam; massive; friable; common, coarse, distinct, strong-brown (7.5YR 5/6 and 5/8) mottles; calcareous.

The surface and subsurface layers are black or very dark brown in color and range from 8 to 14 inches in total thickness. The subsoil is medium acid to moderately alkaline. It ranges from 12 to 24 inches in thickness. The texture of the underlying material ranges from heavy loam to sandy loam.

These variants have a thinner silt layer and a thinner subsoil than Elburn soils. They are not so poorly drained as Drummer soils, and their underlying material is finer textured.

Griswold silt loam, mottled subsoil variant, 0 to 3 percent slopes (GwA).—This soil occurs in nearly level to slightly depressional areas and in natural drainageways on glacial till plains. The nearly level and depressional areas are generally irregular in shape, and many are more than 40 acres in size. The areas in drainageways are narrow and follow the drainage pattern.

Included in some of the areas mapped are areas of Pella silt loam, less than 3 acres in size; these areas occur on the slightly lower, wetter parts of the landscape. Also included are small areas of Elburn silt loam, Conover silt loam, and Plano silt loam where the lower part of the subsoil is mottled.

The depressional areas are subject to ponding after heavy rains. Wetness is caused by slow surface and internal drainage and by accumulation of runoff from adjoining areas. Management practices are needed to control runoff.

Where adequately drained, this soil is suitable for corn, small grain, grasses, and legumes. Undrained areas are better suited to pasture than to cultivated crops. This soil is not well suited to residential development. (Capability unit IIw-2; woodland group 12; recreation group 5; wildlife group 6)

Hebron Series

The Hebron series consists of deep, well drained to moderately well drained, nearly level to gently sloping soils in glacial lakebeds. These soils are mainly in the northwestern part of the county, but they occur also on the broad valley floors along the major streams in the eastern part of the county.

In a typical profile the surface layer is very dark grayish-brown loam about 7 inches thick. The subsurface layer, about 4 inches thick, is friable, brown loam. The subsoil, about 17 inches thick, is mildly alkaline. Its upper part is friable, dark-brown loam; the upper middle part is firm, dark-brown clay loam; the lower middle part is very firm, dark yellowish-brown clay loam that has a few dark-brown mottles; and the lower part is very firm, yellowish-brown heavy silty clay loam that is mottled with strong brown. The underlying material is calcareous, firm, laminated, light yellowish-brown heavy silty clay loam.

Permeability is moderate in the upper part of the profile, but it is slow in the underlying material. The available moisture capacity is moderately high. The natural fertility is moderate.

These are good farming soils, but they are not of major importance, because their acreage is limited. Most of the acreage is used for the crops commonly grown in the county. These soils are not suitable for sewage disposal filter fields, because permeability is slow in the underlying material. They are poorly suited to highway subgrade and building foundations.

Typical profile of Hebron loam in a cultivated field, 1,200 feet north of the south section line, 50 feet west of town road, SE¼SE¼ sec. 1, T. 2 N., R. 18 E.

Ap—0 to 7 inches, very dark grayish-brown (10YR 3/2) loam, light brownish gray (10YR 6/2) when dry; weak, coarse, subangular blocky structure breaking to moderate, medium, granular; friable; mildly alkaline; abrupt, smooth boundary.

A2—7 to 11 inches, brown (10YR 5/3) loam; moderate, medium, platy structure; friable; mildly alkaline; clear, smooth boundary.

B1—11 to 16 inches, dark-brown (10YR 4/3) loam; weak to moderate, medium, subangular blocky structure; friable; mildly alkaline; clear, smooth boundary.

B21t—16 to 20 inches, dark-brown (10YR 4/3) clay loam; moderate to strong, medium, subangular blocky structure; firm; thin, patchy clay films on all ped surfaces; mildly alkaline; clear, smooth boundary.

B22t—20 to 24 inches, dark yellowish-brown (10YR 4/4) clay loam; moderate to strong, fine, subangular blocky structure; very firm; few, fine, faint, dark-brown (7.5YR 4/4) mottles, prominent patchy clay films on ped faces; mildly alkaline; clear, smooth boundary.

IIB23t—24 to 28 inches, yellowish-brown (10YR 5/4) heavy silty clay loam; moderate to strong, fine, subangular blocky structure; very firm; few, large, distinct, strong-brown (7.5YR 5/6) mottles; continuous thick clay films on ped faces; gravel layer at top of this horizon; mildly alkaline; gradual, smooth boundary.

IIC—28 to 60 inches, light yellowish-brown (10YR 6/4) heavy silty clay loam; laminated; firm; calcareous.

The texture of the surface layer is generally loam, but it is sandy loam and silt loam in some places. The color of the surface and subsurface layers ranges from dark brown to very dark grayish brown. The subsoil, which ranges from 14 to 24 inches in thickness, developed in layered material; its texture ranges from silt loam to sandy loam in the upper part and from clay loam to clay in the lower part. It is slightly acid to moderately alkaline. The underlying material is layered, and its texture ranges from silt to clay.

Hebron soils are coarser textured in the upper part of the profile than Saylesville soils. They are finer textured in the lower part of the profile and in the underlying material than McHenry soils.

Hebron loam, 1 to 6 percent slopes (HeB).—This soil occurs mainly in glacial lakebeds northwest of the Kettle Moraine. It also occurs in broad valleys in other parts of the county as higher lying, circular areas within larger areas of Aztalan or Navan soils, or as narrow borders around these lower, wetter soils. The areas are generally less than 40 acres in size.

Included in some of the areas mapped are small areas of Hebron soils where the surface layer is darker colored sandy loam or silt loam. Also included are small areas of Casco and Fox soils where the underlying material is clayey or loamy. In places the included Fox soils have a dark surface layer and a mottled subsoil.

Erosion has removed 4 to 8 inches of the original surface layer from about 10 percent of the acreage. In these places, the surface layer is lighter colored than that of the adjoining uneroded soils.

The hazard of water erosion is slight. Permeability is slow in the underlying material, which results in rapid runoff during periods of heavy rain.

If well managed, Hebron soils can be cropped fairly intensively. Management practices that help to control runoff are needed. (Capability unit IIe-6; woodland group 1; recreation group 10; wildlife group 3)

Hennepin Series

The Hennepin series consists of well-drained, loamy soils on steep glacial hills and moraines throughout the county.

In a typical profile the surface layer is black loam about 3 inches thick. The subsurface layer, about 3 inches thick, is friable, dark grayish-brown loam. The subsoil, about 5 inches thick, is moderately alkaline, dark-brown, friable loam. The underlying material is calcareous, very friable, yellowish-brown gravelly sandy loam.

Permeability is moderately rapid, and the available moisture capacity is low. The natural fertility is moderately low. The coarse, calcareous underlying till restricts the roots of most crops, and roots generally do not penetrate below a depth of about 12 inches.

Hennepin soils are too shallow over the gravelly layer and too droughty to be used for farming. They are used mainly for perennial pasture or woodland.

Typical profile of Hennepin loam in a grassy opening on a wooded moraine, SW¼NE¼ sec. 18, T. 4 N., R. 16 E.

A1—0 to 3 inches, black (10YR 2/1) loam; moderate, fine, granular structure; friable; bleached sand grains; mildly alkaline; clear, wavy boundary.

A3—3 to 6 inches, dark grayish-brown (10YR 4/2) loam; moderate, fine, granular and weak, fine, subangular blocky structure; friable; mildly alkaline; clear, wavy boundary.

B—6 to 11 inches, dark-brown (10YR 4/3) loam; weak, fine, subangular blocky structure; friable; moderately alkaline; clear, wavy boundary.

C1—11 to 16 inches, brown (10YR 5/3) gravelly sandy loam; massive; very friable; calcareous; gradual, wavy boundary.

C2—16 to 60 inches, yellowish-brown (10YR 5/4) gravelly sandy loam; massive; very friable; calcareous.

In uncultivated areas, the color of the surface and subsurface layers ranges from black to very dark gray. In cultivated areas, the color of the surface layer is dark grayish brown or very dark grayish brown. The texture of the surface layer is loam in most places, but there are also areas of silt loam. The subsoil generally ranges from 5 to 15 inches in thickness. The underlying material is generally gravelly sandy loam, but it ranges from sandy loam to heavy loam.

Hennepin soils are shallower over the gravelly layer than McHenry soils, and they lack the clayey subsoil of those soils. They differ from Rodman soils in having developed in glacial till, rather than in outwash sand and gravel.

Hennepin-Miami loams, sandy loam substratum, 20 to 35 percent slopes (HfE).—This complex occurs on ridges and moraines, mainly in the northern part of the county. The larger areas are on hilly, irregular topography. The smaller areas are generally on simple slopes. In most places they are narrow and less than 20 acres in size. About 65 percent of the acreage consists of Hennepin loam, and 35 percent of Miami loam.

The Hennepin soil in this complex has the profile described as typical of the series.

The Miami soil has a dark grayish-brown surface layer, about 6 inches thick, and a brown subsurface layer. The subsoil is dark-brown light clay loam about 22 inches thick.

Included in some of the areas mapped are small areas of Casco and Rodman soils. Also included are small areas of McHenry silt loam in less sloping areas, and of Hennepin soils that have a surface layer of silt loam and sandy loam.

Most of the acreage is in woodland. These areas need protection from grazing to maintain the stands and to improve the habitat for wildlife. Grazing should be controlled to protect the sod and guard against gullying in any areas that are used for pasture. (Capability unit VIIs-5; woodland group 5; recreation group 4; wildlife group 5)

Houghton Series

The Houghton series consists of deep, very poorly drained muck and peat soils. These soils occur in depressions and on flood plains and low terraces in all parts of the county.

In a typical profile the upper 31 inches is friable, slightly acid, black muck. The underlying material is neutral, matted, dark reddish-brown, partly decomposed peat.

Permeability is moderate, and the available moisture capacity is high. The natural fertility is low. The depth of the root zone is generally limited by the water table.

Drainage is needed if these soils are used for cultivated crops. Drained areas are suited to corn or forage plants. They are also suited to special crops, such as truck crops and mint. Undrained areas are suited to perennial pasture or wildlife habitat. These soils are not suitable for building sites, highway subgrade, or recreational development.

Typical profile of Houghton muck in a cultivated field, NW¼SW¼ sec. 15, T. 3 N., R. 16 E.

1—0 to 9 inches, black (N 2/0) muck; amorphous; very friable; slightly acid; clear, smooth boundary.

2—9 to 31 inches, black (N 2/0) muck; weak, coarse, angular blocky structure; friable; slightly acid; diffuse, smooth boundary.

3—31 to 60 inches, mucky peat; dark reddish brown (5YR 3/2) when wet, dark reddish gray (5YR 4/2) when pressed; matted; wet; nonsticky; neutral.

The surface layer ranges from very friable muck to loamy muck in areas where overwash of mineral soil was mixed with the surface layer. In these places the loamy layer ranges from 7 to 15 inches in thickness. The profile ranges from muck throughout to a mucky surface layer overlying layers of fibrous peat at a depth below 18 inches. Houghton muck occurs in undisturbed areas that have not been drained for many years. The profile is generally composed of a layered, relatively undecomposed mass of plant material. These soils are slightly acid to moderately alkaline.

The organic layer is thicker in the Houghton soils than in Adrian, Palms, and Rollin soils. Houghton soils do not have the thick overwash of mineral soil material that Wallkill soils have.

Houghton muck (0 to 2 percent slopes) (Ht).—The larger areas of this soil occur in large depressions and on broad, flat valley floors of major streams. The smaller areas are in pockets in minor drainageways, where they occur with Alluvial land.

Included in some of the areas mapped are small areas of Adrian muck and Palms muck that are underlain by sandy or loamy material at a depth of less than 42 inches. These areas generally occur as thin bands around the edge of Houghton muck, where the organic soil adjoins mineral soils. Also included are small areas of Wallkill soils, where mineral soil material was deposited over Houghton muck by runoff water. The areas mapped also include small areas of peat; these areas are generally undrained and uncultivated. Areas of calcareous Houghton soils also occur, either as individual soil areas or as areas surrounded by the normal Houghton soil. If these areas of calcareous soil are cultivated and the surface is dry, they are easily identified by the dark-gray color and by numerous snail shells.

This soil is subject to ponding, and surface drainage is needed to remove the water rapidly. Both surface and tile drainage systems are suitable. If this soil is drained, however, subsidence and wind erosion are serious hazards. This soil is also subject to burning. The phosphorus and potash content is low.

Most of the larger areas of this soil are cultivated. Most of the smaller areas are in perennial pasture. (Capability unit IIIw-9; woodland group 10; recreation group 8; wildlife group 9)

Juneau Series

The Juneau series consists of deep, well drained to moderately well drained soils that occur as small areas on foot slopes and in natural waterways throughout the county. These soils formed in silty sediments deposited by runoff water.

In a typical profile the surface layer is dark grayish-brown and very dark grayish-brown silt loam to a depth of about 28 inches. The subsurface layer is very dark grayish-brown, friable silt loam about 6 inches thick. The subsoil, about 26 inches thick, is medium acid. The upper part is dark-brown, friable heavy silt loam, and the lower part is dark-brown, firm silty clay loam.

Permeability is moderate, and the available moisture capacity is moderately high. The root zone is deep. Tillage is easy.

These soils are suitable for all general farm crops and for many special crops. Crops respond well to applications of lime and fertilizer. There are no serious limitations.

Typical profile of Juneau silt loam in a cultivated field, SE¼NE¼ sec. 3, T. 3 N., R. 16 E.

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, subangular blocky structure and weak, medium, platy; friable; slightly acid; abrupt, smooth boundary.

A1—9 to 28 inches, dark grayish-brown (10YR 4/2) to very dark grayish-brown (10YR 3/2) silt loam; weak, medium, platy structure; friable; medium acid; clear, smooth boundary.

Ab—28 to 34 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, fine, subangular blocky structure and weak, thin, platy; friable; medium acid; clear, smooth boundary.

B1b—34 to 42 inches, dark-brown (10YR 4/3) heavy silt loam; weak, fine, subangular blocky structure and weak, thin, platy; friable; medium acid; gradual, smooth boundary.

B2b—42 to 60 inches, dark-brown (10YR 3/3) silty clay loam; moderate, medium, subangular blocky structure; firm; medium acid.

The color of the surface and subsurface layers ranges from very dark grayish brown to dark brown. The thickness of the sedimentary overwash ranges from 18 to 36 inches. The texture of the surface layer is silt loam. This layer is neutral to medium acid. The soil material beneath the sedimentary layer ranges from well drained to somewhat poorly drained.

Juneau soils differ from Troxel soils in having formed from light-colored material. They are lighter colored and better drained than Radford soils.

Juneau silt loam, 1 to 3 percent slopes (JuA).—This soil is in intermittent natural waterways and at the base of slopes where sediment has been deposited by runoff. The areas are generally less than 20 acres in size.

Included in some of the areas mapped are small areas of light-colored upland soils, such as those of the Miami, McHenry, Fox, and St. Charles series.

This soil is subject to occasional flooding and water erosion. Under good management, it can be cropped intensively in areas where overflow and erosion can be controlled. (Capability unit I-1; woodland group 1; recreation group 7; wildlife group 8)

Kendall Series

The Kendall series consists of deep, nearly level to gently sloping, somewhat poorly drained soils. These soils occur on uplands, mainly in the central part of the county.

In a typical profile the surface layer is very dark gray silt loam about 5 inches thick. The subsurface layer, about 4 inches thick, is dark-gray, very friable silt loam.

The subsoil is about 37 inches thick. The upper part is friable, medium acid, dark-brown silt loam that is mottled with brown and dark brown. Below this is firm to very firm, medium acid to neutral, dark-brown to dark grayish-brown silty clay loam that is mottled with strong brown to pinkish gray. This layer is underlain by friable, moderately alkaline, grayish-brown to light brownish-gray silt loam mottled with yellowish brown. The lower part is friable, moderately alkaline, brown and yellowish-brown loam mottled with strong brown.

The underlying material is calcareous, friable, brown and yellowish-brown light loam that contains many pebbles and cobblestones.

Permeability is moderately slow, and the available moisture capacity is high. These soils dry out and warm up more slowly in spring than better drained soils.

Most of the acreage is used for crops, but drainage is needed for dependable yields. If drained, these areas are productive. Corn is the principal crop.

Typical profile of Kendall silt loam in a permanent pasture, SE¼NW¼ sec. 18, T. 2 N., R. 17 E.

A1—0 to 5 inches, very dark gray (10YR 3/1) silt loam; weak, fine, subangular blocky structure; friable; neutral; clear, wavy boundary.

A2—5 to 9 inches, dark-gray (10YR 4/1) silt loam; weak, thin, platy structure; very friable; light-gray (10YR 6/1) and light brownish-gray (10YR 6/2) silt coats on plates; medium acid; abrupt, smooth boundary.

B1—9 to 12 inches, dark-brown (10YR 3/3) silt loam; weak, medium to thick, platy structure breaking to weak, fine, subangular blocky; friable; medium acid; silt coatings as in horizon above; few, fine, prominent, dark-brown (7.5YR 4/4) mottles and few, fine, distinct, brown (7.5YR 5/2) mottles; abrupt, smooth boundary.

B21t—12 to 16 inches, dark-brown (10YR 3/3) silty clay loam; weak, coarse, prismatic structure breaking to moderate, fine, subangular blocky; firm; dark grayish-brown (10YR 4/2) to dark-gray (10YR 4/1) coatings on ped surfaces; few, fine, prominent, dark-brown (7.5YR 4/4) mottles and few, fine, distinct, brown (7.5YR 5/2) mottles; clay films on all ped surfaces; medium acid; clear, smooth boundary.

B22t—16 to 23 inches, dark grayish-brown (10YR 4/2) heavy silty clay loam; weak, medium, prismatic structure breaking to fine to medium, angular blocky; very firm; few, fine, prominent, strong-brown (7.5YR 5/6 and 5/8) mottles and few, fine, distinct, pinkish-gray (7.5YR 6/2) mottles; clay films on all ped surfaces; neutral; clear, wavy boundary.

B23t—23 to 26 inches, grayish-brown (10YR 5/2) heavy silt loam; weak, medium, prismatic structure breaking to moderate, medium to thick, platy; firm; clay films on all ped surfaces; common, fine to medium, prominent, strong-brown (7.5YR 5/6 and 5/8) mottles; mildly alkaline; clear, smooth boundary.

B31—26 to 36 inches, grayish-brown (2.5Y 5/2) to light brownish-gray (2.5Y 6/2) silt loam; weak, coarse, subangular blocky structure; friable; many, medium to coarse, prominent, yellowish-brown (10YR 5/6) and 5/8) mottles; dark-colored, thick clay-flows in root cavities; some pebbles at lower horizon boundary; moderately alkaline; clear, wavy boundary.

IIB32—36 to 46 inches, brown (7.5YR 5/4) and yellowish-brown (10YR 5/4) loam; weak, coarse, subangular blocky structure; friable; many, coarse, distinct, strong-brown (7.5YR 5/6 and 5/8) mottles; horizon contains some gravel and cobblestones; moderately alkaline; gradual, smooth boundary.

IIC—46 to 60 inches, brown (10YR 5/3) and yellowish-brown (10YR 5/4) light loam; many pebbles and cobblestones; massive; friable; calcareous.

The texture of the surface layer is generally silt loam, but it is loam in some spots. The color of the surface layer ranges from very dark gray to black. The silty layer ranges from 36 to 50 inches in thickness. The subsoil, 24 to 42 inches thick, is medium acid to moderately alkaline. The underlying material ranges from sandy loam to light clay loam.

Kendall soils are wetter than St. Charles soils, and mottling occurs higher in the subsoil than in those soils. They are not so wet as Pella soils, and their subsoil is not so gray.

Kendall silt loam, 1 to 3 percent slopes (KlA).—This soil occurs on glacial till plains as nearly level to slightly depressional areas and in natural drainageways. The nearly level and depressional areas are generally irregular in shape, and many are more than 40 acres in size. The areas in drainageways are narrow and follow the drainage pattern.

Included in some of the areas mapped are small areas, less than 3 acres in size, of Pella silt loam. These areas occur on slightly lower and wetter parts of the landscape. Also included are small areas of St. Charles silt loam in higher, better drained positions.

The depressional areas are subject to ponding after heavy rains. Surface and internal drainage are slow, and runoff from adjoining soils accumulates.

Drained areas are suitable for corn, small grain, grasses, and legumes. Undrained areas are suited to pasture. (Capability unit IIw-2; woodland group 7; recreation group 5; wildlife group 6)

Knowles Series

This series consists of moderately deep, gently sloping, well-drained soils underlain by limestone bedrock. These soils occur on till plains in the northwestern part of the county.

In a typical profile the surface layer is very dark grayish-brown silt loam about 6 inches thick. The subsurface layer, about 3 inches thick, is dark grayish-brown, friable silt loam. The subsoil, about 19 inches thick, is firm to very firm silty clay loam. The upper part is slightly acid and is dark yellowish brown with light brownish-gray coatings on ped surfaces. The lower part is mildly alkaline to moderately alkaline, dark-brown gritty silty clay loam. Dolomitic limestone is at a depth of about 28 inches.

Permeability is moderate, and the available moisture capacity is moderate. The depth of the root zone is limited by bedrock.

Tillage is easy, but these soils are slightly droughty. They are generally acid, and lime is needed. These soils respond well to good management. They are suitable for all crops generally grown in the county.

Typical profile of Knowles silt loam in a cultivated field, NW¼NE¼ sec. 10, T. 4 N., R. 15 E.

Ap—0 to 6 inches, very dark grayish-brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) when dry; moderate, fine, granular structure; friable; neutral; abrupt, smooth boundary.

A2—6 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, platy structure; friable; mildly alkaline; clear, smooth boundary.

B1—9 to 14 inches, dark yellowish-brown (10YR 3/4) silty clay loam; moderate, fine, subangular blocky structure; firm; light brownish-gray (10YR 6/2) silt coatings on ped surfaces; slightly acid; gradual, smooth boundary.

B21t—14 to 22 inches, dark-brown (10YR 3/3) silty clay loam; strong, fine, subangular blocky structure; very firm; thin, continuous, very dark grayish-brown (10YR 3/2) clay films; mildly alkaline; gradual, irregular boundary.

IIB22t—22 to 28 inches, dark-brown (10YR 4/3) gritty silty clay loam from till and limestone residuum; moderate, fine, subangular blocky structure; very firm; conspicuous clay films on all ped faces; very dark brown (10YR 2/2) organic stains; moderately alkaline; abrupt, smooth boundary.

IIIR—28 to 60 inches, dolomitic limestone bedrock.

The color of the surface layer ranges from dark brown to very dark grayish brown. The subsoil is slightly acid to moderately alkaline. The depth to bedrock generally ranges from 20 to 40 inches.

Knowles soils are similar to McHenry and Dodge soils, except that the subsoil rests on limestone bedrock rather than on glacial till.

Knowles silt loam, 1 to 6 percent slopes (KwB).—This soil occurs on till plains. Most areas are less than 20 acres in size. They generally follow the slopes set by the drainage pattern.

Included in some of the areas mapped are small areas of Knowles soils where the surface layer is loam and small areas where the slope is 6 to 12 percent. Also included are small areas of Dodge, Miami, and Martinton soils.

This soil is slightly droughty, and there is a slight hazard of water erosion. It is suited to irrigation. Management practices that control runoff and conserve moisture are needed. This soil is not well suited to residential and commercial development, because bedrock interferes with excavation. Neither is it suitable for sewage disposal filter fields. (Capability unit IIe-2; woodland group 1; recreation group 1; wildlife group 1)

Knowles Series, Mottled Subsoil Variant

The variants from the normal Knowles soils are moderately deep, poorly drained, loamy soils underlain by limestone bedrock. They occur in depressions and drainageways of till plains in the vicinity of the town of Whitewater in the northwestern part of the county.

In a typical profile the surface layer is black to very dark gray silt loam about 11 inches thick. The subsoil, about 23 inches thick, is moderately alkaline. The upper part is olive-gray, friable heavy silt loam that is mottled with light olive brown and strong brown. The middle part is light brownish-gray, slightly sticky clay loam mottled with yellowish brown. The lower part is light brownish-gray loam mottled with yellowish brown. Limestone is at a depth of about 34 inches.

Permeability is moderately slow, and the available moisture capacity is high. The depth of the root zone is limited by wetness. Drainage is needed if the soils are cultivated. Undrained areas are suitable for perennial pasture. Nearly all the acreage is undrained and is used for pasture.

Typical profile of Knowles silt loam, mottled subsoil variant, in a cultivated field, SE¼SW¼ sec. 10, T. 4 N., R. 15 E.

Ap—0 to 7 inches, black (10YR 2/1) silt loam; weak, fine, subangular blocky structure breaking to moderate, medium, granular; friable; mildly alkaline; abrupt, smooth boundary.

A1—7 to 11 inches, very dark gray (5Y 3/1) heavy silt loam; weak, fine and very fine, subangular blocky structure; friable; mildly alkaline; gradual, smooth boundary.

B1—11 to 19 inches, olive-gray (5Y 5/2) heavy silt loam; weak, fine, subangular blocky structure; friable; many, medium, prominent, light olive-brown (2.5Y 5/6) and strong-brown (7.5YR 5/8) mottles; many tongues of organic staining from horizon above; moderately alkaline; clear, smooth boundary.

B21—19 to 23 inches, light brownish-gray (10YR 6/2) heavy silt loam; weak, fine, subangular blocky structure; slightly sticky when wet; many, medium, distinct, yellowish-brown (10YR 5/6 and 5/8) mottles; moderately alkaline; clear, smooth boundary.

IIB22—23 to 29 inches, light brownish-gray (10YR 6/2) light clay loam; weak, fine, angular blocky structure; slightly sticky when wet; many, medium, distinct, yellowish-brown (10YR 5/6 and 5/8) mottles; numerous pebbles 5 to 10 millimeters in diameter; moderately alkaline; clear, smooth boundary.

IIB3—29 to 34 inches, light brownish-gray (10YR 6/2) loam; weak, medium, subangular blocky structure; nonsticky when wet; many, fine, distinct, yellowish-brown (10YR 5/6 and 5/8) mottles; moderately alkaline; abrupt, smooth boundary.

IIIR—34 to 60 inches +, limestone rock.

The surface layer is black in most places and ranges from 8 to 12 inches in thickness. The subsurface layer is grayer and ranges from 3 to 5 inches in thickness. The subsoil is neutral to moderately alkaline. The depth to bedrock ranges from 20 to 40 inches.

The mottled subsoil variant of the Knowles soils is similar to Pella and Sebewa soils, but it differs in that the subsoil rests on limestone bedrock rather than on glacial till or outwash sand and gravel.

Knowles silt loam, mottled subsoil variant, 0 to 2 percent slopes (KyA).—This soil occurs in depressions and in drainageways. Areas in depressions are somewhat circular or are irregular in shape; areas in drainageways are generally narrow and follow the drainage pattern. A few areas are more than 40 acres in size, but most occupy less than 20 acres.

Included in some of the areas mapped are small areas of Knowles soils that are somewhat better drained. Also included are small areas of Aztalan, Pella, and Navan soils, and of Wet alluvial land.

This soil is subject to ponding after heavy rains. Waterways and diversions are needed to dispose of runoff.

Surface drainage is needed if this soil is used for crops. Generally, this soil does not need lime, but it is low in potash. It is slow to dry out in spring, and fieldwork must be delayed. Where bedrock is near the surface, it interferes with excavation. (Capability unit IIIw-3; woodland group 7; recreation group 5; wildlife group 6)

Lorenzo Series

The Lorenzo series consists of gently sloping to steep, dark-colored, chiefly well drained, loamy soils that are shallow over stratified sand and gravel. These soils are on stream terraces and outwash plains, mainly in the northern and eastern parts of the county.

In a typical profile the surface layer is very dark brown loam about 9 inches thick. The subsoil is about 10 inches thick and, in the upper part, consists chiefly of firm, moderately alkaline, dark-brown clay loam. The lower part is friable, mildly alkaline, dark yellowish-brown light sandy clay loam. Layers of calcareous, light yellowish-brown sand and gravel make up the underlying material.

Lorenzo soils are somewhat excessively drained in areas where the subsoil is thin and the underlying sand and gravel are near the surface. Although the soils are moderately permeable, they have moderately low to low available moisture capacity and are somewhat droughty. Above the coarse-textured underlying material, the soils are favorable for root growth.

Lorenzo soils are used mainly for crops or pasture, but plant growth is generally poor. They are a good source of sand and gravel.

Typical profile of Lorenzo loam in a cultivated field, SE¼SW¼ sec. 14, T. 3 N., R. 16 E.

Ap—0 to 9 inches, very dark brown (10YR 2/2) loam; moderate, fine, granular structure; friable; mildly alkaline; abrupt, smooth boundary.

B1—9 to 11 inches, dark-brown (10YR 3/3) light clay loam; moderate, fine, subangular blocky structure; friable; few pebbles; moderately alkaline; gradual, wavy boundary.

B21t—11 to 16 inches, dark-brown (10YR 3/3) clay loam; moderate, medium, subangular blocky structure; firm; thin, very dark grayish-brown (10YR 3/2) clay films on all ped faces; moderately alkaline; clear, wavy boundary.

B22t—16 to 19 inches, dark yellowish-brown (10YR 3/4) light sandy clay loam; weak, medium, subangular blocky structure; friable; thin, discontinuous, very dark grayish-brown (10YR 3/2) clay films on peds; mildly alkaline; clear, wavy boundary.

C—19 to 60 inches, light yellowish-brown (10YR 6/4), stratified sand and gravel; single grain; loose; calcareous.

In some places the A horizon is black, and in some areas the texture is silt loam, sandy loam, or gravelly loam. This horizon is stony in some places. The B horizon is normally clay loam to sandy clay loam, and it is neutral to moderately alkaline. The depth to the underlying sand and gravel ranges from 12 to 24 inches.

Lorenzo soils are deeper over sand and gravel than Rodman soils and contain more clay in the subsoil. They are shallower over sand and gravel than Warsaw soils.

Lorenzo loam, 2 to 6 percent slopes (LyB).—This soil occurs on stream terraces and outwash plains. The areas on stream terraces are long and narrow and lie between the flood plain and steeper Lorenzo or Rodman soils, which are in slightly higher positions. The areas on outwash plains are irregular in shape and generally less than 40 acres in size.

The surface layer is very dark brown loam about 10 inches thick. It is underlain by a dark-brown clay loam subsoil about 12 inches thick. In most places this soil is slightly deeper than the soil described in the typical profile.

Included in mapping are small areas of level or concave Warsaw soils. Also included, on knolls and ridges, are small areas of Lorenzo gravelly loam and of Rodman gravelly loam.

This soil is fairly easy to work, and nearly all the acreage is used for crops, though small fields are in perennial pasture. Surface runoff is moderate, and the hazard of water erosion is slight. In cultivated areas management is needed that controls runoff and conserves moisture. The soil responds well to irrigation, especially in periods of low rainfall. It also is well suited to residential, commercial, and recreational development. (Capability unit IIIe-4; woodland group 12; recreation group 4; wildlife group 5)

Lorenzo loam, 6 to 12 percent slopes, eroded (LyC2).—This soil occurs on stream terraces, outwash plains, and side slopes bordering drainageways. It occupies irregularly shaped areas, generally less than 40 acres in size, within larger areas of gently sloping Lorenzo and Warsaw soils.

This soil has the profile described as typical of the series. In some areas the soil has lost as much as 8 inches of its original surface layer through erosion, and in places there are rills and thin spots where the subsoil is exposed.

Included in mapping are small areas of nearly level or concave Lorenzo silt loam, Warsaw loam, and Warsaw silt loam. Also included are small areas of steeper Lorenzo gravelly loam and Rodman gravelly loam.

Nearly all the acreage is cropped, but a small part is in perennial pasture. This soil is more droughty than Lorenzo loam, 2 to 6 percent slopes, because generally it is slightly shallower than that soil and runoff is more rapid. Water erosion is a moderate hazard, and management practices that conserve moisture and control runoff are needed. The soil is well suited to residential, commercial, and recreational development. (Capability unit IVe-4; woodland group 12; recreation group 4; wildlife group 5)

Lorenzo-Rodman complex, 12 to 20 percent slopes, eroded (LzD2).—This complex consists of moderately steep, eroded Lorenzo and Rodman soils that lie on knolls, ridges, and terrace escarpments. These soils occur in such an intricate pattern that mapping them separately was impractical. They generally occupy oval or narrow areas that follow the drainage pattern, but in places they are in areas of hilly, irregular relief where slopes normally are complex and do not conform to that pattern. On about half their acreage, the soils have lost 4 to 6 inches of their original surface layer through erosion.

Nearly 70 percent of the acreage is Lorenzo loam, and 30 percent is Rodman gravelly loam. The Lorenzo soil is in concave areas and is less sloping than the Rodman soil. It has a surface layer of very dark brown loam, about 7 inches thick, and a subsoil of dark yellowish-brown clay loam about 10 inches thick. The Rodman soil is steeper and has convex slopes. Its surface layer is black gravelly loam about 6 inches thick, and its subsoil is dark-brown gravelly sandy loam about 6 inches thick.

Included in areas mapped as these soils are small areas, each less than 5 acres in size, of Warsaw loam, Warsaw silt loam, and Lorenzo silt loam. The Warsaw soils lie in hollows, on nearly level hilltops, and at the base of steeper slopes.

Almost all the acreage is in pasture or meadow, for which the soils are suitable. They also are suitable as wildlife habitat, but they are not suited to cultivated crops. Runoff is very rapid, and in tilled areas the hazard of water erosion is severe. Because the soils are droughty, highly susceptible to washing, and exposed to the hot sun on southerly slopes, their suitability for planted evergreens is limited. In some areas only a few planted seedlings survive. (Capability unit VIe-4; woodland group 12; recreation group 4; wildlife group 5)

Marsh

Marsh (0 to 2 percent slopes) (Mf) consists of mineral and organic soil materials that generally are intermingled. The larger areas occur along lakes and streams, and small areas are scattered throughout the county. Marsh has a permanently high water table and is covered with water most of the year. The natural vegetation is mostly rushes, sedges, reeds, and other water-tolerant plants.

This land type has a dark-colored surface layer that is underlain by grayish material. It is neutral to moderately alkaline. Included in mapping are small bodies of open water.

Marsh is not suited to any crops grown in the county, and in most places it cannot be drained feasibly or economically. It is suitable as wildlife habitat. (Capability unit VIIIw-15; woodland group 11; recreation group 6; wildlife group 7)

Martinton Series

This series consists of deep, somewhat poorly drained, dark-colored soils. These soils developed in water-laid silt and clay in glacial lakebeds. They are nearly level to gently sloping. The largest areas are in the northwestern part of the county, but they also occur in broad river valleys in the eastern part of the county.

In a typical profile the surface layer is very dark grayish-brown silt loam about 6 inches thick. The subsurface layer, about 4 inches thick, is very dark gray, friable, mottled silt loam. The subsoil, about 23 inches thick, is slightly acid and mottled. The upper part is friable, very dark gray and dark grayish-brown silt loam; the middle part is very firm, dark grayish-brown silty clay; and the lower part is very firm, grayish-brown silty clay. The underlying material is calcareous, friable to firm, dark grayish-brown layers of silt and clay.

Permeability is moderately slow, and the available moisture capacity is high. The root zone is favorable to a depth of about 3 feet. Tillage is easy.

Most areas of these soils are in crops. Drainage is needed in cultivated areas; crops respond to applications of lime. These soils are not well suited to highway subgrade and building foundations. They are not suitable for sewage disposal filter fields, because permeability is slow in the underlying material.

Typical profile of Martinton silt loam in a cultivated field, SE¼SW¼ sec. 9, T. 4 N., R. 15 E.

Ap—0 to 6 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, fine, subangular blocky structure; friable; moderately alkaline; abrupt, smooth boundary.

A3—6 to 10 inches, very dark gray (10YR 3/1) silt loam; weak, fine, subangular blocky structure; friable; few, fine, distinct, dark yellowish-brown (10YR 4/4) mottles; mildly alkaline; clear, smooth boundary.

B1—10 to 15 inches, very dark gray (10YR 3/1) silt loam; weak, fine, subangular blocky structure; friable; few, fine, distinct, dark yellowish-brown (10YR 4/4) mottles; neutral; clear, smooth boundary.

B21t—15 to 20 inches, dark grayish-brown (10YR 4/2) heavy silt loam; weak, medium, prismatic structure breaking to moderate, fine, subangular blocky; friable to firm; common, fine, faint, brown (7.5YR 5/2) mottles and many, fine, distinct, dark-brown and strong-brown (7.5YR 4/4 and 5/8) mottles; slightly acid; clear, smooth boundary.

B22t—20 to 29 inches, dark grayish-brown (10YR 4/2) silty clay; moderate, medium, prismatic structure breaking to strong, fine, angular blocky; very firm; common, fine, faint, brown (7.5YR 5/2) mottles and many, fine, prominent, strong-brown (7.5YR 5/6 and 5/8) mottles; dark-brown (10YR 3/3) clay films continuous on ped faces; slightly acid, gradual, smooth boundary.

B23t—29 to 33 inches, grayish-brown (10YR 5/2) silty clay; moderate, medium, prismatic structure breaking to moderate, medium, angular blocky; very firm; common, medium, distinct, yellowish-brown (10YR 5/6 and 5/8) mottles; clay films continuous on prism faces, patchy on horizontal ped faces; slightly acid; gradual, smooth boundary.

C—33 to 60 inches, dark grayish-brown (10YR 4/2) stratified silt and clay; friable to firm; thin, light brownish-gray (10YR 6/2) bands of coarse silt; calcareous.

The surface and subsurface layers range from very dark brown to very dark gray in color and from 7 to 12 inches in total thickness. The subsoil is slightly acid to mildly alkaline. It ranges from silt loam to silty clay in texture and from 16 to 30 inches in thickness. The underlying material consists of layered silt and clay. In places thin bands of coarse silt and very fine sand occur below a depth of 36 inches.

Martinton soils formed in finer textured material than Aztalan and Mundelein soils, and they have a finer textured subsoil than those soils. They differ from Elburn soils mainly in being underlain by silt and clay, rather than loam to sandy loam glacial till.

Martinton silt loam, 1 to 3 percent slopes (MgA).—This soil generally occurs between poorly drained Pella and Navan soils in lowlands and higher lying Hebron and Saylesville soils. It forms narrow, gently sloping borders of depressions. Smaller areas occur as low knolls in larger, poorly drained areas.

Included in some of the areas mapped are a few small areas of Saylesville, Aztalan, and Pella soils and a small acreage of Martinton soils where the surface layer is light colored.

This soil is subject to ponding after heavy rains. Wetness is caused by slow surface and internal drainage and by accumulation of runoff from adjoining areas. Waterways and diversions are needed to remove surface water rapidly. Tile drains help to speed internal drainage and increase the depth of the root zone.

This soil is suited to most general farm crops and to many special crops, but water management is needed for dependable yields. (Capability unit IIw-2; woodland group 7; recreation group 5; wildlife group 6)

Matherton Series

The Matherton series consists of nearly level, somewhat poorly drained soils on low terraces and outwash plains. These soils are moderately deep to sand and gravel.

In a typical profile the surface layer is very dark brown silt loam about 7 inches thick. The subsurface layer, about 4 inches thick, is grayish-brown, friable, mottled silt loam. The subsoil is about 25 inches thick. The upper part is mildly alkaline, brown, friable silt loam that is mottled with strong brown. The middle part is neutral, firm to very firm, grayish-brown and strong-brown silty clay loam; and the lower part is moderately alkaline, grayish-brown, firm sandy clay loam that is mottled with yellowish brown. The underlying material is moderately alkaline, layered, grayish-brown sand and gravel.

Permeability is moderate through the subsoil and rapid in the underlying layer. The available moisture capacity is high. The depth of the root zone is limited by wetness.

Generally, these soils do not need lime. Surface drainage is needed if cultivated crops are grown. Tile drainage is not suitable. Drained areas are suitable for corn, small grain, grasses, and legumes. Undrained areas are used for pasture or meadow.

Typical profile of Matherton silt loam in a cultivated field, NE¼NE¼ sec. 15, T. 4 N., R. 18 E.

Ap—0 to 7 inches, very dark brown (10YR 2/2) silt loam; weak, fine, granular structure; friable; mildly alkaline; abrupt, smooth boundary.

A2—7 to 11 inches, grayish-brown (10YR 5/2) silt loam; moderate, thin, platy structure; friable; many, fine, prominent, strong-brown (7.5YR 5/6 and 5/8) mottles; mildly alkaline; clear, wavy boundary.

B1—11 to 15 inches, brown (10YR 5/3) silt loam; weak, medium, prismatic structure breaking to moderate, fine, subangular blocky; friable; many, moderate, prominent, strong-brown (7.5YR 5/6 and 5/8) mottles and many, fine, faint, pinkish-gray (7.5YR 6/2) mottles; mildly alkaline; gradual, smooth boundary.

B21t—15 to 19 inches, equal parts of grayish-brown (10YR 5/2) and strong-brown (7.5YR 5/6 and 5/8) silty clay loam; moderate, medium, prismatic structure breaking to moderate, fine, subangular blocky; firm; thin clay films, patchy on ped surfaces; neutral; clear, smooth boundary.

I&IIB22t—19 to 24 inches, equal parts of grayish-brown (10YR 5/2) and strong-brown (7.5YR 5/6 and 5/8) silty clay loam; moderate, medium, prismatic structure breaking to moderate, fine, angular blocky; very firm; clay films patchy on ped surfaces and in root channels; a few pebbles smaller than 5 millimeters; neutral; clear, smooth boundary.

I&IIB23t—24 to 27 inches, equal parts of grayish-brown (10YR 5/2) and strong-brown (7.5YR 5/6 and 5/8) silty clay loam; moderate, medium, prismatic structure breaking to weak, medium, angular blocky; very firm; gray (5Y 5/1) clay films along vertical faces of prisms and in root channels; a few pebbles smaller than 5 millimeters; moderately alkaline; clear, smooth boundary.

IIB3—27 to 36 inches, grayish-brown (2.5Y 5/2) sandy clay loam; weak, coarse, prismatic structure breaking to weak, coarse, subangular blocky; firm; common, coarse, prominent, yellowish-brown (10YR 5/6 and 5/8) mottles; many weathered dolomite pebbles; moderately alkaline; gradual, smooth boundary.

IIC—36 to 60 inches, +, grayish-brown (10YR 5/2) sand and gravel; single grain; loose; laminated; contains thin layers of fine-textured material; spots of light-gray (10YR 7/2) weathered dolomite; moderately alkaline.

The surface layer ranges from very dark grayish brown to black and is 6 to 10 inches thick. The texture is generally loam or silt loam, but it is sandy loam in some areas. The subsurface layer is grayish brown in most places; it ranges from 3 to 5 inches in thickness. The subsoil is medium acid to moderately alkaline. The finer textured part ranges from silty clay loam to sandy clay loam in texture. The depth to the underlying sand and gravel ranges from 24 to 42 inches.

Matherton soils differ from Kendall soils mainly in having an underlying layer of sand and gravel outwash rather than loamy till.

Matherton silt loam, 1 to 3 percent slopes (MmA).—This soil occurs on low stream terraces, in wide valleys, and bordering depressions and lakes. The areas are irregular in shape and generally are less than 40 acres in size.

Included in some of the areas mapped are small areas where the silt layer is thicker than is normal for Matherton soils, small areas where the silt is thinner than normal, and a few acres where this soil is better drained than normal. Also included are some areas where the surface layer is loam or sandy loam.

This soil has a high water table; it is subject to ponding after heavy rains. Surface drainage is needed to dispose of surface water rapidly and to lower the water table enough to increase the depth of the root zone.

This soil is suitable for most crops, but water management is needed. It is not well suited to residential, commerical, or recreational development. (Capability unit IIw-5; woodland group 7; recreation group 5; wildlife group 6)

McHenry Series

The McHenry series consists of nearly level to moderately steep, well-drained soils on glacial till plains. These soils occur throughout the county.

In a typical profile the surface layer is very dark brown silt loam about 4 inches thick. The subsurface layer, about 4 inches thick, is dark grayish-brown to dark-brown, friable silt loam. The subsoil, about 27 inches thick, is firm. The upper part is strongly acid and very strongly acid, dark-brown silt loam and gritty silty clay loam. The lower part is very strongly acid or neutral, dark-brown clay loam. The underlying material is calcareous, dark-brown, friable gravelly sandy loam.

Permeability is moderate, and the available moisture capacity is moderate. The depth of the root zone is limited by the gravelly underlying till. The soils are easy to work.

McHenry soils are good farming soils and are well suited to crops. They are generally acid, but they respond well to applications of lime and fertilizer.

Typical profile of McHenry silt loam in a road cut, NW¼SE¼ sec. 15, T. 2 N., R. 15 E.

A1—0 to 4 inches, very dark brown (10YR 2/2) silt loam; weak, fine, granular structure; friable; medium acid; clear, wavy boundary.

A2—4 to 8 inches, dark grayish-brown to dark-brown (10YR 4/2 and 4/3) silt loam; weak, thin, platy structure; friable; medium acid; abrupt, wavy boundary.

B1—8 to 15 inches, dark-brown (7.5YR 4/4) silt loam; weak to moderately fine, subangular blocky structure; firm; strongly acid; gradual, wavy boundary.

I&IIB21—15 to 22 inches, dark-brown (7.5YR 4/4) gritty silty clay loam; moderate, fine, subangular blocky structure; firm; numerous chert pebbles; very strongly acid; clear, wavy boundary.

IIB22t—22 to 31 inches, dark-brown (7.5YR 4/4) clay loam; moderate, medium, subangular blocky structure; firm; numerous chert pebbles; continuous dark-brown (7.5YR 3/4) clay films on all ped faces; very strongly acid; clear, wavy boundary.

IIB23t—31 to 35 inches, dark-brown (7.5YR 4/4) clay loam; weak to moderate, medium, subangular blocky structure; firm; many weathered dolomite pebbles; continuous dark-brown (7.5YR 3/4) clay films on all ped faces; neutral; gradual, wavy boundary.

IIC—35 to 60 inches, dark-brown (10YR 4/3) gravelly sandy loam till; massive; friable; calcareous.

The A horizon is silt loam. It ranges from very dark grayish brown to dark grayish brown in color. In the southern part of the county, some of the areas are very dark brown. The subsurface layer is grayish brown to dark brown; it ranges from 3 to 6 inches in thickness. The subsoil is strongly acid to mildly alkaline. It ranges from 18 to 30 inches in thickness. The silty layer is generally 15 to 24 inches thick. The underlying material is generally sandy loam, but it ranges from gravelly loamy sand to sandy loam that contains many cobblestones.

McHenry soils have a thinner silt cap than Dodge soils, and more of their B horizon developed in the underlying glacial till. They differ from Miami soils mainly in having coarser textured underlying till.

McHenry silt loam, 2 to 6 percent slopes (MpB).— This soil occurs on till plains, mainly in the north-central part of the county. It occurs with the well-drained Dodge and St. Charles soils and the wetter Kendall soils. The areas are irregular in shape. Some of them follow the slopes set by the drainage pattern. Most areas are more than 40 acres in size. The larger part of the acreage consists of areas more than 80 acres in size.

This soil has the profile described as typical of the series.

Included in some of the areas mapped are small areas that lack the coarse-textured underlying material. In most areas the surface layer is silt loam, but there are tracts of loam and sandy loam also. In addition, a small acreage of McHenry soils on 0 to 2 percent slopes was mapped with this soil.

The hazard of water erosion is slight. Tillage is easy.

If well managed, this soil can be cropped fairly intensively. It is suited to all the crops generally grown and to many special crops. It is also suitable for residential and industrial development. There are no serious limitations. (Capability unit IIe-1; woodland group 1; recreation group 1; wildlife group 1)

McHenry silt loam, 2 to 6 percent slopes, eroded (MpB2).—This soil is on till plains. It occurs with Dodge and Miami soils and the lower lying St. Charles and Kendall soils. The areas are irregular in shape and generally follow the slopes set by the drainage pattern. Most areas are less than 40 acres in size.

The surface layer of this soil is lighter colored than that of the soil described as typical of the series. It consists of dark grayish-brown silt loam about 7 inches thick. The subsurface layer has been mixed with the surface layer. The subsoil, about 24 inches thick, is dark-brown clay loam. Erosion has removed 4 to 8 inches of the original surface layer from about half of the acreage, and in these places the surface layer is lighter colored than in uneroded areas and is less friable.

Included in some of the areas mapped are small areas, less than 3 acres in size, of St. Charles and Kendall soils. Also included are small areas of Dodge and Miami soils.

The hazard of water erosion is slight. Management practices that include control of runoff are beneficial. Tillage is easy.

If well managed, this soil can be cropped fairly intensively. It is suitable for residential and industrial development. (Capability unit IIe-1; woodland group 1; recreation group 1; wildlife group 1)

McHenry silt loam, 6 to 12 percent slopes (MpC).—This soil occurs on sloping areas of till plains, mainly in the central part of the county. It occurs with well-drained Dodge and Miami soils. The areas are irregular in shape and follow no general pattern, or they are narrow and follow the slopes set by the drainage pattern. Most areas are less than 60 acres in size.

The surface layer is dark grayish-brown silt loam about 8 inches thick. The subsurface layer has been mixed with the surface layer. The subsoil, about 24 inches thick, is dark-brown silty clay loam grading to clay loam in the lower part.

Included in some of the areas mapped are small areas of St. Charles, Kendall, and Conover soils on the more gently sloping, lower lying positions on the landscape. Also included are small areas of Dodge and Miami soils.

Most of the acreage is in woodland. Some areas are used for perennial pasture. This soil is productive, but there is a moderate erosion hazard. Woodlands that are protected from grazing yield better returns and also provide better food and cover for wildlife. (Capability unit IIIe-1; woodland group 1; recreation group 1; wildlife group 1)

McHenry silt loam, 6 to 12 percent slopes, eroded (MpC2).—This soil occurs on sloping till plains. It occurs with well-drained Dodge and Miami soils. The areas are generally long and narrow and follow the slopes set by the drainage pattern. Many form the side slopes of drainageways. Most of them are less than 60 acres in size.

The surface layer is dark-brown silt loam about 7 inches thick. The subsurface layer has been mixed with the surface layer. The subsoil, about 24 inches thick, is dark-brown silty clay loam, grading to yellowish-brown sandy clay loam in the lower part. Generally, the surface layer is thinner, lighter colored, and less friable than that of uneroded soils because material from the subsoil has been mixed with the surface layer through tillage.

Included in some of the areas mapped are small areas that lack the coarse-textured underlying material. In these areas the surface layer is generally silt loam, but in places it is loam.

The hazard of erosion is moderate. Careful management is needed to control further erosion and to maintain soil structure. Management practices that include control of runoff, return of organic matter, and maintenance of fertility are needed. (Capability unit IIIe–1; woodland group 1; recreation group 1; wildlife group 1)

Metea Series

The Metea series consists of nearly level to gently sloping, well-drained to somewhat excessively drained sandy soils in the north-central and northeastern parts of the county. These soils developed from sandy glacial drift and the underlying loamy till.

In a typical profile the surface layer is dark grayish-brown loamy fine sand about 9 inches thick. The subsurface layer, about 2 inches thick, is dark grayish-brown, very friable loamy fine sand. The subsoil is about 49 inches thick. The upper part is slightly acid, dark-brown, friable loamy fine sand; the middle part is neutral, dark-brown, firm sandy clay loam and clay loam; and the lower part is strongly acid, dark-brown and brown, friable silt loam. The underlying material is slightly acid, brown, friable silt loam that grades to sandy loam as depth increases.

Permeability is rapid in the sandy upper layer and moderate in the lower part of the subsoil and underlying material. The available moisture capacity is moderately low to low in the upper part of the soil, but it is moderately high in the lower part of the subsoil and substratum. The natural fertility is moderately low, and lime is needed. The hazard of wind erosion is severe.

These soils are used mainly for crops and pasture. Some fields have been taken out of cultivation and are kept in permanent vegetation. In recent years some of the areas have been planted to coniferous trees. Deep-rooted plants are better suited to these soils than shallow-rooted crops because they can reach the moisture in the lower part of the subsoil and in the substratum.

Typical profile of Metea loamy fine sand in a cultivated field, SE¼SW¼ sec. 6, T. 4 N., R. 18 E.

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) loamy fine sand; weak, fine, subangular blocky structure; very friable; slightly acid; abrupt, smooth boundary.

A2—9 to 11 inches, dark grayish-brown (10YR 4/2) loamy fine sand; weak, thick, platy structure; very friable; slightly acid; abrupt, wavy boundary.

B11—11 to 22 inches, dark-brown (10YR 4/3) loamy fine sand; weak, coarse, subangular blocky structure; very friable; slightly cemented when dry; few well-rounded pebbles as much as 60 millimeters in size; slightly acid; clear, smooth boundary.

B12t—22 to 25 inches, dark-brown (7.5YR 4/4) sandy loam; weak, coarse, subangular blocky structure; friable when moist, slightly hard when dry; few dark reddish-brown (5YR 3/3 and 3/4) clay flows within the weakly formed peds; few spots of iron and manganese; slightly acid; clear, smooth boundary.

IIB21t—25 to 28 inches, dark-brown (7.5YR 4/4) light sandy clay loam; moderate, fine and medium, subangular blocky structure; firm; thin, dark-brown (10YR 3/3) clay films on all ped surfaces; many iron and manganese discolorations; neutral; clear, smooth boundary.

IIB22t—28 to 34 inches, dark-brown (7.5YR 4/4) clay loam; moderate, fine, subangular blocky structure; firm; thick, dark-brown (10YR 3/3) clay films on all ped surfaces; many iron and manganese discolorations; neutral; clear, smooth boundary.

IIB31t—34 to 50 inches, dark-brown (10YR 4/3) heavy silt loam; moderate, medium, subangular and angular blocky structure; friable to firm; dark-brown (10YR 3/3) clay films that are thick on vertical ped surfaces but thin on horizontal surfaces; many iron and manganese discolorations; few pebbles 15 to 25 millimeters in diameter; strongly acid; clear, smooth boundary.

IIB32t—50 to 60 inches, brown (10YR 5/3) silt loam; weak, medium, subangular blocky structure; friable; few, very thin, dark-brown (10YR 4/3) clay films on ped surfaces; few pebbles 15 to 25 millimeters in diameter; strongly acid; gradual, smooth boundary.

IIC—60 to 66 inches, brown (10YR 5/3) silt loam; massive; friable; few pebbles 15 to 25 millimeters in diameter; slightly acid.

The surface and subsurface layers range from dark grayish brown to dark brown or brown in color and from 8 to 14 inches in total thickness. Some areas are very dark grayish brown. The texture is generally loamy fine sand, but it ranges from fine sand to fine sandy loam. The sandy upper part of the subsoil is 18 to 33 inches thick. The subsoil ranges from loamy fine sand to sandy loam in the upper part and from sandy clay loam to clay loam or silty clay loam in the lower part. It is neutral to strongly acid.

Metea soils have a coarser textured, thicker sandy upper layer than the sandy loams of the Fox series, and they lack the underlying layer of sand and gravel of those soils. They are finer textured in the lower part of the subsoil and underlying material than Boyer soils.

Metea loamy fine sand, 0 to 2 percent slopes (MuA).—This soil occurs on rolling outwash plains with Casco, Fox, and Boyer soils. The areas are generally irregular in shape and less than 80 acres in size.

This soil has the profile described as typical of the series.

Included in some of the areas mapped are small areas of Casco, Fox, and Boyer soils. Also included are a few acres of Metea soils that have a dark-colored surface layer.

This soil is suited to corn, soybeans, small grain, grasses, and legumes. Deep-rooted plants withstand extended dry periods better than shallow-rooted plants. Practices that control wind erosion and conserve moisture are needed in cultivated areas. If the soil is irrigated and well managed, row crops can be grown year after year. Grazing should be carefully controlled to protect the sod in areas used for perennial pasture.

This soil is also suitable for woodland and wildlife habitat. (Capability unit IIIs–4; woodland group 4; recreation group 3; wildlife group 4)

Metea loamy fine sand, 2 to 6 percent slopes (MuB).—This soil occurs on undulating outwash plains with Boyer, Casco, and Fox soils. The areas are generally irregular in shape and less than 100 acres in size. Some areas are gently undulating, and in the hollows the texture of their surface layer is sandy loam.

The surface layer, about 9 inches thick, is dark grayish-brown loamy fine sand. The subsurface layer is about 3 inches thick. The upper part of the subsoil is dark-brown loamy fine sand about 18 inches thick, and the lower part is dark-brown clay loam about 28 inches thick.

Included in some of the areas mapped are small areas of Casco, Fox, and Boyer soils. Also included are a few acres of Metea soils that have a dark-colored surface layer.

This soil is suited to corn, soybeans, small grain, grasses, and legumes. It is also suited to perennial pasture. Management practices that control wind and water erosion are needed in cultivated areas. Practices that conserve moisture and maintain organic-matter content are also beneficial. This soil is suitable for irrigation. Grazing should be carefully controlled to protect the sod in areas used for perennial pasture.

This soil is also suitable for woodland and wildlife habitat. (Capability unit IIIs-4; woodland group 4; recreation group 3; wildlife group 4)

Miami Series

The Miami series consists of nearly level to steep, well-drained soils. These soils occur on glacial till plains throughout the county.

In a typical profile the surface layer is dark grayish-brown silt loam about 8 inches thick. The subsurface layer, about 2 inches thick, is dark-gray, friable silt loam. The subsoil is about 20 inches thick. The upper part is slightly acid, dark-brown, friable light silty clay loam; the middle part is slightly acid, dark-brown, firm silty clay loam; and the lower part is slightly acid and mildly alkaline, dark yellowish-brown, firm clay loam. The underlying material is calcareous, yellowish-brown, friable loam.

Permeability is moderate, and the available moisture capacity is moderately high. The depth of the root zone extends to more than 3 feet. Tillage is easy.

Miami soils are suitable for all general farm crops and for many special crops. Crops respond well to applications of lime and fertilizer.

Typical profile of Miami silt loam in a cultivated field, NW¼NE¼ sec. 6, T. 1 N., R. 16 E.

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

A2—8 to 10 inches, dark-gray (10YR 4/1) silt loam; moderate, thin, platy structure; friable; neutral; clear, wavy boundary.

B1—10 to 14 inches, dark-brown (10YR 4/3) light silty clay loam; weak, thick, platy structure breaking to moderate, fine, subangular blocky; friable; slightly acid; clear, wavy boundary.

I&IIB21t—14 to 19 inches, dark-brown (10YR 4/3) gritty silty clay loam; moderate to strong, fine, subangular blocky structure; slightly hard when dry, slightly plastic when wet; thin, dark yellowish-brown (10YR 3/4) clay films on ped faces, light-gray (10YR 7/1) silt coats on peds; slightly acid; gradual, wavy boundary.

IIB22t—19 to 23 inches, dark yellowish-brown (10YR 4/4) clay loam; moderate, medium to fine, subangular blocky structure; hard when dry, plastic when wet; very dark grayish-brown (7.5YR 3/2) clay films on all ped faces; slightly acid; clear, wavy boundary.

IIB23t—23 to 30 inches, dark yellowish-brown (10YR 4/4) heavy clay loam; moderate, medium, subangular blocky structure; hard when dry, plastic when wet; very dark grayish-brown (7.5YR 3/2) clay films on all ped faces: mildly alkaline; clear, wavy boundary.

IIC—30 to 60 inches, yellowish-brown (10YR 5/4) loam; massive; friable; calcareous.

The texture of the surface layer is loam or silt loam. This layer together with the subsurface layer ranges from 8 to 12 inches in total thickness. The color of the surface layer generally ranges from dark gray to dark grayish brown or very dark grayish brown, but in the southern part of the county some of the areas are very dark brown. In most places the subsurface layer is grayer in color than the surface layer. The subsoil, 12 to 30 inches thick, is neutral to strongly acid. Its texture ranges from silty clay loam to clay loam. The depth to the IIC horizon of till ranges from 24 to 42 inches. The till is generally a loam, but it ranges from light loam to light clay loam. Gravel makes up less than 15 percent of the till. The color ranges from yellowish brown to reddish brown.

Miami soils have finer textured, less gravelly underlying material than McHenry soils. They have a thinner silt cap than Dodge soils, and most of their subsoil developed in till.

Miami sandy loam, sandy loam substratum, 2 to 6 percent slopes (MvB).—This soil occurs on till plains in the northwestern corner of the county. It also occurs with soils of outwash plains, such as Casco and Fox soils, in the north-central part of the county. The areas are irregular in shape, and a few areas are more than 40 acres in size.

The surface layer, about 7 inches thick, is dark grayish-brown sandy loam. The subsurface layer is brown and is about 3 inches thick. The subsoil, about 20 inches thick, is dark-brown light sandy clay loam.

Included in some of the areas mapped are small areas of Casco and Fox soils. Also included are small areas of Miami loam and a small acreage of Miami sandy loam that is mottled in the lower part of the subsoil.

This soil is droughty. The hazard of wind and water erosion is slight.

This soil is suitable for corn, soybeans, small grain, grasses, and legumes. It is also suitable for pasture, woodland, and wildlife habitat. Management practices that conserve moisture and control wind and water erosion are needed. (Capability unit IIIe-4; woodland group 3; recreation group 2; wildlife group 1)

Miami loam, 6 to 12 percent slopes, eroded (MwC2).—This soil occurs on till plains with Dodge and McHenry soils. The areas are long and narrow and follow the slopes set by the drainage pattern. Many areas form the side slopes of drainageways. Most areas are less than 60 acres in size.

The surface layer, about 7 inches thick, is dark grayish-brown or dark-brown loam. The subsurface layer is about 3 inches thick. The subsoil, about 22 inches thick, is dark-brown clay loam, grading to reddish-brown clay loam in the lower part. The surface layer generally is thinner and lighter colored than that in the profile described as typical of the series. About two-thirds of the acreage has lost 4 to 8 inches of the original surface layer through erosion.

Included in some of the areas mapped are small areas of Miami silt loam, as well as areas of Miami loam and silt loam where the subsoil is 2 to 6 inches thinner than normal. Also included are small areas of Dodge and Miami soils that are underlain by clay loam till.

The hazard of erosion is moderate. Careful management is needed to control erosion and to maintain soil structure.

This soil is suited to all general farm crops and to many special crops. Management practices are needed that include control of runoff, return of organic matter to the soil, and maintenance of fertility. (Capability unit IIIe–1; woodland group 1; recreation group 2; wildlife group 1)

Miami loam, 12 to 20 percent slopes, eroded (MwD2).—This soil occurs on moraines and side slopes of deep drainageways. The areas are generally long and conform to the slopes. Many are more than 40 acres in size. This soil is extensive in the vicinity of Lake Como and Lake Geneva.

The surface layer, about 7 inches thick, is dark grayish-brown or dark-brown loam. Most of the subsurface layer has been mixed with the surface layer. The subsoil, about 26 inches thick, is dark reddish-brown clay loam. About one-third of the acreage has lost 4 to 8 inches of the original surface layer through erosion. The surface layer in eroded areas is lighter colored than in uneroded areas and is less friable.

Included in some of the areas mapped is a small acreage of Miami soils where the slope is 20 to 30 percent. Also included are small areas of McHenry and Miami silt loam, as well as areas of Miami soils where the subsoil is 4 to 12 inches thinner than normal.

Runoff is very rapid, and the hazard of erosion is severe.

This soil is not suited to row crops, unless erosion control practices are applied. It is better suited to close-growing crops, such as small grain and forage plants. Organic matter should be returned to the soil. (Capability unit IVe–1; woodland group 1; recreation group 2; wildlife group 1)

Miami loam, sandy loam substratum, 2 to 6 percent slopes (MxB).—This soil is on till plains. It occurs with McHenry and Dodge soils and lower lying St. Charles and Kendall soils. The areas are irregular in shape and generally follow the slopes set by the drainage pattern. Most areas are less than 40 acres in size.

The surface layer, about 8 inches thick, is dark grayish-brown loam. The subsurface layer, about 3 inches thick, is grayish-brown loam. The subsoil, about 28 inches thick, is dark-brown clay loam, grading to sandy clay loam in the lower part. About half of the acreage has lost 4 to 8 inches of the original surface layer through erosion. The surface layer in eroded areas is lighter colored and is not so friable as the surface layer in uneroded areas.

Included in some of the areas mapped is a small acreage of these soils where the subsoil is 4 to 12 inches thinner than normal. Also included are small areas of these soils where the lower part of the subsoil is mottled. Other inclusions are small areas, less than 3 acres in size, of St. Charles and Kendall soils. Also included are small areas of Dodge and McHenry soils and small areas of Miami soils that are slightly mottled in the lower part of the subsoil.

This soil can be cropped fairly intensively if well managed. It is easily worked. There is a slight hazard of water erosion. Management practices that include control of runoff are beneficial. (Capability unit IIe–1; woodland group 1; recreation group 2; wildlife group 1)

Miami loam, sandy loam substratum, 6 to 12 percent slopes, eroded (MxC2).—This soil occurs on till plains with well-drained Dodge and McHenry soils. The areas are generally long and narrow and follow the slopes set by the drainage pattern. Many areas form side slopes of drainageways. Most are less than 60 acres in size.

The surface layer, about 6 inches thick, is dark-brown loam. The subsurface layer, about 3 inches thick is grayish brown. The subsoil, about 26 inches thick, is dark-brown clay loam, grading to sandy clay loam in the lower part.

About three-fourths of the acreage has lost 4 to 8 inches of the original surface layer through erosion. The surface layer in uneroded areas is darker colored than the surface layer in eroded areas. In places the subsoil is exposed.

Included in some of the areas mapped is a small acreage of these soils where the subsoil is 4 to 12 inches thinner than normal. Also included are a few acres where the surface layer is sandy loam, as well as a few acres where the subsoil is mottled in the lower part.

This soil is suited to the crops commonly grown in the county. There is a moderate erosion hazard, and careful management is needed to control further erosion and to maintain soil structure. Management practices that include control of runoff, return of organic matter, and maintenance of fertility are needed. (Capability unit IIIe–1; woodland group 1; recreation group 2; wildlife group 1)

Miami loam, sandy loam substratum, 12 to 20 percent slopes, eroded (MxD2).—This soil occurs on moraines and the side slopes of drainageways. The areas are generally long and narrow. Most are less than 40 acres in size.

The surface layer, about 6 inches thick, is dark-brown loam. Most of the subsurface layer has been mixed with the surface layer. The subsoil, about 24 inches thick, is dark-brown clay loam grading to sandy loam in the lower part. About one-third of the acreage has lost 4 to 8 inches of the original surface layer through erosion. The surface layer in uneroded areas is darker colored than the surface layer in eroded areas.

Included in some of the areas mapped are small areas that are underlain by finer textured material; these areas have a surface layer of silt loam, loam, or sandy loam. Also included are small, severely eroded areas and a small acreage of Hennepin soils.

Runoff is very rapid, and the hazard of erosion is severe.

This soil is not suited to row crops, unless erosion control practices are followed. It is better suited to close-growing crops, such as small grain and forage plants. (Capability unit IVe–1; woodland group 1; recreation group 2; wildlife group 1)

Miami loam, sandy loam substratum, 20 to 35 percent slopes, eroded (MxE2).—This soil occurs mainly on steep moraines. The areas are generally long and narrow, and most are less than 60 acres in size. About 15 percent of the acreage is severely eroded.

The surface layer is loam or silt loam about 7 inches thick. It is very dark brown in the upper part and dark brown in the lower part. Most of the subsurface layer has been mixed with the surface layer. The subsoil, about 18 inches thick, is dark-brown clay loam grading to sandy clay loam in the lower part.

Included in some of the areas mapped are small areas that are underlain by finer textured material. The surface layer of the included areas is silt loam and sandy loam. Also included are areas of Miami soils where the subsoil is 4 to 12 inches thinner than normal.

Runoff is very rapid, and the hazard of erosion is very severe.

This soil is not suited to cultivated crops, but it can be used for perennial pasture, woodland, or wildlife habitat. Most of the acreage is in woodland or pasture. Grazing should be controlled in order to maintain a good sod and to prevent gullying. Machine planting of trees is hazardous because of the steep slopes. (Capability unit VIe–1; woodland group 1; recreation group 2; wildlife group 1)

Miami silt loam, 0 to 2 percent slopes (MyA).—This soil occurs on till plains, mainly in the south-central and southwestern parts of the county. The largest areas are between Lake Geneva and Delavan Lake. The areas are irregular in shape, and most are more than 80 acres in size.

The surface layer, about 8 inches thick, is dark grayish-brown silt loam. The subsurface layer, about 4 inches thick, is grayish brown. The subsoil, about 24 inches thick, is dark-brown silty clay loam grading to dark yellowish-brown clay loam in the lower part. Generally, this soil has a thicker subsoil than the soil described as typical of the series.

Included in some of the areas mapped are small areas, less than 3 acres in size, of St. Charles and Kendall soils. Also included are small areas of Dodge soils and Juneau soils in small depressions. In addition, there are a few acres of Miami soils where the lower part of the subsoil is mottled.

If well managed, this soil can be cropped intensively. It has no serious limitations. Tillage is easy. The main consideration in management is to maintain fertility and organic-matter content and to preserve soil structure. (Capability unit I–1; woodland group 1; recreation group 1; wildlife group 1)

Miami silt loam, 2 to 6 percent slopes (MyB).—This soil occurs on till plains, mainly in the south-central part of the county. It occurs with Dodge, St. Charles, and Kendall soils. The areas are irregular in shape. Some areas follow the slopes set by the drainage pattern. Most areas are more than 40 acres in size. Areas more than 80 acres in size make up most of the acreage.

This soil has the profile described as typical of the series.

Included in some of the areas mapped are small areas of Miami loam and small areas of Miami silt loam where the subsoil is 4 to 12 inches thinner than normal. Also included is a small acreage of Miami silt loam where the lower part of the subsoil is mottled. About 14 percent of the acreage has lost 4 to 6 inches of the original surface layer through erosion.

The hazard of water erosion is slight.

If well managed, this soil can be cropped fairly intensively. It is easily worked, and there are no serious limitations. It is suited to all general farm crops and to many special crops. (Capability unit IIe–1; woodland group 1; recreation group 1; wildlife group 1)

Miami silt loam, 6 to 12 percent slopes (MyC).—This soil consists mainly of a sloping, loamy soil that is underlain by loamy glacial till. It is slightly shallower to the underlying glacial till than a representative soil of the series. The depth to the underlying till is about 25 inches.

Included in some of the areas mapped are small areas of Miami loam and areas where the subsoil is mottled.

The hazard of erosion is moderate. (Capability unit IIIe–1; woodland group 1; recreation group 1; wildlife group 1)

Miami silt loam, 6 to 12 percent slopes, eroded (MyC2).—This soil consists mainly of a sloping, loamy soil that has lost most of its dark-colored surface layer through erosion. It is slightly shallower to the underlying loamy glacial till than a representative soil of the series.

Included in some of the areas mapped are small areas of Miami loam; Miami loam, sandy substratum; and slightly eroded areas.

The hazard of erosion is moderate. (Capability unit IIIe–1; woodland group 1; recreation group 2; wildlife group 1)

Mundelein Series

The Mundelein series consists of deep, nearly level, somewhat poorly drained, dark-colored soils that developed in medium-textured water-laid material. These soils occur mainly on glacial lakebeds in the northwestern part of the county, but also in broad valleys in other parts of the county.

In a typical profile the surface layer is very dark grayish-brown and very dark gray silt loam about 9 inches thick. The subsurface layer, about 2 inches thick, is dark-brown, friable, mottled silt loam. The subsoil, about 16 inches thick, is mottled. The upper part is mildly alkaline, dark-brown, firm light silty clay loam; the middle part is mildly alkaline, dark-brown, friable heavy silt loam; and the lower part consists of moderately alkaline, pale-brown and very pale brown very fine sandy loam. The underlying material is calcareous, mottled, dark grayish-brown and pale-brown layers of friable silt and very fine sand.

Permeability is moderately slow, and the available moisture capacity is high. Wetness is caused by slow surface and internal drainage and by a seasonally high water table. Surface drainage is needed if cultivated crops are grown. If the soils are drained, roots can penetrate to a depth of more than 30 inches. Tile drainage is not suitable.

Most of the acreage is used for crops. Undrained areas are better suited to meadow or pasture. These soils are not suitable for residential, commercial, or recreational development.

Typical profile of Mundelein silt loam in a cultivated field, SW¼NE¼ sec. 13, T. 4 N., R. 15 E.

Ap—0 to 7 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, fine, subangular blocky structure; friable; moderately alkaline; abrupt, smooth boundary.

A1—7 to 9 inches, very dark gray (10YR 3/1) silt loam, weak, fine, subangular blocky structure; friable; mildly alkaline; abrupt, smooth boundary.

A3—9 to 11 inches, dark-brown (10YR 3/3, rubbed) silt loam; weak to moderate, fine, subangular blocky structure; friable; very dark grayish-brown (10YR 3/2) coats on peds; common, fine, distinct, yellowish-brown (10YR 5/6) mottles; mildly alkaline; clear, smooth boundary.

B21t—11 to 15 inches, dark-brown (10YR 4/3, rubbed) light silty clay loam; weak, medium, prismatic structure breaking to moderate, fine, subangular blocky; firm; dark-brown (10YR 3/3), thin clay films on all ped faces; many, fine, distinct, strong-brown (7.5YR 5/6 and 5/8) mottles and common, fine, distinct, brown (7.5YR 5/2) mottles; mildly alkaline; clear, smooth boundary.

B22t—15 to 22 inches, dark-brown (10YR 4/3) heavy silt loam; lenses of silt; weak, medium, prismatic structure breaking to weak, fine, subangular blocky; friable; dark-brown (10YR 3/3), patchy clay films on all ped faces; many, fine to medium, distinct, yellowish-brown (10YR 5/6 and 5/8) and grayish-brown (10YR 5/2) mottles; mildly alkaline; clear, smooth boundary.

B3—22 to 27 inches, pale-brown (10YR 6/3) and very pale brown (10YR 7/3) very fine sandy loam; weak, fine, subangular blocky structure; friable; common, fine, prominent, reddish-yellow (7.5YR 6/8) mottles and common, fine, faint, grayish-brown (10YR 5/2) mottles; very dark grayish-brown (10YR 3/2) and very dark brown (10YR 2/2) coats on some vertical faces; moderately alkaline; gradual smooth boundary.

C—27 to 60 inches, dark grayish-brown (10YR 4/2) and pale-brown (10YR 6/3) laminated silt and very fine sand; friable; common, fine, prominent, reddish-yellow (5YR 6/8) mottles and common, fine, faint, grayish-brown (10YR 5/2) mottles; calcareous.

The surface layer ranges from very dark grayish brown to black in color and from 6 to 10 inches in thickness. The texture is generally silt loam, but there are also small areas of loam and fine sandy loam. The subsurface layer ranges from dark brown to very dark gray in color and from 3 to 5 inches in thickness. The subsoil, 16 to 24 inches thick, is slightly acid to mildly alkaline. Its texture ranges from heavy silt loam to sandy clay loam and fine sandy loam. The underlying material is mainly layered silt and fine sand. Some spots have thin layers of clay.

Mundelein soils have a coarser textured lower subsoil than Aztalan soils. They have finer textured underlying material than Matherton soils.

Mundelein silt loam, 1 to 3 percent slopes (MzfA).—The larger areas of this soil occur on glacial lakebeds northwest of the Kettle Moraine. They are irregular in shape, and many are more than 40 acres in size. Smaller areas occur in broad valleys in other parts of the county; in these places the areas are generally long and follow the drainage pattern.

Included in some of the areas mapped are areas that have a coarser textured subsoil than is normal. Also included are small areas of Pella, Navan, and Colwood soils.

This soil is subject to ponding after heavy rains. It is slow to dry out and to warm up in spring; nitrogen is needed as a starter fertilizer for rapid early growth of crops. Most of the acreage is used for general farming. (Capability unit IIIw-3; woodland group 7; recreation group 5; wildlife group 6)

Navan Series

The Navan series consists of deep, poorly drained soils formed in material deposited in glacial lakes. These soils occur mainly in the northwestern part of the county, but also on broad valley floors of major streams in other parts of the county.

In a typical profile the surface layer is black silt loam about 7 inches thick. The subsurface layer, about 6 inches thick, is very dark gray and dark grayish-brown, friable sandy clay loam. The subsoil, about 18 inches thick, is moderately alkaline and is mottled. The upper part is olive-gray, friable sandy clay loam; the middle part is grayish-brown, firm clay loam; and the lower part is grayish-brown, firm silty clay. The underlying material is calcareous, yellowish-brown, firm silty clay loam that has grayish-brown and light brownish-gray mottles.

Permeability is slow, and the available moisture capacity is high. The depth of the root zone is limited by wetness. These soils are subject to ponding, and water management is needed.

Most of the acreage has been drained and is used for general farm crops. Undrained areas are used for perennial pasture.

Typical profile of Navan silt loam in a cultivated field, NW¼SE¼ sec. 1, T. 4 N., R. 15 E.

Ap—0 to 7 inches, black (N 2/0) silt loam; weak, medium, subangular blocky structure; friable; moderately alkaline; clear, smooth boundary.

A1—7 to 13 inches, equal parts of very dark gray (N 3/0) and dark grayish-brown (2.5Y 4/2) sandy clay loam; weak, fine, subangular blocky structure breaking to weak, fine, granular; friable; moderately alkaline; gradual, wavy boundary.

B1g—13 to 19 inches, olive-gray (5Y 5/2) sandy clay loam; weak, fine, subangular blocky structure; friable; common, coarse, distinct, very dark gray (N 3/0) and light olive-brown (2.5Y 5/6) mottles; moderately alkaline; abrupt, wavy boundary.

B21tg—19 to 25 inches, grayish-brown (2.5Y 5/2) clay loam; weak, fine, subangular blocky structure; firm; thin, continuous clay films on all ped surfaces; common, medium, distinct, olive-brown (2.5Y 4/4) and yellowish-brown (10YR 5/8) mottles; moderately alkaline; abrupt, wavy boundary.

IIB22tg—25 to 31 inches, grayish-brown (10YR 5/2) silty clay; weak, medium, platy structure breaking to weak, very fine, subangular blocky; firm; thin, continuous clay films on all ped surfaces; common, medium, distinct, brownish-yellow (10YR 6/8) and yellowish-brown (10YR 5/8) mottles; moderately alkaline; abrupt, wavy boundary.

IIC—31 to 60 inches, yellowish-brown (10YR 5/6) silty clay loam; strong, medium, angular blocky structure; firm; common, medium, distinct, grayish-brown (10YR 5/2) and light brownish-gray (10YR 6/2) mottles; calcareous.

Navan soils have very dark gray, black, or very dark brown surface and subsurface layers 7 to 14 inches in total thickness. The texture is mainly silt loam, but it is loam in places. The subsoil is slightly acid to moderately alkaline and ranges from 12 to 30 inches in thickness. The texture of the subsoil ranges from silty clay to clay loam or sandy clay loam.

Navan soils developed in finer textured material than Colwood or Pella soils. They differ from Drummer soils in being underlain by layered silt and clay rather than sand and gravel.

Navan silt loam (0 to 2 percent slopes) (Na).—The largest acreage of this soil occurs on glacial lakebeds northwest of the Kettle Moraine. Less extensive areas are in broad valleys of Honey Creek and the White River. The areas are irregular in shape, and many are more than 80 acres in size.

Included in some of the areas mapped are small areas of Navan loam. Also included are small areas of Colwood, Drummer, and Sebewa soils that are underlain by clay or sand and gravel.

This soil is subject to ponding after heavy rains. It is slow to dry out and warm up in spring, and fieldwork must be delayed. Waterways and diversions are needed to dispose of excess water rapidly.

Drained areas are suited to corn, small grain, grasses, and legumes. (Capability unit IIw–1; woodland group 7; recreation group 6; wildlife group 7)

Palms Series

The Palms series consists of nearly level, very poorly drained muck soils underlain by loamy material at a depth of 12 to 42 inches. These soils are in depressions and on flood plains and low terraces in all parts of the county.

In a typical profile the surface layer is black muck about 18 inches thick. Below this is about 18 inches of black muck that contains very dark brown, partly decomposed plant roots; it is mildly alkaline and friable. The underlying material is moderately alkaline, olive-gray heavy silt loam mottled with dark brown in the upper part and greenish gray below a depth of 40 inches.

Permeability is moderate, and the available moisture capacity is high. The natural fertility is moderately low. The depth of the root zone is limited by the water table. Drainage is needed if this soil is used for cultivated crops. Drained areas are suited to corn or forage crops. They are also suited to special crops, such as truck crops and mint. Undrained areas are suited to perennial pasture or wildlife habitat.

Typical profile of Palms muck in a cultivated field, NW¼NW¼ sec. 24, T. 1 N., R. 17 E.

1—0 to 9 inches, black (N 2/0) muck; weak, very fine, granular structure; very friable; mildly alkaline; gradual, smooth boundary.

2—9 to 14 inches, black (N 2/0) muck; weak to moderate, medium, subangular blocky structure; friable; mildly alkaline; clear, smooth boundary.

3—14 to 18 inches, black (N 2/0) muck; weak, coarse, subangular blocky structure; friable; mildly alkaline; clear, smooth boundary.

4—18 to 36 inches, black (N 2/1) muck matrix; very dark brown (10YR 2/2), partly decomposed plant roots; massive; friable; mildly alkaline; clear, smooth boundary.

IIC—36 to 60 inches +, olive-gray (5Y 5/2) heavy silt loam; massive; nonsticky when wet; few, fine, prominent, dark-brown (7.5YR 4/4) mottles along root channels; few, coarse, distinct, greenish-gray (5BG 5/1) mottles below a depth of 40 inches; moderately alkaline.

The surface layer is generally muck, but areas of loamy muck, 7 to 15 inches thick, occur where overwash of mineral soil has been mixed with the organic surface layer. In some areas layers of fibrous peat occur below a depth of 18 inches. Palms soils are slightly acid to moderately alkaline.

The organic layer in Palms soils is not so thick as that in Houghton soils. Palms soils do not have the overwash of mineral soil material that is characteristic of Wallkill soils.

Palms muck (0 to 2 percent slopes) (Pa).—The larger areas of this soil are in depressions and on broad, flat valley floors. Smaller areas are in pockets in drainageways, where they occur with Alluvial land.

Included in some of the areas mapped are small areas of Houghton, Adrian, and Rollin soils. Also included are small areas of Wallkill soils where mineral soil material has been deposited over Palms muck by runoff water. A small area of muck where the underlying material is clay is also included. Calcareous Palms soils are also included. They occur either as individual areas or within areas of the normal soil. Where these calcareous soils are cultivated and the surface is dry, they are easily identified by their dark-gray color and the numerous snail shells.

This soil is subject to ponding, and surface drainage is needed to dispose of excess water rapidly. Either surface or tile drainage is suitable. Diversions can be used to intercept runoff. Wind erosion and subsidence are serious hazards in drained areas. Fire is also a hazard.

This soil is low in phosphorus and potash, and these kinds of fertilizer are needed. Most of the larger areas are cultivated, and most of the smaller areas are in perennial pasture. (Capability unit IIIw–9; woodland group 10; recreation group 8; wildlife group 9)

Pecatonica Series

The Pecatonica series consists of deep, well-drained soils that developed in silt-covered glacial till. These soils are on glacial till plains in the southwestern corner of the county, mainly in Sharon Township. They are nearly level to sloping.

In a typical profile the surface layer is very dark grayish-brown silt loam about 7 inches thick. The subsurface layer, about 4 inches thick, is brownish-gray, friable silt loam. The subsoil is about 37 inches thick. The upper part is strongly acid, dark-brown, firm silty clay loam; the middle part is strongly acid, dark-brown, firm clay loam; and the lower part is medium acid, dark-brown, friable sandy loam. The underlying material is moderately alkaline, brown, loose sandy loam.

Permeability is moderate, and the available moisture capacity is moderately high. The root zone is favorable to a depth of more than 3 feet. The soils are generally acid.

Pecatonica soils are good farming soils. They are suited to all general farm crops and to many special crops. They are also suitable for pasture, woodland, and wildlife habitat. Crops respond well to applications of lime and fertilizer.

Typical profile of Pecatonica silt loam, SW¼NW¼ sec. 18, T. 1 N., R. 15 E.

Ap—0 to 7 inches, very dark grayish-brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) when dry; moderate, medium, granular structure; friable; neutral; abrupt, smooth boundary.

352-633—71——4

A2—7 to 11 inches, brownish-gray (10YR 5/2) silt loam; moderate, thin, platy structure; friable; neutral; clear, smooth boundary.
B1—11 to 13 inches, dark-brown (10YR 4/3) heavy silt loam; weak, medium, subangular blocky structure; friable; slightly acid; clear, wavy boundary.
B21t—13 to 24 inches, dark-brown (10YR 4/3) silty clay loam; moderate, medium, angular blocky structure; firm; thin clay films on vertical ped surfaces; strongly acid; clear, wavy boundary.
IIB22t—24 to 30 inches, dark-brown (7.5YR 4/4) clay loam; moderate, medium to coarse, angular blocky structure; firm; thin, continuous clay films on all ped surfaces; strongly acid; gradual, wavy boundary.
IIB23t—30 to 42 inches, dark-brown (7.5YR 4/4) clay loam; moderate, medium, angular blocky structure; slightly plastic when wet; thin clay films on all ped surfaces; strongly acid; gradual, wavy boundary.
IIB3—42 to 48 inches, dark-brown (7.5YR 4/4) sandy loam; weak, coarse, subangular blocky structure; friable; medium acid; clear, wavy boundary.
IIC—48 to 60 inches, brown (7.5YR 5/4) sandy loam; single grain; loose; moderately alkaline.

Pecatonica soils have a surface layer that generally ranges from dark brown to dark gray; in some areas the color ranges to very dark grayish brown. The surface layer is generally silt loam, but there are some small areas of loam. It ranges from 5 to 10 inches in thickness. The subsurface layer is usually 3 to 6 inches thick. The combined silty layers range from 18 to 30 inches in thickness. The subsoil ranges from silty clay loam in the upper part to clay loam or sandy clay loam in the lower part. The depth to the underlying till ranges from 45 to more than 60 inches.

Pecatonica soils have a thinner silt layer and a thinner solum than Flagg soils. They have a thicker silt cap than Westville soils.

Pecatonica silt loam, 0 to 2 percent slopes (PeA).—This soil occurs on till plains and on foot slopes between higher lying, sloping Westville soils and the lower lying, wetter, mottled subsoil variant of the Flagg series that occurs near drainageways. Other areas occur on relatively flat uplands. The areas are irregular in shape, and many are more than 80 acres in size.

This soil has the profile described as typical of the series.

Included in some of the areas mapped are small areas, less than 3 acres in size, of Flagg soils and Flagg, mottled subsoil variant, soils. Also included is a relatively small acreage of Pecatonica silt loam where the surface layer is darker colored.

If well managed, this soil can be cropped intensively. Tillage is easy. The main considerations in management are to maintain organic-matter content, fertility, and soil structure. There are no serious limitations. (Capability unit I–1; woodland group 1; recreation group 1; wildlife group 3)

Pecatonica silt loam, 2 to 6 percent slopes (PeB).—This soil occurs on till plains in Sharon Township and on foot slopes between higher lying Westville soils and the lower lying mottled subsoil variant of the Flagg series. These areas are narrow and follow the pattern set by the drainageways. Other areas are more centrally located on low ridges between drainageways. Most areas are more than 40 acres in size. In about 16 percent of the acreage, approximately 4 to 6 inches of the original surface layer has been lost through erosion.

The surface layer, about 9 inches thick, is dark grayish-brown silt loam. The subsurface layer is about 4 inches thick. The subsoil, about 40 inches thick, is dark-brown silty clay loam grading to dark-brown sandy clay loam at a depth of 24 inches.

Included in some of the areas mapped are small areas, less than 3 acres in size, of Flagg soils and Flagg, mottled subsoil variant, soils. Also included are a few acres of Pecatonica silt loam where the surface layer is darker colored.

If well managed, this soil can be cropped fairly intensively. It is susceptible to sheet erosion and rilling because slopes are long and runoff accumulates during heavy rains. The hazard of water erosion is slight. Management practices that include control of runoff and maintenance of soil structure are beneficial. (Capability unit IIe–1; woodland group 1; recreation group 1; wildlife group 3)

Pella Series

The Pella series consists of deep, poorly drained, silty soils in drainageways and depressions on glacial till plains throughout the county.

In a typical profile the surface layer is black silt loam about 12 inches thick. The subsoil, about 30 inches thick, is firm. The upper part is neutral, dark-gray light silty clay loam; the middle part is mildly alkaline, olive-gray silty clay loam; and the lower part is calcareous, olive-gray silty clay loam that is mottled with yellowish brown. The underlying material is calcareous, olive-gray, friable to firm silt loam that is mottled with yellowish brown.

Permeability is moderately slow, and the available moisture capacity is high. These soils are neutral to moderately alkaline.

Most of the acreage is drained and is used for general farm crops. Undrained areas are used for perennial pasture. These soils are of limited value for woodland, but in their natural state, they provide good wildlife cover.

Typical profile of Pella silt loam in a cultivated field, NW¼NW¼ sec. 12, T. 2 N., R. 17 E.

Ap—0 to 8 inches, black (10YR 2/1) silt loam; weak, medium, subangular blocky structure; friable; mildly alkaline; abrupt, smooth boundary.
A1—8 to 12 inches, black (N 2/0) silt loam; moderate, fine, granular structure; friable; neutral; gradual, smooth boundary.
B1g—12 to 23 inches, dark-gray (N 4/0) light silty clay loam; weak, medium, prismatic structure breaking to moderate, very fine, angular blocky; firm; many iron and manganese concretions; neutral; gradual, irregular boundary.
B21g—23 to 31 inches, olive-gray (5Y 5/2) silty clay loam; moderate, medium, prismatic structure breaking to moderate, fine, angular blocky; firm; dark-colored organic coats on prism faces; many iron and manganese concretions; mildly alkaline; clear, smooth boundary.
B22g—31 to 35 inches, olive-gray (5Y 5/2) silty clay loam; moderate, medium, prismatic structure breaking to moderate, medium, angular blocky; firm; many, fine, prominent, yellowish-brown (10YR 5/8) mottles; dark-colored organic coats on prism faces; many iron and manganese concretions; calcareous; clear, smooth boundary.
B3g—35 to 42 inches, olive-gray (5Y 5/2) silty clay loam; weak, medium, prismatic structure breaking to weak, medium, angular blocky; firm; few, fine, prominent, yellowish-brown (10YR 5/8) mottles; dark-colored organic coats on prism faces, less continuous than in B22g horizon; many iron and manganese concre-

tions; horizon includes thin lenses of very fine sand; calcareous; gradual, smooth boundary.

C1g—42 to 47 inches, olive-gray (5Y 5/2) silt loam; massive; weak, vertical cleavage planes; friable to firm; common, fine, prominent, grayish-brown (10YR 5/2) mottles; dark-colored, patchy organic coats on prism faces; thin lenses of very fine sand; calcareous; clear, smooth boundary.

C2g—47 to 60 inches +, olive-gray (5Y 5/2) silt loam; stratified; massive; friable to firm; common, fine, prominent, yellowish-brown (10YR 5/6) mottles; calcareous.

The surface layer ranges from 8 to 14 inches in thickness. In most places the texture is silt loam, but it is silty clay loam in some areas. The subsoil ranges from silt loam to silty clay loam in texture, and from 30 to 42 inches in thickness. In places thin layers of sand occur in the lower part of the subsoil and in the underlying material. The underlying material ranges from silt loam to sandy loam, and it is generally weakly stratified.

Pella soils are wetter than Kendall soils, and they have a grayer subsoil than those soils. Their underlying material is finer textured than that of Sebewa and Drummer soils.

Pella silt loam (0 to 3 percent slopes) (Ph).—This soil occurs in depressions and in drainageways. The areas in depressions are somewhat circular or are irregular in shape. Areas in drainageways are generally narrow and follow the drainage pattern. Many areas are more than 80 acres in size; others occupy less than 20 acres.

Included in some of the areas mapped are small areas of Elburn, Kendall, and Conover soils. Also included is a small acreage of Pella soils where the surface layer is silty clay loam. These areas are mainly in the northwestern part of the county; they occur with soils of glacial lakebeds.

This soil is subject to ponding after heavy rains. Waterways and diversions are needed to dispose of runoff rapidly and without damage to crops.

This soil is well suited to general farm crops and and many special crops, but water management is needed. Either tile or surface drainage is suitable. Generally this soil does not need lime, but it is low in potash. A starter fertilizer that contains nitrogen helps to promote rapid early growth of crops. (Capability unit IIw-1; woodland group 7; recreation group 6; wildlife group 7)

Plano Series

The Plano series consists of deep, nearly level to sloping, dark-colored, well-drained soils on glacial till plains throughout the county.

In a typical profile the surface layer is black silt loam about 8 inches thick. The subsurface layer is friable, very dark grayish-brown silt loam about 5 inches thick. The subsoil, about 32 inches thick, is firm in the major part. The upper part is medium acid, dark yellowish-brown silt loam; the middle part is medium acid, dark-brown silty clay loam; and the lower part is neutral, dark-brown light clay loam. The underlying material is calcareous, friable, yellowish-brown sandy loam glacial till.

Permeability is moderate, and the available moisture capacity is moderately high. The root zone extends to a depth of more than 3 feet. The soils are generally acid. If well managed, they respond well to applications of lime and fertilizer.

Plano soils are suited to all general farm crops and to many special crops. They are among the best farming soils in the county. Most of the acreage is used for cultivated crops. There are no serious limitations for rural or urban development.

Typical profile of Plano silt loam in a cultivated field, SE¼SW¼ sec. 36, T. 1 N., R. 17 E.

Ap—0 to 8 inches, black (10YR 2/1) silt loam; moderate, medium, granular structure; friable; neutral; abrupt, smooth boundary.

A3—8 to 13 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, very fine, subangular blocky structure; friable; neutral; clear, wavy boundary.

B1—13 to 17 inches, dark yellowish-brown (10YR 3/2) silt loam; moderate, very fine, subangular blocky structure; friable; neutral; clear, wavy boundary.

B21t—17 to 28 inches, dark-brown (7.5YR 4/4) silty clay loam; weak, medium, prismatic structure breaking to moderate, fine, subangular blocky; firm; thin, very dark grayish-brown (10YR 3/2) clay films on most ped faces; medium acid; clear, wavy boundary.

B22t—28 to 39 inches, dark-brown (7.5YR 4/4) silty clay loam; weak, medium, prismatic structure breaking to moderate, fine, angular blocky; firm; thin, very dark grayish-brown (10YR 3/2) clay films on all ped faces; medium acid; clear, wavy boundary.

IIB3t—39 to 45 inches, dark-brown (7.5YR 4/4) light clay loam; moderate, medium, subangular blocky structure; firm; few very thin clay films on ped faces; neutral; clear, wavy boundary.

IIC—45 to 60 inches, yellowish-brown (10YR 5/4) sandy loam; massive; friable; calcareous.

The surface layer ranges from 8 to 12 inches in thickness and from black to very dark grayish brown in color. The subsurface layer ranges from 3 to 6 inches in thickness. The subsoil is strongly acid to neutral. Its texture ranges from heavy silt loam or silty clay loam in the upper part to clay loam or sandy clay loam in the lower part. The silt layer is generally 36 to 48 inches thick. In some places Plano soils are underlain by loamy glacial till, and in other places they are underlain by water-laid sand and gravel. The underlying till ranges from sandy loam to heavy loam.

Plano soils have a thicker solum than Griswold soils, and they are finer textured in the surface layer and the upper part of the subsoil than those soils.

Plano silt loam, 0 to 2 percent slopes (PsA).—This soil occurs on prairie till plains with Griswold and Elburn soils. The areas are irregular in shape, and most of them are more than 100 acres in size. The largest areas are northeast of Delavan.

This soil has the profile described as typical of the series.

Included in some of the areas mapped are small areas of Griswold and Elburn soils. Also included is a small acreage of Plano soils where the silty layer is thinner than 36 inches, and other areas of these soils where the lower part of the subsoil is mottled.

If well managed, this soil can be cropped intensively. Tillage is easy. The main consideration in management is to maintain the organic-matter content and fertility and to preserve soil structure. This soil has no serious limitations. (Capability unit I-1; woodland group 12; recreation group 1; wildlife group 1)

Plano silt loam, 2 to 6 percent slopes (PsB).—This soil occurs on prairie till plains with Griswold and Elburn soils. The areas are irregular in shape, and some follow the slopes set by the drainage pattern. Most areas are more than 40 acres in size. The largest areas are northeast of Delavan and in Spring Prairie. In about one-sixth of the acreage, 4 to 6 inches of the original surface layer has been lost through erosion.

The surface layer, about 9 inches thick, is black silt loam. The subsurface layer is very dark grayish brown to dark brown and is about 3 inches thick. The subsoil, about 32 inches thick, is dark-brown silty clay loam grading to clay loam in the lower part.

Included in some of the areas mapped are small areas of Griswold and Elburn soils. Also included is a small acreage of Plano soils where the silty layer is thinner than 36 inches, as well as other areas of these soils where the lower part of the subsoil is mottled.

This soil is easy to work. If well managed, it can be cropped fairly intensively. Management practices that include control of runoff are beneficial. There is a slight hazard of water erosion. (Capability unit IIe-1; woodland group 12; recreation group 1; wildlife group 1)

Plano silt loam, 6 to 12 percent slopes (PsC).—This soil is on till plains in prairie areas. It occurs as mounds or ridges within larger areas of less sloping Plano soils. Most areas are less than 40 acres in size.

The surface layer, about 9 inches thick, is dark grayish-brown silt loam. Most of the subsurface layer has been mixed with the surface layer. The subsoil, about 34 inches thick, is dark-brown silty clay loam grading to clay loam in the lower part.

Included in some of the areas mapped are small areas of Griswold soils, some of which are on 12 to 20 percent slopes. Also included is a small acreage of Plano soils where the lower part of the subsoil is mottled and a small acreage that is moderately eroded.

Most of the acreage is used for crops. Some areas are used for perennial pasture. There is a moderate erosion hazard. Management practices that include control of runoff and erosion are needed. (Capability unit IIIe-1; woodland group 12; recreation group 1; wildlife group 1)

Plano silt loam, gravelly substratum, 0 to 2 percent slopes (PtA).—This soil occurs mainly on outwash plains. The areas are irregular in shape, and many are more than 100 acres in size.

Except that it is underlain by sand and gravel, this soil has the profile described as typical of the series.

Included in some of the areas mapped are small areas of Warsaw soils and the gravelly substratum phases of Plano soils. These Plano soils are mottled in the lower part of the subsoil. Also included are areas of Troxel soils in small depressions.

If this soil is well managed, row crops can be grown year after year. Tillage is easy. The main consideration in management is to maintain the organic-matter content and fertility and to preserve soil structure. This soil is well suited to irrigation. There are no serious limitations. (Capability unit I-1; woodland group 12; recreation group 1; wildlife group 2)

Plano silt loam, gravelly substratum, 2 to 6 percent slopes (PtB).—This soil occurs mainly on outwash plains. The areas are generally irregular in shape, and most are more than 80 acres in size. Many adjoin drainageways and follow the slopes set by the drainage pattern. Some small areas have lost 4 to 8 inches of the original surface layer through erosion.

The surface layer, about 9 inches thick, is very dark brown silt loam. The subsurface layer is about 4 inches thick. The subsoil, about 33 inches thick, is dark-brown silty clay loam grading to gravelly clay loam at a depth of 42 inches.

Included in some of the areas mapped are small areas of Warsaw soils and the gravelly substratum phases of Plano soils. These Plano soils are mottled in the lower part of the subsoil. Also included are small areas of Troxel soils in slight depressions, and of the gravelly substratum phase of Plano soils, where the surface layer is loam and sandy loam.

If well managed, this soil can be cropped fairly intensively. It is easily worked. The hazard of water erosion is slight. Management practices that include control of runoff are needed. This soil is well suited to irrigation. There are no serious limitations. (Capability unit IIe-1; woodland group 12; recreation group 1; wildlife group 2)

Plano silt loam, gravelly substratum, 6 to 12 percent slopes, eroded (PtC2).—This soil occurs on stream terraces and outwash plains as steeper areas within larger areas of gently sloping Plano soils. The areas are irregular in shape, and generally are less than 40 acres in size. This soil also occurs on side slopes of drainageways.

The surface layer, about 9 inches thick, is very dark brown silt loam. Most of the subsurface layer has been mixed with the surface layer. The subsoil, about 36 inches thick, is dark-brown silty clay loam grading to dark yellowish-brown sandy clay loam at a depth of about 40 inches.

Included in some of the areas mapped are small areas where the lower part of the subsoil is mottled. About two-thirds of the acreage has lost 4 to 8 inches of the original surface layer through erosion. The surface layer is lighter colored in eroded areas than in uneroded areas. Rills have formed in places, and there are spots where the subsoil is exposed.

Most of the acreage is used for crops. Infiltration is slower than on uneroded Plano soils, and runoff is more rapid. There is also a moderate erosion hazard. Management practices that control runoff, conserve moisture, and improve soil structure are needed. (Capability unit IIIe-1; woodland group 12; recreation group 1; wildlife group 2)

Radford Series

The Radford series consists of deep, somewhat poorly drained to poorly drained, dark-colored soils that developed in silty sediments deposited by runoff. These soils occur throughout the county as small areas in natural waterways and on foot slopes adjacent to wet depressions.

In a typical profile the surface layer is very dark brown silt loam about 23 inches thick. The upper part of the subsurface layer, about 7 inches thick, is slightly acid, very dark gray, friable silt loam. The lower part, about 10 inches thick, is slightly acid, black, firm heavy silt loam. The subsoil, about 20 inches thick, is neutral and slightly sticky when wet. The upper part is black light silty clay loam. The lower part is dark-grey light silty clay loam.

Permeability is moderately slow, and the available moisture capacity is high. Wetness is caused by a high water table, poor surface drainage, or seepage. These soils are subject to occasional flooding, and drainage is needed for dependable crops.

If drainage is improved and flooding is controlled, these soils are suited to corn, small grain, grasses, and some legumes. Generally, the soils are acid and need lime. Undrained areas are better suited to pasture or meadow than to cultivated crops. These soils are also suitable for woodland and wildlife habitat. They are not suitable for residential, commercial, or recreational development, or for highway subgrade. They are a good source of topsoil.

Typical profile of Radford silt loam in an uncultivated depression, NE¼SW¼ sec. 31, T. 1 N., R. 17 E.

A11—0 to 4 inches, very dark brown (10YR 2/2) silt loam; weak, very fine, crumb structure; very friable; slightly acid; clear, smooth boundary.

A12—4 to 23 inches, very dark brown (10YR 2/2) silt loam; weak, thick, platy structure breaking to moderate, fine, subangular blocky; friable; numerous spots of manganese and iron; slightly acid; gradual, smooth boundary.

A13—23 to 30 inches, very dark gray (10YR 3/1) silt loam; moderate, thick, platy structure breaking to moderate, fine, subangular blocky; friable; dark organic stains in root channels; slightly acid; abrupt, smooth boundary.

Ab—30 to 40 inches, black (N 2/0) heavy silt loam; weak, medium, prismatic structure breaking to weak, medium, subangular blocky; firm; dark organic stains in root channels; slightly acid; diffuse, smooth boundary.

B1b—40 to 45 inches, very dark gray (N 3/0) light silty clay loam; weak, medium, prismatic structure breaking to moderate, medium, subangular blocky; slightly sticky when wet; neutral; diffuse, smooth boundary.

B2bg—45 to 60 inches, dark-gray (5Y 4/1) light silty clay loam; moderate, fine, angular blocky structure; slightly sticky when wet; common, fine, prominent, yellowish-brown (10YR 5/6 and 5/8) mottles; neutral.

The surface layer is black, very dark brown, or very dark gray. The sedimentary layer ranges from 18 to 42 inches in thickness. The texture is generally silt loam, but in some areas it is loam. In places thin layers of sandy loam occur in the sedimentary layer. This layer is medium acid to mildly alkaline.

Radford soils are more poorly drained than Troxel soils. They differ from Wallkill soils in being mineral soils throughout the profile.

Radford silt loam, 0 to 3 percent slopes (RaA).—This soil occurs in intermittent natural waterways and at the base of slopes bordering wet depressions. The areas are generally less than 20 acres in size. Most are too small to be managed separately.

Included in some of the areas mapped are small areas of Juneau, Troxel, Pella, Sebewa, and Drummer soils.

This soil is not suited to tile drainage, but it is suited to open-ditch and surface drainage. If it is drained and protected from flooding, row crops can be grown year after year.

Establishing a tree plantation can be difficult, because of wetness and competition from grasses and other plants. (Capability unit IIw-13; woodland group 9; recreation group 7; wildlife group 8)

Rodman Series

The Rodman series consists of somewhat excessively drained, gravelly soils that are very shallow over sand and gravel. These soils are on sloping to very steep hills and moraines throughout the county. In Walworth County they are mapped only with Casco and Lorenzo soils.

In a typical profile the surface layer is black gravelly loam about 6 inches thick. The subsoil, about 5 inches thick, is moderately alkaline, dark yellowish-brown, friable gravelly sandy loam. The underlying material is calcareous, light yellowish-brown sand and gravel.

Permeability is rapid, and the available moisture capacity is low. The natural fertility is moderately low. The root zone extends to the underlying outwash.

These soils are too shallow, infertile, and droughty to be used for cultivated crops. A limited acreage is cultivated, along with larger areas of Casco and Lorenzo soils. Most of the acreage is used for perennial pasture, woodland, and wildlife habitat. The largest areas are on moraines, mainly the Kettle Moraine.

Typical profile of Rodman gravelly loam in a pasture, SW¼SW¼ sec. 3, T. 4 N., R. 16 E.

A—0 to 6 inches, black (10YR 2/1) gravelly loam; weak, fine, granular structure; very friable; neutral; clear, smooth boundary.

B—6 to 11 inches, dark yellowish-brown (10YR 3/4) gravelly sandy loam; weak, medium, subangular blocky structure; friable; dolomitic pebbles show weathering; moderately alkaline; gradual, wavy boundary.

C—11 to 60 inches +, light yellowish-brown (10YR 6/4) sand and gravel with some cobblestones; single grain; loose; calcareous.

The surface layer is very dark brown or black. It ranges from 4 to 8 inches in thickness and from loam to gravelly loam or sandy loam in texture. The subsoil is neutral to moderately alkaline. The depth to the underlying outwash ranges from 6 to 12 inches.

Rodman soils are shallower over sand and gravel than Casco or Lorenzo soils and lack the clayey subsoil of those soils. They differ from Hennepin soils in having developed in gravelly outwash rather than glacial till.

Rodman-Casco complex, 30 to 45 percent slopes (RsF).—This complex is on ridges and moraines, mainly in the northern and eastern parts of the county. The larger areas are on hilly, irregular topography; the smaller areas are generally on simple slopes. These smaller areas are generally narrow and less than 20 acres in size. About 70 percent of the acreage consists of Rodman gravelly loam, 20 percent of Casco loam, and 10 percent of Casco silt loam.

The Rodman soil in this complex has the profile described as typical of the series, except that in spots the subsoil is thinner or is entirely lacking.

The Casco soils have a surface layer of black loam or silt loam about 3 inches thick. This is underlain by a dark grayish-brown loam or silt loam subsurface layer about 4 inches thick. The subsoil is clay loam about 10 inches thick.

Included in some of the areas mapped are small areas of Lorenzo and Hennepin soils. Also included are small areas of Fox soils in draws and on foot slopes.

Most of the acreage is in woodland. These areas need protection from grazing to maintain the stand and to improve the habitat for wildlife. Grazing should be carefully controlled to protect the sod and to prevent gullying in areas used for pasture. (Capability unit VIIs-5; woodland group 6; recreation group 4; wildlife group 5)

Rollin Series

The Rollin series consists of very poorly drained muck soils underlain by marl at a depth of 12 to 42 inches. These soils are in depressions on flood plains and low terraces in all parts of the county.

In a typical profile the surface layer is black muck about 8 inches thick. The subsurface layer, about 24 inches thick, is black, partly decomposed peat. It is mildly alkaline, friable, and massive. The underlying material is gray, friable marl. It is massive and contains many small snail shells.

Permeability is moderate, and the available moisture capacity is high. The natural fertility is moderately low. The depth of the root zone is limited by the water table or the marl.

Drainage is needed before these soils can be used for cultivated crops. When drained, Rollin muck is suited to corn or forage crops. It is also suited to special crops, such as truck crops and mint. Undrained areas are suited to perennial pasture or wildlife habitat.

Typical profile of Rollin muck in a cultivated field, SW¼NW¼ sec. 27, T. 4 N., R. 17 E.

1—0 to 8 inches, black (N 2/0) muck; weak, fine, granular structure; very friable; mildly alkaline; clear, smooth boundary.

2—8 to 32 inches, black (5YR 2/1), dark reddish brown (5YR 2/2 rubbed), disintegrated peat; massive; friable; many fine fibers in matrix; mildly alkaline; abrupt, smooth boundary.

IIC—32 to 60 inches, gray (5Y 6/1) marl; massive; friable; common, medium, prominent, dark-brown (7.5YR 4/4) and strong-brown (7.5YR 5/6 and 5/8) mottles along root channels; an abundance of snail shells throughout; calcareous.

The thickness of the organic layer generally ranges from 12 to 42 inches. The surface layer is generally muck, but areas of loamy muck, 7 to 15 inches thick, occur where overwash of mineral soil was mixed with the organic surface layer. In some areas layers of fibrous peat occur below a depth of 18 inches. Rollin soils are slightly acid to moderately alkaline.

The organic layer in Rollin soils is not so thick as in Houghton soils. Rollin soils do not have the overwash of mineral soil material that is characteristic of Wallkill soils. They differ from Adrian and Palms soils in being underlain by marl, rather than coarse-textured outwash and loamy material.

Rollin muck, deep (0 to 2 percent slopes) (Ru).—The larger areas of this soil are in large depressions and on the floor of wide river valleys. Smaller areas are in pockets in the smaller drainageways, where they occur with Alluvial land.

This soil has the profile described as typical of the series.

Included in some of the areas mapped are small areas of Houghton, Adrian, and Palms soils. Also included are small areas of Wallkill soils where mineral soil material has been deposited over Rollin muck by runoff water.

This soil is subject to ponding, and surface drainage is needed to dispose of surface water rapidly. Tile drainage is not suitable. Diversions can be used to intercept runoff from adjoining areas. Wind erosion and subsidence are serious hazards in drained areas. Burning is also a hazard.

This soil is low in phosphorus and potash, and fertilizer is needed. Most of the larger areas are cultivated, and most of the smaller areas are in perennial pasture. (Capability unit IVw-7; woodland group 10; recreation group 8; wildlife group 9)

Rollin muck, shallow (0 to 2 percent slopes) (Rv).—The larger areas of this soil are on the wide floors of river valleys. Other areas occur with Alluvial land as pockets in smaller drainageways.

The surface layer, about 16 inches thick, is black, friable muck. The underlying material is gray, friable marl that has many dark-brown mottles and contains many snail shells. This soil has a thinner organic layer than that of the soil described as typical of the series. The depth to the marl substratum is less than 24 inches.

Included in some of the areas mapped are small areas of Palms and Adrian soils and of the deeper Rollin muck. Also included are small areas of Wallkill soils.

This soil is subject to ponding after heavy rains. It is suitable for surface drainage, mainly to improve meadows and pastures. Although the soil is shallow and not well suited to row crops, many of the larger areas are drained and cultivated along with the deeper muck soils. Control of wind erosion and subsidence is needed in cultivated areas. A cover of perennial close-growing crops, such as forage for hay or pasture, helps to lessen the hazards.

This soil is low in phosphorus and potash. Most of the smaller areas are in perennial pasture. (Capability unit Vw-7; woodland group 10; recreation group 8; wildlife group 9)

St. Charles Series

The St. Charles series consists of deep, nearly level to gently sloping, moderately well drained soils. These soils occur on glacial till plains throughout the county.

In a typical profile the surface layer is dark grayish-brown silt loam about 8 inches thick. The subsoil is about 35 inches thick. The upper part is mildly alkaline and slightly acid, dark-brown and dark yellowish-brown, chiefly firm silty clay loam and silt loam. The middle part is mildly alkaline, dark yellowish-brown, firm silty clay loam mottled with brown and yellowish brown. The lower part is calcareous, light-brown and strong-brown loam. The underlying material is calcareous, brown and light-brown, friable, loamy glacial till.

Permeability is moderate, and the available moisture capacity is moderately high. These soils are easily worked and have no serious limitations, but they are slightly slower to dry out and warm up in spring than well-drained soils. Generally, lime is needed.

Most of the acreage is used for crops. St. Charles soils are suited to all general farm crops and to many special crops. There are no serious limitations for residential development.

Typical profile of St. Charles silt loam in a cultivated field, SE¼NE¼ sec. 35, T. 3 N., R. 16 E.

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

B1—8 to 12 inches, dark-brown (10YR 4/3) heavy silt loam; moderate, fine, subangular blocky structure; friable; mildly alkaline; clear, smooth boundary.

B21t—12 to 16 inches, dark-brown (10YR 4/3) silty clay loam; weak, coarse, prismatic structure breaking to moderate, fine, subangular blocky; firm; continuous, thin clay films; slightly acid; clear, smooth boundary.

B22t—16 to 23 inches, dark yellowish-brown (10YR 4/4) silty clay loam; weak, medium, prismatic structure breaking to moderate, fine to medium, angular blocky; firm; few, fine, distinct, strong-brown (7.5YR 5/6 and 5/8) mottles; continuous clay films on ped faces; slightly acid; clear, wavy boundary.

B23t—23 to 30 inches, dark yellowish-brown (10YR 4/4) light silty clay loam; moderate, medium, prismatic structure breaking to moderate, medium, subangular blocky; firm; common, fine, distinct, strong-brown (7.5YR 5/6 and 5/8) mottles; nearly continuous clay films on prism faces, patchy on blocky ped faces; few small dolomitic pebbles; mildly alkaline; clear wavy boundary.

B31—30 to 38 inches, 60 percent pale-brown (10YR 6/3) and 40 percent yellowish-brown (10YR 5/8) silt loam; weak, coarse, subangular blocky structure; friable; clay flows in wormholes and root cavities; stronger vertical than horizontal cleavage planes; dark grayish-brown (10YR 4/2) discolorations along vertical cleavage planes, calcareous; abrupt, smooth boundary.

IIB32—38 to 43 inches, 60 percent light-brown (7.5YR 6/4) and 40 percent strong-brown (7.5YR 5/8) pebbly loam; weak, coarse, subangular blocky structure; friable; calcareous; diffuse, smooth boundary.

IIC—43 to 60 inches, brown (7.5YR 5/4) and light-brown (7.5YR 6/4) pebbly loam; weak, thick, platy structure to massive; friable; calcareous.

In areas where St. Charles soils grade to Plano soils, the Ap horizon is normally darker colored than that described. The silty layer generally ranges from 36 to 55 inches in thickness. The B horizon ranges from neutral to strongly acid. The texture of the B horizon ranges from silt loam to silty clay loam in the upper part, and from silt loam and loam to sandy clay loam in the lower part. In some places the soils have a gravelly substratum of outwash sand and gravel, and in other places they are underlain by loamy glacial till. The IIC horizon of glacial till ranges from sandy loam to light clay loam. The color of the till ranges from brown to yellowish brown or reddish brown. In the gravelly substratum phases, the IIC horizon ranges from gravelly clay loam to a mixture of sand and gravel.

St. Charles soils have a thicker silt cap and a thicker subsoil than Miami soils.

St. Charles silt loam, 0 to 2 percent slopes (ScA).—This soil occurs on till plains, with Miami, Dodge, Kendall, and Pella soils. It occurs mainly in the central part of the county. The areas are irregular in shape, and many are more than 40 acres in size.

This soil has the profile described as typical of the series.

Included in some of the areas mapped are areas, less than 3 acres in size, of Pella and Kendall soils in slightly lower and wetter parts of the landscape. Also included are small areas of Miami, Dodge, and McHenry soils in higher lying, better drained positions.

This soil can be cropped intensively if well managed. (Capability unit I-1; woodland group 1; recreation group 1; wildlife group 3)

St. Charles silt loam, 2 to 6 percent slopes (ScB).—This soil occurs on upland till plains. Some of the areas lie between the lower lying, wetter areas of Kendall and Pella soils and the well-drained Miami and Dodge soils. Other areas of St. Charles soils are in lower lying spots within larger areas of Miami and Dodge soils. The areas are irregular in shape, or they are narrow and follow the slope contours set by the drainage pattern. Most areas are less than 40 acres in size.

The surface layer, about 10 inches thick, is dark grayish-brown silt loam. The subsoil, about 38 inches thick, is silty clay loam, mottled with yellowish brown in the lower part.

Included in some of the areas mapped are small areas of Pella and Kendall soils. Also included are small areas of Miami, Dodge, and McHenry soils.

This soil can be cropped fairly intensively if well managed. The hazard of water erosion is slight. (Capability unit IIe-1; woodland group 1; recreation group 1; wildlife group 3)

St. Charles silt loam, gravelly substratum, 0 to 2 percent slopes (SeA).—This soil occurs mainly on outwash plains. The areas are irregular in shape, and many are more than 80 acres in size.

The profile is similar in most respects to the profile representative of the series, but this soil is underlain by sand and gravel at a depth of 42 to 60 inches.

Included in some of the areas mapped are small areas of St. Charles, gravelly substratum soils, where the lower part of the subsoil is mottled. Also included are small areas of Juneau soils in small depressions and a small acreage of the gravelly substratum phases of St. Charles soils, where the surface layer is loam or sandy loam.

If this soil is well managed, row crops can be grown year after year. Tillage is easy. The main consideration in management is to maintain the organic-matter content and fertility and to preserve soil structure. This soil is well suited to irrigation. It has no serious limitations. (Capability unit I-1; woodland group 1; recreation group 1; wildlife group 3)

St. Charles silt loam, gravelly substratum, 2 to 6 percent slopes (SeB).—This soil occurs mainly on outwash plains. These areas are generally irregular in shape. Many adjoin drainageways and follow the slopes set by the drainage pattern. Most are less than 80 acres in size.

The surface layer, about 8 inches thick, is dark grayish-brown silt loam. The subsoil, about 38 inches thick, is dark yellowish-brown silty clay loam grading to dark grayish-brown gravelly clay loam at a depth of 42 inches.

Included in some of the areas mapped are small areas of St. Charles, gravelly substratum soils, where the lower part of the subsoil is mottled. Also included are small areas of Juneau soils in slight depressions, and a small acreage of the gravelly substratum phases of St. Charles soils, where the surface layer is loam or sandy loam.

If well managed, this soil can be cropped fairly intensively. Tillage is easy. There is a slight hazard of water erosion. Management practices that include control of runoff are needed. This soil is well suited to irrigation. It has no serious limitations. (Capability unit IIe-1; woodland group 1; recreation group 1; wildlife group 3)

Sandy Lake Beaches

Sandy lake beaches (0 to 3 percent slopes) (Sfb) consists of loose sand and some gravel on the beaches of some of the lakes in the county. The areas are coarse textured, porous, infertile, and droughty, even though the water table is at a depth of less than 5 feet in places. They are subject to flooding. In some places there are a few yellow and brown mottles at a depth below 2 or 3 feet.

Permeability is very rapid, and the available moisture capacity is very low. The root zone is limited by the coarse-textured material.

This land type supports little vegetation. It is of very limited extent and is suited only to recreation or wildlife habitat. Some areas that have been undisturbed for many years have sparse stands of willows, river birch, and some scrub oak. (Capability unit VIIIs-10; woodland group 11; recreation group 9; wildlife group 10)

Saylesville Series

The Saylesville series consists of deep, nearly level to gently sloping, well drained to moderately well drained soils. These soils developed in water-laid silt and clay on glacial lakebeds. They are mainly in the northwestern part of the county, but they occur also in broad river valleys in other parts of the county.

In a typical profile the surface layer is very dark grayish-brown silt loam about 8 inches thick. The subsurface layer, about 4 inches thick, is dark grayish-brown friable silt loam. The subsoil, about 17 inches thick, is firm. The upper part is neutral, yellowish-brown silty clay loam that has pinkish-gray coats on the surfaces of blocks. The middle part is neutral, dark-brown silty clay. The lower part is moderately alkaline, dark-brown silty clay.The underlying material is calcareous, yellowish-brown silty clay loam. It is friable to firm and is mottled with yellowish brown.

Permeability is moderate in the subsoil, but it is slow in the substratum. The available moisture capacity is moderately high. The root zone extends to a depth of about 3 feet.

These soils are suited to all general farm crops and to many special crops. Most of the acreage is cultivated. Crops respond well to applications of lime and fertilizer. These soils are not suitable for highway subgrade or building foundations. Neither are they suitable for sewage disposal filter fields, because of the slow permeability of the underlying material.

Typical profile of Saylesville silt loam in a cultivated field, SW¼SW¼ sec. 22, T. 4 N., R. 15 E.

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) when dry; weak, medium, granular structure; friable; mildly alkaline; abrupt, smooth boundary.

A2—8 to 12 inches, dark grayish-brown (10YR 4/2) silt loam; weak, thin to medium, platy structure; friable; neutral; clear, smooth boundary.

B1—12 to 16 inches, yellowish-brown (10YR 5/4) silty clay loam; moderate, medium, subangular blocky structure; firm; pinkish-gray (7.5YR 6/2) silt coats on peds; neutral; clear, smooth boundary.

B21t—16 to 24 inches, dark-brown (7.5YR 4/4) silty clay; strong, fine, angular blocky structure; firm; dark-brown (10YR 3/3) clay films continuous on all ped faces; neutral; gradual, smooth boundary.

B22t—24 to 29 inches, dark-brown (7.5YR 4/4) silty clay; moderate, medium, subangular blocky structure; firm; dark-brown (10YR 3/3) clay films continuous on vertical faces, patchy on horizontal faces; moderately alkaline; gradual, smooth boundary.

C—29 to 60 inches +, yellowish-brown (10YR 5/4) silty clay loam; weak, thick, platy structure; friable to firm; common, fine, faint, yellowish-brown (10YR 5/8) and brownish-yellow (10YR 6/8) mottles; few soft lime concretions 5 to 10 millimeters in diameter; many iron and manganese spots; calcareous.

The surface layer ranges from grayish brown to very dark grayish brown in color and from 6 to 8 inches in thickness. The subsurface layer ranges from dark grayish brown to brown and from 3 to 5 inches in thickness. The subsoil is slightly acid to moderately alkaline. It is 15 to 30 inches thick. The texture of the subsoil generally ranges from silty clay loam to silty clay. The underlying material is weakly layered silt and clay.

Saylesville soils are finer textured in the upper part of the profile than Hebron soils. They have finer textured underlying material than McHenry and Miami soils.

Saylesville silt loam, 0 to 2 percent slopes (ShA).—The largest acreage of this soil occurs on glacial lakebeds northwest of the Kettle Moraine. Other areas are in broad valleys in other parts of the county. The areas are irregular in shape and are generally less than 60 acres in size.

The surface layer, about 8 inches thick, is dark grayish-brown silt loam. The subsurface layer, about 3 inches thick, is dark grayish-brown silt loam. The subsoil, about 26 inches thick, is dark-brown silty clay loam grading to silty clay in the lower part.

Included in some of the areas mapped are a few small areas of Martinton soils and Saylesville soils where the surface layer is loam. Also included is a small acreage of Saylesville soils where the surface layer is dark colored.

This soil is slow to dry out in spring and after heavy rains, because permeability is slow in the underlying material. Waterways and diversions are needed to remove surface water rapidly. If good management practices that include maintenance of fertility are applied, row crops can be grown year after year. (Capability unit IIs-7; woodland group 2; recreation group 10; wildlife group 3)

Saylesville silt loam, 2 to 6 percent slopes (ShB).—This soil is mainly on glacial lakebeds northwest of the Kettle Moraine; other areas are in broad valleys in other parts of the county. They occur as circular areas in higher lying positions within larger areas of the wetter Martinton or Pella soils. They also occur as narrow borders around these soils. The areas are generally less than 60 acres in size.

This soil has the profile described as typical of the series.

Included in some of the areas mapped are small areas of Martinton soils. Also included is a small acreage of Saylesville soils where the surface layer is dark colored, or the surface layer is loam, or where the slope is 6 to 12 percent.

The hazard of water erosion is slight. Slow permeability of the underlying material contributes to increased runoff during periods of heavy rain. Waterways and diversions to dispose of surface water rapidly and safely are beneficial. Management practices that check runoff and control erosion are needed.

This soil can be cropped intensively if well managed. (Capability unit IIe-6; woodland group 2; recreation group 10; wildlife group 3)

Sebewa Series

The Sebewa series consists of nearly level, poorly drained soils that developed in moderately deep loamy material over sand and gravel outwash. These soils are on low terraces, in drainageways, and in depressions of outwash plains.

In a typical profile the surface layer is black silt loam about 13 inches thick. The subsoil, about 16 inches thick, is moderately alkaline. The upper part is firm, gray clay loam mottled with dark reddish brown. The lower part is friable, grayish-brown sandy loam mottled with light olive brown. The underlying material is strongly alkaline, grayish-brown coarse sand mottled with yellowish brown in the upper part.

Permeability is moderate through the subsoil and very rapid in the underlying layer. The available moisture capacity is high. The depth of the root zone is limited by wetness. Surface drainage is needed, but the soils are not suitable for tile drainage. Generally these soils do not need lime.

Most of the larger areas are drained and are used for crops. Corn, small grain, grasses, and some legumes are suitable crops. Undrained areas are better suited to pasture or meadow.

Typical profile of Sebewa silt loam in uncultivated depressions, SE¼SW¼ sec. 23, T. 2 N., R. 17 E.

A11—0 to 4 inches, black (10YR 2/1) silt loam; weak, fine, granular structure; friable; mildly alkaline; clear, smooth boundary.

A12—4 to 10 inches, black (10YR 2/1) silt loam; moderate, fine to very fine, subangular blocky structure; friable; mildly alkaline; clear, smooth boundary.

A13—10 to 13 inches, black (10YR 2/1) silt loam; moderate, medium, prismatic structure; firm; fine sand grains in lower 1 inch of this horizon; mildly alkaline; clear, wavy boundary.

IIB2tg—13 to 26 inches, gray (5Y 5/1) clay loam; moderate, medium, prismatic structure; firm; few, fine, prominent, dark reddish-brown (5YR 3/4) mottles, mostly along vertical cleavage planes and root channels; thin clay films on vertical ped faces; many weathered dolomitic pebbles; moderately alkaline; gradual, wavy boundary.

IIB3—26 to 29 inches, grayish-brown (2.5Y 5/2) sandy loam; weak, medium, subangular blocky structure; friable; many, medium, distinct, light olive-brown (2.5Y 5/6) mottles; many pebbles 5 to 15 millimeters in size; moderately alkaline; clear, wavy boundary.

IIC1—29 to 35 inches, grayish-brown (2.5Y 5/2) coarse sand; single grain; loose; many, medium, distinct, yellowish-brown (10YR 5/6 and 5/8) mottles; strongly alkaline.

IIC2—35 to 60 inches +, grayish-brown (2.5Y 5/2) coarse sand; single grain; loose; strongly alkaline.

The surface layer is very dark gray or black. It ranges from 4 to 9 inches in thickness. The texture is loam or silt loam. The subsurface layer ranges from 3 to 10 inches in thickness. The subsoil is neutral to moderately alkaline. Its texture ranges from silty clay loam to clay loam or sandy loam. The depth to sandy outwash ranges from 24 to 42 inches.

Sebewa soils are not so deep over sand as Drummer soils. They differ from Pella soils mainly in having an underlying layer of sand and gravel outwash, rather than loamy till.

Sebewa silt loam (0 to 3 percent slopes) (Sm).—This soil is mainly on flood plains of drainageways, in depressions on outwash plains, and in low areas bordering lakes. Most areas are more than 40 acres in size. The areas on flood plains are generally long and narrow, and they follow the pattern set by the drainageways. The areas in depressions are generally circular or irregular in shape.

Included in some of the areas mapped are small areas of shallower soils where the surface layer is loam, sandy loam, or silt loam.

This soil is subject to flooding after heavy rains, and good water management is needed. Waterways and diversions help to remove excess surface water rapidly.

If drained, this soil is suited to most general farm crops. It is slow to dry out and warm up in spring, and fieldwork must be delayed. Nitrogen is needed as a starter fertilizer to promote rapid early growth of crops. This soil is not suitable for residential, commercial, or recreational development. (Capability unit IIw-5; woodland group 7; recreation group 6; wildlife group 7)

Troxel Series

The Troxel series consists of deep, well drained to moderately well drained, dark-colored soils that developed in silty sediments deposited by runoff. These soils occur on foot slopes and in natural waterways throughout the county.

In a typical profile the surface layer is black silt loam about 9 inches thick. The subsurface layer, about 28 inches thick, is black to very dark brown, friable silt loam. It is neutral in the upper part but becomes medium acid with depth. The subsoil, about 23 inches thick, is medium acid. The upper part is dark-brown, friable heavy silt loam. The lower part is dark-brown, firm light silty clay loam.

Permeability is moderate, and the available moisture capacity is moderately high. The root zone is deep. Tillage is easy.

These soils are suited to all general farm crops and to many special crops. They respond well to applications of lime and fertilizer. There are no serious limitations.

Typical profile of Troxel silt loam in a cultivated field, SW¼NE¼ sec. 10, T. 3 N., R. 16 E.

Ap—0 to 9 inches, black (10YR 2/1) silt loam; weak, medium, subangular blocky structure; friable; mildly alkaline; clear, smooth boundary.

A1—9 to 27 inches, black (N 2/1) silt loam; weak to moderate, fine, subangular blocky structure; friable; neutral; clear, wavy boundary.

A1b—27 to 37 inches, very dark brown (10YR 2/2) silt loam; weak, medium, platy structure and weak, fine, subangular blocky; friable; medium acid; gradual, smooth boundary.

B1b—37 to 44 inches, dark-brown (10YR 3/3) heavy silt loam; moderate, medium, subangular blocky structure; friable; medium acid; clear, smooth boundary.

B2tb—44 to 60 inches +, dark-brown (10YR 3/3) light silty clay loam; moderate, medium, subangular blocky structure; firm; thin clay films on all ped surfaces; medium acid.

In most places the surface layer is black, but it ranges to very dark brown in some areas. The thickness of the sedimentary overwash ranges from 18 to 36 inches. The texture of this layer is generally silt loam, but thin layers of loam or sandy loam occur in some places. This layer is neutral to medium acid. The soil below the sedimentary layer is well drained to somewhat poorly drained.

Troxel soils differ from Juneau soils in having developed in dark-colored material. They are better drained than Radford soils.

Troxel silt loam, 0 to 3 percent slopes (TxA).—This soil occurs in intermittent natural waterways and at the base of slopes where sediment has been deposited by runoff. The areas are generally less than 20 acres in size.

Included in some of the areas mapped are small areas of Plano, Warsaw, and Lorenzo soils and of the gravelly substratum phases of Plano soils.

This soil is subject to water erosion and occasional overflow. It can be cropped intensively where overflow and erosion are controlled and good management practices are applied. Most areas are too small to be managed separately. (Capability unit I-1; woodland group 12; recreation group 7; wildlife group 8)

Wallkill Series

The Wallkill series consists of poorly drained soils that developed in dark-colored mineral soil material deposited over organic material. These soils occur throughout the county on flood plains and around areas of organic soils.

In a typical profile the surface layer is black silt loam about 21 inches thick. The underlying material is mildly alkaline, black, friable muck to a depth of about 32 inches. Below this is moderately alkaline, very dark brown, partly decomposed sedge peat.

Permeability is moderate, and the available moisture capacity is high. The root zone is limited by the water table. These soils are subject to occasional flooding, and drainage is needed for dependable crops. Tillage is easy.

If drainage is improved and flooding is controlled, these soils are suited to corn, small grain, grasses, and some legumes. Undrained areas are better suited to pasture or meadow. In some places the soils are acid, and lime is needed. The soils are also suitable for woodland and wildlife habitat. They are not suitable for residential, commercial, or recreational development, or for highway subgrade. The mineral surface layer is a good source of topsoil.

Typical profile of Wallkill silt loam in a cultivated field, NW¼NW¼ sec. 24, T. 1 N., R. 17 E.

Ap—0 to 9 inches, black (N 2/0) silt loam; moderate, fine, granular structure; friable; mildly alkaline; abrupt, smooth boundary.

A11—9 to 15 inches, black (N 2/0) silt loam; moderately fine, angular and subangular blocky structure; friable; neutral; clear, smooth boundary.

A12—15 to 21 inches, black (10YR 2/1) silt loam; weak, coarse, subangular blocky structure; friable; neutral; abrupt, smooth boundary.

IIC1—21 to 32 inches, black (10YR 2/1) muck matrix that contains very dark brown (10YR 2/2), partly decomposed plant roots; massive; friable; mildly alkaline; gradual, smooth boundary.

IIC2—32 to 60 inches +, very dark brown (10YR 2/2), disintegrated sedge peat; weak, thick, platy structure; friable; moderately alkaline.

Wallkill soils have black or very dark brown mineral surface and subsurface layers that range from 12 to 42 inches in total thickness. The texture is mainly silt loam, but in some places it is loam. Thin layers of sandy loam occur in the mineral layer in places. These layers are slightly acid to mildly alkaline. The underlying organic material ranges from well-decomposed muck to partly decomposed peat.

Wallkill soils differ from Adrian, Houghton, Palms, and Rollin soils in having a mineral layer at the surface.

Wallkill silt loam (0 to 3 percent slopes) (Wa).—This soil occurs in pockets on flood plains, on alluvial fans where upland waterways empty into muck-filled depressions, and as borders around depressions. The areas are generally less than 20 acres in size.

Included in some of the areas mapped are small areas of Troxel and Radford soils and of Alluvial land.

This soil is suited to open-ditch, surface, or tile drainage. If it is drained and protected from flooding, row crops can be grown year after year.

Establishing a tree plantation can be difficult because of wetness and competition from grasses and other plants. (Capability unit IIw-13; woodland group 9; recreation group 7; wildlife group 8)

Warsaw Series

The Warsaw series consists of nearly level to moderately steep, well-drained, dark-colored loamy soils that are moderately deep over sand and gravel. These soils occur on stream terraces and outwash plains, mainly in the western part of the county.

In a typical profile the surface layer is very dark brown silt loam about 7 inches thick. The subsurface layer, about 3 inches thick, is very dark grayish-brown, friable silt loam. The subsoil is about 29 inches thick. The upper part is medium acid, dark yellowish-brown, friable to firm silt loam and silty clay loam. The middle part is medium acid to neutral, dark yellowish-brown and dark-brown, firm clay loam. The lower part is moderately alkaline and strongly alkaline, very dark brown and dark brown, firm to friable sandy clay loam to sandy loam. The underlying material is calcareous, pale-brown sand and gravel.

Permeability is moderate, and the available moisture capacity is moderate. The depth of the root zone is limited by the coarse-textured outwash. The natural fertility is fairly high, but these soils are slightly droughty. Tillage is easy.

Warsaw soils are used mainly for crops. They are generally acid and need lime.

Typical profile of Warsaw silt loam in a cultivated field, SW¼NE¼ sec. 9, T. 3 N., R. 16 E.

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

A3—7 to 10 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, medium, granular structure; friable; medium acid; gradual, wavy boundary.

B1—10 to 15 inches, dark yellowish-brown (10YR 3/4) silt loam; moderate, medium, subangular blocky structure; friable; medium acid; gradual, wavy boundary.

B21t—15 to 20 inches, dark yellowish-brown (10YR 3/4) silty clay loam; moderate, fine, subangular blocky structure; firm; thin clay films on vertical faces of peds; medium acid; gradual, wavy boundary.

IIB22t—20 to 27 inches, dark yellowish-brown (10YR 4/4) clay loam; moderate, medium, subangular blocky structure; firm; dark-brown (7.5YR 3/2) clay films on all ped faces; medium acid; clear, wavy boundary.

IIB23t—27 to 32 inches, dark-brown (7.5YR 4/4) clay loam; strong, fine, angular blocky structure; firm; thick, very dark brown (10YR 2/2) clay films on all ped faces and on pebbles; neutral; gradual, wavy boundary.

IIB31t—32 to 36 inches, very dark brown (10YR 2/2) sandy clay loam; weak, medium to coarse, subangular blocky structure; firm; moderately alkaline; clear, wavy boundary.

IIB32t—36 to 39 inches, dark-brown (10YR 3/3) sandy loam; weak, coarse, subangular blocky structure; friable; very thin clay bridging on sand grains; strongly alkaline; clear, wavy boundary.

IIC—39 to 60 inches, pale-brown (10YR 6/3) sand and gravel; single grain; loose; calcareous.

Warsaw soils have a black, very dark brown, or very dark gray surface layer 6 to 9 inches thick. The texture is mainly loam or silt loam, but in some areas it is sandy loam. The subsurface layer is black to very dark grayish-brown loam or silt loam 3 to 6 inches thick. The subsoil is strongly acid to neutral. The depth to the underlying sand and gravel outwash ranges from 24 to 42 inches.

Warsaw soils are deeper over sand and gravel than Lorenzo soils, but they are not so deep as the gravelly substratum phases of the Plano soils. They differ from Plano and Griswold soils in having sand and gravel underlying material, rather than loamy till.

Warsaw loam, 0 to 2 percent slopes (WeA).—This soil is on outwash plains and stream terraces. On stream terraces, most areas occur as long, narrow strips between the flood plain and the sloping Warsaw and Lorenzo soils that occupy slightly higher positions. On outwash plains, the areas are irregular in shape and are generally more than 40 acres in size.

The surface layer, about 8 inches thick, is black loam that grades to very dark brown in the lower part. The subsurface layer is black loam about 6 inches thick. The subsoil, about 24 inches thick, is dark-brown clay loam that grades to sandy clay loam in the lower part.

Included in some of the areas mapped are small areas where the surface layer is sandy loam or silt loam. Also included is a small acreage of Warsaw loam where the lower part of the subsoil is mottled.

Most of the acreage is used for crops. All crops commonly grown in the county are suitable, as well as some special crops, such as sweet corn, lima beans, and peas. The soil is slightly droughty, and crops are damaged by extended dry periods. It can be cropped intensively if it is irrigated and other good management practices are applied. Management practices that conserve moisture are beneficial. (Capability unit IIs–1; woodland group 12; recreation group 2; wildlife group 2)

Warsaw silt loam, 0 to 2 percent slopes (WhA).—This soil has the profile described as typical of the series.

Included in some of the areas mapped are small areas of gently sloping Warsaw loam and Warsaw silt loam.

Most of the acreage is used for crops. The soil is slightly droughty, but it is suitable for the crops commonly grown in the county. (Capability unit IIs–1; woodland group 12; recreation group 1; wildlife group 2)

Warsaw silt loam, 2 to 6 percent slopes (WhB).—This soil occurs on stream terraces and outwash plains. The areas on stream terraces generally form a narrow strip between drainageways and Warsaw and Lorenzo soils that occupy slightly higher positions. The areas on outwash plains are generally irregular in shape. Many areas are more than 80 acres in size.

The surface layer, about 8 inches thick, is silt loam that is very dark brown grading to very dark grayish brown in the lower part. The subsurface layer, about 4 inches thick, is very dark grayish brown. The subsoil, about 22 inches thick, is dark-brown silty clay loam grading to clay loam.

Included in some of the areas mapped are small areas, less than 3 acres in size, of loam or sandy loam. Also included is a small acreage of Warsaw silt loam where the lower part of the subsoil is mottled, as well as a small acreage where 4 to 8 inches of the original surface layer has been lost through erosion.

This soil is slightly droughty. Runoff is moderate, and the erosion hazard is slight.

Most of the acreage is used for crops. Some small areas are used for perennial pasture. This soil is suited to all crops generally grown in the county. Management practices that control runoff and conserve moisture are needed. The soil is suitable for irrigation. (Capability unit IIe–2; woodland group 12; recreation group 1; wildlife group 2)

Warsaw silt loam, 6 to 12 percent slopes, eroded (WhC2).—This soil occurs mainly on outwash plains. The areas are generally narrow and adjoin larger, less sloping Warsaw soils on one side and steeper Lorenzo and Rodman soils on the other. Most areas are less than 40 acres in size.

The surface layer, about 7 inches thick, is very dark grayish-brown silt loam. Most of the subsurface layer has been mixed with the surface layer. The subsoil, about 28 inches thick, is dark-brown silty clay loam grading to sandy clay loam in the lower part.

Included in some of the areas mapped are small areas of Plano silt loam, gravelly substratum. Also included are some areas of Warsaw soils that are mottled in the lower part of the subsoil, and areas where the slope is 12 to 20 percent. A small acreage of slightly eroded Warsaw soils is also included.

More than three-fourths of the acreage has lost 4 to 8 inches of the original surface layer through erosion. The surface is generally lighter colored because some of the brown subsoil has been mixed with the surface layer in tillage.

Runoff is rapid, and there is a hazard of water erosion. The available moisture capacity is moderate. This soil is slightly more droughty than the less sloping, less eroded Warsaw soils.

This soil is not suited to row crops, unless management practices are applied to control erosion, conserve moisture, and return organic matter to the soil. It is better suited to close-growing crops, such as small grain and forage plants. Most of the acreage, however, has been cultivated along with adjoining, less sloping soils. The areas are suitable for tree planting and for residential, commercial, and recreational development. (Capability unit IIIe–2; woodland group 12; recreation group 1; wildlife group 2)

Westville Series

The Westville series consists of deep, well-drained soils that developed in glacial till covered with a thin layer of silt. These soils occur on till plains in the southwestern corner of the county, mainly in Sharon Township. They are gently sloping to moderately steep.

In a typical profile the surface layer is dark grayish-brown silt loam about 8 inches thick. The subsoil, about 42 inches thick, is dark brown. The upper part is neutral to strongly acid, friable to firm silt loam and silty clay loam. The middle part is strongly acid, firm clay loam. The lower part is medium acid to neutral, firm loam. The underlying material is moderately alkaline, dark yellowish-brown, friable gravelly sandy loam.

Permeability is moderate, and the available moisture capacity is moderately high. The root zone extends to a depth of more than 3 feet.

Westville soils are good farming soils. If well managed, they are suited to crops and they respond well to applications of lime and fertilizer. They are generally acid and need lime. They are well suited to residential, industrial, and recreational development. They have slight limitations for sewage disposal systems.

Typical profile of Westville silt loam in a cultivated field, NW¼SW¼ sec. 7, T. 1 N., R. 15 E.

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

B1—8 to 11 inches, dark-brown (10YR 4/3) heavy silt loam; moderate, fine, subangular blocky structure; firm; neutral; clear, smooth boundary.

I&IIB21t—11 to 20 inches, dark-brown (7.5YR 4/4) gritty silty clay loam; moderate, fine to medium, subangular and angular blocky structure; firm; few thin clay films; strongly acid; gradual, smooth boundary.

IIB22t—20 to 33 inches, dark-brown (7.5YR 4/4) clay loam; moderate, medium to fine, subangular blocky structure; firm; thin, nearly continuous clay films; strongly acid; gradual, smooth boundary.

IIB31t—33 to 42 inches, dark-brown (7.5YR 4/4) loam; weak, medium, subangular blocky structure; firm; few thin clay flows on vertical ped surfaces; medium acid; gradual, wavy boundary.

IIB32t—42 to 50 inches, dark-brown (7.5YR 4/4) loam; weak, medium, subangular blocky structure; firm; organic stains at lower horizon boundary; spots of manganese throughout; few clay flows and clay films along vertical faces of peds; neutral; gradual, wavy boundary.

IIC—50 to 60 inches +, dark yellowish-brown (10YR 4/4) gravelly sandy loam; weak, medium, platy structure; friable; moderately alkaline.

The surface layer is dark brown to dark gray. It ranges from 6 to 12 inches in thickness. The thickness of the silty layer ranges from 6 to 18 inches. The subsoil is neutral to very strongly acid. Its texture ranges from silty clay loam or clay loam to sandy clay loam. The IIC horizon (underlying till) is generally gravelly sandy loam, but it ranges from heavy loamy sand to light loam. The depth to the underlying till ranges from 42 to 60 inches.

Westville soils have a thinner silt cap than Pecatonica and Flagg soils. They generally have a thicker solum and are more acid than McHenry and Miami soils.

Westville silt loam, 2 to 6 percent slopes, eroded (WvB2).—This soil is on till plains in the southwestern corner of the county. It occurs on uplands with Flagg and Pecatonica soils. The areas are irregular in shape and are generally less than 40 acres in size.

The surface layer, about 8 inches thick, is dark grayish-brown silt loam. The subsoil, about 40 inches thick, is dark-brown silty clay loam in the upper part, grading to clay loam.

Most of the acreage has lost 4 to 8 inches of the original surface layer through erosion. The surface layer of the uneroded areas is more friable and darker colored than that of the eroded areas.

Included in some of the areas mapped are small areas of Pecatonica and Flagg soils.

This soil is suited to all general farm crops and to many special crops. It is also suitable for pasture, woodland, and wildlife habitat. Most of the acreage is in crops. If well managed, it can be cropped intensively. There is a slight erosion hazard. Management practices that include control of water erosion, return of organic matter to the soil, and maintenance of fertility are beneficial. (Capability unit IIe–1; woodland group 1; recreation group 1; wildlife group 1)

Westville silt loam, 6 to 12 percent slopes, eroded (WvC2).—This soil is on till plains in the southwestern corner of the county. It occurs with well-drained Flagg and Pecatonica soils. The areas are generally narrow and follow the slopes set by the drainage pattern. Many of the areas form the side slopes of drainageways. Most are less than 20 acres in size.

This soil has the profile described as typical of the series.

About two-thirds of the acreage has lost 4 to 8 inches of the original surface layer through erosion. The surface layer of the uneroded areas is darker colored than that of eroded areas.

Included in some of the areas mapped are small areas of Pecatonica and Flagg soils. Also included is a small acreage of Westville soils where the surface layer is dark colored.

This soil has a moderate erosion hazard. Careful management is needed to control further erosion and to maintain soil structure. Management practices that include control of runoff, return of organic matter to the soil, and maintenance of fertility are needed. (Capability unit IIIe–1; woodland group 1; recreation group 1; wildlife group 1)

Wet Alluvial Land

Wet alluvial land (0 to 2 percent slopes) (Ww) occurs as nearly level areas or depressions on flood plains that are frequently flooded. The soil material consists of alluvial sediments that range from silt loam to sandy loam in texture. In places sand and gravel occur on the surface or as thin layers of the soil material. In places the surface is pitted and marked by old drainage channels.

Permeability is moderate, and the available moisture capacity is moderately high. The water table is near the surface most of the year.

This land type occurs with soils of the Adrian, Houghton, Palms, and Radford series. Its texture is more variable than that of the Radford soils.

Most of the acreage is suitable for pasture, woodland, or wildlife habitat and is a fairly good source of topsoil. It is not suitable for crops, or for residential, commercial, or recreational development. Some of the areas are not accessible with machinery, because they contain stream channels. (Capability unit Vw–14; woodland group 9; recreation group 6; wildlife group 7)

Use and Management of the Soils

This section contains information about the use and management of the soils of Walworth County for crops and pasture, woodland, wildlife, and engineering. It explains the system of capability classification used by the Soil Conservation Service and gives predicted yields of the principal crops grown in the county under two levels of management.

This section also groups the soils according to their suitability for woodland and wildlife habitat. It contains tables that give ratings of the soils for farm and nonfarm uses and for recreation, and it has a section that gives information about soils significant in engineering.

Management for Crops and Pasture

Minimum tillage, the addition of organic matter to the soil, and the use of grasses and legumes in cropping systems help to maintain or improve soil tilth. Overtillage and traffic with farm machinery compact the soil and alter tilth, especially when the soils are wet. Also, seedbeds that have been raked too smooth are susceptible to wind erosion during dry periods and to puddling and crusting after rainfall. Sandy, droughty soils are especially susceptible to wind erosion when cultivated. Plow planting, a practice in which the field is plowed and planted in one operation, is a good way to minimize tillage. Chemical weed control is also helpful.

Any given field may contain several soils that differ in acidity. Generally, the deep, well-drained, permeable soils, such as those of the Dodge, Flagg, and St. Charles series, need the heaviest applications of lime. Shallow soils, such as those of the Casco and Lorenzo series, need lesser amounts. Some of the soils, such as those of the Hennepin and Rodman series, which are very shallow, do not need lime. Generally, poorly drained soils, such as those of the Drummer and Pella series, need little or none. Lime should be applied in accordance with the results of soil tests.

The amount and kind of fertilizer to apply depend on the supply of plant nutrients in the soil, the ability of the soil to hold nutrients, the amount of moisture available, the kinds of crops to be grown, and the crop rotation.

In planning a cropping system, the soils of the entire farm must be considered. Soils that have few or slight limitations can be cropped intensively; that is, row crops can be grown year after year, or frequently in rotation with small grains. The cropping system should be planned to protect the soil and minimize damage. For example, the plant cover is thinner on Lorenzo soils than on Warsaw soils and provides less protection against erosion and returns less organic matter to the soil. To overcome this deficiency, a cropping system for Lorenzo soils should include a larger proportion of grasses and legumes than one used on Warsaw soils. Sandy soils that are susceptible to severe erosion should generally be left in permanent vegetation. Wet soils that cannot be adequately drained are generally more suitable to forage crops than to cultivated crops.

Figure 8.—**Contour stripcropping of corn, grain, and alfalfa on Miami silt loam. The gently sloping soil at left center is in class II. The more sloping soil at the right of the picture is in class III.**

Practices that effectively control water erosion include terracing, grassed waterways, stripcropping (fig. 8), contour tillage, plow planting, growing sod crops or cover crops in rotations, and returning crop residue to the soil.

Practices that help to control wind erosion are stripcropping at right angles to the direction of prevailing winds, stubble mulching, leaving crop residue on the surface, growing cover crops or meadow crops, and establishing shelterbelts. These practices are effective on sandy, droughty soils, such as those of the Boyer and Chelsea series. These practices also help to catch snow and add moisture to the soil.

Drainage can be improved on most of the wet soils if there are suitable outlets. Upland soils, such as those of the Elburn and Conover series, which formed in glacial till, and the Pella series, which formed in deep, silty material, respond well to both tile and surface drainage. Soils of outwash plains or lake plains, such as those of the Sebewa and Colwood series, generally are not suited to tile drainage, but they respond well to surface and open-ditch drainage. Soils of flood plains need protection from flooding, in addition to surface drainage.

Most forage crops in the county consist of strips of hay grown in the cropping system.

Most upland pastures on well-drained soils of classes II, III, IV, and VI need renovating to maintain fertility. A good seedbed should be prepared, and a suitable mixture of grasses and legumes seeded. Examples of suitable mixtures for seeding are alfalfa with bromegrass or timothy and birdsfoot trefoil with bromegrass. The pasture plants should be seeded with a companion crop of oats, which provides a protective cover the first season and helps to control erosion.

Large amounts of phosphorus and potassium are needed at the time of seeding. Nitrogen should be applied as a topdressing, especially if grasses are dominant in the pasture. Permanent pasture should be topdressed with fertilizer each year or renovated every 5 years to maintain good-quality forage. Rotation of grazing will protect the sod and extend the life of the forage plants.

Soils in class V have a high water table and are subject to flooding. Tillage is not practical, and renovation is not feasible. Such soils are generally kept in reed canarygrass or bromegrass. The areas should be grazed only in dry seasons; hummocks, which hinder surface drainage, develop if the soils are grazed when wet.

Pastures on soils of class VI are difficult to renovate, and soils of class VII are not suitable for renovation. Tillage is not practical, and these soils are generally kept in native grasses. Control of grazing and addition of commercial fertilizer are ways to maintain fertility and control gullying. Topdressing these soils with fertilizer each year is better than renovating the pasture because the sod does not need to be plowed when applying the fertilizer.

Capability Grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The soils are grouped according to their limitations 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, all kinds of soils are grouped at three levels, the capability class, subclass, and 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 subject to little or no erosion but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife habitat.

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 habitat.

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 habitat.

Class VIII soils and landforms have limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife habitat, 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.

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 habitat, 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 IIIs-4. 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 paragraphs; and the Arabic numeral specifically identifies the capability unit within each subclass. The capability units are not numbered consecutively within the subclass, because they fit into a statewide system of capability classification, and not all the capability units in the State are represented in this county.

Management by capability units

In the following pages the capability units in Walworth County are described, and suggestions for use and management of the soils are given. The names of the soil series represented are mentioned in the description of each capability unit, but the listing of the series name does not necessarily indicate that all the soils of a series are in the same capability unit. The capability classification of any given soil can be learned by referring to the "Guide to Mapping Units."

CAPABILITY UNIT I-1

This unit consists of deep, well drained and moderately well drained, nearly level soils of the Dodge, Flagg, Juneau, Miami (fig. 9), Pecatonica, Plano (fig. 10), St. Charles, and Troxel series. Juneau and Troxel soils, which are in drainageways and on foot slopes, are subject to occasional flooding. The moderately well drained soils are somewhat slow to dry out and to warm up in spring.

These soils are moderately permeable and have moderate to high available moisture capacity. They are easy to work and have few limitations.

These soils can be used intensively for corn, small grain, forage crops, and special crops, such as lima beans, peas, and sweet corn. They are also well suited to pasture and to production of wildlife food and cover. Except for the Troxel and Plano soils, they are well suited to woodland.

CAPABILITY UNIT IIe-1

This unit consists of deep and moderately deep, gently sloping soils of the Dodge, Flagg, Griswold, McHenry, Miami, Pecatonica, Plano, St. Charles, and Westville series.

These soils are moderately permeable and have moderate to high available moisture capacity. There is a slight erosion hazard. The soils are easy to work, but they generally need lime. The moderately well drained soils are slow to dry out and warm up in spring.

These soils are well suited to all the crops commonly grown in the county. Corn is the main row crop, and oats and alfalfa-bromegrass hay are the main close-growing crops. Special crops, such as sweet corn, lima beans, and peas, are also suitable. These soils are well suited to pasture and to production of wildlife food and cover. Except for the Griswold and Plano soils, they are suited to trees.

CAPABILITY UNIT IIe-2

This unit consists of well-drained, gently sloping soils of the Fox, Knowles, and Warsaw series. These soils are moderately deep over sand, gravel, or bedrock.

These soils are moderately permeable and have moderate available moisture capacity. They are easy to work and to keep in good tilth, but they are slightly droughty. Some of the soils have lost as much as 8 inches of the original surface layer through erosion, and there is a slight hazard of further erosion. Limestone bedrock, which interferes with excavation, is at a depth of 20 to 40 inches in Knowles silt loam.

These soils are well suited to corn, small grain, grasses, and legumes. They are also well suited to pasture and wildlife habitat. Except for Warsaw soils, they are well suited to woodland. If protected from fire and livestock grazing, areas now in woodland generally will bring better cash returns than if those areas were used for both pasture and woodland.

CAPABILITY UNIT IIe-6

This unit consists of deep, well drained and moderately well drained, gently sloping soils of the Hebron and Saylesville series. These soils are on glacial lakebeds.

These soils are moderately permeable through the upper layers, but they are slowly permeable through the underlying material. They have moderate to high available moisture capacity. They are easy to work, and good tilth is easy to maintain. There is a slight hazard of further erosion. The soils are somewhat slow to dry out in spring and after heavy rains, and consequently, spring fieldwork must be begun later than on more permeable soils.

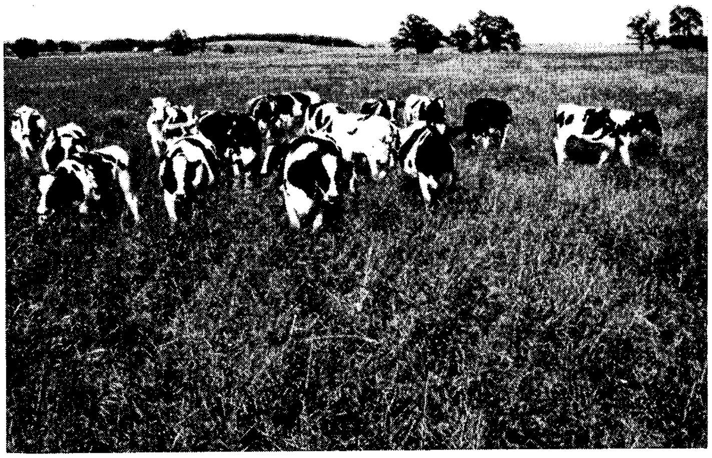


***Figure 9.*—Rotation pasture of alfalfa and bromegrass on Miami silt loam. If properly managed, this kind of pasture provides green, succulent forage throughout the grazing season. The roots of bromegrass form a tough, dense sod that helps to control wind and water erosion.**

These soils are suited to corn, small grain, grasses, and legumes. They are also suitable for woodland and wildlife habitat. If protected from fire and livestock grazing, areas now in woodland will bring better cash returns than if those areas were used for both pasture and woodland.

CAPABILITY UNIT IIw-1

This unit consists of deep, poorly drained soils of the Drummer, Navan, and Pella series.

These soils have moderate to slow permeability and high available moisture capacity. The natural fertility is high. These soils are subject to ponding, and they remain wet longer after heavy rains than the adjoining better drained areas. Wetness is caused by slow surface and internal drainage and a high water table.

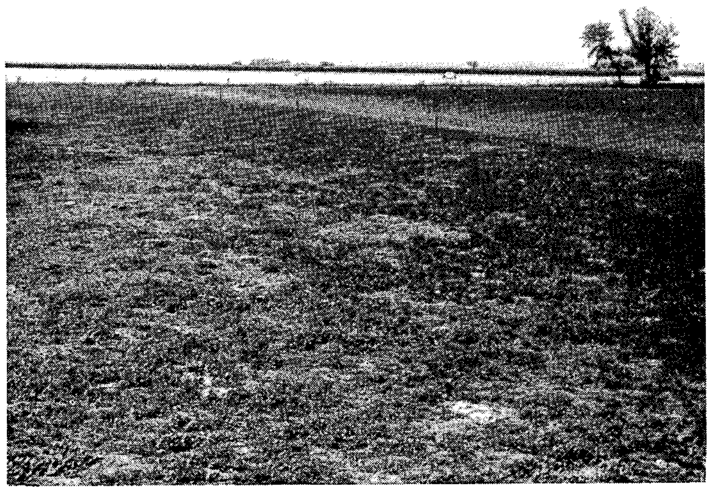


***Figure 10.*—An area of Plano silt loam, a deep, dark-colored, highly productive soil in capability unit I-1. This area is used for pasture.**

Grassed waterways can be installed to improve surface drainage, and diversions can be used to intercept runoff from adjoining areas. Surface or tile drainage can be used if outlets are available. The Drummer soil is underlain by sand and gravel; tile must be carefully laid to prevent the sand from entering and clogging the tile line.

Drained areas are suited to corn, small grain, grasses, and legumes and can be cropped intensively. Undrained areas are better suited to pasture or meadow and to woodland and wildlife habitat than to cultivated crops. Areas that cannot be drained are better suited to alsike and Ladino clover than to alfalfa.

CAPABILITY UNIT IIw-2

This unit consists of deep, somewhat poorly drained soils of the Aztalan, Conover, Elburn, Flagg, mottled subsoil variant, Griswold, mottled subsoil variant, Kendall, and Martinton series.

These soils have high available moisture capacity and moderately slow permeability. They are subject to ponding and are slow to dry out and warm up in spring. They remain wet longer after heavy rains than the adjoining better drained areas. Wetness is caused by slow surface and internal drainage and by accumulation of water from adjoining areas. There is a slight hazard of erosion on gently sloping areas.

Grassed waterways improve surface drainage and reduce ponding after heavy rains. Diversions can be installed to intercept runoff from adjoining areas. Surface or tile drainage can be used if outlets are available. Elburn silt loam, gravelly substratum, is underlain by sand and gravel; tile must be carefully laid to prevent the sand from entering and clogging the tile line.

Drained areas are suited to corn, small grain, grasses, and legumes and can be cropped intensively. Minimum tillage and maintenance of the organic-matter content help to preserve soil structure and improve tilth. Undrained areas are suited to pasture or meadow and to wildlife habitat. Areas that cannot be drained are better suited to alsike and Ladino clover than to alfalfa. The Conover, Flagg, and Kendall soils are suited to woodland.

CAPABILITY UNIT IIw-5

This unit consists of somewhat poorly drained and poorly drained soils of the Matherton and Sebewa series. These soils are underlain by sand and gravel.

Permeability is moderate in the loamy upper layer, but it is rapid in the underlying sand and gravel. The available moisture capacity is high.

These soils are subject to ponding, and they are slow to dry out and warm up in spring. They remain wet longer after heavy rains than adjoining areas of better drained soils. Wetness is caused mainly by a high water table. Grassed waterways improve surface drainage and reduce ponding after heavy rains. Diversions can be installed to intercept runoff from adjoining areas.

Drainage is needed for best growth of many crops. Drained areas are suited to corn, small grain, grasses, and legumes. Undrained areas are suited to pasture or forage crops. Areas that cannot be drained are better suited to alsike and Ladino clover than to alfalfa. Sebewa soils are poorly drained and have a greater wetness limitation than Matherton soils.

These soils are well suited to woodland and wildlife habitat. Machine planting of trees is not feasible in all places, because of wetness.

CAPABILITY UNIT IIw-13

This unit consists of deep, somewhat poorly drained soils of the Radford and Wallkill series. These soils occur on flood plains and in drainageways. They are nearly level and are subject to occasional flooding.

These soils are moderately permeable and have high available moisture capacity. Wetness is caused by a high water table, poor surface drainage, or seepage. Grassed waterways improve surface drainage and reduce ponding after heavy rains. Diversions can be installed to intercept runoff from adjoining areas.

If these soils are drained and protected from flooding, they are suited to corn, small grain, grasses, and legumes. Undrained areas are suitable for permanent pasture and forage crops, but they should not be used for pasture when the soils are wet and soft. They are also suitable for woodland and wildlife habitat. Tree planting is generally difficult because of wetness and plant competition.

CAPABILITY UNIT IIs-1

This unit consists of well drained and moderately well drained, nearly level soils of the Fox and Warsaw series.

These soils are moderately permeable and have moderate available moisture capacity. They are slightly droughty. They are easy to work, and good tilth is easy to maintain. Crop yields are low during extended dry periods. Lime is needed.

These soils are suited to all the crops commonly grown. Corn is the main row crop, and oats and alfalfa-bromegrass hay are the main close-growing crops. Special crops, such as sweet corn, lima beans, and peas, are also suitable. The soils are well suited to pasture and to wildlife habitat.

The Fox soils are suited to trees. If protected from fire and grazing animals, areas now in woodland will bring larger cash returns from trees than if the areas were used for both pasture and woodland.

CAPABILITY UNIT IIs-7

The only soil in this unit is Saylesville silt loam, 0 to 2 percent slopes. It is a deep, well drained to moderately well drained, nearly level soil on glacial lakebeds.

This soil is moderately permeable through the upper layers, but it is slowly permeable through the underlying material. It has moderate to high available moisture capacity. The soil is easy to work and to keep in good tilth, but it is somewhat slow to dry out in spring and after heavy rains.

This soil is suited to corn, small grain, grasses, and legumes. It is also suited to woodland and wildlife habitat.

CAPABILITY UNIT IIIe-1

This unit consists of deep and moderately deep, well-drained soils of the Griswold, McHenry, Miami, Plano, and Westville series. These soils occur on sloping uplands.

These soils are moderately permeable and have moderate to high available moisture capacity. They are easily worked. In most areas as much as 8 inches of the original surface layer has been lost through erosion, and there is a moderate hazard of further erosion.

These soils are suited to all the crops commonly grown. They are well suited to pasture and to wildlife habitat. Except for the Griswold and Plano soils, they are well suited to woodland. Corn is the main row crop, and oats and alfalfa-bromegrass hay are the main close-growing crops. Special crops, such as sweet corn, lima beans, and peas, are also suitable. Soil and water conserving practices, such as contour stripcropping, reduce runoff and loss of soil.

CAPABILITY UNIT IIIe-2

This unit consists of sloping soils of the Fox and Warsaw series. These soils are moderately deep over sand and gravel. They are moderately permeable and have moderate available moisture capacity. They are easy to cultivate but are slightly droughty. As much as 8 inches of the original surface layer has been lost through erosion, and there is a moderate hazard of further water erosion.

These soils are suited to corn, small grain, grasses, and legumes. They are also well suited to pasture and wildlife habitat. The Fox soils are well suited to woodland.

Soil and water conserving practices, such as contour farming, reduce runoff and loss of soil.

CAPABILITY UNIT IIIe-4

This unit consists of somewhat droughty, gently sloping soils of the Casco, Lorenzo, and Miami series, sandy loam substratum. These soils are shallow to moderately deep over sandy or gravelly glacial drift.

The available moisture capacity is moderately low to low. Permeability is moderate to rapid in the upper layer, but it is rapid in the underlying material. In some places as much as 8 inches of the original surface layer has been lost through erosion, and there is a slight hazard of further wind and water erosion.

These soils are suited to corn, small grain, grasses, and legumes. They are also suited to pasture and wildlife habitat. The Casco and Miami soils are suited to woodland. Crops respond well to irrigation. Irrigated areas can be used fairly intensively for cultivated crops if erosion is controlled and the organic-matter content is maintained. Keeping the soils in good tilth is especially important because good tilth helps to conserve moisture.

CAPABILITY UNIT IIIe-7

The only soil in this unit is Fox sandy loam, 6 to 12 percent slopes, eroded. This soil is moderately deep over sand and gravel.

Permeability is moderately rapid through the subsoil and rapid in the underlying sand and gravel. The available moisture capacity is moderately low. The natural fertility is moderately low. This soil is somewhat droughty, and there is a moderate hazard of wind and water erosion.

This soil is suited to small grain, grasses, and legumes. Row crops, such as corn and soybeans, can be grown if erosion is controlled. Pasture, pine plantations, and wildlife habitat are also suited.

Stripcropping is needed to control wind and water erosion if this soil is used for cultivated crop. Pine plantations bring larger long-term returns than pasture or meadow. The soil and the slope are well suited to machine planting.

CAPABILITY UNIT IIIw-3

This unit consists of deep to moderately deep, somewhat poorly drained to poorly drained soils of the Colwood, Knowles, mottled subsoil variant, and Mundelein series. The Colwood and Knowles soils are poorly drained. The Knowles soil has dolomite bedrock within 20 to 40 inches of the surface.

These soils have high available moisture capacity and moderately slow to slow permeability. Wetness is caused by a high water table, slow surface drainage, and slow internal drainage. Colwood and Mundelein soils generally are not suitable for tile drainage, but surface drainage gives good results. Grassed waterways can be installed to intercept runoff from adjoining areas.

Drained areas are suited to corn, small grain, grasses, and legumes. Undrained areas are suited to pasture or forage crops. Areas that cannot be drained are better suited to alsike and Ladino clover than to alfalfa.

These soils are suitable for woodland and wildlife habitat. Tree planting is generally difficult because of wetness and plant competition. In some areas machine planting is not possible, because of the wetness.

CAPABILITY UNIT IIIw-9

This unit consists of deep to moderately deep, poorly drained peat and muck soils of the Houghton and Palms series. These soils are in depressions and on bottom lands.

The available moisture capacity is high, and the natural fertility is moderately low. Undrained areas are subject to flooding. Open-ditch or tile drainage is needed before the soils can be used for cultivated crops. Wind erosion and subsidence are serious hazards in drained areas; fire is also a hazard. Subsidence can be reduced by controlling the water level. In some areas these soils have a strongly alkaline or calcareous surface layer, and special management is needed.

Drained areas are suited to corn, small grain, grasses, and legumes. They are also suited to many special crops, such as truck crops, mint, and sod. Undrained areas are suited to meadow, pasture, or wildlife habitat. Tame hay is a more productive forage crop than native grasses. Undrained areas can also be made into excellent habitat for waterfowl by level ditching or by installing structures to control the water level. If fertility is maintained and erosion controlled, row crops can be grown year after year.

CAPABILITY UNIT IIIw-12

This unit consists only of Alluvial land, a deep, well drained to moderately well drained land type on flood plains.

Permeability is moderate, and the available moisture capacity is moderate. The natural fertility is moderate.

These areas are nearly level and subject to occasional flooding; some are subject to streambank erosion. In some areas random surface drains are needed to channel water out of depressions. Generally, this soil is not suited to tile drainage.

Areas that are protected from stream overflow are suited to corn, small grain, grasses, and legumes. Special crops, such as potatoes and peas, are also suitable. Continuous row crops can be grown if minimum tillage is practiced and if fertility and organic-matter content are maintained. Unprotected areas are suited to forage crops, woodland, or wildlife habitat.

CAPABILITY UNIT IIIs-4

This unit consists of moderately deep to deep, somewhat droughty, nearly level to gently sloping, sandy soils of the Fox and Metea series. The subsoil or substratum is finer textured than the surface layer.

These soils have moderately low available moisture capacity. The natural fertility is moderately low. There is a moderate to severe hazard of wind erosion and a slight hazard of water erosion on slopes. Permeability of Fox sandy loam is moderately rapid through the subsoil and rapid in the underlying sand and gravel. The Metea soils are rapidly permeable in the upper, coarse-textured layer and moderately permeable in the finer textured substratum.

These soils are suited to corn, soybeans, small grain, and grasses. They are also suited to pasture and wildlife habitat. Row crops can be grown year after year on level areas if the soils are irrigated and erosion is controlled.

These soils are well suited to pine plantations. The soils and slopes are well suited to machine planting.

CAPABILITY UNIT IVe-1

This unit consists of deep to moderately deep soils of the Griswold and Miami series. These soils are on moderately steep uplands.

Permeability is moderate, and the available moisture capacity is moderate to high. Runoff is rapid, and there is a severe hazard of water erosion. In most places as much as 8 inches of the original surface layer has been lost through erosion. These soils need careful management if they are cultivated. Lime is needed to supplement fertilizer.

These soils are suited to corn, small grain, grasses, and legumes. They are also suited to pasture and wildlife habitat. Practices that conserve soil and water are needed to control erosion and to improve infiltration of water. If these practices are not applied, the soils should be planted to grasses. Tilth can be improved in eroded areas by heavy applications of barnyard manure or green manure. The Miami soils are suitable for woodland.

CAPABILITY UNIT IVe-4

This unit consists of shallow to moderately deep, somewhat droughty, sloping soils of the Casco, Fox, and Lorenzo series. These soils are underlain by sandy or gravelly glacial drift. In places the surface layer is stony.

Permeability is moderate through the subsoil and rapid in the underlying material. The available moisture capacity is moderately low. As much as 8 inches of the original surface layer has been lost through erosion. The hazard of water erosion is moderate.

These soils are suited to corn, small grain, grasses, and legumes. They are also suitable for pasture and wildlife habitat. Maintaining a high organic-matter content and keeping these soils in good tilth are especially important because these practices increase the rate of infiltration. If management practices that conserve moisture and control erosion are not applied, the soils are suited only to close-growing crops.

Casco soils are suited to trees. Woodland brings only fair returns because the soils are shallow and droughty. The choice of trees for planting is limited.

CAPABILITY UNIT IVw-7

This unit consists of poorly drained muck soils of the Adrian and Rollin series. These soils are underlain by sand or marl.

The available moisture capacity is high, and the natural fertility is moderately low. Undrained areas are subject to flooding. Open-ditch drainage is needed before the soils can be used for cultivated crops. The areas are generally not suitable for tile drainage. Wind erosion and subsidence are serious hazards in drained areas; fire is also a hazard. Subsidence can be reduced by controlling the water level. In some areas the soils have a strongly alkaline to calcareous surface layer, and special management is needed.

Drained areas are suited to corn, small grain, and grasses. They are also suited to many special crops, such as truck crops, mint, and sod. These soils warm up slowly in spring, and a starter fertilizer that contains nitrogen is needed for rapid early growth of crops. They are also low in content of phosphorus and potash. Undrained areas are suited to meadow, pasture, or wildlife. Tame hay is a more productive forage crop than native grasses. Undrained areas can also be made into excellent habitat for waterfowl by level ditching or by installing structures to control the water level.

CAPABILITY UNIT IVs-3

This unit consists of moderately shallow to deep, droughty, gently sloping, sandy soils of the Boyer and Chelsea series. These soils have a loamy subsoil.

Permeability is rapid, and the available moisture capacity is low. The natural fertility is low. There is a moderate hazard of wind erosion. On gentle slopes there is a slight hazard of water erosion.

These soils are suited to corn, soybeans, small grain, grasses, and legumes. They are also suited to pasture, woodland, and wildlife habitat. Row crops can be grown year after year if the soils are irrigated, if all crop residue is returned to the soil, and if cover crops are grown.

These soils are well suited to pine plantations, which bring larger long-term returns than pasture or meadow. The soils and slope are well suited to machine planting.

CAPABILITY UNIT Vw-7

The only soil in this unit is Rollin muck, shallow. This is a poorly drained muck soil that is underlain by marl.

This soil has high available moisture capacity and low natural fertility. It is subject to flooding. The surface layer in some areas is strongly alkaline to calcareous.

This soil is not suitable for row crops, because it is too shallow and because it subsides under cultivation. It is suited to pasture and forage crops. It warms up slowly in spring, and a starter fertilizer containing nitrogen is needed for rapid early growth of forage crops. Tame hay is a more productive forage crop than native grasses. Surface drainage is needed to improve this soil for pasture and meadow. Undrained areas can be used for pasture, meadow, or wildlife habitat. They can be made into excellent habitat for waterfowl by level ditching or by controlling the water level. Potholes that fill up with water can be made by blasting with dynamite.

CAPABILITY UNIT Vw-14

This unit consists only of Wet alluvial land. This nearly level land type is deep and poorly drained. In places the surface is pitted and marked by old drainage channels, which limit accessibility with machinery.

Permeability is moderate, and the available moisture capacity is high. The natural fertility is moderate. Lime generally is not needed. These areas have a high water table and are subject to frequent flooding.

These areas are not suitable for row crops. Most areas are suitable for pasture, woodland, or wildlife habitat. Replacing low-quality native grasses with a high-quality grass and legume mixture increases returns from these areas. Topdressing pastures each year will keep up good-quality grasses. Dikes or embankments can be used to protect against flooding.

Dikes or ditches can be used to control the water level and make excellent habitat for waterfowl. Potholes that fill up with water can be blasted out where the permanent water table is near the surface.

CAPABILITY UNIT VIe-1

This unit consists only of Miami loam, sandy loam substratum, 20 to 35 percent slopes, eroded.

This soil has moderate available moisture capacity and moderate permeability. It has a severe water erosion hazard if used for row crops.

This soil is not suitable for cultivated crops. It is suited to meadow, pasture, woodland, or wildlife habitat. Meadow or pasture should be renovated at least 1 year out of 5. Moderately high yields of forage can be expected if a legume-grass seeding is used and if fertility is maintained.

Woodland areas should be protected from fire and grazing animals. Machine planting is hazardous on the steeper slopes.

CAPABILITY UNIT VIe-4

This unit consists of somewhat droughty, sloping to moderately steep soils of the Casco, Fox, Lorenzo, and Rodman series. These soils are shallow over sandy or gravelly glacial drift. In places the surface layer is stony.

These soils have moderately low available moisture capacity. Permeability is moderate through the subsoil and rapid in the underlying material. These soils generally do not need lime. Maintaining high organic-matter content and good tilth is particularly desirable because good tilth helps to improve the infiltration rate. The severely eroded soils are low in organic-matter content and fertility, and they are difficult to cultivate.

These soils are not suitable for cultivated crops. They are suited to meadow, pasture, woodland, or wildlife habitat. Meadow or pasture should not be renovated more than 1 year out of 5. Moderately high yields of forage can be expected if legume-grass seeding is used and if fertility is maintained. Heavy applications of barnyard manure help to establish a plant cover on severely eroded areas.

Casco loam, 12 to 20 percent slopes, eroded, is the only soil in this unit that is in native woodland. Timber yields are only fair because of the shallow soil and droughtiness. The choice of trees for planting is limited. Machine planting is hazardous on the moderately steep slopes.

CAPABILITY UNIT VIe-9

This unit consists of droughty, moderately steep, sandy soils of the Boyer and Chelsea series. These soils have a loamy subsoil.

Permeability is rapid, and the available moisture capacity is low. The natural fertility is low. There is a severe hazard of water erosion and a moderate hazard of wind erosion. In some areas of Boyer soils, as much as 8 inches of the original surface layer has been lost through erosion. A good vegetative cover is the best way to control erosion.

These soils are not suitable for cultivated crops. They are suited to meadow, pasture, pine plantations, or wildlife habitat. Maintaining fertility at a high level or renovating pastures every 5 years will produce the best yields of good-quality forage.

Planting these soils to pines usually brings larger long-term returns than using them for pasture or meadow. Machine planting, however, is hazardous because of the slope. Areas used for woodland also provide habitat for wildlife.

CAPABILITY UNIT VIIe-4

This unit consists of somewhat droughty, moderately steep to very steep soils of the Casco and Rodman series. These soils are shallow over sandy or gravelly glacial drift. Many areas are stony. The subsoil is exposed in most of the severely eroded areas.

Permeability is moderate through the subsoil and rapid in the underlying material. The available moisture capacity is low. The organic-matter content and fertility are low. Runoff is very rapid, and there is a severe hazard of erosion and gullying.

These soils are not suitable for cultivated crops. They are suited to meadow, pasture, woodland, and wildlife. Maintaining a high organic-matter content and keeping the soils in good tilth are especially desirable because these practices increase infiltration of water. Controlled grazing helps to maintain the sod and to check the formation of gullies. Topdressing with fertilizer each year substitutes for renovation and keeps up a good yield of forage. Heavy applications of barnyard manure and fertilizer may be necessary to establish vegetation on severely eroded areas.

Areas now in woodland can be maintained by protecting them from fire and grazing animals. This protection also improves the woodland for wildlife habitat. The choice of trees for planting is limited, and the use of machinery for planting is hazardous.

CAPABILITY UNIT VIIs-5

This unit consists of droughty, steep and very steep soils of the Casco, Hennepin, Miami, and Rodman series. These soils are shallow and very shallow over sand and gravel. Stones are common in the surface layer.

Permeability is rapid, and the available moisture capacity is low. Runoff is very rapid, and there is a severe hazard of water erosion.

These soils are suited to woodland and wildlife habitat. They can be used for pasture, but yields are low and a good sod is difficult to maintain. The long-term returns from woodland are generally larger than those from pasture. A large part of the acreage is wooded, and these areas should be protected from fire and grazing animals. The natural growth of young trees and shrubs provides food and cover for wildlife. Except for the Rodman soils, these soils are suitable for planting pine. Seedling survival is lower on areas of the Rodman soils than on other soils because of droughtiness, erosion, and exposure to heat.

CAPABILITY UNIT VIIIw-15

This unit consists only of Marsh, a wet land type in depressions and in areas bordering lakes. These areas are flooded most of the year. They are covered by cattails, bulrushes, and other plants that grow in shallow water.

Marsh is not suitable for pasture or trees, but it is suitable for wildlife habitat. Ditching or controlling the water level by installing structures will improve the habitat for waterfowl. Potholes that fill with water can be blasted out with dynamite. In dry seasons these areas need protection from fire.

CAPABILITY UNIT VIIIs-10

This unit consists only of Sandy lake beaches, which are infertile, droughty, sandy areas along lakeshores. These areas are subject to frequent flooding as the water level rises and falls. Their use is limited mainly to recreation. Trees and brush grow in areas where roots can penetrate to the moist soil above the water table, but the soil material is generally so droughty and infertile that planted seedlings are likely to die. Existing trees and shrubs can be preserved, and the areas can be managed for recreation and wildlife habitat.

Predicted Yields

Table 2 gives predicted average yields per acre for the principal crops grown in the county. These predictions are based on interviews with farmers, on results obtained by the agricultural experiment station on experimental test plots, and on observations made by soil scientists and other agricultural workers who are familiar with the soils. Soils and land types that are not suitable for the crops shown are not listed in the table.

The yields given in table 2 are for two levels of management. The columns marked "Average" give yields to be expected under an average level of management. The columns marked "High" give yields to be expected under improved management.

The following practices are assumed to be part of an average level of management. Wet soils are drained, but drainage is generally inadequate. The soils are adequately limed. For corn, about 12,000 plants of a suitable hybrid variety are grown per acre. The seedbed is plowed and harrowed in the usual manner. About 8 tons of barnyard manure is applied per acre and 150 pounds of 0–10–30 commercial fertilizer. About 150 pounds of 6–24–24 commercial fertilizer is applied as a starter. The fields are cultivated twice. There is a minimum amount of chemical weed control.

For seeding oats with legume-grass mixtures, the seedbed is plowed and harrowed. Suitable disease-resistant seed is used. About 150 pounds of 0–10–30 is broadcast as a starter fertilizer. No additional fertilizer is applied to hayfields. Hay is cut twice each year.

The following practices are assumed to be part of a high level of management. Wet soils are adequately drained. Lime and fertilizer are applied according to crop needs, as indicated by soil tests. For corn, about 14,000 to 18,000 plants of a suitable hybrid variety are grown per acre. The seedbed is plowed and harrowed in the usual manner. About 10 tons of barnyard manure is applied per acre, and about 300 pounds of 0–10–30 commercial fertilizer is broadcast. Seeding is done at the right time and at the proper rate. A starter fertilizer of about 200 pounds of 6–24–24 is applied, followed by a sidedressing of 80 pounds of nitrogen. Weeds are chemically controlled.

For seeding oats with legume-grass mixtures, a starter fertilizer of 300 pounds of 0–10–30 commercial fertilizer is broadcast. Suitable disease-resistant seed is planted at the recommended rate and at the proper time. Weeds are chemically controlled.

For alfalfa-bromegrass hay, management includes seeding recommended mixtures of clean, viable seed, clipping grain stubble after harvest, cutting hay early when quality is at its peak, and topdressing every 2 years with 300 pounds of 0–10–30 commercial fertilizer.

Table 2 does not show predicted yields for pasture. The trend among farmers of the county is toward storage feeding, which consists of chopping green forage into a silo and feeding as required.

The yields given in table 2 are based on averages over a long period of time and on average amounts of rainfall. Even higher yields than those shown can be obtained, but to do so, larger amounts of fertilizer must be used and management must be more careful. The county agent or soil conservationist can be consulted about use of lime and fertilizer and about seed varieties and seeding rates.

Use of the Soils for Woodland [2]

Originally, about 77 percent of Walworth County was forested. Land clearing began as early as 1840 and continues virtually unabated to the present day. At present, less than 10 percent of the county, or about 34,000 acres, is woodland, most of which is in the townships of La Grange, Linn, East Troy, Geneva, and Richmond. Only about 1,200 acres, in the Kettle Moraine State Forest, is under public ownership.

[2] By Robert E. Greenlaw, woodland conservationist, Soil Conservation Service.

TABLE 2.—*Predicted average yields per acre of principal crops under two levels of management*

[Yields in columns marked "Average" are to be expected under an average level of management; yields in columns marked "High" are to be expected under a high level of management. Dashes indicate that the soil is not suited to the crop specified, or that the crop is not ordinarily grown. Soils and land types that are not suitable for the crops shown are not listed in the table]

Soil	Corn for grain		Corn for silage		Oats		Alfalfa-bromegrass hay [1]	
	Average	High	Average	High	Average	High [2]	Average	High
	Bu.	*Bu.*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Tons*	*Tons*
Adrian muck	—	—	12	17	—	—	—	—
Alluvial land [3]	70	100	11	16	50	65	3.0	4.0
Aztalan loam, 1 to 3 percent slopes	65	105	11	17	50	60	2.5	4.5
Boyer complex, 2 to 6 percent slopes	45	65	8	11	35	50	1.5	2.5
Boyer complex, 6 to 12 percent slopes, eroded	45	60	7.5	10	30	45	1.25	2.25
Casco loam, 2 to 6 percent slopes, eroded	50	70	8	12	40	55	1.75	2.75
Casco loam, 6 to 12 percent slopes, eroded	45	65	7	11	35	50	1.5	2.5
Casco loam, 12 to 20 percent slopes, eroded	—	—	—	—	30	45	1.25	2.25
Casco soils, 6 to 12 percent slopes, severely eroded	—	—	—	—	30	45	1.25	2.25
Casco soils, 12 to 20 percent slopes, severely eroded	—	—	—	—	—	—	1.0	2.0
Casco-Fox loams, 12 to 20 percent slopes, eroded	—	—	—	—	—	—	1.5	2.25
Casco-Fox silt loams, 6 to 12 percent slopes, eroded	50	70	8	12	45	65	1.75	2.75
Casco-Rodman complex, 12 to 20 percent slopes, eroded	—	—	—	—	—	—	1.0	2.0
Casco-Rodman complex, 20 to 30 percent slopes, eroded	—	—	—	—	—	—	1.0	1.5
Chelsea fine sand, 1 to 6 percent slopes	30	45	6.5	8.5	25	40	1.0	2.0
Chelsea fine sand, 6 to 30 percent slopes	—	—	—	—	—	—	1.0	2.0
Colwood silt loam	65	95	12	16	45	60	—	4.0
Conover silt loam, 1 to 3 percent slopes	75	110	12.5	17.5	55	65	2.5	4.0
Dodge silt loam, 0 to 2 percent slopes	80	110	13.0	18	65	75	3.5	4.75
Dodge silt loam, 2 to 6 percent slopes	75	105	—	—	60	75	3.0	4.5
Drummer silt loam, gravelly substratum	70	110	12	18	45	65	—	4.0
Elburn silt loam, 1 to 3 percent slopes	85	120	14	19	55	65	2.5	4.75
Elburn silt loam, gravelly substratum, 1 to 3 percent slopes	85	125	14	19	55	70	3.0	4.0
Flagg silt loam, 0 to 2 percent slopes	80	110	13.5	18.5	65	75	3.5	4.75
Flagg silt loam, 2 to 6 percent slopes	75	105	12.5	17.5	60	73	3.0	4.5
Flagg silt loam, mottled subsoil variant, 0 to 3 percent slopes	80	115	13	18	55	65	2.5	4.5
Fox loam, 2 to 6 percent slopes	50	85	9.5	12	40	55	2.25	3.0
Fox loam, 6 to 12 percent slopes, eroded	45	70	8	11	35	50	2.0	2.75
Fox sandy loam, 1 to 6 percent slopes	48	68	8	11	35	50	1.75	2.25
Fox sandy loam, 6 to 12 percent slopes, eroded	40	60	7	9.5	30	40	1.25	1.75
Fox silt loam, 0 to 2 percent slopes	60	85	10	14	50	65	2.5	3.5
Fox silt loam, 2 to 6 percent slopes	58	83	9.5	13	48	63	2.25	3.25
Fox silt loam, 6 to 12 percent slopes, eroded	45	75	8	11	40	55	2.0	2.75
Griswold loam, 2 to 6 percent slopes	65	90	11	15	50	65	2.5	3.5
Griswold loam, 6 to 12 percent slopes, eroded	55	70	9	12	40	50	2.0	2.5
Griswold loam, 12 to 20 percent slopes, eroded	—	—	—	—	—	—	1.75	2.2
Griswold silt loam, mottled subsoil variant, 0 to 3 percent slopes	80	110	13	17.5	50	60	2.25	4.0
Hebron loam, 1 to 6 percent slopes	75	105	11	17	50	65	2.75	4.0
Hennepin-Miami loams, sandy loam substratum, 20 to 35 percent slopes	—	—	—	—	—	—	1.5	2.0
Houghton muck	—	—	15	19	—	—	—	—
Juneau silt loam, 1 to 3 percent slopes [3]	75	105	12.5	17.5	55	70	3.5	4.5
Kendall silt loam, 1 to 3 percent slopes	80	115	13	18	55	65	2.5	4.5
Knowles silt loam, 1 to 6 percent slopes	60	85	10	14	50	70	2.5	3.5
Knowles silt loam, mottled subsoil variant, 0 to 2 percent slopes	65	(4)	12	(4)	45	(4)	—	(4)
Lorenzo loam, 2 to 6 percent slopes	55	75	8	12	40	55	1.75	2.75
Lorenzo loam, 6 to 12 percent slopes, eroded	45	65	7	11	35	50	1.5	2.5
Lorenzo-Rodman complex, 12 to 20 percent slopes, eroded	—	—	—	—	—	—	1.0	2.0
Martinton silt loam, 1 to 3 percent slopes	70	105	12	17.5	53	68	3.0	4.5
Matherton silt loam, 1 to 3 percent slopes	65	90	11	15	45	65	2.5	3.5
McHenry silt loam, 2 to 6 percent slopes	78	105	12.5	16.5	58	73	2.75	3.75
McHenry silt loam, 2 to 6 percent slopes, eroded	70	100	12	16	55	70	2.5	3.5
McHenry silt loam, 6 to 12 percent slopes	70	95	12	16	55	70	2.5	3.5
McHenry silt loam, 6 to 12 percent slopes, eroded	65	90	11	15	50	65	2.25	3.25
Metea loamy fine sand, 0 to 2 percent slopes	50	70	8.5	10.5	38	53	1.75	2.75
Metea loamy fine sand, 2 to 6 percent slopes	45	65	8.0	10	35	50	1.5	2.5
Miami sandy loam, sandy loam substratum, 2 to 6 percent slopes	60	80	10	13	40	50	2.0	2.5
Miami loam, 6 to 12 percent slopes, eroded	70	100	12	16	55	70	3.0	4.25
Miami loam, 12 to 20 percent slopes, eroded	65	90	11	15	50	60	2.75	4.0

See footnotes at end of table.

TABLE 2.—*Predicted average yields per acre of principal crops under two levels of management*—Continued

Soil	Corn for grain		Corn for silage		Oats		Alfalfa-bromegrass hay [1]	
	Average	High	Average	High	Average	High [2]	Average	High
	Bu.	*Bu.*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Tons*	*Tons*
Miami loam, sandy loam substratum, 2 to 6 percent slopes	65	85	11	14	50	65	2.25	3.25
Miami loam, sandy loam substratum, 6 to 12 percent slopes, eroded	60	80	10	13	45	60	2.0	3.0
Miami loam, sandy loam substratum, 12 to 20 percent slopes, eroded	55	75	9	12	40	55	1.75	2.5
Miami loam, sandy loam substratum, 20 to 35 percent slopes, eroded	----	----	----	----	----	----	1.5	2.0
Miami silt loam, 0 to 2 percent slopes	80	115	14	18	65	80	3.5	4.75
Miami silt loam, 2 to 6 percent slopes	78	110	13	17	63	78	3.5	4.75
Miami silt loam, 6 to 12 percent slopes	75	105	12	17	60	75	3.25	4.5
Miami silt loam, 6 to 12 percent slopes, eroded	70	100	12	16	55	70	3.0	4.25
Mundelein silt loam, 1 to 3 percent slopes	75	100	12	17	45	65	3.0	4.5
Navan silt loam	65	115	12	18	45	65	----	4.0
Palms muck	----	----	15	19	----	----	----	----
Pecatonica silt loam, 0 to 2 percent slopes	85	120	14	18	65	80	3.25	4.75
Pecatonica silt loam, 2 to 6 percent slopes	80	115	13	17.5	60	75	3.0	4.5
Pella silt loam	75	115	12.5	18	55	65	----	4.0
Plano silt loam, 0 to 2 percent slopes	83	123	13.5	18.5	68	78	3.25	4.75
Plano silt loam, 2 to 6 percent slopes	80	120	13	18	65	75	3.0	4.5
Plano silt loam, 6 to 12 percent slopes	60	90	10	14	50	65	2.5	3.0
Plano silt loam, gravelly substratum, 0 to 2 percent slopes	85	125	14	19	60	75	3.25	4.75
Plano silt loam, gravelly substratum, 2 to 6 percent slopes	80	110	13.5	18.5	60	75	3.0	4.5
Plano silt loam, gravelly substratum, 6 to 12 percent slopes, eroded	60	90	10	14.5	45	60	2.5	3.0
Radford silt loam, 0 to 3 percent slopes	65	100	12	17	45	65	2.0	4.0
Rollin muck, deep	----	----	12	17	----	----	----	----
Rollin muck, shallow	----	----	10	15	----	----	----	----
St. Charles silt loam, 0 to 2 percent slopes	85	118	14	18.5	68	75	3.0	4.75
St. Charles silt loam, 2 to 6 percent slopes	80	115	14	18	65	75	3.0	4.75
St. Charles silt loam, gravelly substratum, 0 to 2 percent slopes	80	120	13	18	60	75	3.5	4.75
St. Charles silt loam, gravelly substratum, 2 to 6 percent slopes	75	105	12	17	55	70	3.25	4.5
Saylesville silt loam, 0 to 2 percent slopes	65	85	12	14	50	70	3.0	4.5
Saylesville silt loam, 2 to 6 percent slopes	65	85	12	14	50	70	3.0	4.5
Sebewa silt loam	65	90	11	15	45	65	----	4.0
Troxel silt loam, 0 to 3 percent slopes	80	115	14	19	55	70	3.5	4.5
Wallkill silt loam	80	105	13	17	40	60	----	----
Warsaw loam, 0 to 2 percent slopes	60	85	10	14	45	60	2.5	3.0
Warsaw silt loam, 0 to 2 percent slopes	65	90	12	15	50	65	2.5	3.25
Warsaw silt loam, 2 to 6 percent slopes	63	88	10	14	48	63	2.25	3.2
Warsaw silt loam, 6 to 12 percent slopes, eroded	50	80	9.0	13	40	55	1.75	2.5
Westville silt loam, 2 to 6 percent slopes, eroded	75	110	12	17	55	75	3.0	4.0
Westville silt loam, 6 to 12 percent slopes, eroded	65	90	11	15	50	65	2.5	3.0

[1] Average annual yields of first- and second-year hay after adequate stands are established (absolute dry matter basis).
[2] These yields are for oats when used as a nurse crop for establishing a legume-grass meadow. Higher yields can be obtained, but a poorer stand of the legume-grass mixture usually results.
[3] The yields given are for areas that are protected from flooding.
[4] A drainage system is needed to make this soil suitable for high-level management, but most areas are unsuitable for installation of a drainage system, because bedrock is too near the surface.

The woodland consists principally of red oak, white oak, elm, ash, hickory, red maple, sugar maple, basswood, and cherry. Oak, the predominant forest type, makes up about 40 percent of the woodland and accounts for more than two-thirds of the volume of cut timber. Sugar maple, which is shade tolerant, is gradually replacing oak in the understory.

Estimated yields of wood products

Table 3 gives estimates of average yields of wood products. These averages represent fully stocked, managed stands and include culls, or defective trees. In unmanaged stands, the culls, seedling mortality, and uncontrolled stocking generally result in lower average yields than those given in the table.

About 80 percent of the woodland is poorly stocked. An acre produces only about 0.135 cord of wood a year. The stands can be improved by harvesting culls for fuel and fenceposts. Less than 2,000 acres is considered suitable for planting because of the limitations of slope and brushiness. About 18,500 acres of woodland is heavily grazed. Livestock should be excluded from these areas

TABLE 3.—*Estimated yields of wood products*

[In board feet per acre, Scribner rule. Dashes indicate that the soil type is not suitable for or is not used for the class of trees specified. Soil types not suitable for woodland and those for which no data are available are not listed]

Soil type	Woodland group	Mixed hardwoods	Oak	Red pine	White pine
		Bd. ft. per acre	*Bd. ft. per acre*	*Bd. ft. per acre*	*Bd. ft. per acre*
Adrian muck	10	100–200	----------	----------	----------
Boyer loamy sand (Member of Boyer complex)	3	----------	60–120	----------	----------
Casco loam	5	----------	100–150	----------	----------
Casco sandy loam (Member of Casco soils)	5	----------	60–90	----------	----------
Casco silt loam	5	135–165	135–165	----------	----------
Chelsea fine sand	4	----------	80–120	----------	----------
Colwood silt loam	7	100–150	----------	----------	----------
Conover silt loam	7	160–190	160–190	----------	----------
Dodge silt loam	1	200–250	160–190	400–450	475–550
Drummer silt loam	7	80–120	----------	----------	----------
Flagg silt loam	1	225–275	225–275	----------	----------
Flagg silt loam, mottled subsoil variant	7	135–165	135–165	----------	----------
Fox loam	1	160–190	135–165	325–400	400–450
Fox sandy loam	3	135–165	135–165	325–400	400–450
Fox silt loam	1	180–220	135–165	325–400	400–450
Hebron loam	1	135–165	135–165	----------	----------
Hennepin loam (Member of Hennepin-Miami loams, sandy loam substratum)	5	80–120	80–120	----------	----------
Houghton muck	10	100–200	----------	----------	----------
Juneau silt loam	1	180–220	180–220	----------	----------
Kendall silt loam	7	135–165	135–165	----------	----------
Knowles silt loam	1	135–165	160–190	275–350	350–400
Knowles silt loam, mottled subsoil variant	7	80–120	80–120	----------	----------
Matherton silt loam	7	135–165	135–165	----------	----------
Martinton silt loam	7	----------	135–165	----------	----------
McHenry silt loam	1	180–220	180–220	300–175	350–500
Metea loamy fine sand	4	80–120	80–120	----------	----------
Miami sandy loam, sandy loam substratum	3	100–150	100–150	----------	----------
Miami loam	1	180–220	180–220	300–375	350–400
Miami loam, sandy loam substratum	1	180–220	180–220	450–500	450–500
Miami silt loam	1	180–220	180–220	300–375	350–400
Mundelein silt loam	7	100–150	100–150	----------	----------
Navan silt loam	7	60–90	----------	----------	----------
Palms muck	10	100–200	----------	----------	----------
Pecatonica silt loam	1	160–190	160–190	400–450	450–500
Pella silt loam	7	80–120	----------	----------	----------
Radford silt loam	9	135–165	----------	----------	----------
Rodman gravelly loam (Member of Casco-Rodman complex)	6	----------	40–60	----------	----------
Rollin muck	10	100–200	----------	----------	----------
St. Charles silt loam	1	180–220	180–220	----------	----------
St. Charles silt loam, gravelly substratum	1	200–250	225–275	450–500	450–500
Saylesville silt loam	2	225–275	225–275	----------	----------
Sebewa silt loam	7	80–120	----------	----------	----------
Wallkill silt loam	9	135–165	----------	----------	----------
Westville silt loam	1	225–275	225–275	----------	500–600

because woodland provides poor pasture and because grazing animals damage young trees.

Markets are currently available for veneer logs and saw logs. Timber production is decreasing in this county. The value of trees grown for lumber is being eclipsed by the value of trees grown for shade and ornamental purposes for homes, parkways, and recreational areas.

Woodland groups

The soils of Walworth County have been placed in woodland groups. All the soils in one group have about the same response to use and management, and all are limited to about the same degree by the hazards of seedling mortality, plant competition, equipment limitations, windthrow, and erosion. Factors that affect management also include soil-associated diseases and insects.

Potential productivity is expressed in the descriptions of the woodland groups in terms of site index. Site index for many of the soils was determined from measurements made by foresters and soil scientists working together. Where a woodland site was not available for measurement on a specified soil, a site on a similar soil was used for comparison. The site index is the average height that dominant trees can be expected to reach in 50 years on a specified soil. It depends largely on the capacity of the soil to furnish moisture and growing space for roots.

Seedling mortality refers to the expected loss of seedlings as a result of unfavorable characteristics of the soil. A mortality rating of slight indicates that a loss of not more than 25 percent of the seedlings is expected, or that trees ordinarily regenerate naturally in places where there are adequate sources of seed. A rating of moderate indicates that a loss of 25 to 50 percent of the seedlings is expected, or that trees do not ordinarily regenerate naturally in numbers needed for adequate restocking. In some places replanting to fill open spaces will be necessary. A rating of severe indicates that a loss of more than 50 percent of the seedlings is expected, or that trees do not ordinarily regenerate naturally.

Plant competition refers to competition from undesirable trees and shrubs that invade the site and hinder the establishment and growth of desirable trees after the woodland has been disturbed by cutting. Competition is slight if undesirable species are no special problem. It is moderate if the invaders delay but do not prevent the natural regeneration of desirable plants and if simple methods will prevent undesirable trees from invading. Competition is severe if trees cannot regenerate naturally. If seedlings are planted, undesirable plants must be controlled by carefully preparing the site and using intensive woodland management.

Equipment limitation refers to the limitation on the use of ordinary equipment caused by unfavorable soil characteristics or topography. Some of the unfavorable characteristics that limit the use of equipment are poor drainage, stones, rocks, and steep slopes. The limitation is slight if there is no special problem in use of equipment. It is moderate if not all types of equipment can be used at all times, if the periods when wetness or a high water table restricts the use of equipment are not longer than 3 months, or if use of equipment damages the roots of trees to some extent. It is severe if many types of equipment cannot be used, if the periods when wetness or a high water table restricts the use of equipment are longer than 3 months, or if the use of equipment seriously damages the roots of trees and the structure and stability of the soil.

Windthrow hazard is related to soil characteristics that affect the development of tree roots, and the firmness with which the roots anchor the tree in the soil. The hazard is slight if the roots hold the tree firmly against a normal wind. It is moderate if the trees are not subject to windthrow except when the soil is excessively wet or the wind velocity is very high. It is severe if root development is not deep enough to give adequate stability and individual trees are likely to be blown over if they are released on all sides.

Erosion hazard refers to the risk of erosion on well-managed woodland that is not protected by special practices. It is slight where a small loss of soil is expected. Generally, erosion is slight if slopes range from 0 to 2 percent and runoff is slow or very slow. The erosion hazard is moderate where there is a moderate loss of soil, runoff is not controlled, and the vegetative cover is not adequate for protection. It is severe where steep slopes, rapid runoff, slow infiltration and permeability, and past erosion make the soil susceptible to severe erosion.

In the following pages each of the woodland groups in Walworth County is described. The groups are numbered according to a statewide system. Group 8 of this system is not represented in this county. The names of the soil series represented are mentioned in the description of each group, but this does not mean that all the soils of a given series are in that group. The woodland group of each soil mapped in the county is given in the "Guide to Mapping Units."

WOODLAND GROUP 1

This group consists of soils that are deep enough for good root development and have good available moisture capacity, high fertility, and good internal drainage. These soils have the highest potential for production of wood products in the county, but since they are highly desirable for farmland, only small, isolated areas are used for woodland. They are members of the Dodge, Flagg, Fox, Hebron, Juneau, Knowles, McHenry, Miami, Pecatonica, St. Charles, and Westville series. Areas of Alluvial land are also in this group.

Stands of native trees consist of red oak, white oak, maple, basswood, and, on more moist sites, elm and ash.

Individual plot measurements on soils representative of this group show a site index for red oak ranging from 51 to 58 and averaging 55. Production is as much as 175 board feet a year. Generally, the potential production for northern hardwoods is as much as 250 board feet a year, but on ridgetops and on the hot, dry, southwest-facing slopes, it is somewhat lower. The trees to favor in natural stands on the more favorable sites, such as coves and northern and eastern exposures, are maple, basswood, ash, red oak, and white pine, and on the less favorable sites, such as southern and western exposures, red oak. The trees preferred for forest plantings are white pine, Norway pine, and white spruce. Those preferred for farm windbreak plantings are white pine, white spruce, and white cedar.

Seedling mortality for white pine and Norway pine is slight. Hardwood plantings generally are not successful, and establishing stands of oak by natural regeneration is slow. The supply of acorns is adequate in most places, but there are heavy losses of both acorns and seedlings to insects and rodents. In some places weevils infest as much as 90 percent of the acorns. Oaks need a fair amount of light, and consequently, harvesting should open the forest enough to admit sufficient light for oak seedlings to grow. If there is an adequate supply of seed available, stands of maple, hickory, ash, elm, basswood, and other hardwoods are generally easier to establish than stands of oak because these trees need less light.

Plant competition is severe if measures to control brush, grass, and weeds are inadequate. Control of grass in young plantations is necessary, and scalping, furrowing, or clean tillage before the site is planted help to reduce the competition. Herbicides can be used effectively on most sites.

The use of equipment is limited only by temporary wetness after heavy rains or spring thaws in most areas, but the use of machinery for planting and fire control is limited by steep topography in some areas. The use of heavy logging equipment may cause some damage from soil compaction; less damage results if logging is done in winter. In areas that have slopes of more than 12 percent, the roads used for logging and access to fire should be located either on the ridges or on the contour. Slanting skid trails helps to control erosion in steep areas.

The hazards of frost, frost heave, and excessive wetness are slight. The hazard of drought ranges from slight on the northern and eastern exposures to moderate on southern and western exposures. Damage caused by insects is moderate, except in some grassy areas where white grubs seriously damage tree roots. To reduce the damage to young plantations caused by field mice and other rodents, it is necessary to control the growth of grass. The control of white-pine blister rust is not a problem, except in small areas where plants of the genus *Ribes*, such as currant and gooseberry bushes, are common. Deer and rabbits can cause severe local damage.

In general, the trees harvested are tall and well formed and are used for high-quality saw logs and veneer logs; those harvested from eroded sites and from the upper part of slopes are used mostly for posts and low-quality saw logs.

WOODLAND GROUP 2

This group consists of deep, moderately well drained to well drained, medium-textured soils. These soils are members of the Saylesville series.

Stands of native trees generally consist of northern hardwoods.

Site quality is good for hardwoods and fair for conifers. The species to favor in natural stands are sugar maple, basswood, white ash, red oak, and white oak, and those preferred for planting are white pine and white spruce.

Competition from grass, brush, and weeds is severe. Wheeled vehicles should be used only in winter or in dry seasons, to avoid compacting the soil and bogging down the equipment. Planting frequently has to be delayed until the soils are dry enough.

Drought and frost heave are moderate hazards. The control of white grubs, which damage tree roots, is a problem in grassy areas. Care should be taken to avoid planting white pine in areas where there is a high concentration of currant and gooseberry bushes, which are alternate hosts to white-pine blister rust.

Harvested trees are used mainly for saw logs and fuel.

WOODLAND GROUP 3

This group consists of deep, somewhat excessively drained to moderately well drained, moderately coarse textured soils. These soils are members of the Boyer, Fox, and Miami series.

Stands of native trees consist of aspen, black oak, and bur oak.

Site quality is good for pine and poor for oak and other hardwoods in most areas, but it is poor for all three species in severely eroded areas. Normally, production of pines is greater than that of hardwoods.

There is a slight hazard to seedlings from frost.

Plant competition is slight, except in a few places where there is brush on north-facing slopes.

There are no special limitations on the use of equipment for planting, harvesting, and fire control.

Damage from drought is a moderate hazard in most areas, but it can be a severe hazard on eroded soils and on south-facing slopes. The control of white grubs and sawflies, the main insect pests, and in a few places, of rodents is a moderate problem. The control of oak wilt can be a severe local problem. The control of rabbits and deer can also be a local problem, especially in new plantations.

Harvested trees are used mainly for fuel and sawtimber.

WOODLAND GROUP 4

This group consists of excessively drained, droughty soils. These soils are members of the Chelsea and Metea series.

The native forest vegetation consists of northern pin oak and bur oak. On the steep, eroded sites, brush, grass, and weeds are common.

The average site index for oak is 40 or less. The species preferred for planting in the steeper areas and in eroded areas is redcedar. White pine may be underplanted in poor stands of oak.

Seedling mortality is severe because of the doughtiness.

Plant competition is generally slight.

The use of equipment is limited by slope and stoniness. Roads in steeper areas should be located on the contour or on ridgetops and should be protected from concentrations of water.

Frost heave is only a slight hazard in plantations, and the control of tree diseases in only a minor problem.

WOODLAND GROUP 5

This group consists of shallow, somewhat excessively drained, medium-textured soils. These soils are members of the Casco, Fox, Hennepin, Miami, and Rodman series. These soils have calcareous underlying material, which is a moderate limitation when they are used for woodland. Because of the limited depth, there is less available moisture capacity and the growth of tree roots is restricted.

The native vegetation consists mainly of oak, but there are some maple, basswood, and aspen trees. On the drier sites and the eroded sites, bur oak and redcedar are common.

Measurements on Casco loam show an average site index of 48 for red oak. The site index ranges from 47 to 59 for sugar maple. The species preferred for planting on north-facing and east-facing slopes and for underplanting is white pine, and that preferred for planting on eroded slopes and on south-facing and west-facing slopes is redcedar.

Establishing stands of oak by natural regeneration is possible, but brush control is needed so that brush does not overtop the favored species. Heat and drought are limiting factors on the poorest sites. The control of rabbits and meadow mice is a local problem at times. White grubs are a pest in sodded areas.

The use of tree-planting machinery is somewhat limited by gullies and stoniness on the lower parts of slopes and in the steeper areas. Timber should be harvested only in winter or in a dry season to control erosion and prevent soil compaction. Road construction is generally difficult in the steeper areas, and where possible, roads should be built along ridge lines.

352-633—71——5

WOODLAND GROUP 6

This group consists only of Rodman-Casco complex, 30 to 45 percent slopes. These soils are less than 20 inches deep to sand or gravel. They are droughty.

The native vegetation consists mainly of grass, bur oak, and red cedar. The trees grow slowly and are poorly formed, scrubby, short boled, and limby.

Site quality is poor for all species. The only species preferred for planting is redcedar, but this tree grows so slowly that there is little likelihood of producing salable logs.

Regeneration of woody plants is slow because of droughtiness and unfavorable exposures.

The use of equipment is severely limited by the slope.

Windthrow is not a severe hazard, even though the soils are shallow. Drought and erosion are severe hazards.

Maintaining the woodland is the principal management objective. All existing trees can be used for recreational or esthetic purposes. Few forest products are harvested. These are mainly light cutting for fenceposts and fuel.

WOODLAND GROUP 7

This group consists of somewhat poorly drained to very poorly drained, medium-textured soils. These soils are members of the Colwood, Conover, Drummer, Flagg, Kendall, Knowles, Martinton, Matherton, Mundelein, Navan, Pella, and Sebewa series.

Stands of native woodland on the somewhat poorly drained soils consist mainly of oak, aspen, and other hardwoods. Those on the poorly drained soils commonly consist of elm, ash, soft maple, and white-cedar.

For hardwoods and white pine, white-cedar, and white spruce, site quality is medium to good on the somewhat poorly drained soils but only fair on the poorly drained soils. The species to favor in natural stands are maple and oak.

The species preferred for planting are white spruce, white pine, and white-cedar.

Seedling mortality ranges from moderate on the somewhat poorly drained soils to severe on the poorly drained soils because of excessive wetness. If economically feasible, surface drainage is a good practice in young stands and in areas to be planted.

Competition from grass, sedges, and brush is severe.

The use of machinery for planting trees, harvesting timber, and controlling fire is limited by wetness, which is likely to bog down equipment and to cause serious soil compaction. Logging should be done in winter or in a dry season.

Windthrow is a severe hazard. Any system of logging used should remove only the mature trees and the defective ones and should leave tree windbreaks around the edges of the stand. In a few places the control of erosion is a problem. Drought is a slight hazard, and frost is a slight hazard in depressions. The control of white-pine blister rust is a problem in areas near plants of the genus *Ribes*, such as goooseberry and currant. The control of root rot is a common and serious problem. Dutch elm disease is a major threat to elm trees. Locally, rabbits and deer can seriously damage trees, especially in new plantations.

Timber is difficult to reestablish on these soils. Trees should be planted on mounds or ridges but not in shallow pockets. Harvested trees are used mainly for fuel or for sawtimber.

WOODLAND GROUP 9

This group consists of somewhat poorly drained to very poorly drained soils. These soils developed in alluvium under forest cover. They are members of the Radford and Wallkill series. Areas of Wet alluvial land are also in this group.

For hardwoods, the site quality ranges from poor to good. Cottonwoods grow well on the somewhat poorly drained soils. Other than willows, which are useful for streambank protection, the preferred species for planting are cottonwoods.

Seedling mortality is severe because of wetness.

Plant competition is severe because of the encroachment of tall weeds and brush in openings.

The use of machinery for planting trees can be risky on the somewhat poorly drained soils and impractical on the poorly drained soils. Timber should be harvested only in winter or in a dry season. Access for fire-control equipment is generally difficult, but fire is infrequent on these soils.

The windthrow hazard is moderate in most places, but it is severe in areas where the water table remains high for prolonged periods. Erosion is a severe hazard in a few places along the streambanks, but control is not a problem in most places. Drought and frost are only slight hazards. Normally, the hazard of insect damage is only slight. Root rot or stem rot is a moderate to severe hazard. Dutch elm disease is a major threat to elm trees.

In any logging operations, the composition of the original hardwood forest should be maintained.

WOODLAND GROUP 10

This group consists of soils of the Adrian, Houghton, Palms, and Rollin series. All of these soils consist of muck.

The native vegetation consists mainly of sedges and willows, but there are also white-cedar, dogwood, black ash, soft maple, and alder trees.

The site quality ranges from poor to good, depending on the drainage, which varies with differences in microrelief and internal drainage. No species is preferred for planting, because even hand planting is difficult. Once established, however, white-cedar grows well.

Seedling mortality is severe because late frosts are common and because the soils have a fluctuating water table that drowns the roots of many seedlings.

Equipment limitation is severe, and the use of tree-planting machinery is not practical.

Windthrow is a severe hazard. Wind erosion is a hazard in cultivated areas; willows can be planted as a windbreak.

Harvested trees are used as fuel or for saw logs, but cutting should be restricted because of the severe windthrow hazard.

WOODLAND GROUP 11

This group consists of Marsh and of Sandy lake beaches, which are unproductive and generally unsuited to woodland. Stands of native vegetation consist of small shrubs, grass, and scattered small trees. The quality of all sites is poor for all tree species. Seedling mortality is severe.

The value of these areas for wildlife habitat and for watershed protection should be the main consideration in use and management. Land management should be directed toward maintenance of the existing plant cover.

WOODLAND GROUP 12

This group consists of well-drained to somewhat poorly drained, medium-textured soils on prairies. These soils are members of the Aztalan, Elburn, Griswold, Lorenzo, Plano, Rodman, Troxel, and Warsaw series.

The native vegetation is characteristic of prairie or oak openings. The principal trees are bur oak, northern pin oak, and redcedar.

The site quality is poor for all species.

These soils are not suitable for forest plantings, but they can be used for windbreak plantings. The species preferred for windbreak plantings on well-drained soils are white pine, white-cedar, Norway spruce, European larch, and redcedar. Those preferred for windbreak plantings on somewhat poorly drained soils are white spruce, white-cedar, and cottonwood.

The control of white grubs is a problem in many places, and the use of insecticides may be necessary. Cultivation during the first 2 or 3 years is needed to reduce the competition from weeds and grass and the damage caused by mice.

Although of no commercial importance, some wood is cut for fuel and fenceposts.

Use of the Soils for Wildlife

Many kinds of wildlife are common in Walworth County, and their numbers can be significantly increased in areas where management is directed toward providing suitable habitat. Most of the major soils are intensively farmed, however, and furnish few suitable areas. Wet soils, small marshes, and areas used for woodlots provide important habitat.

Table 4 lists the 10 wildlife groups in which the soils of the county have been placed and shows factors affecting the suitability of the soils of each group for specified kinds of wildlife. All the soils in a wildlife group have similar limitations that affect their use for wildlife. The order in which the groups are numbered has no relationship to the degree of limitations of the soils. Symbols for the soils assigned to each group are given in the table. The soil names can be readily learned by turning to the "Guide to Mapping Units."

The limitations of the soils in each group are rated as slight, moderate, severe, or very severe. A rating of slight indicates that the soils are relatively free of limitations or have limitations that are easily overcome. A rating of moderate indicates that the soils can be used for the specified purpose if carefully managed. A rating of severe indicates that the soils have limitations that are difficult to overcome and that suitability is marginal. A rating of very severe indicates that the soils are generally unsuitable for wildlife habitat. It is not intended that information in table 4 will eliminate the need for evaluation of the suitability of individual sites for wildlife habitat. Only the major limitations are described in the table, and they are based on information presently available.

The degree of limitation given in the table applies only to uneroded soils or to soils where erosion has been not more than moderate. Generally, a severely eroded soil cannot produce the same kind and amount of food and cover as less eroded areas of the same soil. In those instances where the degree of limitation is not given in the table for the entire slope range, the next higher slope range will have limitations one degree more severe than the last one given.

In evaluating the use of the soils for wildlife habitat, no consideration was given to the size and shape of soil areas or to the pattern that the soils form with other soils on the landscape. The kinds and numbers of wild animals in a given area depend on the kinds and amounts of vegetation that the soils produce, the pattern of the vegetation, and the supply of water. Because of their mobility, wild animals can make use of the most suitable habitat on a number of soils. For example, birds may nest in one area, feed in another, and find protective cover in still another. A variety of soils within the home range of a given species usually provides the most suitable habitat.

In rating the soils for use as wildlife habitat, each was compared to a soil capable of producing all the elements of habitat needed by the specified kind of wildlife. The information in the table can be used as a guide for judging suitability of the soil for related kinds of wildlife. For example, prairie chicken and Hungarian partridge need about the same habitat as pheasant. Where the degree of limitation differs for two or more species within the same column of table 4, different ratings are given.

The kinds of habitat needed by the principal kinds of wildlife in Walworth County are discussed in the following paragraphs.

Migratory waterfowl (ducks and geese).—Soils that are nearly level and are well suited to intensive production of grain, seed crops, grasses, legumes, and wild herbaceous plants also provide a suitable habitat for waterfowl. Such soils are not subject to frequent flooding or to erosion and are not droughty. They produce several kinds of plants suitable for food and cover, and they can be easily flooded to attract water birds. Wood ducks generally need nesting boxes or trees. Woodcocks, herons, bitterns, and cranes need about the same habitat as migratory waterfowl.

Upland game birds (grouse, quail, and pheasant).—Although the habitat requirements are somewhat different, the capability of the soils to produce the necessary elements for all of these species is similar. The most suitable soils are those that have a slope of less than 6 percent, are not droughty, and are not erodible when cultivated. They are well suited to grain, seed crops, legumes, and wild herbaceous and woody plants. The soils are not subject to frequent flooding. They have good natural drainage and are relatively free of stones or bedrock obstructions. Hungarian partridge and prairie chicken need about the same habitat as quail and pheasant. Sharp-trailed grouse need a habitat that includes elements suitable for prairie chicken and ruffed grouse.

TABLE 4.—*Degree of limitation of*

Wildlife groups and map symbols	Migratory waterfowl (ducks and geese)	Upland game birds (grouse, quail, and pheasant)
Group 1: Well-drained, upland soils. DdA, DdB, FoB, FoC2, FsA, FsB, FsC2, KwB, MpB, MpB2, MpC, MpC2, MvB, MwC2, MwD2, MxB, MxC2, MxD2, MxE2, MyA, MyB, MyC, MyC2, PsA, PsB, PsC, WvB2, WvC2.	Moderate where slopes are 0 to 6 percent; severe where slopes are 6 to 12 percent. Not suitable for wetland food and cover plants; sloping soils are poorly suited to intensive production of grain and seed crops.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are 12 to 20 percent. Sloping soils are erodible if cultivated and are poorly suited to intensive production of grain and seed crops.
Group 2: Well-drained soils suitable mainly for prairie vegetation. GsB, GsC2, GsD2, PtA, PtB, PtC2, WeA, WhA, WhB, WhC2.	Moderate where slopes are 0 to 6 percent; severe where slopes are 6 to 12 percent. Not suitable for wetland food and cover plants; sloping soils poorly suited to intensive production of grain and seed crops.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent for quail and pheasant. Sloping soils are erodible if cultivated. Severe for grouse. Poorly suited to production of woodland plants.
Group 3: Nearly level to sloping, deep, well-drained soils. FgA, FgB, HeB, PeA, PeB, ScA, ScB, SeA, SeB, ShA, ShB.	Moderate. Not suitable for wetland food and cover plants; sloping areas are erodible if cultivated.	Slight. Sloping areas are erodible if cultivated.
Group 4: Sandy, well-drained, upland soils. BpB, BpC2, FmB, FmC2, MuA, MuB.	Severe. Droughty; open-water areas hard to provide; not suitable for wetland food and cover plants; sloping soils are poorly suited to intensive production of grain and seed crops.	Moderate where slopes are 0 to 6 percent; severe where slopes are 6 to 12 percent. Droughty; soils are erodible where cultivated and are poorly suited to intensive production of grain and seed crops; few species of woodland plants are suitable.
Group 5: Shallow, loamy, sloping to steep, upland soils. CeB2, CeC2, CeD2, CfC3, CfD3, CkD2, ClC2, CrD2, CrE2, HfE, LyB, LyC2, LzD2, RsF.	Severe. Open-water areas hard to provide; not suitable for wetland food and cover plants; sloping soils are poorly suited to intensive production of grain and seed crops.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are 12 to 20 percent. Sloping areas are erodible if cultivated and poorly suited to intensive production of grain and seed crops.
Group 6: Somewhat poorly drained soils. AzA, CyA, EbA, EgA, FlA, GwA, KlA, KyA, MgA, MmA, MzfA.	Slight. Some legumes are not suitable.	Moderate for quail and pheasant; poorly suited to intensive production of grain, seed crops, and legumes. Severe for grouse; poorly suited to production of woodland plants.
Group 7: Poorly drained soils. Cw, Dt, Mf, Na, Ph, Sm, Ww.	Slight. Drainage needed for production of grain, seed crops, and legumes.	Moderate. Drainage needed for production of grain, seed crops, and legumes; erodible if cultivated; few species of woodland plants are suitable; nesting sites may be flooded.
Group 8: Soils of flood plains. Am, JuA, RaA, TxA, Wa.	Moderate. Flooding restricts production of grain and seed crops; nesting sites may be flooded.	Slight for quail and pheasant; severe for grouse. Poorly suited to production of woodland plants.
Group 9: Organic soils in depressions and nearly level areas. Ac, Ht, Pa, Ru, Rv.	Slight. Drainage helps in production of grains, seed crops, and legumes; erodible where cultivated.	Moderate. Drainage helps in the production of grain, seed crops, and legumes; nesting sites may be flooded; few suitable woodland plants.
Group 10: Deep sand and sandy beaches. CtB, CtE, Sfb.	Very severe. Droughty; erodible where cultivated; poorly suited to grain and seed crops and to herbaceous food plants; not suitable for wetland food and cover plants; open-water areas are hard to provide.	Severe for quail and pheasant. Droughty; erodible if cultivated; poor grain and seed crop production. Moderate for grouse. Few suitable woodland plants.

Songbirds.—Well-drained soils on slopes of less than 6 percent are suitable for producing food and cover for songbirds. The soils should be well suited to grain and seed crops, and to wild herbaceous and woody plants. They should not be stony, excessively wet, droughty, erodible when cultivated, or subject to flooding.

Small game (cottontail rabbits and squirrels).—Well-drained soils on slopes of less than 12 percent are suitable for habitat for small game. The soils should be moderately fertile and suited to shrubs, thickets, and mast and den trees. They should not be droughty, excessively stony, poorly drained, or subject to frequent or prolonged flooding.

Big game (deer).—Moderately well drained to well drained soils on slopes of less than 12 percent provide suitable habitat for deer. The soils should be well suited to grain, grasses, legumes, and woodland food plants. They should not be droughty, erodible when cultivated, *the soils for wildlife habitat* ·

Songbirds	Small game (rabbits and squirrels)	Big game (deer)	Furbearers (mink and muskrat)
Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent. severe where slopes are 12 to 20 percent. Sloping soils are erodible if cultivated.	Slight where slopes are 0 to 12 percent; moderate where slopes are 12 to 20 percent; severe where slopes are 20 to 30 percent. Steeper slopes generally provide little cover and natural food.	Slight where slopes are 0 to 12 percent; moderate where slopes are 12 to 20 percent; severe where slopes are 20 to 30 percent. Sloping soils are erodible if cultivated.	Moderate where slopes are 0 to 6 percent; severe where slopes are 6 to 30 percent. Water habitat is hard to provide.
Moderate where slopes are 0 to 6 percent; severe where slopes are 6 to 12 percent. Sloping soils are erodible if cultivated; poorly suited to shrubs and trees for nests.	Moderate. Poor production of woodland plants; thickets, mast, and den trees are widely spaced.	Moderate. Poor production of food and cover plants.	Moderate where slopes are 0 to 6 percent; severe where slopes are 6 to 12 percent. Water habitat is hard to provide.
Slight. Sloping areas are erodible if cultivated.	Slight. No serious limitations---	Slight. Sloping soils are erodible if cultivated.	Moderate. Water habitat is hard to provide.
Moderate where slopes are 0 to 6 percent; severe where slopes are 6 to 12 percent. Soils are erodible if cultivated; droughty; few suitable woodland plants.	Moderate. Low production of cover and natural foods; few suitable mast trees.	Moderate. Limited production of cover, woodland food plants, grain, grasses, and legumes.	Severe where slopes are 0 to 6 percent; very severe where slopes are 6 to 12 percent. Water habitat is hard to provide; low natural fertility; poor production of food and cover.
Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are 12 to 20 percent. Sloping areas are erodible if cultivated.	Slight where slopes are 0 to 12 percent; moderate where slopes are 12 to 20 percent; severe where slopes are 20 to 30 percent. Steeper slopes generally provide little cover and natural food.	Slight where slopes are 0 to 12 percent; moderate where slopes are 12 to 20 percent; severe where slopes are 20 to 30 percent. Slopes are erodible if cultivated.	Severe where slopes are 0 to 6 percent; very severe where slopes are 6 to 12 percent. Not practical to provide water habitat.
Moderate. Poorly suited to shrubs and trees for nests.	Moderate. Poor production of woodland plants; thickets, mast, and den trees are widely scattered.	Moderate. Poor production of woodland food and cover plants; drainage helps production of grain, grasses, and legumes.	Slight. Water habitat is hard to provide.
Moderate. Where drained, grain and seed crops can be produced; few suitable woodland plants.	Moderate for rabbits. Burrows and nests may be flooded. Severe for squirrels. Few mast trees; few natural foods.	Moderate. Drainage helps production of grain, grasses, and legumes.	Slight. No serious limitations.
Moderate. Ground nesting sites may be flooded; poor regeneration of woodland plants.	Moderate. Burrows and nests may be flooded; poor production of woodland plants; few natural foods.	Moderate. Poor production of woodland food and cover plants.	Slight, except where water habitat is hard to provide, as in small upland waterways.
Moderate. Drainage helps in the production of grain and seed crops; few suitable woodland plants.	Moderate for rabbits. Burrows and nests may be flooded. Severe for squirrels. Few mast trees; few natural foods.	Moderate. Drainage helps production of grain, grasses, and legumes.	Slight. Low natural fertility; moderate production of food and cover plants.
Severe. Droughty; erodible if cultivated; poor production of grain, seed crops, and cover; few suitable woodland plants.	Severe. Poor production of cover, natural food plants, and suitable mast trees.	Severe. Poor production of woodland food and cover plants; droughty; erodible if cultivated.	Very severe. Not practical to provide water habitat; low natural fertility; poor production of food and cover plants.

or excessively stony. Land use and the pattern of vegetation are especially important in evaluating the suitability of broad areas of soils for habitat for deer.

Furbearers (mink and muskrat).—The availability of water is the most important element in suitability of the soils as habitat for furbearers. In addition to a dependable source of water, the soils should be on slopes of less than 6 percent. They should be moderately fertile and should produce a wide range of woody plants and cover and aquatic food. Although they are not dependent on a water habitat, mink, raccoon, and skunk often prefer a habitat near water.

Use of the Soils for Recreation

Recreation and the tourist industry are of considerable importance in Walworth County. At present slightly more than 9 percent of the total acreage is used for recreation. Among the recreational areas are Kettle Moraine State Forest, Big Foot Beach State Park, and roadside and county parks. There are many lakes in the county, covering more than 12,000 acres. Among the activities are fishing, boating, swimming, sightseeing, and in cold weather, skating, ice boating, ice fishing, and skiing. There are public hunting, fishing, and conservation areas that are maintained by the Wisconsin Conservation Department, as well as private shooting preserves where hunting is permitted by the landowner upon payment of a fee.

The soils of Walworth County have been placed in 10 recreation groups. The symbols of the soils assigned to each group are given in table 5. The name of each of the soils can be readily learned by referring to the "Guide to Mapping Units." The table describes limitations of the soils for selected recreational uses. Esthetic values and the size and shape of soil areas were not considered in establishing the evaluations given in the table. Only the major hazards and limitations are given. The degree of limitation is not given for the entire slope range of all the soils. For most uses, the limitation for

TABLE 5.—*Degree and kind of limitations*

Recreation groups and map symbols	Playgrounds and intensive play areas	Picnic grounds and extensive play areas
Group 1: Deep, well-drained silt loams DdA, DdB, FgA, FgB, FsA, FsB, FsC2, KwB, MpB, MpB2, MpC, MpC2, MyA, MyB, MyC, PeA, PeB, PsA, PsB, PsC, PtA, PtB, PtC2, ScA, ScB, SeA, SeB, WhA, WhB, WhC2, WvB2, WvC2.	Slight where slopes are 0 to 2 percent; moderate where slopes are 2 to 6 percent; severe where slopes are 6 to 12 percent. Erodibility on slopes; compact easily when wet.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent. Erodibility on slopes; compact easily when wet.
Group 2: Deep, well-drained loams FoB, FoC2, GsB, GsC2, GsD2, MvB, MwC2, MwD2, MxB, MxC2, MxD2, MxE2, MyC2, WeA.	Slight where slopes are 0 to 2 percent; moderate where slopes are 2 to 6 percent; severe where slopes are 12 to 20 percent. Erodibility on slopes; leveling may expose sand and gravel.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are 12 to 20 percent. Erodibility on slopes.
Group 3: Well-drained, sandy soils BpB, BpC2, FmB, FmC2, MuA, MuB.	Moderate where slopes are 0 to 6 percent; severe where slopes are 6 to 12 percent. Droughtiness; erodibility on slopes; leveling may expose sand and gravel.	Moderate. Droughtiness; erodibility.
Group 4: Gently sloping to steep, well-drained soils that are shallow over sand and gravel or glacial till. CeB2, CeC2, CeD2, CfC3, CfD3, CkD2, ClC2, CrD2, CrE2, HfE, LyB, LyC2, LzD2, RsF.	Slight where slopes are 0 to 2 percent; moderate where slopes are 2 to 6 percent; severe where slopes are 6 to 45 percent. Erodibility on slopes; extensive leveling may expose sand and gravel.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are 12 to 45 percent. Erodibility on slopes.
Group 5: Somewhat poorly drained soils AzA, CyA, EbA, EgA, FlA, GwA, KlA, KyA, MgA, MmA, MzfA.	Moderate. Seasonal high water table; erodibility on slopes.	Moderate. Seasonal high water table; erodibility; vegetation is sparse.
Group 6: Poorly drained soils Cw, Dt, Mf, Na, Ph, Sm, Ww.	Severe. High water table; compacts easily when wet; low trafficability when wet; sod easily damaged.	Severe. High water table; drainage needed; compact easily when wet; low trafficability when wet; sod easily damaged.
Group 7: Soils that formed in alluvium Am, JuA, RaA, TxA, Wa.	Moderate. Occasional flooding	Moderate. Occasional flooding; compact easily when wet.
Group 8: Organic soils Ac, Ht, Pa, Ru, Rv.	Very severe. High water table; low trafficability when wet; sod easily damaged, erodibility.	Very severe. High water table; low trafficability when wet; sod easily damaged; erodibility.
Group 9: Sandy soils and beaches CtB, CtE, Sfb.	Moderate where slopes are 0 to 6 percent; severe where slopes are 6 to 30 percent. Droughtiness; erodibility; vegetation is difficult to maintain.	Moderate where slopes are 0 to 12 percent; severe where slopes are 12 to 30 percent. Erodibility; droughtiness; difficult to stabilize.
Group 10: Well-drained, moderately slowly permeable soils HeB, ShA, ShB.	Moderate. Moderately slow permeability; erodibility on slopes.	Slight. Moderately slow permeability; erodibility on slopes.

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

the next higher slope range is one degree more severe than that of the highest slope range given.

The degrees of limitation given for the poorly drained soils are for soils in their natural state without adequate drainage. Many of these soils can be improved by artificial drainage. Soils subject to flooding vary in their degree of limitation for recreational use, depending on the duration of the flooding, as well as on the season. Flooding during the off season, for example, is much less of a limitation than flooding during the season of active use.

The ratings used in the table are slight, moderate, severe, and very severe. A rating of slight indicates that the limitation is not serious and is easily overcome, a rating of moderate indicates that the limitation generally can be corrected by practical means, a rating of severe indicates that the limitation is difficult to overcome and that suitability of the soils for the specific use is questionable, and a rating of very severe indicates that the soils are generally not suitable for the specified purpose.

The information given in the table can serve as a general guide for evaluating the soils for recreational

for recreational facilities

Bridle paths and hiking trails	Golf fairways	Cottages and utility buildings [1]	Tent and trailer sites
Moderate. Muddy and slippery when wet; surfacing needed in places; erodibility on slopes.	Slight where slopes are 0 to 6 percent; moderate where slopes are 0 to 12 percent. Erodibility on slopes.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent. Erodibility on slopes; subject to frost heave.	Moderate where slopes are 0 to 6 percent; severe where slopes are 6 to 12 percent. Surface is wet and soft after rains; compacts easily.
Slight where slopes are 0 to 12 percent; moderate where slopes are 12 to 20 percent. Erodibility on slopes.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are 12 to 20 percent. Erodibility on slopes.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are 12 to 20 percent. Erodibility on slopes.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are 12 to 20 percent. Erodibility on slopes.
Moderate. Erodibility; poor stability on slopes; paths and trails are difficult to maintain; surfacing may be needed.	Severe. Erodibility; droughtiness; good turf difficult to maintain.	Moderate. Erodibility; droughtiness; difficult to establish vegetation; possibility of contamination of ground water.	Moderate where slopes are 0 to 6 percent; severe where slopes are 6 to 12 percent. Erodibility; droughtiness; vegetation difficult to maintain.
Slight where slopes are 0 to 12 percent; moderate where slopes are 12 to 20 percent; severe where slopes are 20 to 45 percent. Erodibility on slopes.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are 20 to 45 percent. Erodibility on slopes.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are 12 to 45 percent. Erodibility on slopes; possibility of contamination of ground water.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are 12 to 45 percent. Erodibility on slopes.
Moderate. Wet for short periods; muddy and slippery when wet.	Moderate. Seasonal high water table; water management needed; turf easily damaged when wet.	Very severe. Seasonal high water table and slow permeability make sanitary systems inoperative; high shrink-swell potential.	Moderate. Surface is wet for short periods.
Severe. High water table; wet for long periods; muddy and slippery when wet.	Severe. High water table; low trafficability when wet; turf easily damaged when wet.	Very severe. High water table makes sanitary systems inoperative; low bearing capacity when wet; subject to frost heave.	Severe. Surface is wet and soft for long periods; poor trafficability when wet.
Moderate. Occasional flooding; wet for short periods; muddy and slippery when wet; erodibility on slopes.	Moderate. Occasional flooding; turf easily damaged when wet.	Severe. Occasional flooding restricts sanitary systems; low bearing capacity when wet; liquefies easily.	Severe. Sites need protection from occasional flooding; compact easily.
Very severe. High water table; low trafficability; paths and trails are difficult to maintain.	Severe. High water table; turf easily damaged when wet; low trafficability when wet.	Very severe. High water table; subject to shrinkage; low bearing capacity; erodibility.	Very severe. Surface is wet and soft; poor trafficability.
Moderate where slopes are 0 to 12 percent; severe where slopes are 12 to 30 percent. Poor stability on slopes; paths and trails are difficult to maintain; erodibility.	Severe. Droughtiness; erodibility; good turf is difficult to maintain.	Moderate where slopes are 0 to 12 percent; severe where slopes are 12 to 30 percent. Droughtiness; erodibility; difficult to establish vegetation.	Moderate where slopes are 0 to 6 percent; severe where slopes are 6 to 30 percent. Erodibility; droughtiness; vegetation difficult to maintain.
Moderate. Muddy and slippery when wet; erodibility on slopes.	Moderate. Erodibility on slopes; moderately slow permeability; turf easily damaged when wet.	Severe. Slow permeability restricts sanitary systems; erodibility on slopes; high shrink-swell potential; subject to frost heave.	Moderate. Surface is wet and soft after rains; soils compact easily.

uses, but the ratings are not intended to eliminate the need for detailed onsite investigation.

The recreational uses listed in the table are discussed in the following paragraphs.

Playgrounds and intensive play areas.—Sites used for this purpose should be at least 2 acres in size. They are subject to relatively heavy foot traffic. Soils that are well suited to this use are nearly level, have good drainage, have soil texture and consistence that provide a firm surface, are free from flooding during periods of use, are free of coarse fragments and hard rock, and can support vegetation in all areas that have not been surfaced.

Picnic grounds and extensive play areas.—Sites used for this purpose should be 3 to 5 acres or more in size. The most desirable soils are nearly level to gently sloping, have good drainage, have texture and consistence that provide a firm surface, are free of flooding during the period of use, are free of coarse fragments and rock outcrops, and can support a good cover of vegetation.

Bridle paths and hiking trails.—The ratings given in the table for this use are for soils in their natural state. In preparing the ratings, it was assumed that the soils will need little or no grading. The most desirable soils are loamy, well drained, and nearly level to sloping. They are not subject to erosion, and are free of rocks, stones, and rock outcrops. They have good stability and provide a good footing for both men and animals. Some areas have outstanding scenic value, but the costs of building and maintaining trails would be high. Slopes that exceed 12 percent for prolonged distances are subject to erosion. Building the path or trail on the contour will help to control erosion in these places. The potential for plant growth was not considered in the ratings, though the vegetation bordering the trails and paths have important esthetic value. The path or trail itself is generally compacted and bare of vegetation.

Golf fairways.—The ratings of the soils for use as golf fairways are based only on those features that affect the use of the soils for fairways. Greens, traps, hazards, and tees are manmade, generally from transported soil material, and were not considered in establishing the ratings given in the table. Soils used for golf fairways should be well drained, firm, and gently undulating. They should be free of flooding during the season of use, have good trafficability, and be relatively free of coarse fragments. They should be capable of supporting a good turf and be well suited to many kinds of trees and shrubs. Loamy soils are well suited, but coarser textured soils are suitable if they are irrigated. Associated poorly drained mineral and organic soils can be used for pond sites or for storing water for turf maintenance. Likewise, associated sandy soils can be used for traps or as a source of sand for the greens.

Cottages and utility buildings.—Sites for this purpose are used seasonally or the year around for cottages, washrooms, bathhouses, and other buildings that do not have public sewer and water facilities. Well-suited soils have good drainage, are nearly level to gently sloping, are not subject to flooding, can absorb waste from domestic sewage disposal systems, have low shrink-swell potential, and have high bearing capacity. They are not subject to liquefaction or frost heave and can support a good cover of vegetation. Erosion is only a slight hazard. The depth to bedrock is at least 6 feet, and there is a minimum of coarse fragments and stones.

Tent and trailer sites.—Sites used for this purpose are suitable for short-period outdoor living. Well-suited soils are loamy, well drained, and level to gently sloping. They have good trafficability and are not subject to flooding during the period of use. The best sites require little preparation, and cars and trailers can be parked on the natural surface. The plant cover is easy to maintain, erosion is not a hazard, the surface is free of coarse fragments, and bedrock does not limit use of the soils. Esthetic values and onsite sewage disposal were not considered in evaluating the soils for these uses.

Nonfarm Uses of the Soils

Much of southeastern Wisconsin is developing into a mixed rural-urban area. Information of the kind given in table 6 is helpful to people planning suburban homes or construction of commercial buildings and to engineers planning roads, railway lines, or airports. The degree of limitation given in the table for the specified uses is expressed in terms of slight, moderate, severe, and very severe. A rating of slight indicates that the limitation is not serious and is easily overcome, a rating of moderate indicates that the limitation generally can be corrected by practical means, a rating of severe indicates that the limitation is difficult to overcome and that suitability of the soils for the specified use is questionable, and a rating of very severe indicates that the soils are generally not suitable for the specified purpose.

The information given in the table can serve as a general guide for evaluating the soils for the given uses, but the ratings are not intended to eliminate the need for detailed onsite investigation.

The nonfarm uses listed in the table are briefly discussed in the following paragraphs.

Among the soil features that affect the use of the soils for residential developments where public sewer systems are available are the bearing capacity of the soils, the shrink-swell potential, and the depth to the water table. Other factors are the hazards of flooding and frost heave and the erodibility of the soils. In areas where poor drainage or frequent flooding is a problem, other soil properties have less significance in the ratings given in the table.

Among the soil features that affect the use of the soils for filter fields for sanitary systems are drainage, permeability, slope, and depth to bedrock. Soils that have a high water table for long periods or that are frequently flooded are unsuitable for this use. Effluent from septic tank systems should move through the soil at a moderate rate. A rapid rate of movement through the soil could contaminate ground water; a slow or very slow rate of movement could saturate the soil and cause effluent to rise to the surface, which could become dangerous to the public health. A rating of severe has been given to soils where the slope is more than 12 percent, even though other characteristics are favorable.

TABLE 6.—*Degree and kind of limitations for nonfarm uses*

Soil series and map symbols	Residential developments with public sewer [1]	Filter fields for sanitary systems	Commercial buildings and light industry [1]	Transportation systems [1]
Adrian: Ac	Severe. Erodibility; subject to shrinkage; high water table.	Very severe. High water table.	Very severe. Erodibility; high compressibility; instability; high water table.	Very severe. High water table; high compressibility; instability; very low bearing capacity.
Alluvial land: Am	Very severe. Low bearing capacity; subject to frost heave; frequent flooding; liquefies easily.	Very severe. Frequent flooding; sanitary systems do not function when soil is flooded.	Very severe. Frequent flooding; low bearing capacity when wet; subject to liquefaction, piping, and frost heave.	Very severe. Frequent flooding; low bearing capacity when wet; subject to liquefaction, piping, and frost heave.
Aztalan: AzA	Moderate. High shrink-swell potential; fluctuating water table.	Very severe. Fluctuating water table; slow permeability; sanitary systems do not function in wet seasons.	Severe. High shrink-swell potential; high compressibility; low shear strength; fluctuating water table.	Severe. Subsoil has low stability and low bearing capacity when wet; substratum has high shrink-swell potential; subject to slippage; subject to frost heave; fluctuating water table.
Boyer: BpB, BpC2	Moderate. Droughtiness; erodibility; difficult to vegetate.	Moderate. Possible contamination of ground water.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent. Erodibility; droughtiness; vegetation difficult to establish in cuts and fills.	Slight. Erodibility; cuts and fills are difficult to stabilize.
Casco: CeB2, CeC2, CeD2, CfC3, CfD3, CkD2, ClC2, CrD2, CrE2. For Fox part of CkD2 and ClC2, see Fox series. For Rodman part of CrD2 and CrE2, see Rodman series.	Slight where slopes are 0 to 12 percent; moderate where slopes are 12 to 20 percent; severe where slopes are more than 20 percent. Erodibility on slopes.	Slight where slopes are 0 to 12 percent; moderate where slopes are 12 to 20 percent; severe where slopes are more than 20 percent.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are more than 12 percent. Erodibility on slopes; vegetation difficult to establish in cuts and fills.	Slight on slopes of 0 to 12 percent; moderate on slopes of 12 to 30 percent. Cuts and fills are difficult to stabilize; subsoil has high shrink-swell potential.
Chelsea: CtB, CtE	Moderate where slopes are 0 to 12 percent; severe where slopes are more than 12 percent. Droughtiness; erodibility; vegetation difficult to establish; liquefies easily.	Moderate where slopes are 0 to 12 percent; severe where slopes are more than 12 percent. Possible contamination of ground water.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are more than 12 percent. Erodibility; droughtiness; vegetation difficult to establish in cuts and fills.	Slight on slopes of 0 to 12 percent; moderate on slopes of more than 12 percent. Droughtiness; erodibility; cuts and fills are difficult to stabilize.
Colwood: Cw	Severe. Liquefies easily; high water table; utilities difficult to install; flotation of pipes; wet basements.	Very severe. High water table; sanitary systems do not function.	Severe. High water table; subject to frost heave, liquefaction, and piping.	Severe. High water table; subsoil has high shrink-swell potential; substratum is subject to liquefaction, piping, and frost heave.
Conover: CyA	Moderate. Fluctuating water table.	Very severe. Fluctuating water table; sanitary systems do not function in wet seasons.	Moderate. Fluctuating water table; subject to frost heave.	Moderate. Fluctuating water table; subject to frost heave; subsoil has high shrink-swell potential and low bearing capacity when wet.

See footnote at end of table.

TABLE 6.—*Degree and kind of limitations for nonfarm uses*—Continued

Soil series and map symbols	Residential developments with public sewer [1]	Filter fields for sanitary systems	Commercial buildings and light industry [1]	Transportation systems [1]
Dodge: DdA, DdB	Slight where slopes are 0 to 12 percent, erodibility on slopes, subject to frost heave.	Slight where slopes are 0 to 6 percent, moderate where slopes are 6 to 12 percent.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent. Erodibility on slopes; subject to frost heave.	Slight where slopes are 6 to 12 percent. Erodibility on slopes; subject to frost heave; subsoil has high shrink-swell potential and low bearing capacity when wet.
Drummer: Dt	Severe. Subject to frost heave; high water table; needs water management; wet basements; flotation of pipes.	Very severe. High water table; sanitary systems do not function.	Severe. High water table; subject to frost heave.	Severe. High water table; subsoil has high shrink-swell potential and low bearing capacity when wet; subject to frost heave.
Elburn: EbA, EgA	Moderate. Erodibility on slopes; fluctuating water table.	Very severe. Fluctuating water table; sanitary systems do not function.	Moderate. Fluctuating water table; subject to frost heave.	Moderate. Subsoil has low bearing capacity when wet and high shrink-swell potential; subject to frost heave; fluctuating water table.
Flagg:				
FgA, FgB	Slight on slopes of 0 to 6 percent. Erodibility on slopes; subject to frost heave.	Slight on slopes of 0 to 6 percent.	Slight on slopes of 0 to 6 percent. Erodibility on slopes; subject to frost heave.	Slight on slopes of 0 to 6 percent. Erodibility on slopes; subsoil has low bearing capacity when wet; subject to frost heave.
FlA	Moderate. Subject to frost heave; fluctuating water table.	Very severe. Fluctuating water table; sanitary systems do not function in wet seasons.	Moderate. Fluctuating water table; subject to frost heave.	Moderate. Fluctuating water table; subject to frost heave.
Fox:				
FoB, FoC2, FsA,, FsB, FsC2.	Slight where slopes are 0 to 12 percent; moderate where slopes are 12 to 20 percent. Erodibility on slopes.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are more than 12 percent.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are more than 12 percent. Erodibility on slopes.	Slight where slopes are 0 to 12 percent; moderate where slopes are 12 to 20 percent. Erodibility on slopes; subsoil has high shrink-swell potential.
FmB, FmC2	Slight where slopes are 0 to 12 percent. Slight droughtiness; erodibility on slopes.	Slight	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are more than 12 percent. Erodibility on slopes.	Slight where slopes are 0 to 12 percent; moderate where slopes are 12 to 20 perc ent. Erodibility on slopes; subsoil has high shrink-swell potential.
Griswold:				
GsB, GsC2, GsD2	Slight where slopes are 0 to 6 percent. Erodibility on slopes.	Slight where slopes are 0 to 6 percent.	Slight where slopes are 0 to 6 percent. Erodibility on slopes.	Slight where slopes are 0 to 6 percent. Erodibility on slopes.
GwA	Moderate. Erodibility on slopes; needs water management; fluctuating water table.	Very severe. Fluctuating water table; sanitary systems do not function in wet seasons.	Moderate. Fluctuating water table; subject to frost heave.	Moderate. Subsoil has low bearing capacity when wet and high shrink-swell potential; subject to frost heave; fluctuating water table.
Hebron: HeB	Slight where slopes are 0 to 6 percent. Erodibility on slopes; low bearing capacity when wet; high shrink-swell potential.	Severe. Slow permeability restricts sanitary systems.	Moderate. High shrink-swell potential; high compressibility; low shear strength.	Moderate. Substratum has low bearing capacity when wet and high shrink-swell potential.
Hennepin: HfE For Miami part, see Miami series.	Severe. Erodibility on slopes; stony in places.	Severe where slopes are 20 to 35 percent.	Severe. Erodibility on slopes; stony in places.	Moderate. Erodibility on slopes; stony in places.
Houghton: Ht	Very severe. Erodibility; subject to shrinkage; low bearing capacity; high water table.	Very severe. High water table.	Very severe. Erodibility; high compressibility; instability; high water table.	Very high. High water table; high compressibility; instability; very low bearing capacity.

See footnote at end of table.

TABLE 6.—*Degree and kind of limitations for nonfarm uses*—Continued

Soil series and map symbols	Residential developments with public sewer [1]	Filter fields for sanitary systems	Commercial buildings and light industry [1]	Transportation systems [1]
Juneau: JuA	Moderate. Erodibility on slopes; liquefies easily; low bearing capacity when wet; subject to frost heave; occasional flooding.	Severe. Occasional flooding; sanitary systems do not function when soil is flooded.	Severe. Occasional flooding; low bearing capacity when wet; subject to liquefaction, piping, and frost heave.	Severe. Occasional flooding; low bearing capacity when wet; subject to frost heave, liquefaction, and piping.
Kendall: KlA	Moderate. Subject to frost heave; fluctuating water table.	Very severe. Fluctuating water table; sanitary systems do not function in wet seasons.	Moderate. Fluctuating water table; subject to frost heave.	Moderate. Fluctuating water table; subject to frost heave; subsoil has high shrink-swell potential and low bearing capacity when wet.
Knowles:				
KwB	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are more than 12 percent. Erodibility on slopes; bedrock may hinder excavation; utilities difficult to install.	Severe. Bedrock may restrict sanitary systems; possible contamination of ground water.	Moderate where slopes are 0 to 12 percent; severe where slopes are more than 12 percent. Erodibility on slopes; bedrock may hinder excavation.	Slight where slopes are 0 to 12 percent; moderate where slopes are more than 12 percent. Erodibility on slopes; subject to frost heave; bedrock may hinder excavation.
KyA	Severe. High water table; bedrock may hinder excavation; utilities difficult to install.	Very severe. High water table; sanitary systems do not function.	Severe. High water table; bedrock may hinder excavation.	Severe. High water table; high shrink-swell potential; low bearing capacity when wet; bedrock may hinder excavation.
Lorenzo: LyB, LyC2 LzD2. For Rodman part of LzD2, see Rodman series.	Slight where slopes are 0 to 12 percent; moderate where slopes are 12 to 20 percent; severe where slopes are more than 20 percent. Erodibility on slopes.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are more than 12 percent. Possible contamination of ground water.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are more than 12 percent. Erodibility on slopes; vegetation difficult to establish in cuts and fills.	Slight where slopes are 0 to 12 percent; moderate where slopes are more than 12 percent. Vegetation difficult to establish in cuts and fills; erodibility on slopes.
Marsh: Mf	Very severe. Low bearing capacity; high water table; frequent flooding; liquefies easily; subject to frost heave.	Very severe. High water table; sanitary systems do not function.	Very severe. Frequent flooding; low bearing capacity; subject to frost heave, liquefaction, and piping.	Very severe. Frequent flooding; low bearing capacity; subject to frost heave, liquefaction, and piping.
Martinton: MgA	Moderate. Erodibility on slopes; high shrink-swell potential; low bearing capacity when wet; fluctuating water table; needs water management.	Very severe. Fluctuating water table; moderately slow permeability; sanitary systems do not function.	Severe. High shrink-swell potential; low bearing capacity when wet; fluctuating water table.	Severe. High shrink-swell potential; low bearing capacity when wet; fluctuating water table; subject to seepage and slippage.
Matherton: MmA	Moderate. Fluctuating water table; needs water management.	Very severe. Fluctuating water table; sanitary systems do not function.	Moderate. Fluctuating water table.	Moderate. Fluctuating water table.
McHenry: MpB, MpB2, MpC, MpC2.	Slight where slopes are 0 to 12 percent; moderate where slopes are 12 to 20 percent; severe where slopes are more than 20 percent. Erodibility on slopes; subject to frost heave.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are more than 12 percent.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are more than 12 percent. Erodibility on slopes; subject to frost heave.	Slight where slopes are 0 to 12 percent; moderate where slopes are 12 to 20 percent. Erodibility on slopes; subsoil has low bearing capacity when wet.
Metea: MuA, MuB	Moderate. Droughtiness; erodibility; vegetation difficult to establish.	Slight	Moderate. Substratum has high shrink-swell potential; high compressibility; low shear strength.	Moderate. Substratum has low bearing capacity when wet; high shrink-swell potential.

See footnote at end of table.

TABLE 6.—*Degree and kind of limitations for nonfarm uses*—Continued

Soil series and map symbols	Residential developments with public sewer [1]	Filter fields for sanitary systems	Commercial buildings and light industry [1]	Transportation systems [1]
Miami:				
MwC2, MwD2, MyA, MyB, MyC, MyC2.	Slight where slopes are 0 to 12 percent; moderate where slopes are 12 to 20 percent; severe where slopes are more than 20 percent. Erodibility on slopes.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are more than 12 percent.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are more than 12 percent. Erodibility on slopes.	Slight where slopes are 0 to 12 percent; moderate where slopes are more than 12 percent. Erodibility on slopes; subsoil has high shrink-swell potential and low bearing capacity when wet.
MvB	Slight. Erodibility on slopes; stony in places.	Slight	Slight. Erodibility on slopes.	Slight. Erodibility on slopes.
MxB, MxC2, MxD2, MxE2.	Slight where slopes are 0 to 12 percent; moderate where slopes are 12 to 20 percent; severe where slopes are more than 20 percent. Erodibility on slopes.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are more than 12 percent.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are more than 12 percent. Erodibility on slopes.	Slight where slopes are 0 to 12 percent; moderate where slopes are more than 12 percent. Erodibility on slopes.
Mundelein: MzfA	Moderate. Erodibility on slopes; liquefies easily; low bearing capacity when wet; subject to frost heave; fluctuating water table.	Very severe. Fluctuating water table; sanitary systems do not function when water table is high.	Moderate. Low bearing capacity when wet; subject to liquefaction, piping, and frost heave; fluctuating water table.	Severe. Low bearing capacity when wet; subject to liquefaction, piping, frost heave, and seepage; fluctuating water table.
Navan: Na	Severe. Substratum has low bearing capacity when wet; high shrink-swell potential; high water table; wet basements.	Very severe. High water table; slow permeability; sanitary systems do not function.	Severe. High water table; high compressibility; low shear strength; high shrink-swell potential; low bearing capacity when wet.	Severe. High water table; substratum has high compressibility and high shrink-swell potential; low bearing capacity when wet.
Palms: Pa	Severe. Erodibility; subject to shrinkage; high water table.	Very severe. High water table; sanitary systems do not function.	Very severe. Erodibility; high water table; peat has high compressibility and instability.	Very severe. High water table; peat component has high compressibility and instability; very low bearing capacity.
Pecatonica: PeA, PeB	Slight. Erodibility on slopes; subject to frost heave.	Slight	Slight. Erodibility on slopes; subject to frost heave.	Slight. Subsoil has low bearing capacity when wet; erodibility; subject to frost heave.
Pella: Ph	Severe. Liquefies easily; low bearing capacity when wet; subject to frost heave; high water table; wet basements; flotation of pipes.	Very severe. High water table; sanitary systems do not function.	Severe. High water table; high shrink-swell potential; subject to liquefaction and piping.	Severe. High water table; high shrink-swell potential; low bearing capacity when wet. Substratum subject to liquefaction and piping; subject to frost heave.
Plano:				
PsA, PsB, PsC	Slight. Erodibility on slopes; subject to frost heave.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent. Subject to frost heave; erodibility on slopes.	Slight. Erodibility on slopes; subsoil has low bearing capacity when wet; subject to frost heave.
PtA, PtB, PtC2	Slight. Erodibility on slopes; subject to frost heave.	Slight. Erodibility on slopes; subject to frost heave.	Slight. Erodibility on slopes; subject to frost heave.	Slight. Subsoil has low bearing capacity when wet; subject to frost heave.
Radford: RaA	Severe. Liquefies easily; low bearing capacity when wet; subject to frost heave; fluctuating water table; occasional flooding.	Very severe. Fluctuating water table; occasional flooding; sanitary systems do not function when soil is flooded.	Severe. Fluctuating water table; low bearing capacity when wet; subject to liquefaction and piping; occasional flooding.	Severe. Fluctuating water table; low bearing capacity when wet; subject to liquefaction, piping, and frost heave; occasional flooding.

See footnote at end of table.

TABLE 6.—*Degree and kind of limitations for nonfarm uses*—Continued

Soil series and map symbols	Residential developments with public sewer [1]	Filter fields for sanitary systems	Commercial buildings and light industry [1]	Transportation systems [1]
Rodman: RsF. For Casco part, see Casco series.	Moderate where slopes are 0 to 12 percent; severe where slopes are more than 12 percent. Erodibility on slopes; droughtiness; utilities difficult to install; stony in many places.	Moderate where slopes are 0 to 12 percent; severe where slopes are more than 12 percent. Possible contamination of ground water.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are more than 12 percent. Erodibility on slopes; droughtiness; stony in places.	Slight where slopes are 0 to 12 percent; moderate where slopes are more than 12 percent. Droughtiness; stony in places.
Rollin: Ru, Rv	Severe. Erodibility; subject to shrinkage; high water table.	Very severe. High water table; sanitary systems do not function.	Very severe. High water table.	Very severe. High water table; peat component has high compressibility and instability; very low bearing capacity.
St. Charles:				
ScA, ScB	Slight. Erodibility on slopes; subject to frost heave.	Moderate. Water table at a depth of 5 feet in wet seasons; sanitary systems do not function when water table is high.	Slight. Erodibility on slopes; fluctuating water table; subject to frost heave.	Moderate. Subsoil has low bearing capacity when wet and high shrink-swell potential; subject to frost heave.
SeA, SeB	Slight where slopes are 0 to 12 percent. Erodibility on slopes; subject to frost heave.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are more than 12 percent. Erodibility on slopes; subject to frost heave.	Slight. Subsoil has low bearing capacity when wet; erodibility on slopes; subject to frost heave.
Sandy lake beaches: Sfb.	Moderate. Erodibility; high water table.	Very severe. High water table; sanitary systems do not function.	Severe. High water table; erodibility.	Moderate. High water table; erodibility.
Saylesville: ShA, ShB	Moderate. Erodibility on slopes; high shrink-swell potential; subject to frost heave.	Severe. Slow permeability restricts sanitary systems.	Moderate. High shrink-swell potential; subject to frost heave; erodibility on slopes.	Moderate. High shrink-swell potential; low bearing capacity when wet; erodibility on slopes; subject to frost heave, slippage, and seepage.
Sebewa: Sm	Severe. High water table; needs water management; wet basements; flotation of pipes.	Very severe. High water table; sanitary systems do not function.	Severe. High water table.	Severe. High water table; subsoil has high shrink-swell potential.
Troxel: TxA	Very severe. Erodibility on slopes; low bearing capacity when wet; subject to frost heave; occasional flooding.	Very severe. Occasional flooding; sanitary systems do not function when soil is flooded.	Severe. Occasional flooding; low bearing capacity when wet; subject to frost heave; erodibility on slopes.	Severe. Occasional flooding; low bearing capacity when wet; subject to frost heave.
Wallkill: Wa	Very severe. Low bearing capacity; subject to shrinkage on drying; high water table; frequent flooding.	Very severe. High water table; sanitary systems do not function when water table is high; frequent flooding.	Very severe. High water table; high compressibility; instability; frequent flooding.	Very severe. High compressibility and instability; frequent flooding; low bearing capacity when wet; high water table.
Warsaw:				
WeA	Slight. Erodibility on slopes; subject to frost heave.	Slight	Slight. Erodibility on slopes; subject to frost heave.	Slight. Erodibility on slopes.
WhA, WhB, WhC2	Slight where slopes are 0 to 12 percent. Erodibility on slopes; subject to frost heave.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent. Erodibility on slopes; subject to frost heave.	Slight. Erodibility on slopes.

See footnote at end of table.

TABLE 6.—*Degree and kind of limitations for nonfarm uses*—Continued

Soil series and map symbols	Residential developments with public sewer [1]	Filter fields for sanitary systems	Commercial buildings and light industry [1]	Transportation systems [1]
Westville: WvB2, WvC2.	Slight where slopes are 0 to 12 percent; moderate where slopes are 12 to 20 percent; severe where slopes are more than 20 percent. Erodibility on slopes.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are more than 12 percent.	Slight where slopes are 0 to 6 percent; moderate where slopes are 6 to 12 percent; severe where slopes are more than 12 percent. Erodibility on slopes; subject to frost heave.	Slight where slopes are 0 to 12 percent; moderate where slopes are more than 12 percent. Subsoil has high shrink-swell potential and low bearing capacity when wet; erodibility on slopes; subject to frost heave.
Wet alluvial land: Ww	Very severe. Liquefies easily; low bearing capacity when wet; subject to frost heave; frequent flooding.	Very severe. Frequent flooding; sanitary systems do not function when soil is flooded.	Very severe. Frequent flooding; low bearing capacity when wet; subject to frost heave, liquefaction, and piping.	Very severe. Frequent flooding; fluctuating water table; low bearing capacity when wet; subject to frost heave, liquefaction, and piping.

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

Soil features that affect use of the soils for commercial buildings and light industry include drainage, bearing capacity, shrink-swell potential, shear strength, frost heave, and compressibility. Structures for such uses are generally three stories or less in height and have at least 2,500 square feet of floor space on any given level. Such structures can be built on slopes of 12 percent or less if the slopes do not exceed 200 to 300 feet in length. The ratings in the table are based on characteristics and properties of the substratum because foundations for the structures rest on this part of the soil.

Transportation systems, as used in table 6, include roads, railroads, and airports. As used here, the term airports refers to those fields that accommodate general-purpose airplanes, mainly light aircraft. Such airports can be constructed on relatively small tracts, which may include areas of sloping soils. The ratings in the table are based on bearing capacity, shrink-swell potential, frost hazard, and depth to the water table. Only the subsoil and substratum are rated, because the surface soil is generally removed during construction.

Use of the Soils in Engineering

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 disposal systems. Among the properties most important to engineers are permeability, shear strength, compaction characteristics, soil drainage, shrink-swell characteristics, grain size, plasticity, and reaction. The depth to the water table, the depth to bedrock or to sand and gravel, and the topography are also important.

Information in this survey can be used in conjunction with the soil map to:

1. Make studies that will aid in selecting and developing industrial, business, residential, and recreational sites.
2. Make preliminary estimates for use in the planning of agricultural drainage systems, farm ponds, irrigation systems, and diversion terraces.
3. Make preliminary evaluations 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 mapping units to develop information that will be useful in designing and maintaining certain engineering practices and structures.
6. Determine the suitability of soil for cross-country movement of vehicles and construction equipment.
7. Supplement the information obtained from other published maps, 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 data and interpretations in this section can be useful for many purposes. They do not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads or excavations deeper than the depth of layers here reported. Even in such situations, however, the soil map is useful for planning more detailed field investigations and for suggesting the kinds of problems that can be expected.

Some of the terms used by soil scientists may be unfamiliar to engineers, and some words, for example, soil, clay, silt, and sand, have special meanings in soil science. These and other special terms are defined in the Glossary.

Soil interpretations for engineering uses are in tabular form. Table 7 contains available engineering test data for representative soils of the county. Table 8 gives the classification of the soils and estimates of some of their properties. Tables 9 and 10 contain engineering interpretations of soil properties for farm and nonfarm uses.

Engineering classification systems

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

In this system soil materials are classified in seven principal groups based on the gradation, liquid limit, and plasticity index of the soils. The groups are designated as A-1 through A-7. The best soils for subgrades, gravelly soil 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 table 7.

In the Unified system soils are identified on the basis of particle size, plasticity, and liquid limit. They are grouped according to their performance as material for engineering construction (*9*). The soil materials are identified as coarse grained, eight classes; fine grained, six classes; and highly organic. The last column of table 7 gives the classification of the tested soils according to the Unified system.

Engineering test data

To help evaluate the soils for engineering purposes, soil samples from major horizons of representative profiles were tested. Table 7 contains engineering test data for several of the more extensive soils in Walworth County.

The engineering classifications given in table 7 are based on data obtained by mechanical analysis and by tests to determine liquid limits and plastic limits. The mechanical analysis was 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 plastic limit measure the effect of water on the consistence of the soil material. As the moisture content of a clayey soil increases from a very dry state, the material changes from a semisolid to a plastic stage. As the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material passes from a semisolid to a plastic state. The liquid limit is the moisture content at which the material passes from a plastic to a liquid state. 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 in a plastic condition.

Table 7 also gives optimum moisture and maximum dry density values for most of the tested soils. If soil material is compacted at successively higher moisture content, assuming that the compactive effort remains constant, the density of the compacted material will increase until the optimum moisture content is reached. After that, the density decreases with increase in moisture content. The highest dry density obtained in the compaction test is termed maximum dry density. Moisture-density data are important in earthwork, for, as a general rule, highest stability is obtained if the soil is compacted to maximum dry density when at optimum moisture content.

Engineering properties of the soils

Estimates of the engineering classification of the soils and of the physical and chemical properties on which these classifications are based are given in table 8. The information is based on the test data in table 7 and on test data from other counties. If no tests were available, estimates were made by comparison with similar soils that have been tested and by making observations and determinations in the field.

The estimates in table 8 are for soils as they occur in their natural state and not for disturbed areas that have been altered by cut and fill operations. Other information about the properties of the soils can be obtained by referring to the section "Descriptions of the Soils."

Under "Classification," the USDA classifications, as well as the Unified and AASHO classifications are given.

The estimated percentage of material passing through the various sieves has been rounded off to the nearest 5 percent. The range is generally from 15 percent more to 5 percent less than the value given.

In the column headed "Permeability," estimates of the rate at which water moves through saturated soil horizons are given. The ratings are in terms of inches per hour. Texture, structure, and consistence are the soil characteristics that have most effect on permeability. The permeability of a soil is generally governed by that of the least permeable layer.

The heading "Available water capacity" refers to the amount of water that can be stored in a soil in a form that plants can use. The estimates are in terms of inches per inch of soil.

The column headed "Reaction" shows the estimated acidity or alkalinity of the soils, expressed as a pH value. A neutral soil has a pH of 7.0. A pH value lower than 7.0 indicates acidity, and one higher than 7.0 indicates alkalinity. The reaction is an indication of the need for lime and also an indication of the hazard of corrosion of metal conduits or of deterioration of concrete tile.

The heading "Shrink-swell potential" refers to the change in volume of a soil material that results from a change in moisture content. It is based on volume-change tests or on observance of other physical properties of the soil. The amount and kind of clay and the content of organic matter affect shrink-swell potential. Soils in which illite clays are predominant, for example, do not have so high a shrink-swell ratio as soils in which montmorillonite clays are predominant.

The column headed "Estimated depth to water table" gives estimates in feet of the depth to free water during seasons of high precipitation, or in spring. Some soils have a temporary, or perched, water table in wet seasons only; other soils have a high water table throughout most of the year.

TABLE 7.—*Engineering*

[Tests performed by State Highway Commission of Wisconsin and Bureau of Public Roads in accordance

Soil type and location	Soil material	Depth from surface	Moisture-density data [1]		Mechanical analysis [2]		
					Percentage passing sieve—		
			Maximum dry density	Optimum moisture content	2 in.	¾ in.	No. 4 (4.7 mm.)
		Inches	*Lb. per cu. ft.*	*Percent*			
Chelsea fine sand: NW¼NW¼ sec. 2, T. 4 N., R. 16 E. (Modal.)	Windblown sandy material.	15–39	108	13	----------	----------	----------
		39–75	108	12	----------	----------	----------
Dodge silt loam: SE¼NE¼ sec. 13, T. 2 N., R. 15 E. (Thicker IIB horizon than modal.)	Silty material over sandy loam till.	14–28	----------	----------	----------	----------	----------
		36–47	----------	----------	100	96	92
		47–59	----------	----------	100	96	87
NW¼SW¼ sec. 31, T. 4 N., R. 15 E. (Coarse till.)	Silty material over sandy loam till.	17–26	----------	----------	----------	----------	----------
		35–45	----------	----------	100	89	73
NW¼SE¼ sec. 36, T. 2 N., R. 16 E. (Modal.)	Silty material over sandy loam till.	17–28	103	20	----------	----------	----------
		28–40	115	14	100	98	93
		40–55	130	9	100	95	82
McHenry silt loam: NW¼SE¼ sec. 15, T. 2 N., R. 15 E. (Modal.)	Silty material over sandy loam till.	22–31	111	15	100	98	93
		35–50	142	6	100	84	66
Miami silt loam: NE¼NE¼ sec. 26, T. 3 N., R. 16 E. (Modal.)	Silty material over loam till.	14–20	101	19	100	98	92
		24–50	129	9	100	99	95
NW¼SW¼ sec. 33, T. 2 N., R. 17 E. (Coarser textured than modal.)	Silty material over loam till.	15–22	----------	----------	100	92	82
		25–50	----------	----------	100	98	93

[1] Based on AASHO Designation T 99–57, Method C (*1*).

[2] Mechanical analysis according to AASHO Designation: T 88-57. Results by this procedure frequently differ somewhat from results that would have been 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 material, including that coaser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and this material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in the table are not suitable for use in naming textural classes for soil.

test data

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

Mechanical analysis [2]—Continued							Liquid limit	Plasticity index	Classification	
Percentage passing sieve—Continued			Percentage smaller than—							
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.			AASHO	Unified [3]
							Percent			
100	99	6	4	3	3	2	----------	[4]	A–3 (0)	SP–SM
100	99	7	5	4	4	4	----------	[4]	A–3 (0)	SP–SM
100	99	97	96	72	41	32	49	29	A–7–6 (17)	CL
90	84	62	58	48	34	28	42	26	A–7–6 (12)	CL
82	70	29	23	12	6	4	----------	[4]	A–2–4 (0)	SM
100	98	94	94	68	40	33	54	32	A–7–6 (19)	CH
64	50	22	19	12	6	4	----------	[4]	A–1–b (0)	SM
100	98	92	91	76	43	35	50	29	A–7–6 (17)	CL
89	75	43	41	35	27	23	38	24	A–6 (6)	SC
76	64	36	33	24	14	10	20	7	A–4 (0)	SM–SC
90	77	44	42	37	30	26	36	19	A–6 (4)	SC
60	48	21	19	13	7	4	----------	[4]	A–1–b (0)	SM
90	84	67	65	55	42	37	54	31	A–7–6 (17)	CH
90	85	59	55	40	26	17	19	7	A–4 (5)	CL
77	66	45	43	38	31	29	43	22	A–7–6 (6)	SC
89	83	56	51	38	22	15	22	9	A–4 (4)	CL

[3] SCS and BPR have agreed that all soils having plasticity indexes within 2 points of the A-line are to be given borderline classifications. SP–SM is an example of a borderline classification obtained by this use.

[4] Nonplastic.

TABLE 8.—*Estimated engineering*

Soil series and map symbols	Estimated depth to water table	Depth from surface	Classification	
			Dominant USDA texture	Unified
	Feet	*Inches*		
Adrian: Ac	0–1	0–29	Muck	Pt
		29–60	Sand	SP
Alluvial land: Am Characteristics variable.	3–5			
Aztalan: AzA	1–3	0–27	Loam	ML
		27–43	Silty clay loam	CH
		43–60	Silty clay loam	CH
Boyer: BpB, BpC2	More than 5	0–26	Sandy loam	SM
		26–36	Loamy sand	SM
		36–60	Sand	SP
Casco: CeB2, CeC2, CeD2, CfC3, CfD3, CkD2, ClC2, CrD2, CrE2. (For Fox part of CkD2 and ClC2, see Fox series. For Rodman part of CrD2 and CrE2, see Rodman series.)	More than 5	0–6	Loam	ML
		6–18	Clay loam	CL
		18–60	Sand and gravel	GP–GM
Chelsea: CtB, CtE	More than 5	0–60	Fine sand	SP–SM
Colwood: Cw	0–1	0–8	Silt loam	ML
		8–22	Silty clay loam	CL
		22–60	Fine sand and silt	ML
Conover: CyA	1–3	0–11	Silt loam	ML
		11–23	Silty clay loam	CL
		23–60	Loam	ML
Dodge: DdA, DdB	More than 5	0–10	Silt loam	ML
		10–42	Silty clay loam	CL
		42–60	Loam	ML
Drummer: Dt	0–1	0–9	Silt loam	ML
		9–40	Silty clay loam	CL
		40–60	Sand and gravel	SP–SM
Elburn:				
EbA	1–3	0–16	Silt loam	ML
		16–42	Silty clay loam	CL
		42–60	Loam	ML
EgA	1–3	0–12	Silt loam	ML
		12–36	Silty clay loam	CL
		36–40	Loam	ML
		40–60	Sand and gravel	GP–GM
Flagg:				
FgA, FgB	More than 5	0–11	Silt loam	ML
		11–46	Silty clay loam	CL
		46–72	Sandy clay loam	SM
FlA	1–3	0–22	Silt loam	ML
		22–48	Silty clay loam	CL
		48–72	Sandy clay loam	SC
Fox: FmB, FmC2, FoB, FoC2, FsA, FsB, FsC2.	More than 5	0–15	Silt loam to sandy loam	ML
		15–38	Clay loam	CL
		38–60	Sand and gravel	SP–SM
Griswold:				
GsB, GsC2, GsD2	More than 5	0–11	Loam	ML
		11–29	Sandy clay loam	CL
		29–60	Sandy loam	SM
GwA	1–3	0–15	Silt loam	ML
		15–26	Clay loam	CL
		26–60	Sandy loam	SM

See footnote at end of table.

properties of the soils

Classification—Continued	Percentage passing sieve—			Permeability	Available water capacity	Reaction [1]	Shrink-swell potential
AASHO	No. 4 (4.76 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				
				Inches per hour	*Inches per inch of soil*	*pH value*	
----------	----------	----------	----------	0. 63–2. 0	0. 20	5. 6–8. 4	Low.
A–3	95	90	<5	6. 3–20. 0	. 04	7. 4–8. 4	Very low.
----------	----------	----------	----------	----------	----------	----------	----------
A–4	100	95	55	0. 63–2. 0	. 18	6. 6–7. 8	Low.
A–6	100	95	80	0. 63–2. 0	. 18	6. 6–7. 3	High.
A–6	100	100	95	0. 06–0. 20	. 16	7. 4–8. 4	High.
A–2	100	85	30	2. 0–6. 3	. 09	5. 6–7. 3	Low.
A–2	95	90	25	2. 0–6. 3	. 07	5. 6–7. 3	Low.
A–3	95	90	5	6. 3–20. 0	. 04	7. 4–8. 4	Very low.
A–4	95	85	60	0. 63–2. 0	. 18	5. 6–7. 3	Low.
A–7	95	85	60	0. 63–2. 0	. 18	5. 1–7. 3	Moderate.
A–1	50	45	5	6. 2–20. 0	. 02	7. 4–8. 4	Very low.
A–3	100	100	5	6. 3–20. 0	. 04	5. 6–7. 8	Very low.
A–4	100	100	95	0. 63–2. 0	. 22	6. 6–8. 4	Low.
A–6	100	100	95	0. 20–0. 63	. 20	6. 6–8. 4	High.
A–4	100	100	70	0. 63–2. 0	. 16	7. 4–8. 4	Low.
A–4	100	100	100	0. 63–2. 0	. 20	5. 6–7. 3	Low.
A–6	100	95	90	0. 20–0. 63	. 18	5. 6–8. 3	High.
A–4	90	85	55	0. 63–2. 0	. 16	7. 4–8. 4	Low.
A–4	100	100	100	0. 63–2. 0	. 20	5. 6–7. 3	Low.
A–6	100	95	90	0. 63–2. 0	. 18	5. 1–6. 5	High.
A–4	95	85	55	0. 63–2. 0	. 16	7. 4–8. 4	Low.
A–6	100	100	100	0. 63–2. 0	. 22	6. 1–7. 8	Moderate.
A–6	100	100	95	0. 06–0. 20	. 20	6. 1–7. 8	High.
A–1	50	45	5	6. 3–20. 0	. 02	7. 4–8. 4	Very low.
A–4	100	100	100	0. 63–2. 0	. 22	6. 1–8. 4	Low.
A–6	100	95	95	0. 2–0. 63	. 20	5. 6–7. 3	High.
A–4	85	80	55	0. 63–2. 0	. 16	7. 4–8. 4	Low.
A–6	100	100	100	0. 63–2. 0	. 22	6. 1–7. 3	Low.
A–7	100	100	100	0. 20–0. 63	. 20	5. 1–7. 3	High.
A–4	100	100	55	0. 63–2. 0	. 16	7. 3–7. 8	Low.
A–1	50	45	10	6. 3–20. 0	. 02	7. 4–8. 4	Very low.
A–4	100	100	100	0. 63–2. 0	. 20	6. 1–7. 8	Moderate.
A–6	100	100	95	0. 63–2. 0	. 18	5. 1–6. 5	High.
A–2	95	90	35	0. 63–2. 0	. 10	6. 6–8. 4	Low.
A–4	100	100	100	0. 63–2. 0	. 20	6. 1–7. 8	Moderate.
A–7	100	100	95	0. 20–0. 63	. 18	5. 6–6. 5	High.
A–4	95	90	45	0. 63–2. 0	. 16	5. 6–7. 3	Moderate.
A–4	100	100	80	0. 63–2. 0	. 20	5. 6–7. 3	Low.
A–7	95	86	60	0. 63–2. 0	. 18	5. 1–6. 5	Moderate.
A–1	50	45	5	6. 3–20. 0	. 02	7. 4–8. 4	Very low.
A–4	100	95	55	0. 63–2. 0	. 20	5. 6–7. 3	Moderate.
A–6	100	100	55	0. 63–2. 0	. 16	7. 4–8. 4	Moderate.
A–2	70	65	35	0. 63–2. 0	. 10	7. 4–8. 4	Low.
A–4	100	100	100	0. 63–2. 0	. 20	6. 1–8. 4	Low.
A–7	100	100	65	0. 20–0. 63	. 18	5. 6–7. 3	High.
A–2	85	80	35	0. 63–2. 0	. 12	7. 4–8. 4	Low.

TABLE 8.—*Estimated engineering*

Soil series and map symbols	Estimated depth to water table	Depth from surface	Classification: Dominant USDA texture	Classification: Unified
	Feet	*Inches*		
Hebron: HeB	3-5	0-16	Loam	ML
		16-24	Clay loam	CL
		24-60	Silty clay loam	CL
Hennepin: HfE (For Miami part of HfE, see Miami series.)	More than 5	0-11	Loam	ML
		11-60	Sandy loam	SM
Houghton: Ht	0-1	0-60	Muck	Pt
Juneau: JuA	3-5	0-34	Silt loam	ML
		34-60	Silty clay loam	CL
Kendall: KlA	1-3	0-12	Silt loam	ML
		12-36	Silty clay loam	CL
		36-60	Loam	ML
Knowles:				
KwB	More than 5	0-9	Silt loam	ML
		9-28	Silty clay loam	CL
		28-60	Limestone.	
KyA	1-3	0-7	Silt loam	ML
		7-34	Silty clay loam	CL
		34-60	Limestone.	
Lorenzo: LyB, LyC2, LzD2 (For Rodman part of LzD2, see Rodman series.)	More than 5	0-9	Loam	ML
		9-19	Clay loam	CL
		19-60	Sand and gravel	SP-SM
Marsh: Mf Characteristics variable.	0-1			
Martinton: MgA	1-3	0-20	Silt loam	ML
		20-33	Silty clay	CH
		33-60	Stratified silt and clay	CL
Matherton: MmA	1-3	0-15	Silt loam	ML
		15-27	Silty clay loam	CL
		27-36	Sandy clay loam	SC
		36-60	Sand and gravel	GP-GM
McHenry: MpB, MpB2, MpC, MpC2	More than 5	0-15	Silt loam	ML
		15-35	Clay loam	CL
		35-60	Gravelly sandy loam	SM
Metea: MuA, MuB	More than 5	0-25	Loamy fine sand	SM
		25-34	Clay loam	CL
		34-60	Silt loam	ML
Miami:				
MvB, MxB, MxC2, MxD2, MxE2	More than 5	0-10	Loam or sandy loam	ML
		10-36	Sandy clay loam	SC
		36-60	Sandy loam	SM
MwC2, MwD2, MyA, MyB, MyC, MyC2.	More than 5	0-10	Silt loam or loam	ML
		10-30	Clay loam	CL
		30-60	Loam	CL
Mundelein: MzfA	1-3	0-11	Silt loam	ML
		11-22	Silty clay loam	CL
		22-60	Silt and fine sand	ML
Navan: Na	0-1	0-7	Silt loam	ML
		7-25	Clay loam	CL
		25-60	Silt clay and silty clay loam	CL

See footnote at end of table.

properties of the soils—Continued

Classification—Continued	Percentage passing sieve—			Permeability	Available water capacity	Reaction [1]	Shrink-swell potential
AASHO	No. 4 (4.76 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				
				Inches per hour	*Inches per inch of soil*	*pH value*	
A–4	100	95	55	0.63–2.0	.18	6.1–7.8	Low.
A–7	95	90	65	0.63–2.0	.16	5.6–7.8	Moderate.
A–6	100	95	90	.06–0.20	.18	7.4–8.4	High.
A–4	95	90	55	0.63–2.0	.20	5.6–7.3	Low.
A–2	95	85	35	2.0–6.3	.10	7.4–8.4	Low.
--------	--------	--------	--------	0.63–2.0	>.20	5.6–8.4	Low.
A–4	100	100	95	0.63–2.0	.22	6.1–7.8	Low.
A–7	100	100	100	0.63–2.0	.18	5.6–7.3	High.
A–4	100	100	95	0.63–2.0	.20	5.6–7.3	Low.
A–6	95	95	90	0.20–0.63	.18	5.6–7.3	High.
A–4	75	65	55	0.63–2.0	.18	7.4–8.4	Low.
A–4	100	100	95	0.63–2.0	.20	5.6–7.3	Low.
A–6	100	96	90	0.63–2.0	.18	5.1–6.6	High.
A–4	100	100	100	0.63–2.0	.22	6.6–8.4	Low.
A–7–6	--------	100	90	0.20–0.63	.20	6.6–7.3	High.
A–4	95	85	60	0.63–2.0	.6	5.6–7.8	Low.
A–7	95	86	60	0.63–2.0	.18	5.1–7.3	Moderate.
A–1	50	45	5	6.3–20.0	.02	7.4–8.4	Very low.
--------	--------	--------	--------	--------	--------	--------	
A–6	100	100	95	0.63–2.0	.22	6.6–8.4	Low.
A–7	100	100	95	0.20–0.63	.18	6.6–7.3	High.
A–7	100	100	100	0.20–0.63	.18	7.4–8.4	High.
A–7	100	100	100	0.63–2.0	.22	6.6–8.4	Low.
A–6	100	100	65	0.63–2.0	.18	5.6–8.4	High.
A–6	100	100	45	0.63–2.0	.16	7.4–7.8	Moderate.
A–1	50	45	5	6.2–20.0	.02	7.4–8.4	Very low.
A–4	100	100	80	0.63–2.0	.20	6.1–7.8	Low.
A–7	95	95	65	0.63–2.0	.18	5.1–7.8	Moderate.
A–1	90	85	30	2.0–6.3	.10	7.4–8.4	Low.
A–2	100	100	25	6.3–20.0	.09	6.1–7.8	Low.
A–7	95	85	65	0.63–2.0	.18	6.1–7.8	Moderate.
A–4	100	100	90	0.63–2.0	.20	5.1–7.3	Low.
A–4	95	90	55	0.63–2.0	.18	5.6–7.3	Low.
A–6	95	95	45	0.63–2.0	.16	5.0–7.3	Moderate.
A–2	85	80	30	2.0–6.3	.10	7.4–8.4	Low.
A–4	100	95	50	0.63–2.0	.18	6.1–7.8	Low.
A–7–6	90	90	65	0.63–2.0	.18	5.1–7.3	Moderate.
A–4	95	90	60	0.63–2.0	.16	7.4–8.4	Low.
A–4	100	100	95	0.63–2.0	.22	6.1–8.4	Low.
A–6	100	100	85	0.20–0.63	.18	6.6–8.4	High.
A–4	100	100	70	0.63–2.0	.16	7.4–8.4	Low.
A–4	100	100	95	0.63–2.0	.22	6.1–7.8	Low.
A–6	100	100	90	0.20–0.63	.18	5.6–7.8	Moderate.
A–6	100	100	95	0.06–0.20	.16	7.4–8.4	High.

TABLE 8.—*Estimated engineering*

Soil series and map symbols	Estimated depth to water table	Depth from surface	Classification: Dominant USDA texture	Classification: Unified
	Feet	*Inches*		
Palms: Pa	0–1	0–36	Muck	Pt
		36–60	Loam, silt loam	ML
Pecatonica: PeA, PeB	More than 5	0–13	Silt loam	ML
		13–42	Clay loam	CL
		42–60	Sandy loam	SC
Pella: Ph	0–1	0–12	Silt loam	ML
		12–42	Silty clay loam	CH
		42–60	Silt loam	ML
Plano:				
PsA, PsB, PsC	More than 5	0–17	Silt loam	ML
		17–45	Silty clay loam	CL
		45–60	Sandy loam	SC
PtA, PtB, PtC2	More than 5	0–20	Silt loam	ML
		20–38	Silty clay loam	CL
		38–49	Loam	ML
		49–60	Sand and gravel	SP–SM
Radford: RaA	1–3	0–30	Silt loam	ML
		30–60	Silty clay loam	CL
Rodman: RsF	More than 5	0–11	Gravelly loam	SP–SM
		11–60	Sand and gravel	SP
Rollin: Ru, Rv	0–1	0–32	Muck	Pt
		32–60	Marl	ML
Sandy lake beaches: Sfb. All characteristics variable.				
St. Charles:				
ScA, ScB	More than 5	0–12	Silt loam	ML
		12–38	Silty clay loam	CL
		38–60	Gravelly loam	SM
SeA, SeB	More than 5	0–11	Silt loam	ML
		11–42	Silty clay loam	CL
		42–49	Gravelly sandy loam	SM
		49–60	Sand and gravel	SP–SM
Saylesville: ShA, ShB	3–5	0–12	Silt loam	ML
		12–29	Silty clay	CH
		29–60	Silty clay loam	CL
Sebewa: Sm	0–1	0–13	Silt loam	ML
		13–29	Clay loam	CL
		29–60	Coarse sand	SP–SM
Troxel: TxA	3–5	0–37	Silt loam	ML
		37–60	Silty clay loam	CL
Wallkill: Wa	0–1	0–21	Silt loam	ML
		21–60	Muck and peat	Pt
Warsaw: WeA, WhA, WhB, WhC2	More than 5	0–15	Silt loam or loam	ML
		15–36	Clay loam	CL
		36–60	Sand and gravel	SP–SM
Westville: WvB2, WvC2	More than 5	0–11	Silt loam	ML
		11–50	Clay loam and loam	SC
		50–60	Gravelly sandy loam	SM
Wet alluvial land: Ww. Characteristics variable.	0–1			

[1] Range in pH value in the surface layer includes both limed and unlimed areas.

properties of the soils—Continued

Classification—Continued	Percentage passing sieve—			Permeability	Available water capacity	Reaction [1]	Shrink-swell potential
AASHO	No. 4 (4.76 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				
				Inches per hour	*Inches per inch of soil*	*pH value*	
—	—	—	—	0.63–2.0	>.20	5.5–8.4	Low.
A–6	95	85	55	0.63–2.0	.16	7.4–8.4	Low.
A–4	100	100	95	0.63–2.0	.20	6.1–7.8	Low.
A–6	95	80	60	0.63–2.0	.18	4.5–6.0	Moderate.
A–4	90	85	45	0.63–2.0	.10	7.4–8.4	Low.
A–4	100	100	100	0.63–2.0	.22	6.6–8.4	Low.
A–7	—	100	95	0.20–0.63	.20	6.6–8.4	High.
A–6	—	100	95	0.63–2.0	.18	7.4–8.4	Low.
A–6	100	100	100	0.63–2.0	.22	6.1–7.3	Moderate.
A–7	100	100	100	0.63–2.0	.20	5.6–6.5	High.
A–4	100	95	40	0.63–2.0	.10	7.4–8.4	Low.
A–6	100	100	100	0.63–2.0	.22	5.6–7.3	Low.
A–7	100	100	90	—	.18	5.1–7.3	High.
A–4	100	85	60	0.63–2.0	.18	6.5–7.3	Low.
A–1	50	45	5	6.3–20.0	.02	7.4–8.4	Very low.
A–4	100	100	95	0.63–2.0	.22	6.1–7.3	Low.
A–6	100	100	100	0.20–0.63	.18	5.6–7.3	Moderate.
A–3	80	75	10	6.0–20.0	.04	5.6–7.3	Very low.
A–1	50	45	<5	>20.0	.02	7.4–8.4	Very low.
—	—	—	—	0.63–2.0	>.20	5.5–8.4	Moderate.
A–4	100	90	85	0.63–2.0	.18	Calcareous	Low.
A–4	100	100	95	0.63–2.0	.20	5.6–7.3	Low.
A–6	100	100	95	0.63–2.0	.20	5.5–7.3	High.
A–4	75	70	40	0.63–2.0	.10	7.4–8.4	Low.
A–4	100	100	95	0.63–2.0	.20	5.6–7.3	Low.
A–7	100	100	95	0.63–2.0	.18	5.1–6.5	High.
A–2	75	70	30	0.63–2.0	.08	7.3–7.8	Low.
A–1	50	45	5	6.3–20.0	.02	7.4–8.4	Very low.
A–4	100	100	100	0.63–2.0	.20	6.1–7.8	Low.
A–7	100	100	90	0.20–0.63	.16	5.6–7.3	High.
A–6	100	100	95	0.06–0.20	.16	7.4–8.4	High.
A–6	100	100	100	0.63–2.0	.20	6.1–7.8	Low.
A–6	100	100	95	0.63–2.0	.18	6.1–8.4	High.
A–1	100	95	5	>20.0	.02	7.4–8.4	Very low.
A–4	100	100	95	0.63–2.0	.22	6.1–7.8	Low.
A–6	100	100	100	0.63–2.0	.20	5.6–7.4	High.
A–4	100	100	90	0.63–2.0	.22	6.1–7.8	Low.
—	—	—	—	0.63–2.0	.20	6.1–7.8	Low.
A–4	100	100	80	0.63–2.0	.20	6.1–7.3	Low.
A–7	95	85	65	0.63–2.0	.18	5.1–6.5	Moderate.
A–1	50	40	5	6.3–20.0	.02	7.4–8.4	Very low.
A–4	100	100	95	0.63–2.0	.20	6.1–7.8	Low.
A–6	95	85	45	0.63–2.0	.16	6.1–7.8	Moderate.
A–4	90	70	40	2.0–6.3	.10	7.4–8.4	Low.
—	—	—	—	—	—	—	—

TABLE 9.—*Engineering interpretations*

Soil series and map symbols	Soil features affecting— Farm ponds: Reservoirs	Soil features affecting— Farm ponds: Embankments
Adrian muck: Ac	Pervious; high water table; suitable for dugout ponds.	Pervious; organic surface has low stability but can be used in low embankments; substratum has high stability but is susceptible to piping.
Alluvial land: Am	Texture varies	Texture varies; onsite investigation needed.
Aztalan: AzA	Pervious to semipervious	Semipervious to impervious; subsoil has high stability and low shrink-swell potential; substratum has low stability and high shrink-swell potential.
Boyer: BpB, BpC2	Pervious	Pervious to semipervious; high stability; low shrink-swell potential; susceptible to piping.
Casco: CeB2, CeC2, CeD2, CfC3, CfD3, CkD2, ClC2, CrD2, CrE2. For Fox part of CkD2 and ClC2, see Fox series. For Rodman part of CrD2 and CrE2, see Rodman series.	Pervious to semipervious	Semipervious to impervious; subsoil has medium stability and high shrink-swell potential; substratum has high stability; low shrink-swell potential.
Chelsea: CtB, CtE	Pervious	High stability; low shrink-swell potential; susceptible to piping.
Colwood: Cw	Pervious to semipervious; high water table; suitable for dugout ponds; sides of ponds very unstable when saturated.	Semipervious to impervious; low stability; moderate to low shrink-swell potential; susceptible to piping.
Conover: CyA	Pervious to semipervious	Semipervious to impervious; subsoil has medium stability and high shrink-swell potential; substratum has high stability and low shrink-swell potential.
Dodge: DdA, DdB	Pervious to semipervious	Semipervious to impervious; subsoil has medium stability and high shrink-swell potential; substratum hashigh stability and low shrink-swell potential.
Drummer: Dt	Pervious to semipervious; high water table; suitable for dugout ponds.	Semipervious to impervious; subsoil has medium stability and high shrink-swell potential; substratum has high stability and low shrink-swell potential.
Elburn: EbA, EgA	Pervious to semipervious	Semipervious to impervious; subsoil has medium stability and medium shrink-swell potential; substratum has high stability and low shrink-swell potential.
Flagg:		
FgA, FgB	Pervious to semipervious	Semipervious to pervious; subsoil has medium stability and high shrink-swell potential; substratum has high stability and low shrink-swell potential.
FlA	Pervious to semipervious	Semipervious to impervious; medium stability; high shrink-swell potential.
Fox:		
FmB, FmC2	Pervious; bottom needs to be scarified and compacted.	Semipervious; high stability; low shrink-swell potential.
FoB, FoC2, FsA, FsB, FsC2	Pervious to semipervious	Semipervious to impervious; subsoil has medium stability and high shrink-swell potential; substratum has high stability and low shrink-swell potential.
Griswold:		
GsB, GsC2, GsD2	Pervious to semipervious	Semipervious to impervious; subsoil has low to medium stability and high shrink-swell potential; substratum has high stability and low shrink-swell potential; stony in places.
GwA	Pervious to semipervious	Semipervious to impervious; subsoil has medium stability and moderate shrink-swell potential; substratum has high stability and low shrink-swell potential.

for farm uses

Soil features affecting—Continued			
Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways
Moderate permeability; substratum generally unstable; subsurface drainage feasible.	High available water capacity; poorly drained; wind erosion hazard.	Unstable material; practices generally not applicable.	Poorly drained; wind erosion hazard.
Subject to overflow	Subject to overflow	Subject to overflow	Practices generally not applicable.
Slow permeability; seasonal high water table; surface or subsurface drainage feasible.	High available water capacity; moderate intake rate; somewhat poorly drained.	Wetness may hinder construction.	Slopes are erodible.
Natural drainage is excessive	Moderate available water capacity; deep soil; rapid intake rate.	Sandy material; difficult to vegetate and stabilize.	Erodible; droughty; difficult to vegetate and stabilize.
Natural drainage is adequate	Moderate available water capacity; moderate intake rate; level to sloping.	Less than 2 feet to sand and gravel.	Erodible on slopes; droughty; less than 2 feet to sand and gravel.
Natural drainage is excessive	Low available water capacity; rapid intake rate; wind erosion hazard.	Sandy material; difficult to vegetate and stabilize.	Erodible; droughty; difficult to vegetate and stabilize.
High water table; substratum generally unstable; surface and subsurface drainage feasible.	High available water capacity; deep soil; moderate intake rate; poorly drained.	Low stability in substratum; highly erodible.	Poorly drained; nearly level.
Seasonal high water table; surface and subsurface drainage feasible.	High available water capacity; moderate intake rate; somewhat poorly drained.	Wetness may hinder construction.	Slopes are erodible.
Natural drainage is adequate	High available water capacity; deep soil; moderate intake rate; nearly level to sloping.	Few or no limitations	Slopes are erodible.
High water table; surface and subsurface drainage feasible.	High available water capacity; moderate intake rate; poorly drained.	Wetness may hinder construction of diversions.	Practices generally not applicable.
Moderately slow permeability; seasonal high water table; subsurface drainage feasible.	High available water capacity; moderate intake rate; somewhat poorly drained.	Wetness may hinder construction.	No major limitations.
Natural drainage is adequate	High available water capacity; moderate intake rate; slopes are erodible.	No major limitations	Slopes are erodible.
Moderately slow permeability; seasonal high water table; subsurface drainage feasible.	High available water capacity; moderate intake rate; somewhat poorly drained.	Wetness may hinder construction.	No major limitations.
Natural drainage is adequate	Moderate available water capacity; moderate intake rate; sand and gravel at a depth of 24 to 42 inches.	Sand and gravel at a depth of 24 to 42 inches.	Slopes are erodible.
Natural drainage is adequate	Moderate available water capacity; moderate intake rate; sand and gravel at a depth of 24 to 42 inches.	Sand and gravel at a depth of 24 to 42 inches.	Slopes are erodible.
Natural drainage is adequate	High available water capacity; moderate intake rate; nearly level to sloping.	Sandy loam substratum has low stability and is highly erodible.	Slopes are erodible.
Moderately slow permeability; seasonal high water table; subsurface drainage feasible.	High available water capacity; moderate intake rate; nearly level.	Wetness may hinder construction of diversions.	No major limitations.

TABLE 9.—*Engineering interpretations*

Soil series and map symbols	Soil features affecting— Farm ponds: Reservoirs	Soil features affecting— Farm ponds: Embankments
Hebron: HeB	Pervious to semipervious	Semipervious to impervious; low stability; moderate shrink-swell potential.
Hennepin: HfE. For Miami part of this unit, see Miami series.	Pervious to semipervious	Semipervious to impervious; medium stability; low shrink-swell potential; stony in some areas.
Houghton: Ht	Pervious; high water table; suitable for dugout ponds; flotation of organic material may occur.	Pervious; low stability; may be used for low embankments.
Juneau: JuA	Pervious to semipervious	Semipervious; medium stability; moderate shrink-swell potential.
Kendall: KlA	Pervious to semipervious	Semipervious to impervious; medium stability; high shrink-swell potential; stony in places.
Knowles:		
KwB	Pervious to semipervious	Semipervious to impervious; subsoil has medium stability and moderate shrink-swell potential; limestone bedrock at depth of 24 to 40 inches.
KyA	Pervious to semipervious above bedrock.	Semipervious to impervious above bedrock; medium stability; high shrink-swell potential; bedrock at depth of less than 42 inches.
Lorenzo: LyB, LyC2, LzD2. For Rodman part of LzD2, see Rodman series.	Pervious to semipervious	Semipervious to impervious; high stability; low shrink-swell potential; stony in places.
Marsh: Mf	Variable	Variable
Martinton: MgA	Semipervious	Impervious; medium to low stability; high shrink-swell potential; sandy layers, if present in substratum, are susceptible to piping.
Matherton: MmA	Pervious to semipervious	Semipervious to impervious; subsoil has medium stability and high shrink-swell potential; substratum has high stability and low shrink-swell potential.
McHenry: MpB, MpB2, MpC, MpC2	Pervious to semipervious	Semipervious to impervious; subsoil has medium stability and moderate shrink-swell potential; substratum has high stability and low shrink-swell potential.
Metea: MuA, MuB	Pervious	Semipervious; subsoil has moderate stability and low shrink-swell potential; clayey substratum has medium stability and high shrink-swell potential.
Miami:		
MvB	Pervious to semipervious	Semipervious to impervious
MwC2, MwD2, MyA, MyB, MyC, MyC2	Pervious to semipervious	Semipervious to impervious; subsoil has medium stability and high shrink-swell potential; substratum has medium stability and low shrink-swell potential.
MxB, MxC2, MxD2, MxE2	Pervious to semipervious	Semipervious to impervious; high stability; low shrink-swell potential; stony in places.
Mundelein: MzfA	Pervious to semipervious	Semipervious to impervious; subsoil has medium stability and moderate shrink-swell potential; substratum has low stability and low shrink-swell potential; susceptible to piping.
Navan: Na	Pervious to semipervious; high water table; suitable for dugout ponds.	Semipervious to impervious; medium to low stability; high shrink-swell potential.
Palms: Pa	Pervious; high water table; suitable for dugout ponds; suitable for reservoirs if organic material is removed.	Pervious; organic material has low stability; may be used for low embankments.

for farm uses—Continued

Soil features affecting—Continued			
Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways
Natural drainage is adequate	High available water capacity; moderate intake rate; clayey subsoil.	Clayey subsoil; construction may be difficult.	No major limitations.
Natural drainage is adequate	Steep slopes; shallow soil	Shallow soil; steep slopes; difficult to stabilize.	Slopes are erodible; difficult to stabilize and vegetate.
Moderate permeability; high water table; surface or subsurface drainage feasible.	Very high available water capacity; deep soil; rapid intake rate; wind erosion hazard; poorly drained.	Unstable material; practices generally not applicable.	Practices generally not applicable.
Natural drainage is adequate	High available water capacity; deep soil; moderate intake rate.	No major limitations	No major limitations.
Moderately permeable; seasonal high water table; subsurface drainage feasible.	High available water capacity; moderate intake rate; somewhat poorly drained.	Wetness may hinder construction.	No major limitations.
Natural drainage is adequate	Moderate available water capacity; moderate intake rate; limestone bedrock at a depth of 24 to 40 inches.	Limestone bedrock at a depth of 24 to 40 inches.	Slopes are erodible.
Moderately slow permeability; seasonal high water table; surface drainage feasible.	Seasonal high water table; moderate intake rate; limestone bedrock at a depth of 24 to 40 inches.	Wetness may hinder construction; limestone bedrock at a depth of 24 to 40 inches.	No major limitations.
Natural drainage is adequate	Low available water capacity; thin soil; sand and gravel at a depth of less than 2 feet.	Less than 2 feet to sand and gravel.	Droughty; slopes are erodible; difficult to establish good cover.
Drainage generally not feasible	High water table; generally not feasible to drain.	Not applicable	Not applicable.
Moderately slow permeable; seasonal high water table; subsurface drainage feasible.	High available water capacity; seasonal high water table; moderate intake rate.	Wetness may hinder construction.	No major limitations.
Moderately permeable; seasonal high water table; surface or subsurface drainage feasible.	Moderate available water capacity; moderate intake rate; somewhat poorly drained.	Sand and gravel at a depth of 24 to 40 inches.	No major limitations.
Natural drainage is adequate	High available water capacity; moderate intake rate; sloping.	Sandy loam substratum; sloping.	Slopes are erodible.
Natural drainage is adequate	Moderate available water capacity; rapid intake rate; level to sloping.	Sandy material is difficult to stabilize and to vegetate.	Slopes are erodible.
Natural drainage is adequate	High available water capacity; moderate intake rate; sloping to steep.	Highly calcareous; loamy substratum at a depth of 24 to 40 inches.	Slopes are erodible; difficult to establish vegetation on steeper slopes.
Natural drainage is adequate	High available water capacity; moderate intake rate; sloping to steep.	Highly calcareous; loamy substratum at a depth of 24 to 40 inches.	Slopes are erodible; difficult to establish vegetation on steeper slopes.
Natural drainage is adequate	High available water capacity; moderate intake rate; sloping to steep.	Highly calcareous; loamy substratum at a depth of 24 to 40 inches.	Slopes are erodible; difficult to establish vegetation on steeper slopes.
Moderately slow permeability; seasonal high water table; subsurface drainage feasible.	High available water capacity; moderate intake rate; somewhat poorly drained.	Wetness may hinder construction.	No major limitations.
Slow permeability; high water table; surface and subsurface drainage feasible.	High available water capacity; moderate intake rate; poorly drained.	Wetness may hinder construction.	Generally not applicable.
Moderately permeable; high water table; surface and subsurface drainage feasible.	Very high available water capacity; rapid intake rate; hazard of wind erosion; poorly drained.	Unstable material; practices generally not applicable.	Generally not applicable.

TABLE 9.—*Engineering interpretations*

Soil series and map symbols	Soil features affecting— Farm ponds: Reservoirs	Soil features affecting— Farm ponds: Embankments
Pecatonica: PeA, PeB	Pervious to semipervious	Semipervious to impervious; subsoil has medium stability and high shrink-swell potential; substratum has high stability and low shrink-swell potential.
Pella: Ph	Pervious to semipervious; high water table; suitable for dugout ponds.	Semipervious to impervious; medium stability; high shrink-swell potential; susceptible to piping.
Plano:		
PsA, PsB, PsC	Pervious to semipervious	Semipervious to impervious; subsoil has low to medium stability and high shrink-swell potential; substratum has high stability and low shrink-swell potential; stony in places.
PtA, PtB, PtC2	Pervious to semipervious	Semipervious to impervious; subsoil has medium stability and high shrink-swell potential; substratum has high stability and low shrink-swell potential.
Radford: RaA	Pervious to semipervious	Semipervious; medium stability; high shrink-swell potential.
Rodman: RsF	Very pervious; too porous to hold water.	Pervious; high stability; low shrink-swell potential.
Rollin: Ru, Rv	Pervious; high water table; suitable for dugout ponds; suitable for reservoirs if organic material is removed.	Pervious; low stability for both marl and organic material; suitable only for low embankments.
St. Charles:		
ScA, ScB	Pervious to semipervious	Semipervious to impervious; medium stability; moderate shrink-swell potential.
SeA, SeB	Pervious to semipervious; bottom may need to be compacted.	Semipervious to impervious; subsoil has medium stability and high shrink-swell potential; substratum has high stability and low shrink-swell potential.
Sandy lake beaches: Sfb	Very pervious; level of water table governed by level of water in lake.	Very pervious; high stability; low shrink-swell potential.
Saylesville: ShA, ShB	Semipervious	Impervious; medium to low stability; high shrink-swell potential; sandy layers in substratum susceptible to piping.
Sebewa: Sm	Pervious to semipervious; high water table.	Semipervious to impervious; subsoil has medium stability and moderate shrink-swell potential; substratum has high stability and low shrink-swell potential.
Troxel: TxA	Pervious to semipervious	Semipervious to impervious; medium stability; moderate shrink-swell potential.
Wallkill: Wa	Pervious to semipervious; high water table; suitable for dugout ponds.	Pervious to impervious; mineral material has medium stability and high shrink-swell potential; organic material has low stability.
Warsaw: WeA, WhA, WhB, WhC2	Pervious to semipervious	Semipervious to impervious; subsoil has medium stability and high shrink-swell potential; substratum has high stability and low shrink-swell potential.
Westville: WvB2, WvC2	Pervious to semipervious	Semipervious to impervious; moderate shrink-swell potential; subsoil has medium stability; substratum has high stability.
Wet alluvial land: Ww	Texture varies	Texture varies; onsite investigation needed.

for farm uses—Continued

Soil features affecting—Continued			
Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways
Natural drainage is adequate	High available water capacity; moderate intake rate; nearly level to sloping.	No major limitations	Slopes are erodible.
Moderately slow permeability; high water table; surface and subsurface drainage feasible.	High available water capacity; moderate intake rate; poorly drained.	Wetness may hinder construction.	Practices generally not applicable.
Natural drainage is adequate	High available water capacity; moderate intake rate; nearly level to sloping.	No major limitations	Slopes are erodible.
Natural drainage is adequate	High available water capacity; moderate intake rate; nearly level to sloping.	No major limitations	Slopes are erodible.
Moderately slow permeability; high water table; surface and subsurface drainage feasible.	High available water capacity; moderate intake rate; somewhat poorly drained to poorly drained.	Wetness may hinder construction.	Practices generally not applicable.
Natural drainage is excessive	Low available water capacity; thin soil; rapid intake rate; sloping to steep.	Less than 18 inches to sand and gravel.	Slopes are erodible; difficult to establish good vegetative cover.
Moderate permeability; high water table; surface and subsurface drainage feasible.	Very high available water capacity; rapid intake rate; hazard of wind erosion; poorly drained.	Unstable material; practices generally not applicable.	Practices generally not applicable.
Natural drainage is adequate	High available water capacity; moderate intake rate; nearly level to sloping.	No major limitations	Slopes are erodible.
Natural drainage is adequate	High available water capacity; moderate intake rate; nearly level to sloping.	No major limitations	Slopes are erodible.
Natural drainage is excessive	Hazard of wind erosion is severe; low water-holding capacity.	Practices generally not applicable.	Practices generally not applicable.
Natural drainage is adequate	Moderately slow permeability; moderate intake rate; nearly level to sloping.	Clayey substratum may hinder construction.	Slopes are erodible.
Moderate permeability; high water table; surface and subsurface drainage feasible.	Moderate available water capacity; moderate intake rate; poorly drained.	Sand and gravel at a depth of 20 to 40 inches; wetness may hinder construction.	Practices generally not applicable.
Natural drainage is adequate	High available water capacity; moderate intake rate; deep soil.	No major limitations	No major limitations.
Moderate permeability; high water table; subject to flooding; surface and subsurface drainage feasible.	Very high available water capacity; moderate intake rate; subject to flooding; poorly drained.	Substratum is unstable material; wetness may hinder construction.	Practices generally not applicable.
Natural drainage is adequate	Moderate available water capacity; moderate intake rate; nearly level to sloping.	Sand and gravel at a depth of 24 to 42 inches.	Slopes are erodible.
Natural drainage is adequate	High available water capacity; moderate intake rate; sloping.	No major limitations	Slopes are erodible.
Subject to frequent flooding; high water table; generally not feasible to drain.	Poorly drained; subject to flooding.	Practices generally not applicable.	Practices generally not applicable.

TABLE 10.—*Engineering interpretations*

Soil series and map symbols	Suitability as a source of—	
	Topsoil	Sand and gravel
Adrian: Ac	Poor: erodible; oxidizes readily	Fair: underlying sand varies greatly and contains fines in many places; high water table hinders excavation.
Alluvial land: Am	Surface layer fair to good. Subsoil poor: varies in texture and contains gravel in places.	Unsuitable: varies in texture and contains considerable fines.
Aztalan: AzA	Surface layer good. Subsoil fair to poor: clayey in lower part.	Unsuitable
Boyer: BpB, BpC2	Unsuitable: subsoil is thin over sand and gravel; erodible.	Fair to good: poorly graded sand; some pockets of gravel.
Casco: CeB2, CeC2, CeD2, CfC3, CfD3, CkD2, ClC2, CrD2, CrE2. For Fox part of CkD2 and ClC2. see Fox series. For Rodman part of CrD2 and CrE2, see Rodman series.	Surface layer good: thin. Subsoil poor to unsuitable: clayey; thin over gravel.	Good: substratum contains poorly graded, stratified sand and gravel.
Chelsea: CtB, CtE	Unsuitable: droughty	Good: substratum contains poorly graded sand; bands of fine-textured material in places.
Colwood: Cw	Surface layer good. Subsoil fair: stratified with sand lenses; high water table.	Poor: substratum has layers of poorly graded fine sand and a few lenses of silt and clay in places.
Conover: CyA	Surface layer good. Subsoil fair to poor: lower part contains gravel in places.	Poor: substratum has pockets of well-graded sand and gravel in places.
Dodge: DdA, DdB	Surface layer good. Subsoil poor to unsuitable: clayey.	Poor: substratum has pockets of well-graded sand and gravel at depths of more than 24 inches.
Drummer: Dt	Surface layer good: thick. Subsoil fair to poor: high water table.	Good: substratum consists of poorly graded stratified sand and gravel; high water table hinders excavation.
Elburn: EbA, EgA	Surface layer good: thick; dark colored. Subsoil fair to poor: thick.	Unsuitable
Flagg:		
FgA, FgB	Surface layer good. Subsoil fair to poor: lower part is clayey in places.	Poor: substratum has pockets of well-graded sand and gravel in places.
FlA	Surface layer good. Subsoil fair to poor: lower part is somewhat clayey in places.	Poor: substratum has pockets of well-graded sand and gravel in places.
Fox: FmB, FmC2, FoB, FoC2, FsA, FsB, FsC2.	Surface layer fair. Subsoil poor: lower part contains gravel and is droughty in many places.	Good: substratum contains poorly graded, stratified sand and gravel.
Griswold:		
GsB, GsC2, GsD2	Surface layer good. Subsoil fair to poor: lower part contains pebbles in places.	Fair to poor: substratum has pockets of well-graded sand and gravel in places.
GwA	Surface layer good. Subsoil fair to poor: lower part contains gravel in places.	Poor: substratum has pockets of well-graded sand and gravel in places.
Hebron: HeB	Surface layer good. Subsoil fair to poor: lower part is clayey in places.	Unsuitable: subsoil contains thin layers of sand and gravel in places.

See footnote at end of table.

for nonfarm uses

Degree and kind of limitation for—		Corrosion potential	
Highway subgrade [1]	Foundations for low buildings [1]	Metal	Concrete
Very severe: organic soil material	Very severe: high compressibility; undesirable construction characteristics.	High in organic soil material; moderate in sand.	Hign where reaction is below pH 5.5; low where reaction is above 5.5.
Severe: extreme variations in texture; unstable at any moisture content; has very low stability when wet.	Severe: may liquefy and flow; highly susceptible to frost heave.	Moderate	Low.
Moderate in subsoil: has high stability and good bearing capacity. Very severe in substratum: unstable at high moisture content.	Very severe: high shrink-swell potential; high compressibility; poor shear strength; seasonal high water table or seepage, or both.	High	Low.
Slight: subsoil needs proper compaction; has low shrink-swell potential. Substratum unstable under wheel load unless moist.	Slight: very low compressibility; good shear strength; good bearing capacity.	Low	Low.
Very severe in subsoil: high shrink-swell potential; elastic. Slight in substratum: high stability at any moisture content.	Slight: very low compressibility; low shrink-swell potential; good shear strength.	Low	Low.
Slight in substratum: unstable under wheel loads unless moist; suitable for all types of pavement when confined.	Slight: very low compressibility; good shear strength; good bearing capacity.	Low	Low.
Very severe in subsoil: moderate shrink-swell potential; poor bearing capacity when wet; unstable on slopes. Slight to fair in substratum if properly compacted.	Severe: moderate shrink-swell potential; may flow when saturated; fairly low compressibility; susceptible to frost heave; poor bearing capacity on thawing; high water table most of the year.	High	Low.
Very severe in subsoil: high shrink-swell potential; poor bearing capacity when wet. Moderate in substratum; low shrink-swell potential; high stability when wet.	Slight: low compressibility; fair shear strength; fair to good bearing capacity.	High	Low.
Severe in subsoil: high shrink-swell potential; poor bearing capacity when wet. Moderate in substratum: high stability; low shrink-swell potential.	Slight: low compressibility; fair shear strength; moderately good bearing capacity.	Moderate	Low.
Very severe in subsoil: high shrink-swell potential; medium stability at high moisture content. Slight in substratum when drained; high stability under wheel loads.	Severe: very low compressibility; low shrink-swell potential; good shear strength; high water table most of the year.	High	Low.
Severe in subsoil: medium shrink-swell potential; poor bearing capacity when wet. Slight in substratum: high stability; low shrink-swell potential.	Slight: good bearing capacity; good shear strength; low compressibility.	High	Low.
Severe in subsoil: somewhat elastic; high shrink-swell potential. Slight in substratum: low shrink-swell potential; high stability when wet.	Slight: good to fair shear strength; low compressibility; may liquefy and flow if worked while wet.	Low to moderate	Low.
Severe in subsoil: somewhat elastic; high shrink-swell potential. Slight in substratum: low shrink-swell potential; high stability when wet.	Slight: good to fair shear strength; low compressibility; may liquefy and flow if worked while wet.	High	Low.
Moderate in subsoil: good bearing capacity when properly compacted. Slight in substratum: high stability at any moisture content.	Slight: very low compressibility; low shrink-swell potential; good shear strength.	Low	Low.
Severe in subsoil: high shrink-swell potential; poor bearing capacity when wet. Slight in substratum: high stability; low shrink-swell potential.	Slight to moderate: low compressibility; good to fair shear strength.	Moderate	Low.
Severe in subsoil: moderate shrink-swell potential; poor bearing capacity when wet. Moderate in substratum: low shrink-swell potential; high stability when wet.	Slight: low compressibility; fair shear strength; fair to good bearing capacity.	High	Low.
Severe in subsoil: low stability and poor bearing capacity when wet. Very severe in substratum: unstable at high moisture content.	Very severe: high shrink-swell potential; high compressibility; poor shear strength.	Moderate	Low.

TABLE 10.—*Engineering interpretations*

Soil series and map symbols	Suitability as a source of—	
	Topsoil	Sand and gravel
Hennepin: HfE. For Miami part of this unit, see Miami series.	Surface layer fair: very thin. Subsoil poor: thin; lower part contains gravel.	Poor: substratum has pockets of well-graded sand and gravel in places; steep.
Houghton: Ht	Surface layer poor: erodible; oxidizes readily.	Unsuitable
Juneau: JuA	Surface layer good: thick. Subsoil fair to poor: clayey in places.	Poor: substratum has pockets of sand and gravel in places.
Kendall: KlA	Surface layer good. Subsoil poor: clayey; moderately thick; seasonal high water table.	Poor: substratum has pockets of well-graded sand and gravel in places; seasonal high water table.
Knowles:		
KwB	Surface layer good. Subsoil poor: thin over bedrock.	Unsuitable: bedrock at a depth of less than 42 inches.
KyA	Surface layer good. Subsoil poor: thin over bedrock.	Unsuitable: bedrock at a depth of less than 42 inches.
Lorenzo: LyB, LyC2, LzD2. For Rodman part of LzD2, see Rodman series.	Surface layer good: dark colored; thin. Subsoil poor to unsuitable: clayey; thin over gravel.	Good: substratum contains poorly graded, stratified sand and gravel.
Marsh: Mf	Unsuitable	Unsuitable
Martinton: MgA	Surface layer good: thick; dark colored. Subsoil fair to poor: somewhat clayey.	Unsuitable: silt and clay
Matherton: MmA	Surface layer good. Subsoil poor: lower part contains gravel and is droughty in many places; seasonal high water table.	Good: substratum contains poorly graded, stratified sand and gravel; seasonal high water table.
McHenry: MpB, MpB2, MpC, MpC2	Surface layer good. Subsoil poor: lower part sandy in places.	Poor: substratum has pockets of well-graded sand and gravel in places.
Metea: MuA, MuB	Surface layer and upper part of subsoil unsuitable: droughty.	Poor: lower part of subsoil and substratum consists of silt and clay.
Miami:		
MvB, MxB, MxC2, MxD2, MxE2, MyA, MyB, MyC, MyC2.	Surface layer fair: thin. Subsoil fair to poor: lower part is droughty in many places.	Fair to poor: substratum has pockets of well-graded sand and gravel in places.
MwC2, MwD2	Surface layer good. Subsoil poor: lower part contains gravel in places.	Poor: substratum has pockets of well-graded sand and gravel.
Mundelein: MzfA	Surface layer good. Subsoil fair to poor: seasonal high water table.	Poor: substratum contains poorly graded fine sand and layers of silt in places; seasonal high water table.
Navan: Na	Surface layer good: thick; dark colored. Subsoil fair to poor: high water table.	Unsuitable: subsoil has thin layers of sand and gravel in places.
Palms: Pa	Surface layer poor: erodible; oxidizes readily.	Unsuitable

See footnote at end of table.

for nonfarm uses—Continued

Degree and kind of limitation for—		Corrosion potential	
Highway subgrade [1]	Foundations for low buildings [1]	Metal	Concrete
Moderate in subsoil: very thin if present. Moderate in substratum: low shrink-swell potential; medium stability when wet.	Slight to moderate: low compressibility; fair shear strength; good bearing capacity; steepness.	Moderate	Low.
Very severe: organic soil material	Very severe: high compressibility; undesirable construction characteristics.	High	High where pH is below 5.5; low where pH is above 5.5.
Very severe in subsoil: moderate shrink-swell potential; poor bearing capacity when wet. Moderate in substratum: moderate shrink-swell potential; medium stability when wet.	Slight to moderate: low compressibility; easy to compact; may liquefy if worked when wet; fair shear strength.	High	Low.
Very severe in subsoil: high shrink-swell potential; poor bearing capacity when wet. Moderate in substratum: low shrink-swell potential; medium stability when wet.	Slight: low compressibility; good bearing capacity; good to fair shear strength; may flow if saturated during excavation.	High	Low.
Moderate to severe in subsoil: moderate shrink-swell potential; poor bearing capacity when wet. Slight in substratum: limestone bedrock.	Slight where footings rest on limestone bedrock.	Low to moderate	Low: bedrock in places prevents excavation.
Very severe in subsoil: high shrink-swell potential; medium stability at high moisture content. Slight in substratum: limestone bedrock.	Slight where footings rest on limestone bedrock.	High	Low: bedrock in places is an excavation problem.
Severe in subsoil: moderate shrink-swell potential; elastic. Slight in substratum: high stability at any moisture content.	Slight: low compressibility; low shrink-swell potential; good shear strength.	Low	Low.
Very severe: high water table; ponded most of the year.	Very severe: high water table; ponded most of the year.	High	High where pH is below 5.5; low where pH is above 5.5.
Very severe: highly elastic; high shrink-swell potential; poor bearing capacity when wet.	Severe: high shrink-swell potential; fair shear strength; moderate compressibility.	High	Low.
Moderate in subsoil: good bearing capacity where properly compacted. Slight in substratum: high stability at any moisture content.	Slight: very low compressibility; very low shrink-swell potential; seasonal high water table or seepage, or both.	Moderate	Low.
Very severe in subsoil: moderately high shrink-swell potential; poor bearing capacity. Moderate in substratum: high stability and fair bearing capacity when properly compacted.	Slight: low compressibility; good to fair shear strength.	Low to moderate	Low.
Severe in subsoil: medium stability and poor bearing capacity when wet. Severe in substratum: unstable at high moisture content.	Very severe: high shrink-swell potential; poor shear strength; high compressibility; tendency toward rapid shrinking and swelling.	Moderate to high	Low.
Slight: medium stability; low shrink-swell potential.	Slight: low compressibility; good to fair shear strength.	Low to moderate	Low.
Very severe in subsoil: high shrink-swell potential; poor bearing capacity when wet. Moderate in substratum: low shrink-swell potential; medium stability when wet.	Slight to moderate: low compressibility; fair shear strength; good bearing capacity.	Moderate	Low.
Severe in subsoil; moderate shrink-swell potential; poor bearing capacity when wet.	Severe: moderate shrink-swell potential; may become quick and flow when saturated; fairly low compressibility; susceptible to frost heave; poor bearing capacity on thawing; seasonal high water table or seepage, or both, in places.	Moderate	Low.
Severe in subsoil: low stability and poor bearing capacity when wet. Very severe in substratum: unstable at high moisture content.	Very severe: high shrink-swell potential; high compressibility; poor shear strength; high water table most of the year.	High	Low.
Very severe: organic soil material	Very severe: high compressibility	High	High where pH is below 5.5; low where pH is above 5.5.

352-633—71——7

TABLE 10.—*Engineering interpretations*

Soil series and map symbols	Suitability as a source of—	
	Topsoil	Sand and gravel
Pecatonica: PeA, PeB	Surface layer good: thick; dark colored. Subsoil fair to poor: lower part is clayey in places.	Poor: has pockets of well-graded sand and gravel in places.
Pella: Ph	Surface layer good: thick; dark colored. Subsoil poor: clayey; high water table.	Unsuitable
Plano:		
PsA, PsB, PsC	Surface layer good: thick; dark colored. Subsoil poor: clayey; moderately thick.	Poor: substratum may have pockets of well-graded sand and gravel at a depth of 4 to 5 feet.
PtA, PtB, PtC2	Surface layer good: dark colored; thick. Subsoil fair to poor: thick; clayey.	Good: substratum contains poorly graded, stratified sand and gravel at a depth of more than 40 inches.
Radford: RaA	Surface layer good: thick. Subsoil poor: thick; seasonal high water table.	Poor: seasonal high water table; substratum has pockets of sand and gravel in places.
Rodman: RsF	Unsuitable: very thin; cobblestones; droughty.	Good: substratum contains poorly graded sand and gravel; stratified; cobblestones in places.
Rollin: Ru, Rv	Surface layer poor: erodible; oxidizes readily.	Unsuitable
St. Charles:		
ScA, ScB	Surface layer good: thin. Subsoil poor: clayey; moderately thick.	Poor: substratum has pockets of well-graded sand and gravel in places.
SeA, SeB	Surface layer good. Subsoil poor: clayey	Good: substratum consists of poorly graded, stratified sand and gravel at a depth of more than 40 inches.
Sandy lake beaches: Sfb	Unsuitable	Fair: poorly graded sand and some gravel
Saylesville: ShA, ShB	Surface layer good. Substratum fair to poor: clayey in places.	Unsuitable: silt and clay
Sebewa: Sm	Surface layer good: dark colored; thick. Subsoil fair to poor: thin; high water table.	Good: substratum consists of poorly graded, stratified sand and gravel; high water table hinders excavation.
Troxel: TxA	Surface layer good: thick; dark colored. Subsoil good to fair: thick.	Unsuitable
Wallkill: Wa	Surface layer good: thick. Subsoil poor: organic soil material; erodible; oxidizes readily; high water table.	Unsuitable: organic soil material
Warsaw: WeA, WhA, WhB, WhC2	Surface layer good: dark colored; thick. Subsoil poor: lower part contains gravel in places.	Good: substratum contains poorly graded, stratified sand and gravel.
Westville: WvB2, WvC2	Surface layer good. Subsoil fair to poor: clayey.	Poor: has pockets of well-graded sand and gravel in places.
Wet alluvial land: Ww	Surface layer fair. Subsoil poor: variable in texture; contains gravel in places; high water table.	Unsuitable: variable in texture; contains considerable fines.

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

for nonfarm uses—Continued

Degree and kind of limitation for—		Corrosion potential	
Highway subgrade [1]	Foundations for low buildings [1]	Metal	Concrete
Very severe in subsoil: high shrink-swell potential; poor bearing capacity when wet. Moderate in substratum: high stability; low shrink-swell potential.	Slight to moderate: fair shear strength; low compressibility; fair bearing capacity.	Moderate	Low.
Very severe: highly plastic; high shrink-swell potential; elastic.	Moderate to severe: may liquefy and flow; fair shear strength; moderate compressibility; high water table; may shrink when drained.	Severe	Low.
Very severe in subsoil: high shrink-swell potential; poor bearing capacity when wet. Moderate in substratum: low shrink-swell potential; high stability when wet.	Severe: good shear strength; low compressibility; good bearing capacity.	Low to moderate	Low.
Severe in subsoil: high shrink-swell potential; poor bearing capacity; highly elastic. Slight in substratum: high stability under wheel load at any moisture content.	Severe: very low compressibility; low shrink-swell potential; good shear strength.	Low to moderate	Low.
Very severe in subsoil: high shrink-swell potential; poor bearing capacity when wet. Severe in substratum: relatively unstable at any moisture content.	Severe: high shrink-swell potential; fair shear strength; liquefies if worked when wet; susceptible to frost heave; seasonal high water table.	Moderate	Low.
Slight: high stability; low shrink-swell potential.	Slight: good shear strength; neglible compressibility.	Low	Low.
Very severe: organic soil material	Very severe: high compressibility	High	High where pH is below 5.5; low where pH is above 5.5.
Very severe in subsoil: moderate shrink-swell potential; poor bearing capacity when wet. Moderate in substratum: low shrink-swell potential; medium stability when wet.	Slight: low compressibility; fair shear strength; may liquefy and flow if saturated during excavation.	Moderate	Low.
Severe in subsoil: high shrink-swell potential; poor bearing capacity. Slight in substratum: high stability under wheel load at any moisture content.	Severe: very low compressibility; low shrink-swell potential; good shear strength.	Low to moderate	Low.
Slight in substratum: stable under wheel loads when moist: suitable for all types of pavement when confined; level of water table governed by level of water in lake.	Slight: low compressibility; may liquefy and flow when saturated.	Low	Low.
Very severe: subsoil has high shrink-swell potential, is very plastic, and is elastic; substratum is relatively unstable at any moisture content.	Severe: high shrink-swell potential; moderate compressibility; fair to poor shear strength; may liquefy and flow.	High	Low.
Very severe in subsoil: moderate shrink-swell potential; medium stability at any moisture content. Slight in substratum where properly drained; high stability under wheel loads.	Slight: very low compressibility; low shrink-swell potential; good shear strength; high water table most of the year.	High	Low.
Severe: relatively unstable at any moisture content; poor bearing capacity when wet.	Moderate to severe: susceptible to frost heave; poor bearing capacity on thawing; liquefies when saturated; fair shear strength; moderate compressibility.	Low	Low.
Very severe: organic soil material	Very severe to unsuitable: high water table; removal of organic material required; special footings required.	High in organic soil material.	High where pH is below 5.5; low where pH is above 5.5.
Severe in subsoil: high shrink-swell potential; poor bearing capacity when wet. Slight in substratum: high stability at any moisture content.	Severe: very low compressibility; low shrink-swell potential; good shear strength.	Low to moderate	Low.
Very severe in subsoil: moderate shrink-swell potential; poor bearing capacity when wet. Moderate in substratum: medium stability; low shrink-swell potential.	Severe to moderate: fair shear strength; low compressibility; fair bearing capacity.	Moderate	Low.
Severe: extreme variations in texture; unstable at any moisture content; very low stability when wet.	Severe: may liquefy and flow; highly susceptible to frost heave.	High	Low.

Engineering interpretations for farm uses

Interpretations of the engineering properties of the soils for specified farm uses are given in table 9.

The soil features that are significant in selecting sites for ponds are permeability, stoniness, depth to bedrock, strength and stability, shrink-swell potential, organic-matter content, and the level of the water table. For reservoir areas, the properties described in table 9 are those of the soil in undisturbed condition; for embankments, the properties described are those of the soil after it has been removed, placed in an embankment, and compacted. Compaction commonly results in increased density and slower permeability. Unless otherwise specified, the comments in these two columns apply to the entire profile.

Soils that can be improved by agricultural drainage, either surface or subsurface, are generally those that have a seasonal or permanent high water table. Improvement can be made, also, in some soils that have slowly permeable layers that cause a perched water table. Permeability is the characteristic of the soil that determines the rate at which water moves through the soil, and it should be taken into consideration when planning the spacing of tile lines or drainage ditches. The stability of the soil should be considered, also, when planning the kind of drainage system to be used. The availability of outlets affects the feasibility of drainage.

Available water capacity and water intake rate are important soil features to be considered in planning irrigation. Available water capacity affects the design and use of the system because it affects the time interval between irrigations. A soil that can hold a large amount of water in the rooting zone can be irrigated less frequently than a soil that holds less. The water intake rate determines the rate at which water can be applied efficiently. Slope affects efficiency of irrigation systems and the degree of erosion that can be expected at a given rate of application of irrigation water. Other factors that affect the feasibility of installing irrigation systems and their design are stoniness, the height of the water table, and the depth of the root zone.

Features that affect limitations for terraces and diversions are those that concern the relative difficulty of laying out and constructing the systems. Such features are uniformity of slope; depth of the soil over bedrock, sand and gravel, or impervious clay; stoniness; and availability of outlets. The texture and permeability of the soils, their stability, and the potential siltation of channels affect the maintenance of terraces after installation. Terraces and diversions are used to protect low-lying areas and poorly drained soils, but they are generally not constructed on such soils, because runoff is too slow. Terraces are difficult to construct and maintain in areas where the slope is more than 12 percent. Diversions, however, are effective on the steeper slopes.

The soil features to be considered in planning grassed waterways are those that affect establishment, growth, and maintenance of plants, and features that could make construction of waterways difficult. Important features are the stability of the soil material and its texture and thickness, the natural drainage, stoniness, slope, available water capacity, and the suitability of the soil for plants usable in waterways.

Engineering interpretations for nonfarm uses

Interpretations of the engineering properties of the soils for specified nonfarm uses are given in table 10.

In this table, the heading "Topsoil" refers to soil material to be used as topdressing for roadbanks, parks, gardens, and lawns. The ratings of relative suitability are based on the texture of the soil and on the content of organic matter. A soil that is medium textured and high in organic-matter content would be rated good as a source of topsoil; a soil that is very fine textured or coarse textured and low in organic-matter content would be rated poor or unsuitable.

The ratings in the column headed "Sand and gravel" refer to deposits within 5 feet of the surface. No distinction has been made between deposits that are mainly coarse grained and those that contain appreciable amounts of finer material. Laboratory analysis of samples from individual pits would be needed to make such a determination.

Limitations for use as highway subgrade depend mainly on the stability, bearing capacity, and shrink-swell potential of the subsoil and substratum. The surface layer is generally removed, and so is not considered. The degrees of limitation were determined mainly on the basis of test data. Surface drainage, depth of frost penetration, and other local factors have to be considered for each site.

For foundations for low buildings, the degree of limitation depends on the stability, compressibility, and shrink-swell potential of the substratum. Foundations are generally placed below the depth of frost penetration.

Corrosion potential is closely related to reaction, drainage, and electrical conductivity of the soil solution. Most conduits are laid in the lower part of the soil or in the underlying material. Generally, soils that have poor aeration, a high pH value, and high electrical conductivity are corrosive to metal conduits. Soils that have a low pH value are the most corrosive to concrete conduits. In both cases, corrosion is more rapid when the moisture content of the soil is high.

The relative degrees of limitation are defined as follows: very slight—practically free of limitations; slight—limitations are few and easy to overcome; moderate—limitations can be overcome by good management and careful design; severe—limitations are difficult to overcome; very severe—limitations make use of the soil for the particular purpose generally inadvisable.

Formation, Classification, and Morphology of the Soils

This section discusses the major factors of soil formation as they relate to the soils of Walworth County and briefly explains the system of classifying soils into categories broader than the series. It also discusses morphology of the soils.

Factors of Soil Formation

The characteristics of the soil at any given point are determined by (1) the climate under which the soil material accumulated and has existed since accumulation; (2) plant and animal life, primarily vegetation; (3) the parent material; (4) the relief, or lay of the land, and the drainage; and (5) the length of time these forces have been active.

Climate and plant and animal life are the active factors of soil genesis. They act on the parent material that has accumulated through the weathering of rocks and slowly change it into a natural body with genetically related horizons. The effects of climate and vegetation are conditioned by relief. The parent material also affects the kind of profile that can be formed and, in some cases, determines it almost entirely. Finally, time is needed for the development of distinct horizons.

The factors of soil genesis are so closely interrelated that few generalizations can be made regarding the effect of any one factor because the effect of each is modified by the other four. Many of the processes of soil development are unknown.

Climate

Climate affects soil formation through the moisture and heat it contributes to an environment. It has a direct effect on the weathering of rocks and the alteration of parent material through the mechanical action of freezing and thawing and the chemical action generated by the leaching of water. It has an indirect effect through its influence on plant and animal life. It provides a suitable environment for living organisms, which is of special significance in the rate of plant growth and the accumulation of organic matter in the soil and the degree of soil fertility. Climate has an indirect effect, too, on the clay content of soils; generally, the clay content tends to be greater in warmer, more humid climates. In this county, soils of the Griswold and Plano series are examples of soils that show the influence of climate on soil formation.

Walworth County has a cool, subhumid, continental climate that is characteristic of the north-central part of the United States. The effects of the continental, or macroclimate, are modified locally by variations in relief and by aspect.

Where slopes are steep, runoff is more rapid and less rainfall soaks into the soil. As a result, biological, mechanical, and chemical agents of weathering are retarded, and soil formation is slow. Soils of the Rodman, Casco, and Hennepin series are examples of soils that show the influence of local variations in relief.

The direction of slope affects the formation of soils. Where slopes face south or west, the soil is warmer and drier than where slopes face north, because south-facing slopes receive direct sunlight for longer periods and because prevailing winds are from the west. Soils on the cooler, more humid, north-facing slopes tend to support denser stands of trees, and soils on south-facing slopes tend to support dominantly grassy vegetation.

Plant and animal life

Plants and animals in and on the soil provide organic matter, mix the soil material, and bring plant nutrients from the lower to the upper soil horizons.

Soils of the Miami series are examples of soils that formed under forest cover. Soils of the Lorenzo series are examples of soils that formed under prairie vegetation.

The influence of different kinds of vegetation on the formation of soils can be illustrated by the difference in color between soils that formed under forest and those that formed under prairie grasses. Soils that formed under forest are light colored. They are generally more acid than those that formed under grass, and organic matter decomposes more rapidly. Soils that formed under grass are dark colored. They accumulate more organic matter and retain it longer (*5*) than soils that formed under forest, and the humus contributes to their darker color. Soils that formed in places where the vegetation is a mixture of trees and grasses generally have characteristics of both forest and prairie soils.

Man's activities have had an important influence on the soils. He has greatly altered the original condition of many of the soils by clearing, burning, and cultivating. He has contributed to accelerated erosion by repeatedly removing plant cover from terraces and uplands; he has perpetuated grassland vegetation in normally wooded areas by repeated burning, which has destroyed seedling trees; he has contributed to loss of organic matter through overcultivation and overtillage; and he has altered the natural acidity or alkalinity of the soils by liming. Soils of the Juneau series are an example of soils that show the influence of accelerated erosion and deposition of soil over older soil material.

Man has also altered the soils by varying the kinds of vegetation that grow on them and by introducing new species of plants. He has improved natural drainage by constructing waterways and building water control structures. All of man's activities affect the soil in some way, but some of the changes may not be evident for many years.

Parent material

Most of the soils of Walworth County formed in loess or were derived from material laid down by glaciers. Some of the soils formed in organic material, mainly decomposed vegetation; others formed in alluvium.

Most of the county is covered by loess (*2*) that ranges from a few inches to 5 feet or more in depth. The loess is generally thickest on outwash plains. Soils of the St. Charles and Plano series are examples of soils that formed in deep loess on outwash plains. Soils such as those of the Flagg series developed in areas where the loess mantle is underlain by till at a depth of 30 to 50 inches. Soils of the Dodge and McHenry series are examples of soils that developed in "two-storied" parent material that consisted of loess over till.

Although loess and till are the more common parent materials in the county, there is also much glaciofluvium (material deposited by streams flowing from glaciers), and alluvium. Soils on terraces and flood plains of the present streams and rivers formed in material originally deposited as local alluvium from uplands or as glaciofluvium from adjacent drift areas. Where rivers and streams have built successions of terraces in the valleys, the higher terraces represent the earlier deposits, and the lower terraces represent the later deposits. Soils of the Plano, Warsaw, St. Charles, and Fox series are examples of soils that formed on silt-mantled terraces.

352-633--71——8

In the northern part of the county, the Kettle Moraine is representative of upland glaciofluvium. Soils of the Rodman, Boyer, and Chelsea series are examples of soils that developed in glaciofluvial material, but lack a mantle of loess. Soils of the Casco and Lorenzo series are examples of soils on the Kettle Moraine that developed in a thin mantle of loess or in material that lacked the loess cap entirely.

Fairly large areas of organic soils occur along Turtle, Honey, and Sugar Creeks. The parent material consisted mainly of decomposed sedges and grasses. Soils of the Adrian, Houghton, and Palms series are examples of soils that formed in this material.

Relief and drainage

Relief influences the formation of soils by controlling drainage, runoff, and erosion. The differences in relief in Walworth County are closely related to differences in drainage, thickness of the A horizon and its organic-matter content, depth of the solum, and horizonation. Drainage characteristics are generally reflected in the color of the soil and in the degree and kind of mottling or gleying in the soil profile.

Of the well-drained soils, those of the Dodge, Flagg, and Miami series are on gently undulating to rolling uplands, and those of the Warsaw and Plano series are on stream terraces. All of these soils have similar mottling characteristics. All are free of mottling in the A and B horizons, but they may be mottled deep in the C horizon or below a depth of several feet.

Of the moderately well drained soils, those of the St. Charles series are on nearly level to gently sloping uplands. They are mottled in the lower part of the B and C horizons.

Of the somewhat poorly drained soils, those of the Matherton series are on nearly level stream terraces, and those of the Kendall, Elburn, and Conover series are on gently sloping to nearly level uplands. All of these soils commonly are mottled below a depth of 6 to 16 inches, in the lower part of the A and B horizons.

Of the poorly drained soils, those of the Pella and Drummer series occur in nearly level to concave areas. They have a dark-colored, organic-mineral surface horizon, generally more than 6 inches thick, and are underlain by a gleyed, mineral horizon.

The thickness of the surface layer and its content of organic matter are commonly related, directly or indirectly, to relief. The usual pattern in this county consists of light-colored soils on the stronger slopes and soils that have a successively darker and thicker surface horizon on the gentler slopes and in areas where the slope changes from convex to concave. Runoff is slower where the slopes are more gentle, and consequently, more water soaks into the soil. As a result, plants grow better, and more organic matter accumulates in the A horizon.

In this county the relationship of relief to soil development is shown by the general pattern of immature, skeletal soils on steep slopes and progressively better developed, deeper soils on the gentler slopes. The deeper soils contain more clay in the subsoil than the immature soils. Soils of the Rodman and Casco series are examples of soils that show the influence of relief on soil development. These soils formed in the same kind of parent material, but the Rodman soils, which are more sloping, lack the textural and structural B horizon of the deeper, more gently sloping Casco soils.

Time

The length of time needed for a soil to form depends on the climate, plant growth and animal activity, the nature of the parent material, and relief and drainage. The degree of profile development depends on the intensity of the different soil-forming factors and on the length of time they have been active.

A soil is young, or immature, if the soil-forming factors have not been active long enough for the soil to be in equilibrium with its environment. A soil is mature, or old, if it has been in place for a long time and has approached equilibrium.

In Walworth County, soils of the Juneau series are an example of immature soils; soils of the Plano series are an example of mature soils.

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 (*6*) and later revised. The system currently used was adopted for general use by the National Cooperative Soil Survey in 1965 and supplemented in March 1967 (*8*). This system is under continual study, and readers interested in the development of the system should refer to the latest literature available (*3*).

Table 11 shows the classification of each of the soil series represented in Walworth County, according to the present system. This system defines classes in terms of observable or measurable properties of soils. The properties chosen are primarily those that permit the grouping of soils that are similar in genesis. Placement of some of the soil series, particularly in families, may change as more precise information becomes available. 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. These are the 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, the Entisols and Histosols, occur in many different climates. Five of the ten soil orders are represented in Walworth County. These are the Alfisols, Entisols, Histosols, Inceptisols, and Mollisols.

Alfisols formed mostly under trees, but some formed under grass. They are light colored and have a base saturation of more than 35 percent. The base saturation increases with increasing depth. This order is represented in Walworth County by soils of the Boyer, Casco, Conover, Dodge, Flagg, Fox, Hebron, Kendall, Knowles, Matherton, McHenry, Metea, Miami, Pecatonica, St. Charles, Saylesville, and Westville series.

TABLE 11.—*Classification of soil series of Walworth County*

Series	Family	Subgroup	Order
Adrian	(1)	(1)	Histosol.
Aztalan	Fine-loamy, mixed, mesic	Aquic Argiudoll	Mollisol.
Boyer	Coarse-loamy, mixed, mesic	Typic Hapludalf	Alfisol.
Casco	Fine-loamy over sandy-skeletal, mixed, mesic	Typic Hapludalf	Alfisol.
Chelsea	Sandy, siliceous, mesic	Alfic Udipsamment	Entisol.
Colwood	Fine-loamy, mixed, noncalcareous, mesic	Typic Haplaquoll	Mollisol.
Conover	Fine-loamy, mixed, mesic	Aquollic Hapludalf	Alfisol.
Dodge	Fine-silty, mixed, mesic	Typic Hapludalf	Alfisol.
Drummer	Fine-loamy, mixed, mesic	Typic Haplaquoll	Mollisol.
Elburn	Fine-silty, mixed, mesic	Aquic Argiudoll	Mollisol.
Flagg	Fine-silty, mixed, mesic	Typic Hapludalf	Alfisol.
Flagg, mottled subsoil variant.	Fine-silty, mixed, mesic	Aquic Hapludalf	Alfisol.
Fox	Fine-loamy over sandy skeletal, mixed, mesic	Typic Hapludalf	Alfisol.
Griswold	Fine-loamy, mixed, mesic	Typic Argiudoll	Mollisol.
Griswold, mottled subsoil variant.	Fine-loamy, mixed, mesic	Aquic Argiudoll	Mollisol.
Hebron	Fine-loamy, mixed, mesic	Typic Hapludalf	Alfisol.
Hennepin	Fine-loamy, mixed, mesic	Typic Eutrochrept	Inceptisol.
Houghton	(1)	(1)	Histosol.
Juneau	Coarse-silty, mixed, nonacid, mesic	Typic Udifluvent	Entisol.
Kendall	Fine-silty, mixed, mesic	Aeric Ochraqualf	Alfisol.
Knowles	Fine-silty, mixed, mesic	Typic Hapludalf	Alfisol.
Knowles, mottled subsoil variant.	Fine-silty, mixed, mesic	Aquic Hapludalf	Alfisol.
Lorenzo	Fine-loamy over sandy or sandy-skeletal, mixed, mesic	Typic Argiudoll	Mollisol.
Martinton	Fine, illitic, mesic	Aquic Argiudoll	Mollisol.
Matherton	Fine-loamy over sandy-skeletal, mixed, mesic	Udollic Ochraqualf	Alfisol.
McHenry	Fine-loamy, mixed, mesic	Typic Hapludalf	Alfisol.
Metea	Coarse-loamy, mixed, mesic	Arenic Hapludalf	Alfisol.
Miami	Fine-loamy, mixed, mesic	Typic Hapludalf	Alfisol.
Mundelein	Fine-silty, mixed, mesic	Aquic Argiudoll	Mollisol.
Navan	Fine-loamy, noncalcareous, mixed, mesic	Typic Argiaquoll	Mollisol.
Palms	(1)	(1)	Histosol.
Pecatonica	Fine-loamy, mixed, mesic	Typic Haludalf	Alfisol.
Pella	Fine-silty, mixed, mesic	Typic Haplaquoll	Mollisol.
Plano	Fine-silty, mixed, mesic	Typic Argiudoll	Mollisol.
Radford	Coarse-silty, mixed, mesic	Fluventic Hapludoll	Mollisol.
Rodman	Sandy-skeletal, mixed, carbonatic, mesic	Typic Hapludoll	Mollisol.
Rollin	(1)	(1)	Histosol.
St. Charles	Fine-silty, mixed, mesic	Typic Hapludalf	Alfisol.
Saylesville	Fine, illitic, mesic	Typic Hapludalf	Alfisol.
Sebewa	Fine-loamy over sandy-skeletal, mixed, noncalcareous, mesic.	Typic Argiaquoll	Mollisol.
Troxel	Fine-silty, mixed, mesic	Cumulic Hapludoll	Mollisol.
Wallkill	Fine-silty, mixed, nonacid, mesic	Thapto-Histic Haplaquept	Inceptisol.
Warsaw	Fine-loamy over sandy-skeletal, mixed, mesic	Typic Argiudoll	Mollisol.
Westville	Fine-loamy, mixed, mesic	Typic Hapludalf	Alfisol.

[1] Histosols are not classified at the subgroup and family levels, because classification at these levels was provisional at the time the survey went to the printer.

Entisols are recent soils in which there has been no horizon development. This order is represented by soils of the Chelsea and Juneau series.

Histosols are highly organic, and their classification has not been completed beyond the order. This order is represented by soils of the Adrian, Houghton, Palms, and Rollin series.

Inceptisols are mineral soils in which horizons have definitely started to develop. They are generally on young, but not recent, land surfaces. This order is represented by soils of the Hennepin and Wallkill series.

Mollisols have a thick, dark-colored surface layer and a high base supply. The vast majority of these soils formed under grass. This order is represented by soils of the Aztalan, Colwood, Drummer, Elburn, Griswold, Lorenzo, Martinton, Mundelein, Navan, Pella, Plano, Radford, Rodman, Sebewa, Troxel, and Warsaw series.

SUBORDER.—Each order is divided 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 suborder 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 those 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 having major horizons that, except for texture of the surface layer, are similar in important characteristics and in arrangement in the profile.

Morphology of the Soils

Soil morphology in Walworth County is expressed generally as prominent horizons within the solum. In some of the soils, however, development is in the early stages, and the horizons are faint or indistinct. For example, well-drained, gently sloping soils that formed in medium-textured to fine-textured material on uplands generally have distinct horizons. On the other hand, soils that formed in sandy material deposited by glacial streams have faint horizons, or none at all.

The differentiation of horizons in soils of the county is the result of the accumulation of organic matter, the leaching of carbonates and salts, the accumulation of silicate clay minerals, and the reduction and transfer of iron.

In all but a few of the soils in this county, some organic matter has accumulated in the uppermost layers to form an A1 horizon. Much of the organic matter is in the form of humus. The quantity is small in some soils but fairly large in others. Soils such as those of the Chelsea series, have a faint, thin A1 horizon that is low in organic-matter content at best. Other soils, such as those of the Plano, Warsaw, and Griswold series, have a thick A1 horizon that is fairly high in organic-matter content.

Leaching of carbonates and salts has occurred in nearly all the soils, but leaching has been of limited importance in horizon differentiation. The effects have been more indirect, in that the leaching has permitted the subsequent translocation of silicate clay minerals in some soils. Carbonates and salts have been completely leached out of most of the well-drained soils. Even in the wettest soils, some leaching is indicated by a lower pH value throughout the solum than in the parent material. Leaching of the very wet soils is slow because movement of water through the profile is slow.

Accumulation of silicate clay minerals has contributed to the development of horizons in most soils of the county. Nearly all the soils in an advanced stage of development show illuvial horizons in which clay has accumulated. In some mature soils, such as those of the Flagg series, which formed in deep loess on uplands, an accumulation of silicate clay is expressed in illuvial B horizons that contain more total clay and more fine clay than horizons either above or below. In shallower loessal soils, such as those of the Miami series, where the B horizon developed partly in the underlying till, horizons of illuviation may not have more total clay than the C horizon. They do have more of the fine clay, however. All the soils that have blocky structure contain clay films. The films occur as thin layers on ped faces with the long axes of the clay particles parallel to the surface on which they are deposited. This translocated clay tends to fill the natural cracks of the soils and jut into crevices and openings left by plant roots, animals, or insects.

The nearly structureless soils, such as those of the Boyer and Chelsea series, have a slight accumulation of silicate clay in their B horizon. They cannot have clay films on ped surfaces, of course, because the peds lack discernible cleavage planes. The clays in the illuvial horizons of these soils generally occur as coatings on individual sand grains and, in many places, they are oriented with the surface of the grain. The few pores in these horizons persist long enough to have weak, patchy clay films.

The reduction and transfer of iron has occurred in all the very poorly drained, poorly drained, and somewhat poorly drained soils of the county. In these naturally wet soils, this process, called gleying, is of importance in horizon differentiation. It is most pronounced in soils of the Pella, Navan, and Sebewa series. The gray colors of the deeper horizons of wet soils indicate the reduction of iron oxides. This reduction is commonly accompanied by some transfer of the iron, which may be local or general in character. After it has been reduced, iron may be removed completely from some horizons, or even from the entire profile. More commonly, in this county, it has moved a short distance, then stopped either in the horizon of its origin or in a nearby horizon. In some of the soils, iron has been segregrated within the deeper horizons, to form yellowish-red, strong-brown, or yellowish-brown mottles. Spots of black manganese are also common.

The differentiation of the A1 horizon from the deeper horizons in poorly drained soils is caused by the reduction and transfer of iron. Horizon differentiation also results partly from a greater accumulation of organic matter in the surface layer.

General Nature of the County

Walworth County was organized in 1836 by settlers who had been establishing themselves in the area since the early 1830's. Many of the settlers built homes in the area now known as Spring Prairie Township, where the open grasslands could be easily converted to farms.

By 1850 the population numbered 17,862, and nearly three-fourths of the county was being farmed. The farm population showed a gradual rise for nearly a hundred years, but it leveled off in the late 1940's, then began to decline. The total population of the county reached 52,368 in 1960, and it continues to rise.

Climate [3]

Walworth County has a continental climate, characterized by marked changes in weather. The area is influenced by pressure systems that move southward from Canada and eastward across the continent.

Winters are relatively cloudy, cold, and snowy. Rivers and lakes begin to freeze over in November, and the ice usually remains until early in April. In winter, heavy fog forms occasionally when relatively warm air moving northward from the Gulf of Mexico is cooled by contact with the cold surface, particularly if the ground is covered with snow.

Spring is slow in coming, and periods of warm weather alternate with cold spells. Snowfall decreases as spring sets in, and by the end of March nearly all the precipitation falls as rain.

Summers are warm and usually include several short periods when the weather is hot and humid. Cool periods are likely to occur at any time during the summer. Dew forms on most summer mornings, and often it is heavy.

Nearly every fall has periods after the first killing frost when the days are unusually warm, skies are generally clear but hazy, and the nights are cool. The change from fall to winter is often abrupt, as is the change from summer to fall.

Table 12 gives temperature and precipitation data based on records at the Lake Geneva Weather Station. Also given in this table are temperatures in terms of heating degree-days (*4*). The number of degree-days 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°, fifteen degree-days would be counted. A knowledge of accumulated degree-days for a stated time is helpful in calculating the amount of fuel needed for heating buildings.

Temperatures vary greatly from season to season and often from day to day and year to year. The average number of days in a year when the temperature reaches 90° F. or higher is 20, but the number ranges from more than 60 to fewer than 6. The average number of days in a year when the temperature falls to zero or below is 12, but the number ranges from more than 40 to fewer than 5. In 1 year out of 5, the temperature is −25° or below on 1 or more days, and in 1 year out of 5, it is 100° or higher on 1 or more days.

The length of the daylight hours ranges from 15 hours and 20 minutes late in June to 9 hours and 3 minutes late in December.

The growing season, which is defined as the number of days between the last freezing temperature in spring and the first in fall, averages 161 days. The probabilities of the last low temperatures in spring and the first in fall are given in table 13. Slight variations in probabilities in the county are caused by differences in elevation and differences in distance from lakes or streams.

Table 14 shows growing degree-days for specified months. Growing degree-days are based on the concept that plant growth and insect development begin at the

[3] By MARVIN W. BURLEY, State climatologist, Weather Bureau, U.S. Department of Commerce.

TABLE 12.—*Temperature and precipitation data*

[All data based on records at Lake Geneva Weather Station]

Month	Temperature				Average heating degree-days [1]	Precipitation			
	Average daily maximum	Average daily minimum	Two years in 10 will have at least 4 days with—			Average total	One year in 10 will have—		Snow
			Maximum temperature equal to or higher than—	Minimum temperature equal to or lower than—			Less than—	More than—	Average total
	°F.	°F.	°F.	°F.		Inches	Inches	Inches	Inches
January	29.8	13.2	46	−9	1,350	1.73	0.45	3.24	11.0
February	33.2	16.4	44	−6	1,130	1.26	.51	2.36	5.5
March	42.6	24.5	60	11	970	2.55	.86	3.98	10.1
April	58.6	36.4	77	25	530	3.24	.94	4.78	1.1
May	69.6	45.9	85	33	260	3.69	1.37	6.18	.1
June	79.2	56.8	93	45	80	4.46	1.41	5.63	0
July	84.0	61.9	93	52	10	4.18	1.01	7.66	0
August	82.6	61.3	93	51	10	3.60	1.40	7.38	0
September	74.1	52.4	90	40	120	1.98	1.28	6.57	0
October	63.7	42.7	79	29	380	2.13	.74	4.55	(2)
November	45.0	28.7	64	12	840	2.16	.43	4.34	4.5
December	33.2	18.6	47	−3	1,210	2.12	.42	2.87	10.8
Year	58.0	38.2			6,890	33.10			43.1

[1] The difference between the average temperature for a given day and 65° F., multiplied by the number of days in the month.

[2] Trace.

TABLE 13.—*Probabilities of last low temperatures in spring and first in fall*

Probability	Dates for given probability and temperature				
	16° F. or lower	20° F. or lower	24° F. or lower	28° F. or lower	32° F. or lower
Spring:					
2 years in 10 later than	March 30	April 10	April 18	May 1	May 14
4 years in 10 later than	March 23	April 2	April 11	April 24	May 7
6 years in 10 later than	March 16	March 26	April 5	April 18	May 1
8 years in 10 later than	March 9	March 18	March 28	April 11	April 25
Fall:					
2 years in 10 earlier than	November 11	November 2	October 24	October 18	October 2
4 years in 10 earlier than	November 18	November 10	November 1	October 26	October 9
6 years in 10 earlier than	November 25	November 17	November 8	November 1	October 15
8 years in 10 earlier than	December 3	November 24	November 15	November 9	October 27

time certain critical temperatures are reached, and that the amount of plant growth or insect development is roughly proportional to the number of accumulated degree-days. The number of growing degree-days is computed by subtracting the daily average temperature from a chosen base. An average temperature of 60 degrees, for example, is 20 growing degrees above a base of 40 degrees, 15 degrees above a base of 45 degrees, and 10 degrees above a base of 50 degrees. On days when the average temperature is the same or lower than the base temperature, the number of growing degree-days is zero.

TABLE 14.—*Growing degree-days for specified months*

Month	Base 40° F.	Base 45° F.	Base 50° F.
April	260	160	80
May	550	400	280
June	840	690	540
July	1, 020	870	710
August	990	840	680
September	700	550	430
October	410	290	180
Total for period	4, 770	3, 800	2, 900
Total for growing season	4, 250	3, 470	2, 690

Annual precipitation is normally adequate for the crops grown. Most of the precipitation in summer falls as highly variable showers. Although the supply of moisture is low in July and August, a severe drought that affects all crops is rare. About 1 inch of rain is needed each week in summer for a good growth of crops. The probability of receiving this amount of rain during a 7-day period is greatest early in June, when a weekly rainfall of 1 inch or more can be expected 4 years in 10.

The driest part of the growing season is late in August and early in September. At these times, the probability is that during a 7-day period only a trace of moisture will be received 3 years out of 10. The number of days in a year when 0.01 inch or more of precipitation falls averages 115, but it ranges from 105 to 125 days in 2 years out of 3.

The occurrence of dry days, or days having less than 0.10 inch of rain, is important. For example, in making field-cured hay, 3 or more consecutive dry days are needed. The probability of having 3 such days in a row is about 49 percent in June and is 57 percent in July and August.

A knowledge of annual precipitation and daily amounts of 0.5 inch or more is useful in estimating the hazard of erosion. Rainfall less intensive than 0.5 inch a day is not likely to cause gullying. Table 15 gives a summary of the amount of precipitation, lasting for a specified length of time from 30 minutes to 10 days, that can be expected in the return periods indicated. The data are for a 24-hour observation period and not for 24 consecutive hours. The amounts, therefore, are a little low. No distinction is made between rainfall and snowfall. In this county the average number of days that have 0.5 inch or more of precipitation is 20. About 60 percent of the annual precipitation falls on days that receive 0.5 inch or more.

TABLE 15.—*Amount of precipitation of stated duration to be expected once in the specified number of years*

Duration	Return period of—						
	1 year	2 years	5 years	10 years	25 years	50 years	100 years
	Inches	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
30 minutes	1. 0	1. 1	1. 4	1. 6	1. 8	2. 0	2. 2
1 hour	1. 2	1. 4	1. 8	2. 0	2. 3	2. 5	2. 7
2 hours	1. 4	1. 7	2. 1	2. 4	2. 7	3. 0	3. 3
3 hours	1. 6	1. 8	2. 2	2. 6	3. 0	3. 3	3. 6
6 hours	1. 8	2. 1	2. 6	3. 0	3. 5	3. 9	4. 2
12 hours	2. 0	2. 5	3. 0	3. 5	4. 0	4. 4	5. 0
24 hours	2. 4	2. 8	3. 5	4. 0	4. 7	5. 1	5. 8
2 days	------	3. 2	4. 1	4. 7	5. 4	6. 1	6. 8
4 days	------	3. 7	4. 9	5. 4	6. 6	7. 1	8. 0
7 days	------	4. 2	5. 4	6. 2	7. 5	8. 2	9. 1
10 days	------	4. 6	6. 0	7. 0	8. 4	9. 5	10. 3

From the middle of November to the end of March, most of the precipitation falls in the form of snow. The average annual snowfall is about 43 inches, but the amount of snow that falls in a year ranges from less than 15 inches to more than 75 inches. The average date of the first snowfall of 1 inch or more is November 28. The chance that 1 inch or more of snow will fall by November 1 is 1 year in 10, and the chance that this amount will fall by December 20 is 9 years in 10. The probability of snow on the ground increases until the middle of February and then decreases rapidly.

The ground usually begins to freeze late in November or early in December, and it begins to thaw early in April. The depth of the penetration of frost into the ground is highly variable. In years when 10 inches or more of snow covers the ground before freezing begins, frost penetration is only a few inches regardless of how low the temperature falls. Frost penetration is usually more than 36 inches in years when freezing begins before the snow cover accumulates, or the snow cover is thin or it melts rapidly. The probabilities of snow cover in winter and early in spring are given in table 16.

TABLE 16.—*Probabilities of snow cover during specified months*

Month	1 inch or more	5 inches or more	10 inches or more
	Percent	*Percent*	*Percent*
November	10	2	0
December	51	15	5
January	62	26	11
February	65	38	14
March	34	13	5
April	1	(1)	0

1 Less than 0.05.

Thunderstorms occur on an average of 40 days a year, but the number ranges from 25 to 60. They are most likely in June and July. The months of August, then May, are next in frequency of thunderstorms. Severe thunderstorms occur most frequently in July, between 2:00 and 7:00 p.m. Some of the storms bring heavy rain, hail, and strong winds, and damage to crops and property is heavy.

Hail falls on an average of 3 days a year. It is more likely in May than in other months. The months of April, June, and July are next in frequency of storms accompanied by hail. Hailstorms are infrequent from the middle of September to the middle of March.

The prevailing winds are from the west in winter and from the south in summer. March, April, and November are the windiest months, when windspeeds average about 12 miles per hour. July and August are the least windy, when the average windspeed is about 9 miles per hour. In about 5 out of 10 years, the annual windspeed, except for gusts, can be expected to reach 55 miles per hour at about 30 feet above the ground and about 45 miles per hour at about 10 feet above the ground. About once in 50 years, the windspeed can be expected to reach 100 miles per hour at about 30 feet above the ground and 85 miles per hour at about 10 feet above the ground. At plant height, surface friction reduces windspeed considerably below that at either the 30-foot level or the 10-foot level.

The average annual amount of sunshine is nearly 60 percent of the daylight hours. The least amount of sunshine is in November and December, when the sun shines about 40 percent of the daylight hours, and the largest amount of sunshine is in July and August, when the sun shines about 70 percent of the daylight hours.

The average annual lake evaporation is nearly 30 inches. About 80 percent of the evaporation each year occurs from May through October.

Farming and Industries

About 85 percent of the farmland in Walworth County is in Land Capability Classes I, II, and III. All of this acreage can be farmed intensively if adequate conservation practices are followed.

Before the Civil War, wheat was the principal crop. After the Civil War, farmers diversified their crops by producing other grains in addition to wheat. By 1900 dairying had become important, and it is now the most important farm enterprise in the county.

Milk is the most important source of farm income. Most of it is marketed as fluid milk. Butter, condensed products, powdered milk, and ice cream are the principal processed milk products. Cottage cheese is produced in large quantities. Cream sales account for only a small part of the farm income.

The trend in the county is toward fewer, but larger, farms. Mechanization and other technological advances have made the operation of larger farms more economical. The number of farmers who supplement their income by nonfarm jobs is increasing, although at a slower rate than the number for the State as a whole. Beef-cattle farming is increasing in importance. Field crops grown for the canning industries are also increasing in importance as a cash-crop enterprise.

The first industries in the county were developed during the early years of settlement. In those years, when settlers depended on farming for a living, industrial development mainly took the form of processing farm products and milling the timber cut from the forests.

Many of the early settlers chose locations near streams, where they could take advantage of the water power. Sawmill operators installed millstones for grinding wheat, and the farmers found markets for the flour produced. The development of the railroads in the 1850's and after the Civil War gave better access to towns and provided a base on which the county's industries could build.

In 1959 farming still ranked first in numbers of people employed in the county, but the number of farming jobs is declining. Manufacturing now ranks second to farming in numbers of people employed, and the retail trade ranks third. In 1960 there were 81 manufacturing jobs in the county per one thousand of population, compared with a State average of 115. Manufactured products are highly varied. They include leather packing, pipe, pumps, machinery, and musical instruments. The strongest retail lines are lumber-hardware-farm equipment, food, automobiles, and the service industries.

The wholesale trade is small. The electronics industries are becoming established in the county and are making substantial gains. Electric and gas utilities and water and sewer services are available throughout the county.

Literature Cited

(1) American Association of State Highway Officials.
1961. standard specifications for highway materials and methods of sampling and testing. Ed. 8, 2 v., illus.

(2) Leighton, Morris M., and Willman, H. B.
1950. loess formations of the mississippi valley. Journal of Geology, v. 58, No. 6, pages 599–623, illus. (Reprinted 1950 as Report of Investigations of Illinois State Geological Survey, No. 149.)

(3) Simonson, Roy W.
1962. soil classification in the united states. Science, v. 137, No. 3535, pp. 1027–1034.

(4) Thom, H. C. S.
1954. the rational relationship between heating degree days and temperature. Monthly Weather Rev. 82: 1–6.

(5) Thorp, James.
1948. how soils develop under grass. U.S. Dept. Agr. Yearbook, pp. 352–358, illus.

(6) United States Department of Agriculture.
1938. soils and men. U.S. Dept. Agr. Yearbook, 1232 pp., illus.

(7) ———
1951. soil survey manual. Agr. Handbook No. 18, 503 pp., illus.

(8) ———
1960. soil classification, a comprehensive system, 7th approximation. 265 pp., illus. [Supplement issued in March 1967]

(9) Waterways Experiment Station, Corps of Engineers.
1953. the unified soil classification system. Tech. Memo. No. 3–357, 3 v., Vicksburg, Miss.

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 moisture capacity. The capacity of a soil to hold water in a form available to plants. Amount of moisture held in soil between field capacity, or about one-third atmosphere of tension, and the wilting coefficient, or about 15 atmospheres of tension.

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; 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.

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

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.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state. In engineering, a high liquid limit indicates that the soil has a high content of clay and a low capacity for supporting loads.

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.

Mottled. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: Abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are these: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Munsell notation. A system for designating color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with a hue of 10YR, a value of 6, and a chroma of 4.

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.*

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is 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	Mildly alkaline	7.4 to 7.8
Very strongly acid	4.5 to 5.0	Moderately alkaline	7.9 to 8.4
Strongly acid	5.1 to 5.5	Strongly alkaline	8.5 to 9.0
Medium acid	5.6 to 6.0	Very strongly alkaline	9.1 and higher
Slightly acid	6.1 to 6.5		
Neutral	6.6 to 7.3		

Relief. The elevations or inequalities of a land surface, considered collectively.

Sand. Individual rock or mineral fragments in soils having diameters ranging from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be 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.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

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.

Topsoil. A presumed fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

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 the soil series to which the mapping unit belongs. In referring to a capability unit, a woodland group, a recreation 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:

Acreage and extent, table 1, p. 10.
Predicted yields, table 2, p. 59.
Estimated yields of wood products, table 3, p. 61.
Wildlife groups, table 4, p. 66.
Recreation groups, table 5, p. 68.
Nonfarm uses, table 6, p. 71.
Engineering uses of the soils, tables 7, 8, 9, and 10, pp. 78 through 97.

Map symbol	Mapping unit	Page	Capability unit		Woodland group		Recreation group	Wildlife group
			Symbol	Page	Number	Page	Number	Number
Ac	Adrian muck	11	IVw-7	56	10	64	8	9
Am	Alluvial land	11	IIIw-12	55	1	62	7	8
AzA	Aztalan loam, 1 to 3 percent slopes	12	IIw-2	54	12	65	5	6
BpB	Boyer complex, 2 to 6 percent slopes	12	IVs-3	56	3	63	3	4
BpC2	Boyer complex, 6 to 12 percent slopes, eroded	12	VIe-9	57	3	63	3	4
CeB2	Casco loam, 2 to 6 percent slopes, eroded	13	IIIe-4	55	5	63	4	5
CeC2	Casco loam, 6 to 12 percent slopes, eroded	13	IVe-4	56	5	63	4	5
CeD2	Casco loam, 12 to 20 percent slopes, eroded	13	VIe-4	57	5	63	4	5
CfC3	Casco soils, 6 to 12 percent slopes, severely eroded	14	VIe-4	57	5	63	4	5
CfD3	Casco soils, 12 to 20 percent slopes, severely eroded	14	VIIe-4	57	5	63	4	5
CkD2	Casco-Fox loams, 12 to 20 percent slopes, eroded	14	VIe-4	57	5	63	4	5
ClC2	Casco-Fox silt loams, 6 to 12 percent slopes, eroded	14	IVe-4	56	5	63	4	5
CrD2	Casco-Rodman complex, 12 to 20 percent slopes, eroded	14	VIe-4	57	5	63	4	5
CrE2	Casco-Rodman complex, 20 to 30 percent slopes, eroded	15	VIIe-4	57	5	63	4	5
CtB	Chelsea fine sand, 1 to 6 percent slopes	15	IVs-3	56	4	63	9	10
CtE	Chelsea fine sand, 6 to 30 percent slopes	16	VIe-9	57	4	63	9	10
Cw	Colwood silt loam	16	IIIw-3	55	7	64	6	7
CyA	Conover silt loam, 1 to 3 percent slopes	17	IIw-2	54	7	64	5	6
DdA	Dodge silt loam, 0 to 2 percent slopes	18	I-1	52	1	62	1	1
DdB	Dodge silt loam, 2 to 6 percent slopes	18	IIe-1	53	1	62	1	1
Dt	Drummer silt loam, gravelly substratum	19	IIw-1	53	7	64	6	7
EbA	Elburn silt loam, 1 to 3 percent slopes	20	IIw-2	54	12	65	5	6
EgA	Elburn silt loam, gravelly substratum, 1 to 3 percent slopes	20	IIw-2	54	12	65	5	6
FgA	Flagg silt loam, 0 to 2 percent slopes	20	I-1	52	1	62	1	3
FgB	Flagg silt loam, 2 to 6 percent slopes	21	IIe-1	53	1	62	1	3
FlA	Flagg silt loam, mottled subsoil variant, 0 to 3 percent slopes	21	IIw-2	54	7	64	5	6
FmB	Fox sandy loam, 1 to 6 percent slopes	22	IIIs-4	56	3	63	3	4
FmC2	Fox sandy loam, 6 to 12 percent slopes, eroded	22	IIIe-7	55	3	63	3	4
FoB	Fox loam, 2 to 6 percent slopes	22	IIe-2	53	1	62	2	1
FoC2	Fox loam, 6 to 12 percent slopes, eroded	23	IIIe-2	55	1	62	2	1
FsA	Fox silt loam, 0 to 2 percent slopes	23	IIs-1	54	1	62	1	1
FsB	Fox silt loam, 2 to 6 percent slopes	23	IIe-2	53	1	62	1	1
FsC2	Fox silt loam, 6 to 12 percent slopes, eroded	23	IIIe-2	55	1	62	1	1
GsB	Griswold loam, 2 to 6 percent slopes	24	IIe-1	53	12	65	2	2
GsC2	Griswold loam, 6 to 12 percent slopes, eroded	24	IIIe-1	54	12	65	2	2
GsD2	Griswold loam, 12 to 20 percent slopes, eroded	24	IVe-1	56	12	65	2	2
GwA	Griswold silt loam, mottled subsoil variant, 0 to 3 percent slopes	25	IIw-2	54	12	65	5	6
HeB	Hebron loam, 1 to 6 percent slopes	26	IIe-6	53	1	62	10	3
HfE	Hennepin-Miami loams, sandy loam substratum, 20 to 35 percent slopes	26	VIIs-5	58	5	63	4	5

Map symbol	Mapping unit	Page	Capability unit Symbol	Capability unit Page	Woodland group Number	Woodland group Page	Recreation group Number	Wildlife group Number
Ht	Houghton muck	27	IIIw-9	55	10	64	8	9
JuA	Juneau silt loam, 1 to 3 percent slopes	27	I-1	52	1	62	7	8
KlA	Kendall silt loam, 1 to 3 percent slopes	28	IIw-2	54	7	64	5	6
KwB	Knowles silt loam, 1 to 6 percent slopes	29	IIe-2	53	1	62	1	1
KyA	Knowles silt loam, mottled subsoil variant, 0 to 2 percent slopes	29	IIIw-3	55	7	64	5	6
LyB	Lorenzo loam, 2 to 6 percent slopes	30	IIIe-4	55	12	65	4	5
LyC2	Lorenzo loam, 6 to 12 percent slopes, eroded	30	IVe-4	56	12	65	4	5
LzD2	Lorenzo-Rodman complex, 12 to 20 percent slopes, eroded	30	VIe-4	57	12	65	4	5
Mf	Marsh	31	VIIIw-15	58	11	64	6	7
MgA	Martinton silt loam, 1 to 3 percent slopes	31	IIw-2	54	7	64	5	6
MmA	Matherton silt loam, 1 to 3 percent slopes	32	IIw-5	54	7	64	5	6
MpB	McHenry silt loam, 2 to 6 percent slopes	33	IIe-1	53	1	62	1	1
MpB2	McHenry silt loam, 2 to 6 percent slopes, eroded	33	IIe-1	53	1	62	1	1
MpC	McHenry silt loam, 6 to 12 percent slopes	33	IIIe-1	54	1	62	1	1
MpC2	McHenry silt loam, 6 to 12 percent slopes, eroded	33	IIIe-1	54	1	62	1	1
MuA	Metea loamy fine sand, 0 to 2 percent slopes	34	IIIs-4	56	4	63	3	4
MuB	Metea loamy fine sand, 2 to 6 percent slopes	34	IIIs-4	56	4	63	3	4
MvB	Miami sandy loam, sandy loam substratum, 2 to 6 percent slopes	35	IIIe-4	55	3	63	2	1
MwC2	Miami loam, 6 to 12 percent slopes, eroded	35	IIIe-1	54	1	62	2	1
MwD2	Miami loam, 12 to 20 percent slopes, eroded	36	IVe-1	56	1	62	2	1
MxB	Miami loam, sandy loam substratum, 2 to 6 percent slopes	36	IIe-1	53	1	62	2	1
MxC2	Miami loam, sandy loam substratum, 6 to 12 percent slopes, eroded	36	IIIe-1	54	1	62	2	1
MxD2	Miami loam, sandy loam substratum, 12 to 20 percent slopes, eroded	36	IVe-1	56	1	62	2	1
MxE2	Miami loam, sandy loam substratum, 20 to 35 percent slopes, eroded	36	VIe-1	57	1	62	2	1
MyA	Miami silt loam, 0 to 2 percent slopes	37	I-1	52	1	62	1	1
MyB	Miami silt loam, 2 to 6 percent slopes	37	IIe-1	53	1	62	1	1
MyC	Miami silt loam, 6 to 12 percent slopes	37	IIIe-1	54	1	62	1	1
MyC2	Miami silt loam, 6 to 12 percent slopes, eroded	37	IIIe-1	54	1	62	2	1
MzfA	Mundelein silt loam, 1 to 3 percent slopes	38	IIIw-3	55	7	64	5	6
Na	Navan silt loam	39	IIw-1	53	7	64	6	7
Pa	Palms muck	39	IIIw-9	55	10	64	8	9
PeA	Pecatonica silt loam, 0 to 2 percent slopes	40	I-1	52	1	62	1	3
PeB	Pecatonica silt loam, 2 to 6 percent slopes	40	IIe-1	53	1	62	1	3
Ph	Pella silt loam	41	IIw-1	53	7	64	6	7
PsA	Plano silt loam, 0 to 2 percent slopes	41	I-1	52	12	65	1	1
PsB	Plano silt loam, 2 to 6 percent slopes	41	IIe-1	53	12	65	1	1
PsC	Plano silt loam, 6 to 12 percent slopes	42	IIIe-1	54	12	65	1	1
PtA	Plano silt loam, gravelly substratum, 0 to 2 percent slopes	42	I-1	52	12	65	1	2
PtB	Plano silt loam, gravelly substratum, 2 to 6 percent slopes	42	IIe-1	53	12	65	1	2
PtC2	Plano silt loam, gravelly substratum, 6 to 12 percent slopes, eroded	42	IIIe-1	54	12	65	1	2
RaA	Radford silt loam, 0 to 3 percent slopes	43	IIw-13	54	9	64	7	8
RsF	Rodman-Casco complex, 30 to 45 percent slopes	43	VIIs-5	58	6	64	4	5
Ru	Rollin muck, deep	44	IVw-7	56	10	64	8	9
Rv	Rollin muck, shallow	44	Vw-7	56	10	64	8	9
ScA	St. Charles silt loam, 0 to 2 percent slopes	45	I-1	52	1	62	1	3
ScB	St. Charles silt loam, 2 to 6 percent slopes	45	IIe-1	53	1	62	1	3

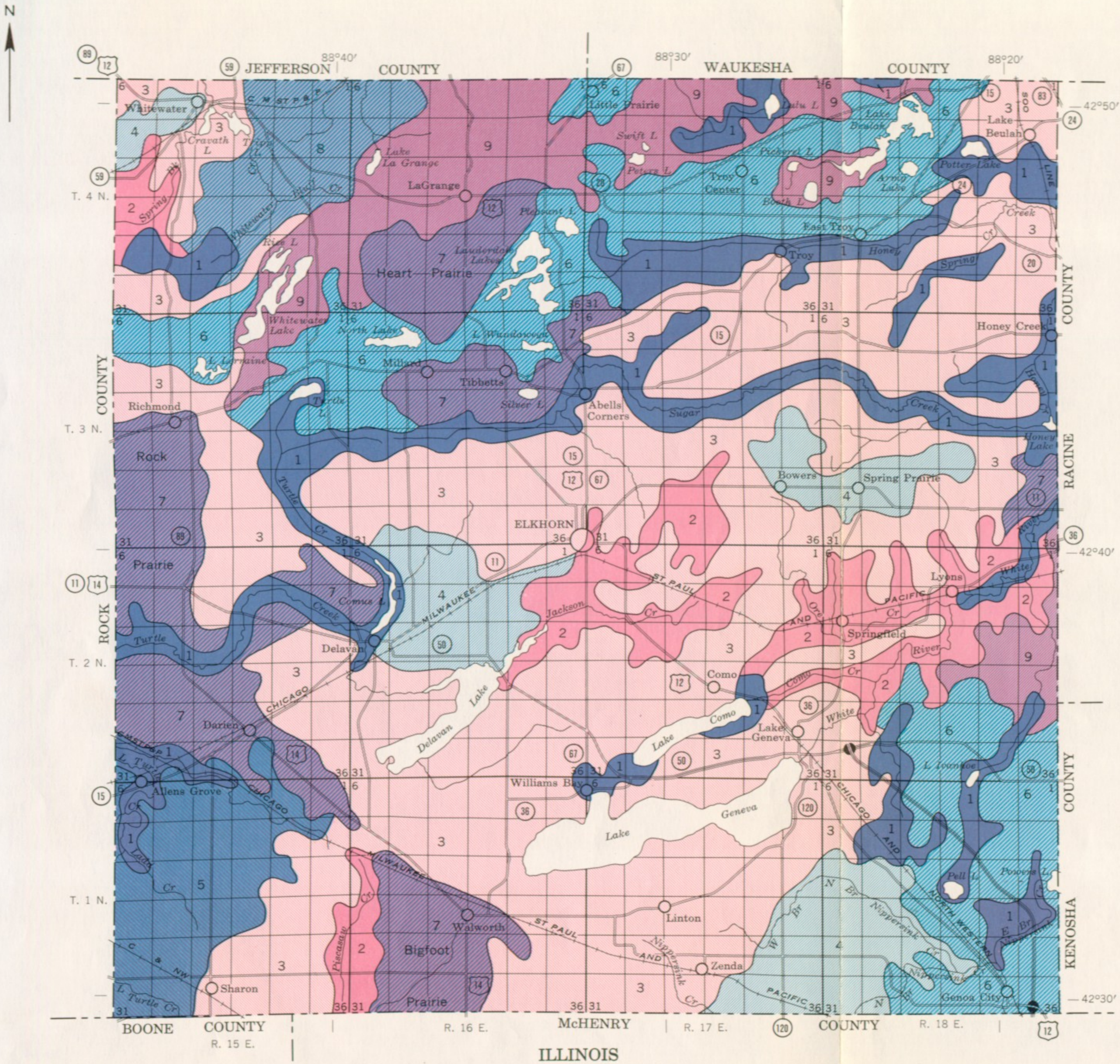
GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Page	Capability unit Symbol	Capability unit Page	Woodland group Number	Woodland group Page	Recreation group Number	Wildlife group Number
SeA	St. Charles silt loam, gravelly substratum, 0 to 2 percent slopes	45	I-1	52	1	62	1	3
SeB	St. Charles silt loam, gravelly substratum, 2 to 6 percent slopes	45	IIe-1	53	1	62	1	3
Sfb	Sandy lake beaches	45	VIIIs-10	58	11	64	9	10
ShA	Saylesville silt loam, 0 to 2 percent slopes	46	IIs-7	54	2	63	10	3
ShB	Saylesville silt loam, 2 to 6 percent slopes	46	IIe-6	53	2	63	10	3
Sm	Sebewa silt loam	47	IIw-5	54	7	64	6	7
TxA	Troxel silt loam, 0 to 3 percent slopes	48	I-1	52	12	65	7	8
Wa	Wallkill silt loam	48	IIw-13	54	9	64	7	8
WeA	Warsaw loam, 0 to 2 percent slopes	49	IIs-1	54	12	65	2	2
WhA	Warsaw silt loam, 0 to 2 percent slopes	49	IIs-1	54	12	65	1	2
WhB	Warsaw silt loam, 2 to 6 percent slopes	49	IIe-2	53	12	65	1	2
WhC2	Warsaw silt loam, 6 to 12 percent slopes, eroded	49	IIIe-2	55	12	65	1	2
WvB2	Westville silt loam, 2 to 6 percent slopes, eroded	50	IIe-1	53	1	62	1	1
WvC2	Westville silt loam, 6 to 12 percent slopes, eroded	50	IIIe-1	54	1	62	1	1
Ww	Wet alluvial land	50	Vw-14	57	9	64	6	7

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
UNIVERSITY OF WISCONSIN,
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY,
SOILS DEPARTMENT, AND WISCONSIN AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP
WALWORTH COUNTY, WISCONSIN

Scale 1:190080



SOIL ASSOCIATIONS

1 Houghton-Palms association: Very poorly drained organic soils in depressions and on bottom lands

2 Pella-Kendall-Elburn association: Poorly drained and somewhat poorly drained soils that have a subsoil of silty clay loam; formed in loess and the underlying loam to clay loam glacial till or outwash and lacustrine materials derived from till

3 Miami-McHenry association: Well-drained soils that have a subsoil of clay loam and silty clay loam; formed in loess and the underlying sandy loam to loam glacial till, on uplands

4 Plano-Griswold association: Well-drained soils that have a subsoil of silty clay loam and sandy clay loam; formed in loess and the underlying sandy loam to loam glacial till, on uplands

5 Flagg-Pecatonica association: Well-drained soils that have a subsoil of silty clay loam; formed in a thick layer of loess and the underlying sandy loam to loam glacial till, on uplands

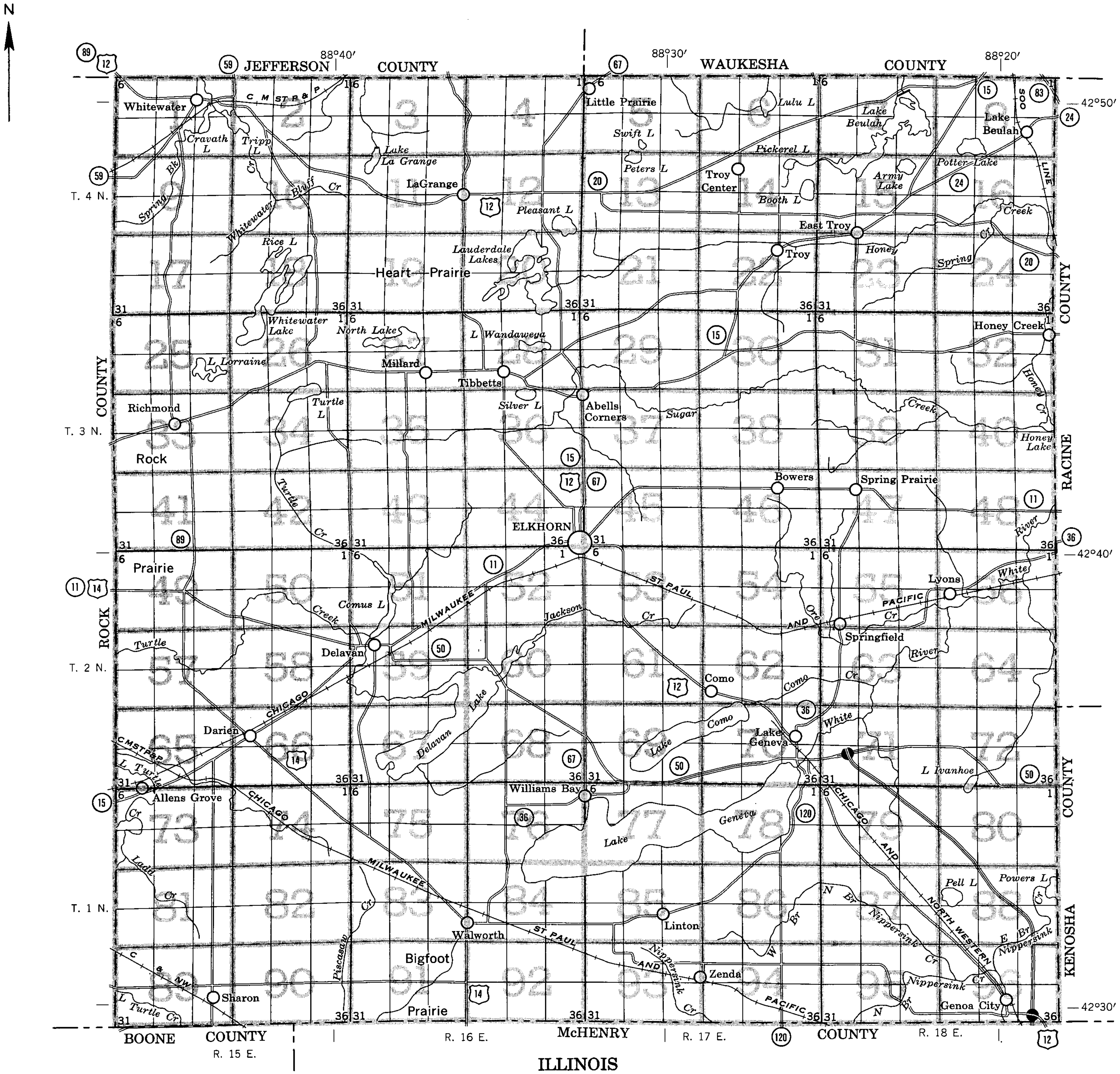
6 Casco-Fox association: Well-drained soils that have a subsoil of clay loam; moderately deep over sand and gravel, on outwash plains and stream terraces

7 Plano, gravelly substratum-Warsaw association: Well-drained soils that have a subsoil of silty clay loam and clay loam; moderately deep and deep over sand and gravel, on outwash plains and stream terraces

8 Navan-Pella-Aztalan association: Poorly drained and somewhat poorly drained soils that have a subsoil of loam to silty clay; over silt and clay sediments, in old lakebeds

9 Casco-Rodman association: Well-drained and somewhat excessively drained soils that have a subsoil of clay loam and gravelly sandy loam; shallow over gravel and sand, on the Kettle Moraine

April 1969



INDEX TO MAP SHEETS
WALWORTH COUNTY, WISCONSIN

Scale 1:190080

1 0 1 2 3 4 Miles

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

WALWORTH COUNTY, WISCONSIN

UNIVERSITY OF WISCONSIN
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY, SOILS DEPARTMENT
WISCONSIN AGRICULTURAL EXPERIMENT STATION

SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, D, E, or F, shows the slope. Most symbols without a slope letter are those of nearly level soils or land types, but some are for soils or land types that have a considerable range in slope. The final number, 2 or 3, in a symbol indicates that the soil is eroded or severely eroded.

SYMBOL	NAME
Ac	Adrian muck
Am	Alluvial land
AzA	Aztalan loam, 1 to 3 percent slopes
BpB	Boyer complex, 2 to 6 percent slopes
BpC2	Boyer complex, 6 to 12 percent slopes, eroded
CeB2	Casco loam, 2 to 6 percent slopes, eroded
CeC2	Casco loam, 6 to 12 percent slopes, eroded
CeD2	Casco loam, 12 to 20 percent slopes, eroded
CfC3	Casco soils, 6 to 12 percent slopes, severely eroded
CfD3	Casco soils, 12 to 20 percent slopes, severely eroded
CkD2	Casco-Fox loams, 12 to 20 percent slopes, eroded
ClC2	Casco-Fox silt loams, 6 to 12 percent slopes, eroded
CrD2	Casco-Rodman complex, 12 to 20 percent slopes, eroded
CrE2	Casco-Rodman complex, 20 to 30 percent slopes, eroded
CtB	Chelsea fine sand, 1 to 6 percent slopes
CtE	Chelsea fine sand, 6 to 30 percent slopes
Cw	Colwood silt loam
CyA	Conover silt loam, 1 to 3 percent slopes
DdA	Dodge silt loam, 0 to 2 percent slopes
DdB	Dodge silt loam, 2 to 6 percent slopes
Dt	Drummer silt loam, gravelly substratum
EbA	Elburn silt loam, 1 to 3 percent slopes
EgA	Elburn silt loam, gravelly substratum, 1 to 3 percent slopes
FgA	Flagg silt loam, 0 to 2 percent slopes
FgB	Flagg silt loam, 2 to 6 percent slopes
FlA	Flagg silt loam, mottled subsoil variant, 0 to 3 percent slopes
FmB	Fox sandy loam, 1 to 6 percent slopes
FmC2	Fox sandy loam, 6 to 12 percent slopes, eroded
FoB	Fox loam, 2 to 6 percent slopes
FoC2	Fox loam, 6 to 12 percent slopes, eroded
FsA	Fox silt loam, 0 to 2 percent slopes
FsB	Fox silt loam, 2 to 6 percent slopes
FsC2	Fox silt loam, 6 to 12 percent slopes, eroded
GsB	Griswold loam, 2 to 6 percent slopes
GsC2	Griswold loam, 6 to 12 percent slopes, eroded
GsD2	Griswold loam, 12 to 20 percent slopes, eroded
GwA	Griswold silt loam, mottled subsoil variant, 0 to 3 percent slopes
HeB	Hebron loam, 1 to 6 percent slopes
HfE	Hennepin-Miami loams, sandy loam substratum, 20 to 35 percent slopes
Ht	Houghton muck
JuA	Juneau silt loam, 1 to 3 percent slopes
KlA	Kendall silt loam, 1 to 3 percent slopes
KwB	Knowles silt loam, 1 to 6 percent slopes
KyA	Knowles silt loam, mottled subsoil variant, 0 to 2 percent slopes
LyB	Lorenzo loam, 2 to 6 percent slopes
LyC2	Lorenzo loam, 6 to 12 percent slopes, eroded
LzD2	Lorenzo-Rodman complex, 12 to 20 percent slopes, eroded
Mf	Marsh
MgA	Martinton silt loam, 1 to 3 percent slopes
MmA	Matherton silt loam, 1 to 3 percent slopes
MpB	McHenry silt loam, 2 to 6 percent slopes
MpB2	McHenry silt loam, 2 to 6 percent slopes, eroded
MpC	McHenry silt loam, 6 to 12 percent slopes
MpC2	McHenry silt loam, 6 to 12 percent slopes, eroded
MuA	Metea loamy fine sand, 0 to 2 percent slopes
MuB	Metea loamy fine sand, 2 to 6 percent slopes
MvB	Miami sandy loam, sandy loam substratum, 2 to 6 percent slopes
MwC2	Miami loam, 6 to 12 percent slopes, eroded
MwD2	Miami loam, 12 to 20 percent slopes, eroded
MxB	Miami loam, sandy loam substratum, 2 to 6 percent slopes
MxC2	Miami loam, sandy loam substratum, 6 to 12 percent slopes, eroded
MxD2	Miami loam, sandy loam substratum, 12 to 20 percent slopes, eroded
MxE2	Miami loam, sandy loam substratum, 20 to 35 percent slopes, eroded
MyA	Miami silt loam, 0 to 2 percent slopes
MyB	Miami silt loam, 2 to 6 percent slopes
MyC	Miami silt loam, 6 to 12 percent slopes
MyC2	Miami silt loam, 6 to 12 percent slopes, eroded
MzfA	Mundelein silt loam, 1 to 3 percent slopes
Na	Navan silt loam
Pa	Palms muck
PeA	Pecatonica silt loam, 0 to 2 percent slopes
PeB	Pecatonica silt loam, 2 to 6 percent slopes
Ph	Pella silt loam
PsA	Plano silt loam, 0 to 2 percent slopes
PsB	Plano silt loam, 2 to 6 percent slopes
PsC	Plano silt loam, 6 to 12 percent slopes
PtA	Plano silt loam, gravelly substratum, 0 to 2 percent slopes
PtB	Plano silt loam, gravelly substratum, 2 to 6 percent slopes
PtC2	Plano silt loam, gravelly substratum, 6 to 12 percent slopes, eroded
RaA	Radford silt loam, 0 to 3 percent slopes
RsF	Rodman-Casco complex, 30 to 45 percent slopes
Ru	Rollin muck, deep
Rv	Rollin muck, shallow
ScA	St. Charles silt loam, 0 to 2 percent slopes
ScB	St. Charles silt loam, 2 to 6 percent slopes
SeA	St. Charles silt loam, gravelly substratum, 0 to 2 percent slopes
SeB	St. Charles silt loam, gravelly substratum, 2 to 6 percent slopes
Sfb	Sandy lake beaches
ShA	Saylesville silt loam, 0 to 2 percent slopes
ShB	Saylesville silt loam, 2 to 6 percent slopes
Sm	Sebewa silt loam
TxA	Troxel silt loam, 0 to 3 percent slopes
Wa	Wallkill silt loam
WeA	Warsaw loam, 0 to 2 percent slopes
WhA	Warsaw silt loam, 0 to 2 percent slopes
WhB	Warsaw silt loam, 2 to 6 percent slopes
WhC2	Warsaw silt loam, 6 to 12 percent slopes, eroded
WvB2	Westville silt loam, 2 to 6 percent slopes, eroded
WvC2	Westville silt loam, 6 to 12 percent slopes, eroded
Ww	Wet alluvial land

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads
- Dual
- Good motor
- Poor motor
- Trail

Highway markers
- National Interstate
- U. S.
- State or county

Railroads
- Single track
- Multiple track
- Abandoned

Bridges and crossings
- Road
- Trail
- Railroad
- Ferry — FY
- Ford — FORD
- Grade
- R. R. over
- R. R. under

Tunnel

Buildings
- School
- Church

Mine and quarry

Gravel pit

Power line

Pipeline

Cemetery

Dams

Levee

Tanks

Well, oil or gas

Forest fire or lookout station

Windmill

BOUNDARIES

National or state

County

Reservation

Land grant

Small park, cemetery, airport

Land survey division corners

DRAINAGE

Streams, double-line
- Perennial
- Intermittent

Streams, single-line
- Perennial
- Intermittent
  - Crossable with tillage implements
  - Not crossable with tillage implements
  - Unclassified

Canals and ditches — CANAL

Lakes and ponds
- Perennial — water, w
- Intermittent

Spring

Marsh or swamp

Wet spot

Alluvial fan

Drainage end

RELIEF

Escarpments
- Bedrock
- Other

Prominent peak

Depressions (Large, Small)
- Crossable with tillage implements
- Not crossable with tillage implements
- Contains water most of the time

SOIL SURVEY DATA

Soil boundary and symbol — Dx

Gravel

Stoniness
- Stony
- Very stony

Rock outcrops

Chert fragments

Clay spot

Sand spot

Gumbo or scabby spot

Made land

Severely eroded spot

Blowout, wind erosion

Gully

Cobble

Soil map constructed 1969 by Cartographic Division, Soil Conservation Service, USDA, from 1963 aerial photographs. Controlled mosaic based on Wisconsin plane coordinate system, south zone, Lambert conformal conic projection, 1927 North American datum.