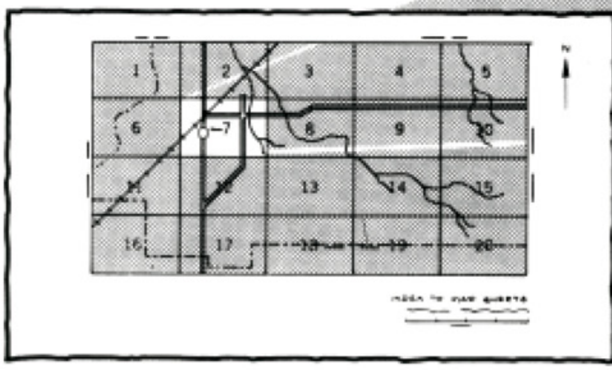
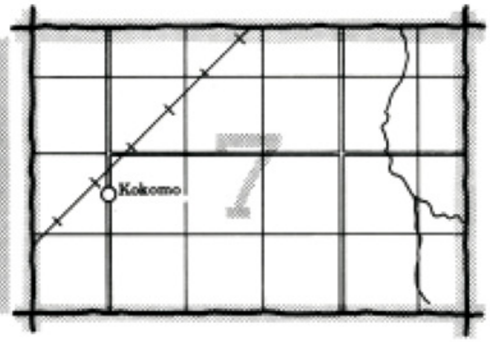
Soil Survey of
White County Indiana

United States Department of Agriculture, Soil Conservation Service
in cooperation with Purdue University Agricultural Experiment Station and
Indiana Department of Natural Resources, Soil and Water Conservation Committee

HOW TO USE

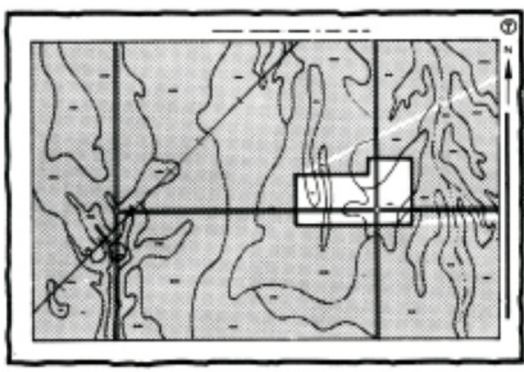
1. Locate your area of interest on the "Index to Map Sheets"

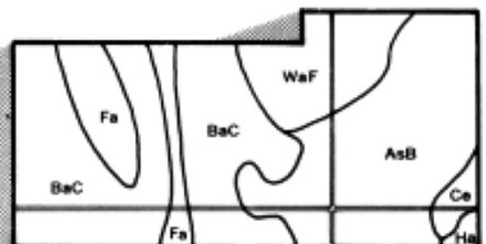




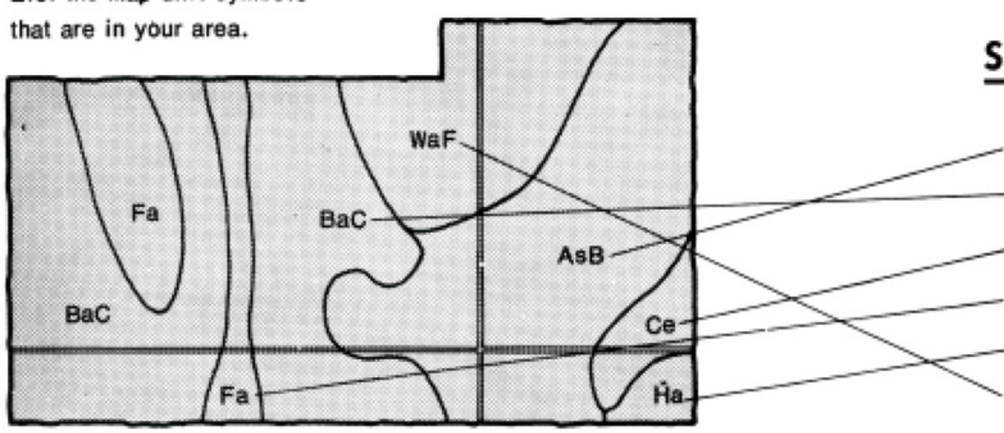
2. Note the number of the map sheet and turn to that sheet.

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





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

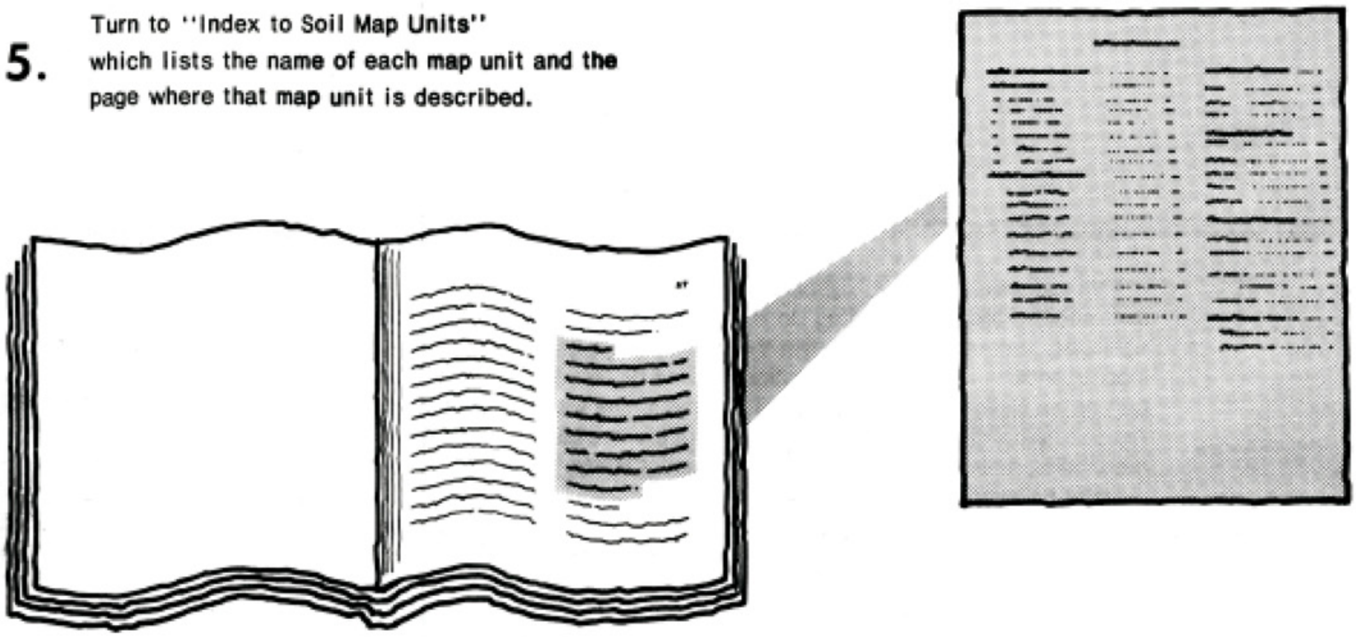


Symbols

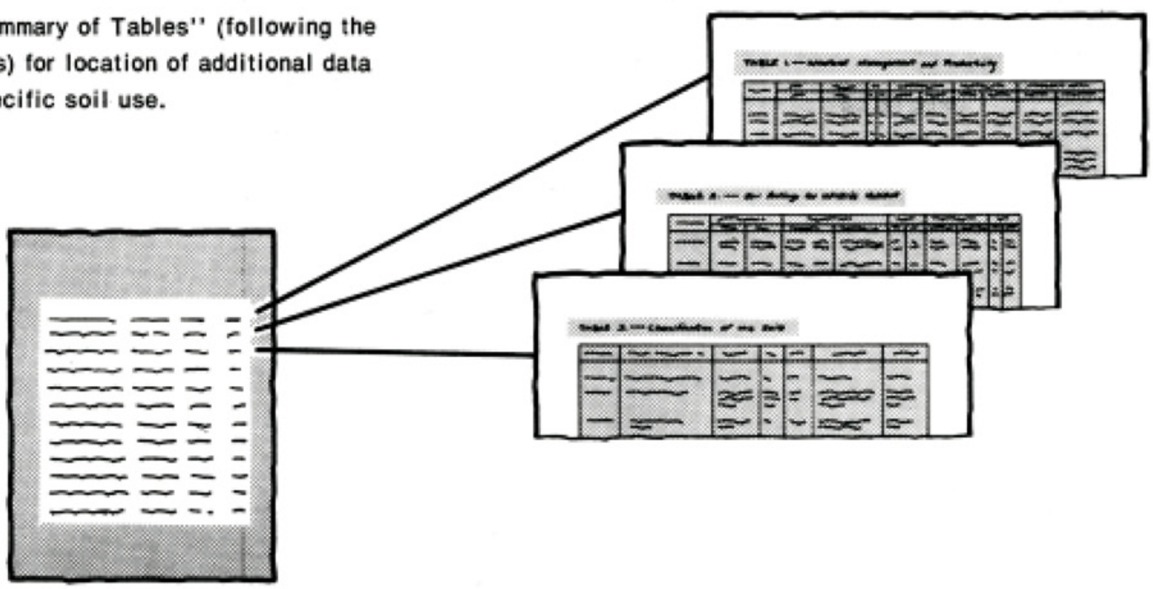
AsB
BaC
Ce
Fa
Ha
WaF

THIS SOIL SURVEY

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



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



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

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

This survey was made cooperatively by the Soil Conservation Service, Purdue University Agricultural Experiment Station, and the Indiana Department of Natural Resources, Soil and Water Conservation Committee. It is part of the technical assistance furnished to the White County Soil and Water Conservation District. Financial assistance was provided by the White County Board of Commissioners and the County Council.

Major fieldwork for this soil survey was performed in the period 1971-78. Soil names and descriptions were approved in 1977. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1978.

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

This soil survey supersedes the soil survey of White County published in 1919.

contents

soil series

Issued February 1982

index to map units

summary of tables

foreword

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

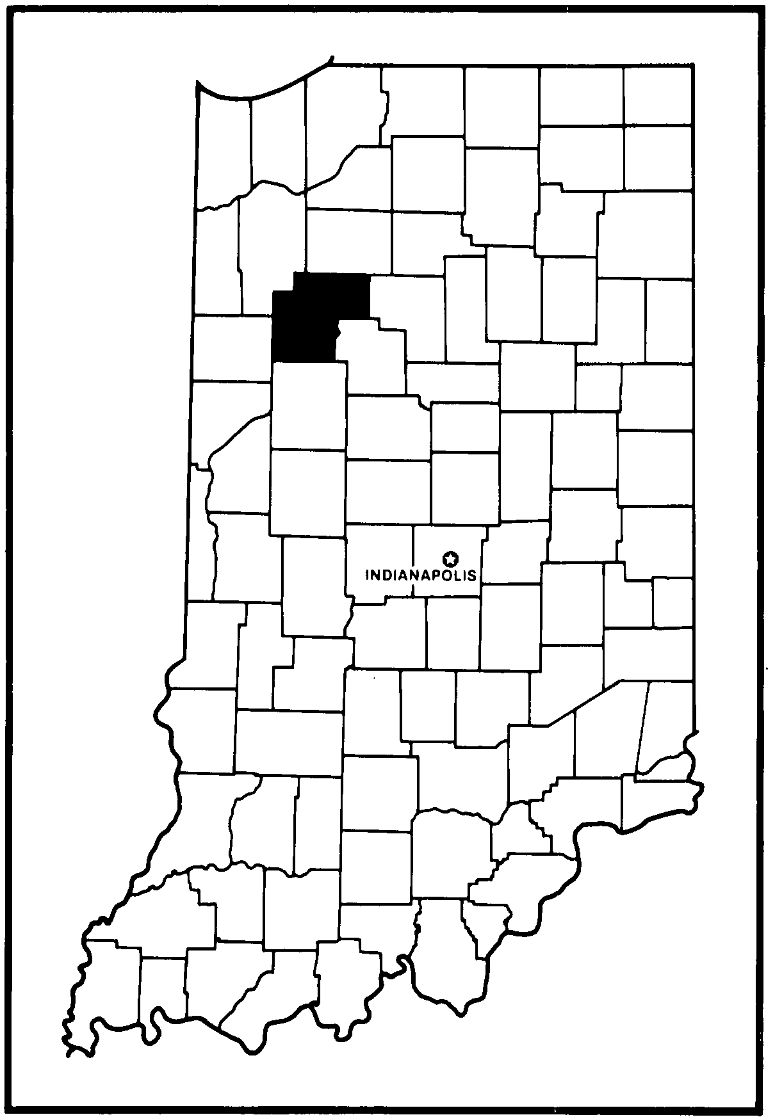
This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey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

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

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

Robert L. Eddleman

Robert L. Eddleman
State Conservationist
Soil Conservation Service



Location of White County in Indiana.

soil survey of
White County, Indiana

By Karl H. Langlois, Jr., Soil Conservation Service

Fieldwork by Karl H. Langlois, Jr., James R. Blank, and Steven K. Kluess,
Soil Conservation Service,
and Larry C. Osterholz, Indiana Department of Natural Resources,
Soil and Water Conservation Committee

United States Department of Agriculture, Soil Conservation Service
in cooperation with Purdue University Agricultural Experiment Station
and Indiana Department of Natural Resources,
Soil and Water Conservation Committee

WHITE COUNTY is in the northwestern part of Indiana. It has a land area of 497 square miles, or 318,080 acres. At its widest points, the county extends about 24 miles from north to south and about 27 miles from west to east. Monticello, the largest city, is the county seat. A variety of business and industry provides jobs for many residents. A small part of the work force is employed in the cities of Lafayette and Logansport. Recreation facilities on Lakes Shafer and Freeman draw people from a large area that includes Chicago and Indianapolis.

About 90 percent of the county is cropland and pasture. Corn, soybeans, and wheat are the principal crops. Cattle, hogs, or poultry are raised on some farms. Most of the hog and poultry operations are managed in conjunction with grain farming. There are a few dairies.

The county is a flat plain dissected by the Tippecanoe River and numerous creeks, streams, and ditches. Low relief characterizes the physiography of the area. The elevation ranges from about 530 feet to 765 feet above sea level.

general nature of the county

This section gives general information about the county. It discusses topographic relief, water, climate, and transportation facilities.

topographic relief

The highest point in White County is approximately 765 feet above sea level. It is in West Point Township about 500 feet from Benton County and approximately 1 mile north of Round Grove Township. The lowest point is approximately 530 feet above sea level. It is where the Tippecanoe River enters Tippecanoe County, about 2 1/4 miles south of Springboro.

White County is mainly a flat plain dissected by the Tippecanoe River and numerous creeks, streams, and ditches. The greatest relief is along the Tippecanoe River and its tributaries south of Monticello. The southern part of the county is characterized by very flat topography and a few gently rolling areas. The northern part of the county is gently undulating and has low relief and few abrupt changes.

water

Water for cities, towns, and rural areas is obtained from municipal and private wells. Most of the water used in the county is ground water pumped from glacial drift. In the northwestern part of the county the glacial drift is thin, and most of the wells are in limestone bedrock. Some of those wells are in sulfurous limestone, which gives the water an objectionable smell and taste.

Two dams along the Tippecanoe River provide the area with hydroelectric power. Norway Dam, constructed in 1922-23, formed Lake Shafer, the northern lake.

Oakdale Dam, constructed in 1924-25, formed Lake Freeman, the southern lake. Lake Shafer is wholly within White County. Lake Freeman is partly in White County and partly in Carroll County. Many houses and summer cottages have been built on the shores of the two lakes. Recreation areas, campgrounds, and small businesses in the vicinity of both lakes cater to a large influx of people in summer.

transportation facilities

Four federal highways traverse White County, including Interstate 65 in the southwestern part of the county. There are 6 state highways and approximately 940 miles of county roads. Most county roads are on section lines, and many have a bituminous surface.

Several airfields in the county serve private planes. A number of communities have rail service, and commercial bus transportation is available.

climate

Prepared by the National Climatic Center, Asheville, North Carolina.

White County is cold in winter and very hot in summer. Winter precipitation, mainly snow, provides an adequate supply of soil moisture in spring and minimizes drought in summer. The normal annual precipitation is adequate for all crops that are adapted to the temperature and growing season in the county.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Delphi, Indiana in the period 1951 to 1974. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 29 degrees F, and the average daily minimum temperature is 21 degrees. The lowest temperature on record, which occurred at Delphi on January 28, 1963, is -25 degrees. In summer the average temperature is 73 degrees, and the average daily maximum temperature is 85 degrees. The highest recorded temperature, which occurred on July 14, 1954 is 107 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Of the total annual precipitation, 23 inches, or 62 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 19 inches. The heaviest 1-day rainfall during the period of record was 6.96 inches at Delphi on May 16, 1968. Thunderstorms occur on about 45 days each year, and most occur in summer.

Average seasonal snowfall is 21 inches. The greatest snow depth at any one time during the period of record was 16 inches. On an average of 14 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 65 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 45 percent in winter. The prevailing wind is from the southwest. Average windspeed is highest, 12 miles per hour, in March.

Tornadoes and severe thunderstorms occur occasionally. These storms are usually local and of short duration and cause damage in a variable pattern.

how this survey was made

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

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

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

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

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

This soil survey supersedes the soil survey of White County published in 1919 (*3*). This survey provides additional information and has larger maps that show the soils in greater detail.

general soil map units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

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

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

The soils in the survey area vary widely in their potential for major land uses. Table 4 shows the extent of the map units shown on the general soil map. It lists the potential of each, in relation to that of the other map units, for major land uses and shows soil properties that limit use. Soil potential ratings are based on the practices commonly used in the survey area to overcome soil limitations. These ratings reflect the ease of overcoming the limitations. They also reflect the problems that will persist even if such practices are used.

Each map unit is rated for *cultivated crops, woodland,* and *urban uses*. Cultivated crops are those grown extensively in the survey area. Woodland refers to areas of native or introduced trees. Urban uses include residential, commercial, and industrial developments.

The names, descriptions, and delineations of soils on the general soil map of this county do not always agree or join fully with those of adjoining counties published at an earlier date. This difference is due to changes in concepts of soil series in the application of the soil classification system. Other differences are caused by a different predominance of soils in map units made up of two or three series. Still other differences may be caused by the range in slope allowed within the map unit of adjoining surveys. In this county or in adjacent counties a map unit may be too small to be delineated.

soil descriptions

Deep, nearly level soils that formed in loamy sediment or loamy glacial till over limestone bedrock

This group of soils makes up about 2 percent of the county. It mostly consists of soils that have a high water table. These soils are used for cultivated crops, except in a few areas where they are used for hay and pasture or as woodland. These soils have good potential for cultivated crops and poor potential for residential and urban development.

1. Gilford, limestone substratum-Seafield Variant-Wolcott, limestone substratum

Very poorly drained and moderately well drained, moderately coarse textured and moderately fine textured soils on outwash plains and till plains

This map unit is characterized by slightly concave topography. It consists mainly of large, irregularly shaped areas that are intermingled with areas of other soils.

This map unit makes up about 2 percent of the county. It is about 30 percent Gilford, limestone substratum, soils, 25 percent Seafield Variant soils, 20 percent Wolcott, limestone substratum, soils, and 25 percent soils of minor extent.

Gilford, limestone substratum, soils are very poorly drained and are in large, irregularly shaped areas. They have a black, moderately coarse textured surface layer and a gray, mottled subsoil that is moderately coarse textured.

Seafield Variant soils are moderately well drained and are in slightly convex areas. They have a very dark gray, moderately coarse textured surface layer and a yellowish brown, mottled subsoil that is moderately coarse textured.

Wolcott, limestone substratum, soils are very poorly drained and are in broad areas and small irregularly shaped areas. They have a black, moderately fine textured surface layer and a gray, mottled subsoil that is medium textured.

The soils of minor extent in this map unit are the excessively drained Chelsea soils on elongated, convex knolls and the well drained Oakville soils in slightly convex areas adjacent to Seafield Variant soils.

The soils in this map unit are mainly used for cultivated crops. In a few small areas they are used for hay, pasture, or trees. Wetness and soil blowing affect the use and management of these soils. Many areas have been drained. In depressional areas, ponding or flooding is common in winter and spring.

The soils have good potential for cultivated crops, fair potential for woodland use, and poor potential for residential and urban development. Wetness is a limitation, and soil blowing affects the use and management of these soils. Many cultivated areas need additional drainage. Woodland harvesting is limited to dry seasons or to when the soil is frozen.

Deep, nearly level to strongly sloping soils that formed in sandy sediment

This group of soils makes up about 13 percent of the county. It consists mostly of sandy soils that are excessively drained, somewhat poorly drained, or well drained. They are used for cultivated crops, except in some areas where they are used for hay, pasture, or trees. These soils have poor potential for cultivated crops and good potential for residential and urban development.

2. Chelsea-Morocco-Oakville

Excessively drained, somewhat poorly drained, and well drained, coarse textured soils on outwash plains

This map unit is characterized by undulating topography. It consists of long narrow areas that are irregularly shaped (fig. 1).

This map unit makes up about 13 percent of the county. It is about 30 percent Chelsea soils, 20 percent Morocco soils, 15 percent Oakville soils, and 35 percent soils of minor extent.

Chelsea soils are excessively drained, are gently sloping to strongly sloping, and are in elongated convex areas. They have a very dark grayish brown, coarse textured surface layer and a yellowish brown, coarse textured subsurface layer.

Morocco soils are somewhat poorly drained and are in slightly convex, irregularly shaped areas. They have a very dark grayish brown, coarse textured surface layer and a yellowish brown and light gray, mottled, coarse textured subsoil.

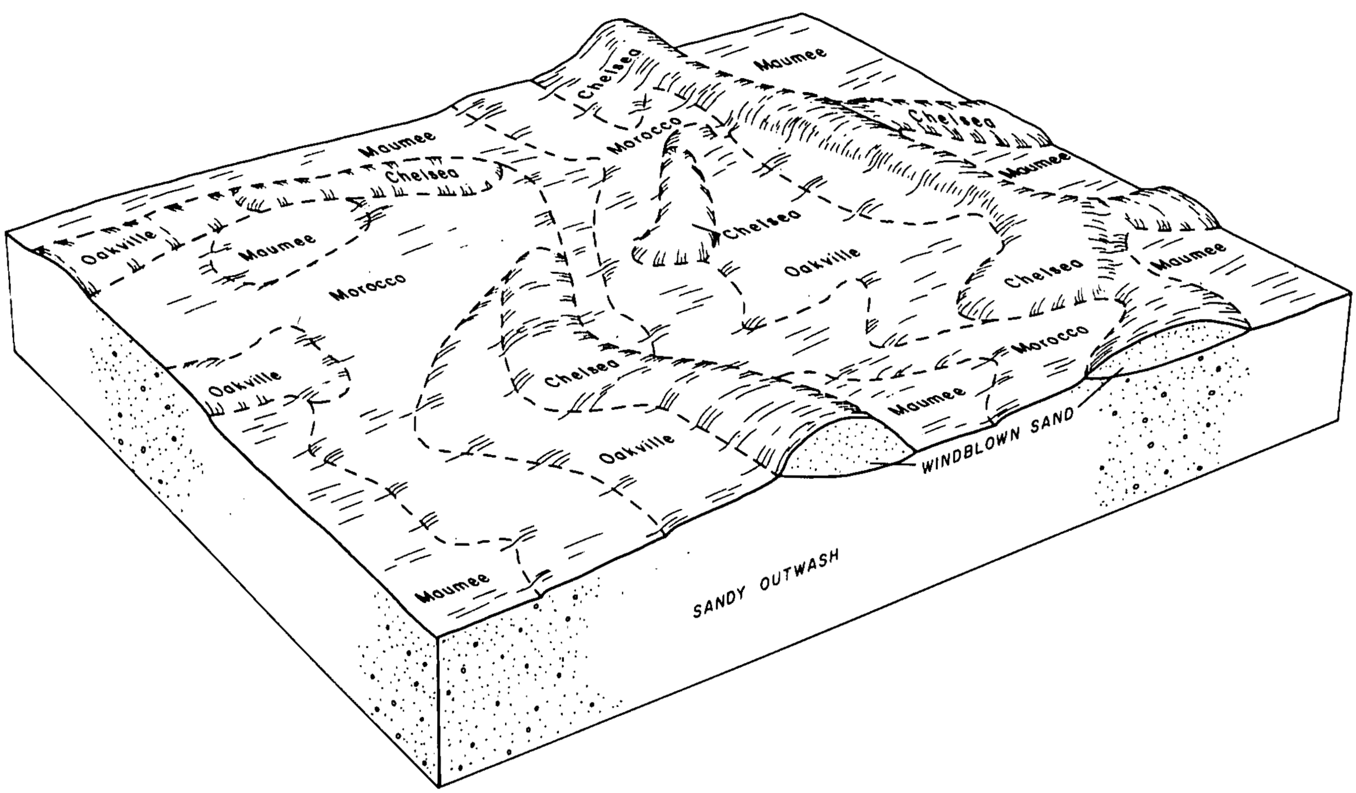


Figure 1.—Pattern of soils, topography, and underlying material in the Chelsea-Morocco-Oakville map unit.

Oakville soils are well drained, are nearly level or gently sloping, and are on long, narrow slightly convex rises. They have a dark brown, coarse textured surface layer and a brown and yellowish brown, coarse textured subsoil.

The soils of minor extent in this map unit are the moderately well drained Brems soils on slight rises adjacent to the Morocco soils, the somewhat poorly drained Seafield soils in level areas downslope of the Oakville and Chelsea soils, and the very poorly drained Gilford and Maumee soils in low-lying level areas or in slight depressions.

The soils in this map unit are used mainly for cultivated crops and trees. In some areas they are used for hay or pasture. Droughtiness and soil blowing affect these soils.

The soils have poor potential for cultivated crops, fair potential for use as woodland, and good potential for residential and urban development. Droughtiness is a limitation, and soil blowing affects the use and management of these soils. Wetness is a limitation of the Morocco soils, and many areas of this soil need drainage. An adequate drainage system would improve the potential of Morocco soils for residential and urban development.

Deep, nearly level soils that formed in sandy sediment, loamy sediment, and organic material

This group of soils makes up about 30 percent of the county. It consists mostly of soils that have a high water table. These soils are used for cultivated crops, except in a few areas where they are used for hay and pasture or as woodland. These soils have fair or good potential for cultivated crops and poor potential for residential and urban development.

3. Gilford-Seafield

Very poorly drained and somewhat poorly drained, moderately coarse textured soils that formed in loamy and sandy sediment on outwash plains

This map unit is characterized by slightly concave and convex topography. It consists mainly of large irregularly shaped areas (fig. 2).

This map unit makes up about 18 percent of the county. It is about 50 percent Gilford soils, 25 percent Seafield soils, and 25 percent soils of minor extent.

Gilford soils are very poorly drained and are in irregularly shaped areas. They have a black, moderately coarse textured surface layer and a gray, mottled subsoil that is moderately coarse textured.

Seafield soils are somewhat poorly drained and are in slightly convex areas. They have a very dark grayish brown, moderately coarse textured surface layer and a grayish brown, mottled subsoil that is mainly moderately coarse textured.

The soils of minor extent in this map unit are the moderately well drained Brems soils in slightly convex areas adjacent to Seafield soils and the very poorly drained Maumee and Rensselaer, sandy substratum, soils in nearly level or slightly concave areas.

The soils in this map unit in most areas are used for cultivated crops. In a few areas they are used for hay and pasture or as woodland. Wetness and soil blowing affect the use and management of these soils. Many areas have been drained. In depressional areas, ponding or flooding is common in winter and spring.

The soils have good potential for cultivated crops, fair potential for woodland, and poor potential for residential and urban development. Wetness is a limitation, and soil blowing affects the use and management of these soils. Many cultivated areas need additional drainage. Woodland harvesting is limited to dry seasons or to when the soil is frozen.

4. Maumee-Ackerman

Very poorly drained, coarse textured soils and mucky soils that formed in sandy sediment or organic material on outwash plains

This map unit is characterized by broad flat topography. It consists mainly of large and small irregularly shaped areas.

This map unit makes up about 2 percent of the county. It is about 70 percent Maumee soils, 25 percent Ackerman soils, and 5 percent soils of minor extent.

Maumee soils are very poorly drained and are in large uniform areas. They have a black, coarse textured surface layer and gray, mottled, coarse textured underlying material.

Ackerman soils are very poorly drained and are in slight depressions. They have black and gray organic material in the upper part of the profile and brownish gray and brownish yellow, mottled, coarse textured underlying material.

The soils of minor extent in this map unit are the well drained Oakville soils on slightly convex rises and the very poorly drained Gilford and Muskego soils in nearly level areas and slight depressions.

The soils in this map unit in most areas are used for cultivated crops. In a few areas they are used for hay, pasture, or mint or as woodland. Wetness affects the use and management of these soils. Soil blowing is a hazard. Some areas have been drained. In depressional areas, ponding is common in winter and spring.

The soils have fair potential for cultivated crops and poor potential for woodland use and for residential and urban development. Wetness is a limitation, and ponding affects the use and management of these soils. Many cultivated areas need additional drainage. Woodland harvesting is limited to dry seasons or to when the soil is frozen.

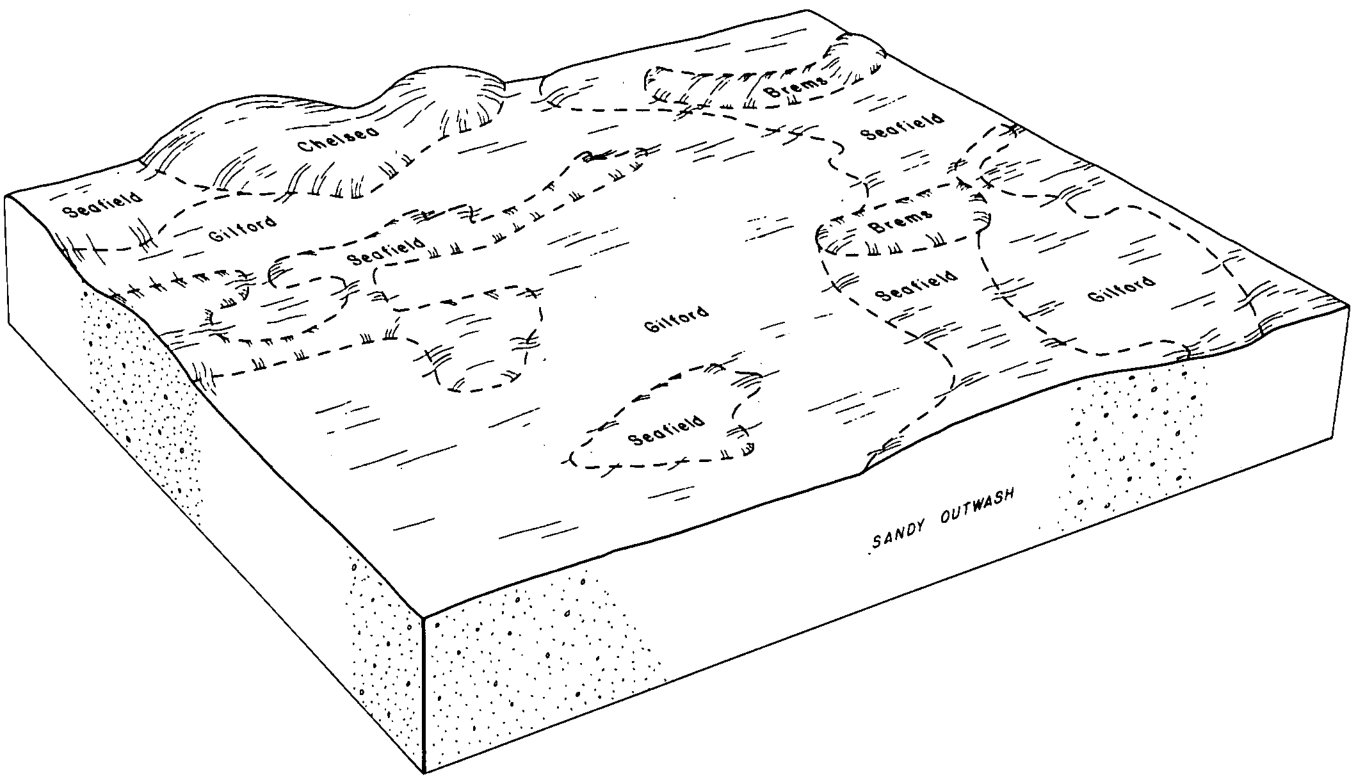


Figure 2.—Pattern of soils, topography, and underlying material in the Gilford-Seafield map unit.

5. Rensselaer, sandy substratum-Gilford

Very poorly drained, medium textured and moderately coarse textured soils that formed in loamy and sandy sediment on outwash plains

This map unit is characterized by broad flat topography. It consists mostly of irregularly shaped areas.

This map unit makes up about 5 percent of the county. It is about 40 percent Rensselaer, sandy substratum, soils, 35 percent Gilford soils, and 25 percent soils of minor extent.

Rensselaer, sandy substratum, soils are very poorly drained and are in large irregularly shaped areas. They have a black, medium textured surface layer and a gray, mottled subsoil that is moderately fine textured and medium textured.

Gilford soils are very poorly drained and are in large irregularly shaped areas. They have a black, moderately coarse textured surface layer and a gray, mottled subsoil that is moderately coarse textured.

The soils of minor extent in this map unit are the moderately well drained Brems soils on narrow rises adjacent to the Gilford soils, the somewhat poorly drained Seafield soils in slightly convex areas, and the very poorly drained Rensselaer Variant soils in slight depressions.

The soils in this map unit are mainly used for cultivated crops. In a few areas they are used for hay and pasture or as woodland. Wetness affects the use and management of these soils. Many areas have been drained. In depressional areas, ponding is common in winter and spring.

The soils of this map unit have good potential for cultivated crops, fair potential for woodland use, and poor potential for residential and urban development. Wetness is a limitation, and ponding affects the use and management of these soils. Some cultivated areas need additional drainage. Woodland harvesting is limited to dry seasons or to when the soil is frozen.

6. Maumee-Morocco

Very poorly drained and somewhat poorly drained, coarse textured soils that formed in sandy sediment on outwash plains

This map unit is characterized by slightly concave and convex topography. It consists mostly of large irregularly shaped areas.

This map unit makes up about 5 percent of the county. It is about 50 percent Maumee soils, 20 percent Morocco soils, and 30 percent soils of minor extent.

Maumee soils are very poorly drained and are in irregularly shaped areas. They have a black, coarse textured surface layer and gray, mottled, coarse textured underlying material.

Morocco soils are somewhat poorly drained and are in slightly convex areas. They have a very dark grayish brown, coarse textured surface layer and a yellowish brown, mottled, coarse textured subsoil.

The soils of minor extent in this map unit are the excessively drained Chelsea soils on elongated convex knolls, the moderately well drained Brems soils in slightly convex areas adjacent to Morocco soils, and the very poorly drained Gilford soils in nearly level or slightly concave areas.

The soils in this map unit are used for cultivated crops, except in a few small areas where they are used for hay, pasture, or trees. Wetness and soil blowing affect the use and management of these soils. Many areas have been drained. In depressional areas, ponding is common in winter and spring.

The soils have fair potential for cultivated crops and for trees and poor potential for residential and urban development. Wetness is a limitation, and soil blowing is a hazard. Many cultivated areas need drainage. Woodland harvesting is limited to dry seasons or to when the soil is frozen.

Deep, nearly level to moderately sloping soils that formed in loamy sediment, sandy sediment, and loamy glacial till

This group of soils makes up about 19 percent of the county. It consists mostly of soils that have a high water table and soils that are well drained. These soils are used for cultivated crops, except in a few areas where they are used for hay, pasture, or trees. These soils have good potential for cultivated crops and fair or good potential for residential and urban development.

7. Aubbeenaubbee-Gilford-Owosso

Very poorly drained, somewhat poorly drained, and well drained, moderately coarse textured soils that formed in loamy sediment and the underlying loamy glacial till or in loamy sediment on till plains and outwash plains

This map unit is characterized by slightly undulating topography. It consists mainly of narrow, irregularly shaped areas intermingled with areas of other soils.

This map unit makes up about 4 percent of the county. It is about 30 percent Aubbeenaubbee soils, 20 percent Gilford soils, 20 percent Owosso soils, and 30 percent soils of minor extent.

Aubbeenaubbee soils are somewhat poorly drained, are nearly level, and are in irregularly shaped areas. They have a dark grayish brown, moderately coarse textured surface layer and a grayish brown, mottled subsoil that is moderately fine textured.

Gilford soils are very poorly drained and are in nearly level or slightly depressional areas. They have a black, moderately coarse textured surface layer and a gray, mottled subsoil that is moderately coarse textured.

Owosso soils are well drained, are nearly level or gently sloping, and are on slightly convex rises. They have a dark grayish brown, moderately coarse textured surface layer and a yellowish brown, moderately fine textured subsoil.

The soils of minor extent in this map unit are the excessively drained Chelsea soils on elongated, convex knolls, the well drained Riddles soils on gently sloping breaks adjacent to drainageways, the somewhat poorly drained Crosier soils in nearly level, broad areas, and the very poorly drained Rensselaer, sandy substratum, and Wolcott soils in nearly level or slightly concave areas.

The soils in this map unit are used for cultivated crops, hay, pasture, or trees. Wetness and soil blowing affect the use and management of these soils. In many areas the Aubbeenaubbee and Gilford soils have been drained.

The soils have good potential for cultivated crops and for use as woodland and fair potential for residential and urban development. Soil blowing affects the use and management of these soils. Wetness is a limitation of the Aubbeenaubbee and Gilford soils. Many areas of these soils need additional drainage. The soils have few limitations to use as woodland. Adequate drainage would improve areas of Aubbeenaubbee soils for residential or urban development.

8. Martinsville-Whitaker-Alvin

Somewhat poorly drained and well drained, medium textured and moderately coarse textured soils that formed in stratified loamy and sandy sediment on outwash plains

This map unit is characterized by slightly undulating or rolling topography. It consists mostly of large, irregularly shaped areas.

This map unit makes up about 15 percent of the county. It is about 35 percent Martinsville soils, 15 percent Whitaker soils, 10 percent Alvin soils, and 40 percent soils of minor extent.

Martinsville soils are well drained, are nearly level to moderately sloping, and are in large, slightly convex areas or on small knolls. They have a dark grayish brown, medium textured surface layer and a brown subsoil that is moderately coarse textured.

Whitaker soils are somewhat poorly drained, are nearly level, and are in irregularly shaped areas. They have a dark grayish brown, medium textured surface layer and a grayish brown and gray, mottled subsoil that is also medium textured.

Alvin soils are well drained, are nearly level to gently sloping, and are in slightly convex areas or on small knolls. They have a dark brown, moderately coarse textured surface layer and a yellowish brown, moderately coarse textured subsoil.

The soils of minor extent in this map unit are the very poorly drained Chalmers and Rensselaer soils in depressions and natural drainageways, the somewhat poorly drained Crosier and Darroch soils and the moderately well drained Foresman soils in lower lying areas, and the well drained Riddles soils on breaks into natural drainageways.

The soils in this map unit in most areas are used for cultivated crops. In some areas they are used for hay, pasture, or trees. Wetness and erosion affect the use and management of most of these soils. Many areas of Whitaker soils have been drained.

The soils in this map unit have good potential for cultivated crops, woodland use, and residential and urban development. Whitaker soils are limited by wetness, and on Martinsville and Alvin soils erosion affects use and management. Whitaker soils in some cultivated areas need additional drainage. Martinsville and Alvin soils need erosion control measures during woodland harvesting. Drainage can improve the suitability of Whitaker soils for residential or urban development.

Deep, nearly level soils that formed in loamy glacial till

This group of soils makes up about 14 percent of the county. It mostly consists of soils that have a high water table. These soils are used for cultivated crops, except in a few areas where they are used for hay or pasture. These soils have good potential for cultivated crops and poor potential for residential and urban development.

9. Wolcott-Conover

Very poorly drained and somewhat poorly drained, moderately fine textured and medium textured soils on till plains

This map unit is characterized by slightly concave and convex topography. It consists mainly of large, uniform areas (fig. 3).

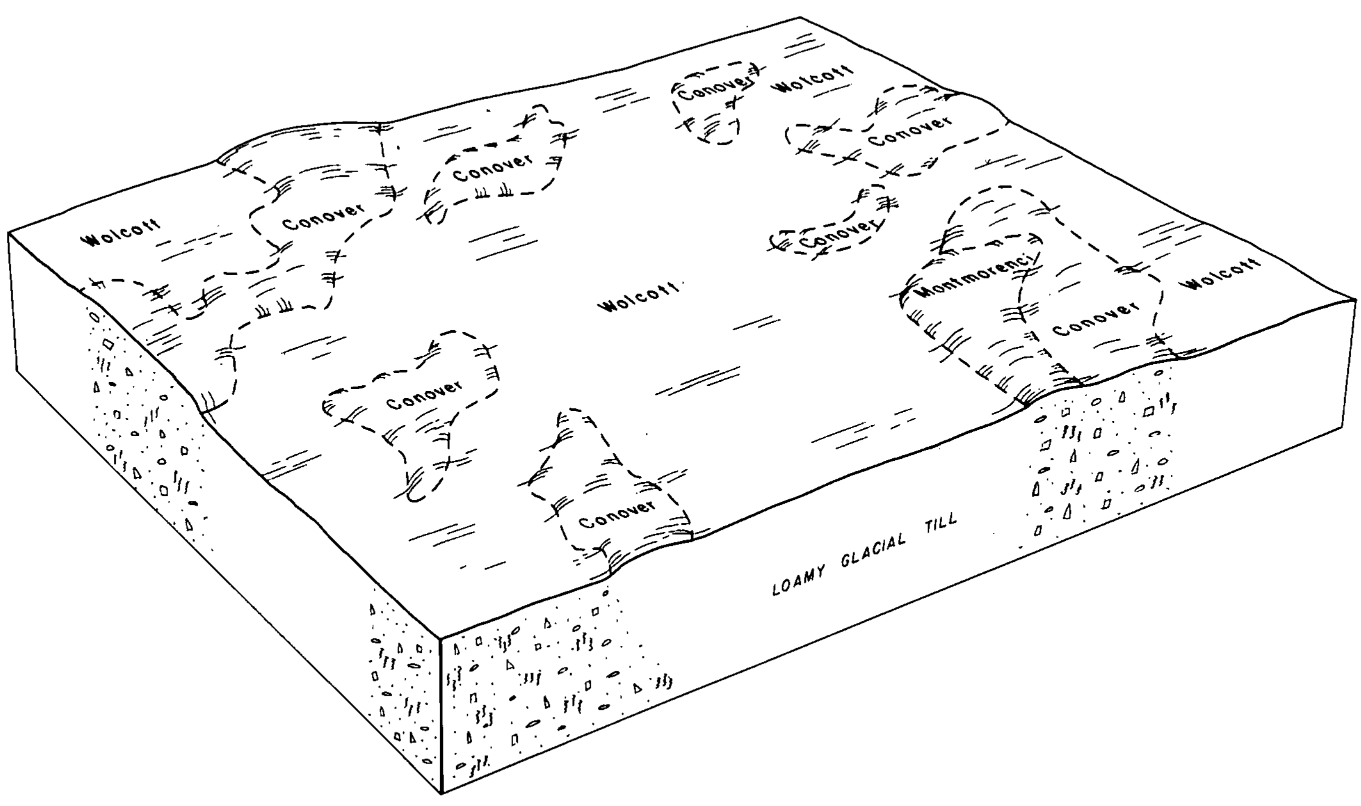


Figure 3.—Pattern of soils, topography, and underlying material in the Wolcott-Conover map unit.

This map unit makes up about 14 percent of the county. It is about 55 percent Wolcott soils, 30 percent Conover soils, and 15 percent soils of minor extent.

Wolcott soils are very poorly drained and are in large, uniform areas or in smaller areas intermingled with areas of soils that are on slightly higher rises. They have a black, moderately fine textured surface layer and a gray, mottled subsoil that is medium textured.

Conover soils are somewhat poorly drained and are in slightly convex areas. They have a very dark grayish brown, medium textured surface layer and a brown, mottled subsoil that is moderately fine textured.

The soils of minor extent in this map unit are the well drained Octagon soils on gently sloping knolls, the moderately well drained Montmorenci soils on slight rises adjacent to Wolcott and Conover soils, and the somewhat poorly drained Odell soils in nearly level areas surrounded by Wolcott soils.

The soils in this map unit are used for cultivated crops, except in a few areas where they are used for hay or pasture. The use of these soils for timber production is of minor importance. Wetness affects the use and management of these soils. Most areas have been drained. In depressional areas, ponding is common in winter and spring.

These soils have good potential for cultivated crops, fair potential for woodland use, and poor potential for residential and urban development. Wetness is the main limitation of these soils. Some cultivated areas need additional drainage. Woodland harvesting is limited to dry seasons or to when the soil is frozen. Adequate drainage would improve areas of Wolcott and Conover soils for residential or urban development.

Deep, nearly level soils that formed in loamy and silty material

This group of soils makes up about 15 percent of the county. It consists mostly of soils that have a high water table. They are used for cultivated crops, except in a few areas where they are used for hay or pasture. These soils have good potential for cultivated crops and poor potential for residential and urban development.

10. Rensselaer, sandy substratum-Whitaker

Very poorly drained and somewhat poorly drained, medium textured soils on outwash plains

This map unit is characterized by slightly concave and convex topography. It consists mainly of small irregularly shaped areas (fig. 4).

This map unit makes up about 2 percent of the county. It is about 60 percent Rensselaer, sandy substratum, soils, 20 percent Whitaker soils, and 20 percent soils of minor extent.

Rensselaer, sandy substratum, soils are very poorly drained. They are in large flat areas and in drainageways. They have a black, medium textured surface layer and a gray, mottled subsoil that is moderately fine textured and medium textured.

Whitaker soils are somewhat poorly drained. They are in large elongated areas and smaller irregularly shaped areas. They have a dark grayish brown, medium textured surface layer and a grayish brown and gray, mottled subsoil that is also medium textured.

The soils of minor extent in this map unit are the well drained Martinsville soils on slightly convex rises adjacent to the Whitaker soils and the somewhat poorly drained Seafield and Crosier soils on slight rises.

The soils in this map unit are mainly used for cultivated crops. In some areas they are used for hay, pasture, or trees. Wetness affects use and management of these soils. Many areas have been drained. In depressional areas, ponding is common in winter and spring.

These soils have good potential for cultivated crops, fair potential for woodland, and poor potential for residential and urban development. Wetness is the main limitation of these soils. Some cultivated areas need additional drainage. Woodland harvesting is limited to dry seasons or to when the soil is frozen.

11. Rensselaer-Darroch

Very poorly drained and somewhat poorly drained, moderately fine textured and medium textured soils on outwash plains and old lacustrine lakebeds

This map unit is characterized by slightly concave and convex topography. It consists mainly of large areas and small irregularly shaped areas.

This map unit makes up about 8 percent of the county. It is about 55 percent Rensselaer soils, 20 percent Darroch soils, and 25 percent soils of minor extent.

Rensselaer soils are very poorly drained. They are in large areas and in small irregularly shaped areas. They have a black, moderately fine textured surface layer and a gray, mottled subsoil that is moderately fine textured.

Darroch soils are somewhat poorly drained. They are in large slightly convex areas. They have a very dark grayish brown, medium textured surface layer and a grayish brown, mottled subsoil that is moderately fine textured and medium textured.

The soils of minor extent in this map unit are the moderately well drained Foresman soils on slight rises adjacent to Darroch and Rensselaer soils, the somewhat poorly drained Conover soils in slightly convex areas, and the very poorly drained Wolcott soils in large nearly level areas.

The soils of this map unit are used mainly for cultivated crops. In a few areas they are used for hay or pasture. The use of these soils for timber production is of minor importance. Wetness affects the use and management of these soils. Many areas have been drained. In depressional areas, ponding is common in winter and spring.

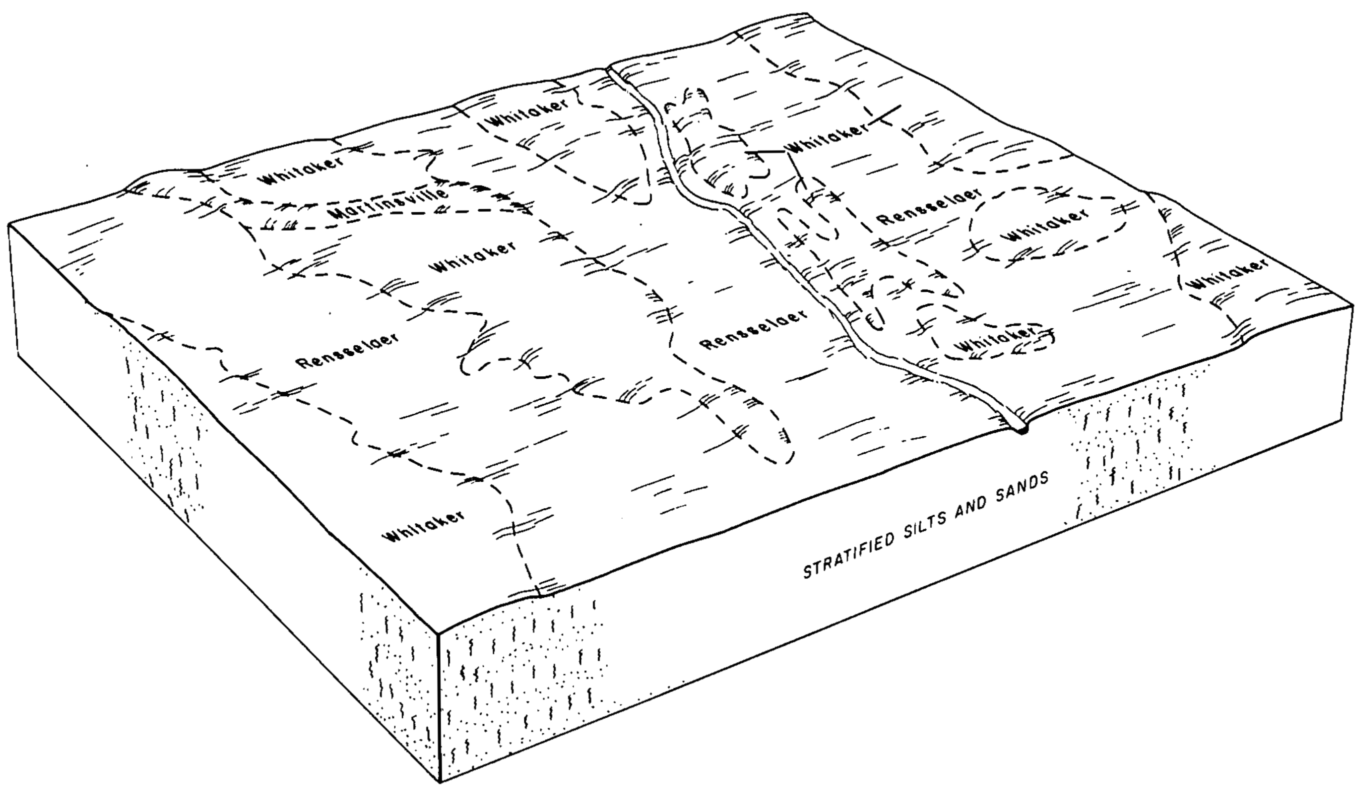


Figure 4—Pattern of soils, topography, and underlying material in the Rensselaer, sandy substratum-Whitaker map unit.

The soils have good potential for cultivated crops, fair potential for woodland, and poor potential for residential and urban development. Wetness is the main limitation of these soils. Some cultivated areas need additional drainage. Woodland harvesting is limited to dry seasons or to when the soil is frozen.

12. Pella-Mundelein

Poorly drained and somewhat poorly drained, moderately fine textured and medium textured soils on outwash plains and old lacustrine lakebeds

This map unit is characterized by slightly concave and convex topography. It mostly consists of large areas and small irregularly shaped areas.

This map unit makes up about 5 percent of the county. It is about 65 percent Pella soils, 15 percent Mundelein soils, and 20 percent soils of minor extent.

Pella soils are poorly drained and are in large areas. They have a black, moderately fine textured surface layer and a gray, mottled subsoil that is moderately fine textured and medium textured.

Mundelein soils are somewhat poorly drained and are in irregularly shaped areas. They have a very dark gray, medium textured surface layer and a grayish brown and light gray, mottled subsoil that is moderately fine textured and medium textured.

The soils of minor extent in this map unit are the somewhat poorly drained Darroch soils, the moderately well drained Foresman soils, and the very poorly drained Rensselaer soils on adjacent slightly higher lying areas.

The soils in this map unit are used mainly for cultivated crops. In some areas they are used for hay or pasture. Wetness affects the use and management of these soils. Many areas have been drained. In depressional areas ponding is common in winter and spring.

The soils have good potential for cultivated crops, fair potential for woodland, and poor potential for residential and urban development. Wetness is the main limitation of these soils. Some cultivated areas need additional drainage. Woodland harvesting is limited to dry seasons or to when the soil is frozen. Adequate drainage would improve areas of these soils for residential or urban development.

Deep, nearly level and gently sloping soils that formed in silty glacial till

This group of soils makes up about 7 percent of the county. It mostly consists of soils that have a high water table. These soils are used for cultivated crops except in a few areas where they are used for hay or pasture. These soils have good potential for cultivated crops and fair potential for residential and urban development.

13. Pella, till substratum-Elliott-Varna

Poorly drained to moderately well drained, moderately fine textured and medium textured soils on till plains and moraines

This map unit is characterized by slightly undulating or rolling topography. It consists mainly of broad elongated areas.

This map unit makes up about 5 percent of the county. It is about 35 percent Pella, till substratum, soils, 25 percent Elliott soils, 15 percent Varna soils, and 25 percent soils of minor extent.

Pella, till substratum, soils are poorly drained and are in broad flat areas and drainageways. They have a black, moderately fine textured surface layer and a grayish brown, mottled subsoil that is moderately fine textured.

Elliott soils are somewhat poorly drained, are nearly level, and are in irregularly shaped convex areas downslope of the Varna soils. They have a very dark gray, medium textured surface layer and a brown, mottled, moderately fine textured subsoil.

Varna soils are moderately well drained, are nearly level or gently sloping, and are in long, narrow areas or on small convex knolls. They have a very dark grayish brown, medium textured surface layer and a yellowish brown, mottled subsoil that is moderately fine textured.

The soils of minor extent in this map unit are the very poorly drained Rensselaer soils in long, narrow areas and slight depressions.

The soils in this map unit are mainly used for cultivated crops. In a few small areas they are used for hay or pasture. The use of these soils for timber production is of minor importance. Wetness and erosion affect the use and management of these soils. Most areas of the Elliott soil and the Pella, till substratum, soil have been drained.

The soils have good potential for cultivated crops and fair potential for residential and urban development. Wetness is a limitation on Pella, till substratum, and Elliott soils, and erosion is a hazard on Varna soils. Some cultivated areas of Pella, till substratum, and Elliott soils need additional drainage. Drainage would improve these soils for residential and urban development.

14. Chalmers-Toronto-Wingate Variant

Very poorly drained, somewhat poorly drained, and moderately well drained, moderately fine textured and medium textured soils on till plains and moraines

This map unit is characterized by slightly undulating topography. It consists mainly of broad areas.

This map unit makes up about 2 percent of the county. It is about 30 percent Chalmers soils, 20 percent Toronto soils, 20 percent Wingate Variant soils, and 30 percent soils of minor extent.

Chalmers soils are very poorly drained and are in drainageways or broad, lower lying areas. They have a black, moderately fine textured surface layer and a grayish brown, mottled subsoil that is also moderately fine textured.

Toronto soils are somewhat poorly drained and are in broad, nearly level areas. They have a black, medium textured surface layer and a brown or pale brown, mottled subsoil that is moderately fine textured.

The Wingate Variant soils are moderately well drained and are on slight rises and on breaks into drainageways. They have a very dark gray, medium textured surface layer and a brown and yellowish brown, mottled, moderately fine textured subsoil.

The soils of minor extent in this map unit are the somewhat poorly drained Darroch soils, the moderately well drained Foresman soils, and the poorly drained Pella soils. These soils are in lower lying areas.

The soils in this map unit are mainly used for cultivated crops. In a few small areas they are used for hay or pasture. The use of these soils for timber production is of minor importance. Wetness and erosion affect the use and management of these soils. Most areas of the Chalmers and Toronto soils have been drained.

The soils have good potential for cultivated crops and fair potential for residential and urban development. Wetness is a limitation of Chalmers and Toronto soils, and erosion is a hazard on the Wingate Variant soils. Some cultivated areas of Chalmers and Toronto soils need additional drainage. Drainage improves areas of Chalmers and Toronto soils for residential or urban development.

broad land use considerations

In White County, most of the acreage is used for cultivated crops. Table 4 shows that the soils making up the general soil map units, for the most part, have good or fair potential for cultivated crops. The soils that have fair potential are in the northern part of the county, and those that have good potential are mostly in the southern part of the county. This difference between soils in the north and soils in the south was caused by the glaciers that deposited various materials that have essentially divided the county into two different areas. The soils in the northern part of the county typically have a coarse or moderately coarse textured surface layer and subsoil. Most of these soils formed in sandy material and have fair potential for cultivated crops. The Chelsea-Morocco-Oakville map unit in this area is the only unit in the county that has poor potential for cultivated crops. The soils in the southern part of the county typically have a medium textured or moderately fine textured surface layer and subsoil. They formed in loamy and silty material and have good potential for cultivated crops.

All map units on the general soil map include some soils that have wetness as a limitation for cultivated crops. In many areas the soils have been drained, but in some areas the soils have not been adequately drained for crops. Soil blowing is a hazard on the soils in the Maumee-Ackerman, Chelsea-Morocco-Oakville, and Maumee-Morocco map units.

The soils in most map units have fair or good potential for woodland use. The production of timber for commercial purposes is not extensive because most of the land is used for crops. A few commercially valuable trees are scattered throughout the county. Wetness is a limitation on most of the soils that have fair potential for trees. Because of wetness, harvesting needs to be done in dry seasons or when the soil is frozen. Martinsville-Whitaker-Alvin, Aubbeenaubbee-Gilford-Owosso, and Pella, till substratum-Elliott-Varna map units have good potential for woodland. Erosion is a hazard on the Martinsville, Alvin, and Varna soils during harvesting. The Maumee-Ackerman map unit is the only unit in the county that has poor potential for woodland. Wetness is a limitation on these soils, and windthrow is a hazard.

The general soil map is useful in selecting areas that have the best potential for urban development and in planning future land use patterns. The general soil map, however, cannot be used to select specific sites for structures. Table 4 shows that the Chelsea-Morocco-Oakville and Martinsville-Whitaker-Alvin map units have good potential for urban development. Wetness is a limitation on the Morocco and Whitaker soils; nevertheless, these soils generally can be developed at a lower cost than soils in other map units in the county. The soils in the Wolcott-Conover map unit, like many soils in the county, have poor potential for urban development because of a seasonal high water table. Wetness is a limitation that affects the use and management of many soils for nonagricultural purposes. In most areas this limitation is very difficult to overcome.

detailed soil map units

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

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

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

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

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Martinsville silt loam, 0 to 2 percent slopes, is one of several phases in the Martinsville series.

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

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

Table 5 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

soil descriptions

Ab—Abscota loamy fine sand, occasionally flooded. This is a deep, moderately well drained, nearly level soil. It is in long narrow areas adjacent and parallel to streams, in irregularly shaped areas, and on small knolls. It is occasionally flooded for brief periods in the spring. Areas range from 3 to 120 acres in size but typically are about 40 acres.

Typically, the surface layer is dark brown loamy fine sand about 10 inches thick. The subsoil is yellowish brown, very friable loamy fine sand about 10 inches thick. The underlying material to a depth of 60 inches is yellowish brown sand. In a few areas the soil is medium acid, and in a few areas the texture of the surface layer is loam or sandy loam. In a few areas the surface layer is darker colored. In some areas the subsoil and underlying material have grayish brown mottles.

Included with this soil in mapping are a few small slightly concave areas of very poorly drained Cohoctah soils. Also included are a few areas where the slope is greater than 3 percent but less than 6 percent. These included areas make up about 12 to 15 percent of the map unit.

The permeability of this soil is rapid, and the available water capacity is low. The organic matter content is low. Surface runoff is slow. This soil has a water table that is at a depth of 2.5 to 5 feet in winter and spring. It has a very friable surface layer that is easily tilled.

This soil is used for cultivated crops, pasture, and trees.

This soil is suited to small grains and is poorly suited to corn and soybeans. Droughtiness is a hazard, especially for row crops, during extended dry periods. Crop residue management helps maintain the organic matter content of the soil and conserves moisture.

This soil is suited to grasses and legumes for hay or pasture. Overgrazing reduces plant density and hardiness. Proper stocking rates, rotation grazing, and restricted use during wet periods help maintain plant density and hardiness.

This soil is suited to trees. Seedling mortality is moderate. Replanting may be necessary. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling.

The capability subclass is IVs, the woodland suitability subclass is 1s.

An—Ackerman muck, drained. This is a deep, very poorly drained, nearly level or depressional soil that is frequently ponded by surface runoff from adjacent areas. Most areas of this soil are irregularly shaped and are in old lakebeds and natural drainageways. Areas range from 3 to 60 acres in size but typically are about 10 acres.

Typically, the organic material is about 14 inches thick. The upper part is black muck, and the lower part is gray, mottled sedimentary peat. The underlying material to a depth of about 60 inches is light brownish gray, mottled, loose fine sand in the upper part and brownish yellow, loose fine sand in the lower part. In some places the peat layer has many small shell fragments. In some small areas the underlying material is loam or sandy loam, and in places the organic matter is thicker. In a few areas there is no sedimentary peat layer.

Included with this soil in mapping, and making up about 10 percent of the map unit, are areas of very poorly drained Maumee soils in slightly higher positions.

The permeability of this soil is slow in the sedimentary peat layer and rapid in the underlying material. The available water capacity is moderate, and the organic matter content is very high. Surface runoff is very slow to ponded. This soil has a water table that is near or above the surface in winter and spring. It has a friable surface layer that is very easy to till under proper moisture conditions.

In many areas this soil is drained and used for cultivated crops. In some areas it is abandoned cropland, in some areas it has been developed for wetland wildlife, and in a few areas it is used for trees.

If adequately drained, this soil is suited to corn and soybeans. Wetness is the main limitation, and soil blowing affects the use and management of this soil. Soil blowing can be controlled by windbreaks and by conservation tillage that leaves crop residue on the surface. Excess water can be removed by open ditches, subsurface drains, pumping, or a combination of these. Excessive drainage over a period of years causes substantial decomposition of the organic matter and may expose the sedimentary peat, which is very hard and brittle when dry and does not soften when rewetted. The peat cannot be worked into a good seedbed.

This soil is well suited to grasses and legumes for hay. It is poorly suited to pasture. This soil must be drained for high yields of hay. Grasses and legumes effectively control soil blowing.

This soil is poorly suited to trees. The use of equipment is severely limited, plant competition is severe, seedling mortality is high, and windthrow is a severe hazard. Prolonged seasonal wetness hinders harvesting, planting, and the survival of seedlings. Replanting may be necessary. Trees are usually harvested when the ground is frozen. Species tolerant of wetness and those with a fibrous root system are best suited to this soil. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling.

The capability subclass is IVw; the woodland suitability subclass is 4w.

AsA—Alvin fine sandy loam, 0 to 2 percent slopes. This is a deep, well drained, nearly level soil in slightly convex areas. The areas are irregularly shaped and adjacent to gently sloping areas. Areas of this soil range from 3 to 50 acres in size but are typically about 20 acres.

Typically, the surface layer is dark brown fine sandy loam about 10 inches thick. The subsoil is about 25 inches thick. The upper part is yellowish brown, friable loam; the lower part is dark yellowish brown and yellowish brown, friable fine sandy loam. The underlying material is pale brown fine sand to a depth of 47 inches and yellowish brown loamy fine sand to a depth of 60 inches. In a few areas the surface layer is very dark grayish brown and in some areas it is loamy fine sand. In places the lower part of the subsoil and the underlying material are mottled. In some areas the underlying material is up to 50 percent coarse sand and fine gravel, and in places the slope is greater than 2 percent.

Included with this soil in mapping are somewhat poorly drained Seafield and Whitaker soils in slightly lower positions and excessively drained Chelsea soils on small knolls. These included soils make up about 10 to 12 percent of the map unit.

The permeability of this soil is moderately rapid in the subsoil and rapid in the underlying material. The available water capacity is moderate, and the organic matter content is low. Surface runoff is slow. This soil has a very friable surface layer that is easily tilled.

In most areas, this soil is used for cultivated crops. In a few areas, it is used for hay, pasture, or trees.

This soil is well suited to corn, soybeans, and small grains. Droughtiness is a hazard during extended dry periods, especially for row crops. Soil blowing is severe if these soils are cultivated. Soil blowing can be controlled by windbreaks and by conservation tillage that leaves crop residue on the surface. Conservation tillage also helps maintain tilth and the organic matter content of the soil and conserves moisture.

This soil is well suited to grasses and legumes for hay and pasture. Overgrazing reduces plant density and hardiness. Proper stocking rates and rotation grazing help maintain plant density and hardiness. Grasses and legumes effectively control soil blowing.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling.

The capability subclass is IIs; the woodland suitability subclass is 2o.

AsB—Alvin fine sandy loam, 2 to 6 percent slopes. This is a deep, well drained, gently sloping soil. It is on long narrow ridges, small knolls, and in irregularly shaped, convex areas. Areas range from 3 to 50 acres in size.

Typically, the upper part of the surface layer is dark grayish brown fine sandy loam about 9 inches thick, and the lower part is yellowish brown fine sandy loam about 5 inches thick. The subsoil is brown, friable fine sandy loam about 37 inches thick. The underlying material is pale brown, fine sand to a depth of 57 inches and is strong brown loamy fine sand to a depth of 60 inches. In places the surface layer is very dark grayish brown, and in some places it is loamy fine sand. In a few places, part of the surface layer is eroded and is more strongly sloping. In some areas the subsoil has more sand, and in a few areas it has more clay. In some areas the lower part of the subsoil and the underlying material are 30 to 50 percent coarse sand and fine gravel.

Included with this soil in mapping are excessively drained Chelsea soils in slightly higher areas and somewhat poorly drained Whitaker soils in slightly lower areas. The included soils make up about 7 to 10 percent of the map unit.

The permeability of this soil is moderately rapid in the subsoil and rapid in the underlying material. The available water capacity is moderate, and the organic matter content is low. Surface runoff is medium. This soil has a very friable surface layer that is easily tilled.

In most areas, this soil is used for cultivated crops. In a few areas, it is used for hay, pasture, or trees.

This soil is well suited to corn, soybeans, and small grains. Droughtiness is a hazard during extended dry periods, especially for row crops. Soil blowing and erosion are hazards if the soil is cultivated. Soil blowing can be controlled by windbreaks and conservation tillage that leaves crop residue on the surface. Erosion can be controlled by crop rotation, conservation tillage, contour farming, grassed waterways, or a combination of these. Conservation tillage helps maintain tilth and the organic matter content of the soil and conserves moisture.

This soil is well suited to grasses and legumes for hay and pasture. Overgrazing reduces plant density and hardiness. Proper stocking rates and rotation grazing help maintain plant density and hardiness. Grasses and legumes effectively control soil blowing.

This soil is well suited to trees. Plant competition is a moderate hazard. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling.

The capability subclass is IIe; the woodland suitability subclass is 2o.

AuA—Aubbeenaubbee fine sandy loam, 0 to 1 percent slopes. This is a deep, somewhat poorly drained, nearly level soil in irregularly shaped areas. Areas range from 2 to 80 acres in size but typically are about 20 acres.

Typically, the surface layer is dark grayish brown, fine sandy loam about 8 inches thick. The subsurface layer is grayish brown, mottled fine sandy loam about 7 inches thick. The subsoil is about 25 inches thick. The upper part is dark yellowish brown, friable fine sandy loam; the upper middle part is dark grayish brown, mottled, firm sandy clay loam; the lower middle part is yellowish brown, mottled, firm clay loam; and the lower part is grayish brown, mottled, firm clay loam. The underlying material to a depth of 60 inches is brown, mottled loam. In places the surface layer is very dark brown, very dark grayish brown, or dark brown. In a few places the surface layer and the upper part of the subsoil are fine sand. In a few areas the soil has less than 15 inches of fine sandy loam, the sandy loam extends to a depth of more than 40 inches, or there are no mottles in the middle part of the subsoil. In places the underlying material is stratified layers of sandy loam and loamy sand.

Included with this soil in mapping are slightly convex areas of moderately well drained Brems soils and well drained Owosso soils. The included soils make up about 10 to 15 percent of the map unit.

The permeability of this soil is moderately rapid in the upper part of the subsoil and moderate or moderately slow in the lower part and in the underlying material. The available water capacity is high, and the organic matter content is low. Surface runoff is slow. This soil has a water table that is at a depth of 1 to 3 feet in winter and spring. It has a very friable surface layer that is easily tilled.

This soil is mainly used for cultivated crops. In some areas it is used for hay, pasture, or trees.

If adequately drained, this soil is well suited to corn, soybeans, and small grains. Wetness is the main limitation, and soil blowing is a hazard if this soil is cultivated. Additional drainage is necessary in many areas. Excess water can be removed by open ditches, subsurface drains, or a combination of these. Soil blowing can be controlled by windbreaks and conservation tillage that leaves crop residue on the surface. Conservation tillage helps maintain the organic matter content of the soil.

This soil is well suited to grasses and legumes for hay or pasture. This soil must be drained to obtain high yields of forage or pasture. Legume selection should be determined by the degree of drainage. Overgrazing reduces plant density and plant hardiness. Proper stocking rates, rotation grazing, and restricted use during wet periods help maintain plant density and hardiness.

This soil is suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling.

The capability subclass is IIw; the woodland suitability subclass is 2o.

BmA—Brems loamy fine sand, 0 to 2 percent slopes. This is a deep, moderately well drained, nearly level soil. It is on slightly convex rises that are irregularly shaped or at the base of gently sloping sand ridges. Areas range from 2 to 20 acres in size, but typically are about 5 acres.

Typically, the surface layer is brown loamy fine sand about 9 inches thick. The subsoil is about 39 inches thick. The upper part is yellowish brown, friable loamy fine sand; the lower part is yellowish brown and light gray, mottled, friable loamy fine sand. The underlying material to a depth of 60 inches is mottled gray and yellowish brown loamy fine sand. In some places there is more clay in the subsoil. In some areas the surface layer is fine sand. In places loam till is at a depth of 40 to 60 inches, and there are no mottles in the subsoil.

Included with this soil in mapping are a few small areas of somewhat poorly drained Morocco soils in slight depressions and a few areas of excessively drained Chelsea soils on small rises. These included soils make up 8 to 12 percent of the map unit.

The permeability of this soil is rapid, and the available water capacity is low. The organic matter content is low. Surface runoff is slow. This soil has a water table that is at a depth of 2 to 3 feet in winter and spring. It has a very friable surface layer that is easily tilled.

In most areas, this soil is used for cultivated crops. In a few areas it is used for hay or pasture, and some areas are used for trees.

This soil is suited to small grains and is poorly suited to corn and soybeans. Droughtiness is a hazard, especially for row crops, during extended dry periods. Soil blowing is a hazard if these soils are cultivated. Soil blowing can be controlled by windbreaks and conservation tillage that leaves crop residue on the surface. Conservation tillage helps maintain or increase the organic matter content of the soil.

This soil is suited to grasses and legumes for hay and pasture. Overgrazing reduces plant density and hardiness. Proper stocking rates and rotation grazing help maintain plant density and hardiness. Grasses and legumes effectively control soil blowing.

This soil is suited to trees. Seedling mortality is moderate. Replanting may be necessary. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling.

The capability subclass is IVs; the woodland suitability subclass is 3s.

Ca—Chalmers silty clay loam. This is a deep, very poorly drained, nearly level or depressional soil. It is on long, narrow drainageways and in elongated, irregularly shaped areas. This soil is frequently ponded with surface runoff from adjacent areas. Areas range from 10 to 320 acres in size but typically are 160 acres.

Typically, the upper part of the surface layer is black silty clay loam about 9 inches thick, and the lower part is black, mottled silty clay loam about 4 inches thick. The subsoil is about 36 inches thick. The upper part is grayish brown, mottled, firm silty clay loam; the middle part is grayish brown, mottled, firm loam; and the lower part is yellowish brown, mottled, firm silt loam. The underlying material to a depth of 60 inches is brown, mottled silt loam. In some places the subsoil is clay loam, in some areas the underlying material is loam, and in a few areas the subsoil and underlying material are stratified.

Included with this soil in mapping are a few small areas of somewhat poorly drained Toronto soils and moderately well drained Wingate Variant soils on slightly higher lying areas. The included soils make up about 10 percent of the map unit.

The permeability of this soil is moderate in the solum and moderately slow in the underlying material. The available water capacity is high, and the organic matter content is high. Surface runoff is very slow. This soil has a water table that is at or above the surface in winter and spring. Some depressional areas are ponded early in spring. This soil has a friable surface layer that is easy to till under proper moisture conditions. Tilling this soil when it is too wet causes the formation of large clods that become very firm when dry and make it difficult to prepare a good seedbed.

In most areas this soil is drained and used for cultivated crops. If adequately drained, this soil is well suited to corn, soybeans, and small grains. Wetness is the main limitation. Excess water can be removed by open ditches, subsurface drains, surface drains, or a combination of these. Conservation practices such as conservation tillage that leaves crop residue on the surface help improve or maintain tilth and the organic matter content of the soil.

This soil is well suited to grasses and legumes for hay or pasture. It must be drained for high yields of forage or pasture. The legume selection depends on the degree of drainage. Overgrazing reduces plant density and hardiness. Proper stocking rates and rotation grazing help reduce surface compaction and maintain good tilth and plant density.

The suitability of this soil for trees has not been determined because of the lack of satisfactory stands for site index studies. There are very few trees on this soil because it formed under prairie grasses and small shrubs.

The capability subclass is IIw; a woodland suitability subclass was not assigned.

ChB—Chelsea fine sand, 2 to 6 percent slopes. This is a deep, excessively drained, gently sloping soil. It is in elongated convex areas and irregularly shaped areas. Areas range from 2 to 40 acres in size but typically are about 10 acres.

Typically, the surface layer is dark brown fine sand about 9 inches thick. The subsurface layer to a depth of about 37 inches is strong brown fine sand in the upper part and yellowish brown, loose fine sand in the lower part. To a depth of 80 inches, there is brownish yellow, loose fine sand that has thin horizontal bands of dark brown, very friable, loamy fine sand. In a few areas the surface layer has been completely eroded by wind, or up to 24 inches of windblown sand has been deposited. In places the surface layer is yellowish brown. In some places the bands are more than 6 inches thick or the bands are absent. In some places the uppermost band is above a depth of 24 inches or below a depth of 48 inches. The soil is as much as 20 percent coarse sand and fine gravel in some areas.

Included with this soil in mapping are moderately well drained Brems soils in small concave areas at the base of the slopes. Also included, at the base of slopes and on nearly level ridges, are small areas of well drained Oakville soils that do not have bands in the subsoil. These included soils make up about 10 to 12 percent of the map unit.

The permeability of this soil is rapid, and the available water capacity is low. The organic matter content is low. Surface runoff is slow. This soil has a very friable surface layer that is easily tilled.

In some areas this soil is used for cultivated crops. In some areas it is used for hay or pasture and in some areas for trees.

This soil is suited to small grains and is poorly suited to corn and soybeans. Droughtiness is a hazard, especially for row crops, during extended dry periods. Soil blowing is a severe hazard if this soil is cultivated. Soil blowing can be controlled by windbreaks and conservation tillage that leaves crop residue on the surface. Conservation tillage also helps maintain or increase the organic matter content of the soil and conserves moisture.

This soil is suited to grasses and legumes for hay or pasture. Overgrazing reduces plant density and hardiness. Proper stocking rates and rotation grazing help maintain plant density and hardiness. Grasses and legumes effectively control soil blowing.

This soil is suited to trees. Seedling mortality is moderate. Replanting may be necessary. Conserving soil moisture helps seedlings survive.

The capability subclass is IVs; the woodland suitability subclass is 3s.

ChC—Chelsea fine sand, 6 to 15 percent slopes. This is a deep, excessively drained, moderately sloping to strongly sloping soil. It is in elongated convex areas, on small knolls, and in irregularly shaped areas. Areas range from 2 to 50 acres in size but typically are about 20 acres.

Typically, the surface layer is very dark grayish brown fine sand about 5 inches thick. The subsurface layer to a depth of 37 inches is dark yellowish brown and yellowish brown, loose fine sand. The underlying material to a depth of 80 inches is yellowish brown, loose fine sand that has thin horizontal bands of dark brown, very friable, loamy fine sand. The cumulative thickness of these bands is 5 inches. In a few places the surface layer has been completely eroded by wind or as much as 6 feet of windblown sand has been deposited. In places the surface layer is yellowish brown. In some places the dark brown bands are cumulatively more than 6 inches thick, or there are no bands. In other places the uppermost band is below a depth of 48 inches, or it is at a depth of 20 to 24 inches. This soil is as much as 20 percent coarse sand and fine gravel in a few places.

Included with this soil in mapping are long, narrow areas where slopes are 15 to 20 percent. Small areas of well drained Oakville, wet substratum, soils at the base of sloping areas and in flat areas on ridgetops are also included. These included areas make up about 10 to 15 percent of the map unit.

The permeability of this soil is rapid, and the available water capacity is low. The organic matter content is low. Surface runoff is medium. This soil has a very friable surface layer that is easily tilled.

In some areas this soil is used for cultivated crops, in some areas it is used for hay or pasture, and in many areas it is used for trees.

This soil is suited to small grains and is poorly suited to corn and soybeans. Droughtiness is a hazard, especially for row crops, during extended dry periods. Soil blowing is a severe hazard if this soil is cultivated. Soil blowing can be controlled by windbreaks and conservation tillage that leaves crop residue on the surface. Conservation tillage also helps maintain or increase the organic matter content of the soil and conserves moisture.

This soil is suited to grasses and legumes for hay or pasture. Overgrazing reduces plant density and hardiness. Proper stocking rates and rotation grazing help maintain plant density and hardiness. Grasses and legumes effectively control soil blowing.

This soil is suited to trees. Seedling mortality is moderate. Replanting may be necessary. Conserving soil moisture helps seedlings survive.

The capability subclass is VIs; the woodland suitability subclass is 3s.

Ck—Cohoctah fine sandy loam, occasionally flooded. This is a deep, very poorly drained, nearly level soil. It is in long, narrow slightly concave areas at the base of sloping soils and in long, winding, narrow depressional areas adjacent to other bottom land soils. This soil is occasionally flooded for brief periods in spring. Areas range from 2 to 80 acres in size but typically are 20 acres.

Typically, the upper part of the surface layer is black fine sandy loam about 9 inches thick, and the lower part is black, mottled, fine sandy loam about 6 inches thick. The underlying material to a depth of 60 inches is gray, mottled, loamy fine sand and fine sandy loam. In a few areas the surface layer is very high in organic matter content, and in some places it is loamy fine sand. There are a few areas that have a subsoil of clay loam, and in some areas the underlying material is loam.

Included with this soil in mapping are areas of somewhat poorly drained soils on slightly convex rises. Also included are a few small depressional areas of undrained, very poorly drained soils that stay wet for long periods of time. These included soils make up about 8 to 12 percent of the map unit.

The permeability of this soil is moderately rapid, and the available water capacity is moderate. The organic matter content is high. Surface runoff is very slow. A seasonal water table is at or near the surface. The soil has a friable surface layer that is easy to till under proper moisture conditions.

In some areas this soil is drained and used for cultivated crops. In some areas it is used for pasture, and in many areas it is used for trees.

If adequately drained, this soil is well suited to corn and soybeans. Wetness is the main limitation, and flooding affects the use and management of this soil. Excess water can be removed by open ditches, subsurface drains, or a combination of these. Overdrainage may cause droughtiness. Intercepting water that seeps from higher lying soils helps reduce wetness in some areas. Prevention of flooding is difficult and may not be feasible. Conservation practices such as conservation tillage that leaves crop residue on the surface help maintain or improve tilth and the organic matter content of the soil.

This soil is well suited to grasses and legumes for hay or pasture. This soil must be drained to obtain high yields of forage or pasture. The legume selection depends on the degree of drainage. Overgrazing reduces plant density and hardiness. Proper stocking rates and rotation grazing help reduce surface compaction and maintain good tilth and plant density.

This soil is suited to trees. The use of equipment is severely limited, however, and seedling mortality, plant competition, and the hazard of windthrow are severe. Prolonged seasonal wetness hinders harvesting, planting, and the survival of seedlings. Replanting may be necessary. Trees are usually harvested during extremely dry seasons or when the ground is frozen. Species tolerant of wetness are best suited to this soil. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling.

The capability subclass is IIIw; the woodland suitability subclass is 2w.

CnA—Conover loam, 0 to 1 percent slopes. This is a deep, somewhat poorly drained, nearly level soil in irregularly shaped areas. Areas range from 2 to 160 acres in size but typically are about 15 acres.

Typically, the surface layer is very dark grayish brown loam about 9 inches thick. The subsoil is about 26 inches thick. The upper part is brown, mottled, firm clay loam; the middle part is yellowish brown, mottled, firm loam; and the lower part is grayish brown, mottled, firm loam. The underlying material to a depth of 60 inches is yellowish brown, mottled loam. In a few small areas the surface layer is fine sandy loam. In places, the surface layer is black, and in a few places the underlying material is stratified. In a few areas the depth to the underlying material is more than 40 inches or less than 24 inches. In some places the upper part of the subsoil is free of mottles.

Included with this soil in mapping are a few small areas of very poorly drained Wolcott soils in depressions and small areas of moderately well drained Montmorenci soils in higher positions. The included soils make up about 10 percent of the map unit.

The permeability of this soil is moderately slow, and the available water capacity is high. The organic matter content is moderate. Surface runoff is slow. This soil has a water table at a depth of 1 to 2 feet in winter and spring. It has a friable surface layer that is easy to till under proper moisture conditions.

In most areas this soil is used for cultivated crops. In some areas it is used for hay or pasture.

If adequately drained, this soil is well suited to corn, soybeans, and small grains. Wetness is the main limitation of this soil. Additional drainage is necessary in many areas. Excess water can be removed by open ditches, subsurface drains, or a combination of these practices. Conservation practices such as conservation tillage that leaves crop residue on the surface help maintain or improve tilth and the organic matter content of the soil.

This soil is well suited to grasses and legumes for hay or pasture. It must be drained for high yields for forage or pasture. The legume selection depends on the degree of drainage. Overgrazing reduces plant density and hardiness. Proper stocking rates, rotation grazing, and restricted use during wet periods help maintain good tilth and plant density.

This soil is suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling.

The capability subclass is IIw; the woodland suitability subclass is 3o.

CsA—Crosier silt loam, 0 to 2 percent slopes. This is a deep, somewhat poorly drained, nearly level soil in irregularly shaped areas. Areas range from 2 to over 400 acres in size but typically are about 40 acres.

Typically, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsurface layer is light brownish gray, mottled silt loam about 2 inches thick. The subsoil is about 27 inches thick. The upper part is yellowish brown, mottled, friable silt loam; the middle part is grayish brown, mottled, firm loam; and the lower part is light brownish gray, mottled, firm clay loam. The underlying material to a depth of 60 inches is yellowish brown, mottled loam. In places the surface layer is loamy sand, and in some places the surface layer is very dark gray. In some areas the upper part of the solum is loam, fine sandy loam, or sandy clay loam outwash material, and in a few areas the lower part of the subsoil is stratified loam, sandy loam, or loamy sand.

Included with this soil in mapping are a few small areas of well drained Riddles soils on slightly convex rises. In some map units, small slightly concave areas of very poorly drained Wolcott soils are also included. These included soils make up about 8 to 10 percent of the map unit.

The permeability of this soil is moderately slow, and the available water capacity is high. The organic matter content is low. Surface runoff is slow. This soil has a water table at a depth of 1 to 3 feet in winter and spring. It has a friable surface layer that is easy to till under proper moisture conditions.

In most areas this soil is used for cultivated crops. In some areas it is used for hay, pasture, or trees.

This soil is well suited to corn, soybeans, and small grains. Wetness is the main limitation of this soil. Additional drainage is necessary in many areas. Excess water can be removed by open ditches, subsurface drains, or a combination of these. Conservation practices such as conservation tillage that leaves crop residue on the surface help maintain or improve tilth and the organic matter content of the soil.

This soil is well suited to grasses and legumes for hay or pasture. It must be drained for high yields of forage or pasture. The legume selection depends on the degree of drainage. Overgrazing reduces plant density and hardiness. Proper stocking rates, rotation grazing, and restricted use during wet periods help maintain good tilth and plant density.

This soil is suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling.

The capability subclass is IIw; the woodland suitability subclass is 3o.

Dc—Darroch silt loam. This is a deep, somewhat poorly drained, nearly level soil in large slightly convex areas. Areas range from 2 to 40 acres in size but typically are about 10 acres.

Typically, the surface layer is very dark grayish brown silt loam about 10 inches thick. The subsoil is about 28 inches thick. The upper part is brown, mottled, friable silt loam; the upper middle part is grayish brown, mottled, firm silt loam; the lower middle part is grayish brown, mottled, firm clay loam; and the lower part is gray, mottled, friable fine sandy loam. The underlying material to a depth of 44 inches is light brownish gray, mottled fine sandy loam. Below that, to a depth of 60 inches, is grayish brown, mottled, stratified fine sandy loam and loamy sand. In a few areas the surface layer is less than 10 inches thick. In some areas the surface layer is dark grayish brown. In some areas there is loam till at a depth of 40 to 60 inches. In some places the underlying material is at a depth of more than 42 inches.

Included with this soil in mapping are small areas of very poorly drained Rensselaer soils in depressions and small areas of well drained Martinsville soils and moderately well drained Foresman soils on slight rises. These included soils make up 10 to 15 percent of the map unit.

The permeability of this soil is moderately slow, and the available water capacity is high. The organic matter content is moderate. Surface runoff is slow. This soil has a water table at a depth of 1 to 3 feet in winter and spring. It has a friable surface layer that is easy to till under proper moisture conditions.

In most areas this soil is used for cultivated crops. In some areas it is used for hay or pasture.

If adequately drained, this soil is well suited to corn, soybeans, and small grains. Wetness is the main limitation. Excess water can be removed by open ditches, subsurface drains, or a combination of these. Conservation practices, such as conservation tillage that leaves crop residue on the surface, help maintain or improve tilth and the organic matter content of the soil.

This soil is well suited to grasses and legumes for hay or pasture. This soil must be drained for high yields of forage or pasture. The legume selection depends on the degree of drainage. Overgrazing reduces plant density and hardiness. Proper stocking rates, rotation grazing, and restricted use during wet periods help maintain good tilth and plant density.

The suitability of this soil for trees has not been determined because of the lack of satisfactory stands for site index studies. There are very few trees on this soil because it formed under prairie grasses and small shrubs.

The capability subclass is IIw; a woodland suitability subclass was not assigned.

ElA—Elliott silt loam, 0 to 2 percent slopes. This is a deep, somewhat poorly drained, nearly level soil in irregularly shaped areas. Areas range from 3 to 80 acres in size but typically are about 15 acres.

Typically, the surface layer is very dark gray silt loam about 9 inches thick. The subsurface layer is dark brown silty clay loam about 6 inches thick. The subsoil is about 20 inches thick. It is brown, mottled, firm silty clay in the upper part and yellowish brown, mottled, firm silty clay loam in the lower part. The underlying material to a depth of 60 inches is grayish brown, mottled silty clay loam. In a few slightly convex areas the surface layer is less than 8 inches thick. In places, the depth to the underlying material is more than 40 inches, and in some places clay films along the vertical cracks extend to a depth of 70 inches.

Included with this soil in mapping are a few small areas of poorly drained Pella, till substratum, soils in small depressions. Also included are small areas of moderately well drained Varna soils on slightly convex rises. The included soils make up 10 to 15 percent of the map unit.

The permeability of this soil is moderately slow, and the available water capacity is high. The organic matter content is high. Surface runoff is slow. This soil has a water table at a depth of 1 to 3 feet in winter and spring.

It has a friable surface layer that is easy to till under proper moisture conditions.

In most areas this soil is used for cultivated crops. If adequately drained, this soil is well suited to corn, soybeans, and small grains. Wetness is the main limitation of this soil. Additional drainage is necessary in many areas. Excess water can be removed by open ditches, subsurface drains, or a combination of these practices. Conservation practices such as conservation tillage that leaves crop residue on the surface help maintain or improve tilth and the organic matter content of the soil.

This soil is well suited to grasses and legumes for hay or pasture. It must be drained for high yields of forage or pasture. The legume selection depends on the degree of drainage. Overgrazing reduces plant density and hardiness. Proper stocking rates, rotation grazing, and restricted use during wet periods help reduce surface compaction and maintain good tilth and plant density.

The suitability of this soil for trees has not been determined because of the lack of satisfactory stands for site index studies. There are very few trees on this soil because it formed under prairie grasses and small shrubs.

The capability subclass is IIw; a woodland suitability subclass was not assigned.

FoA—Foresman silt loam, 0 to 2 percent slopes. This is a deep, moderately well drained, nearly level soil. It is in irregularly shaped slightly convex areas. Areas range from 3 to 25 acres in size but typically are about 15 acres.

Typically, the surface layer is very dark grayish brown silt loam about 10 inches thick. The subsoil is about 19 inches thick. The upper part is yellowish brown, friable silt loam. Below that, yellowish brown, firm silty clay loam overlies brown, mottled, firm silty clay loam. The lower part is grayish brown, mottled, friable fine sandy loam. The underlying material to a depth of 49 inches is light brownish gray, mottled loamy fine sand. To a depth of 60 inches, it is gray, mottled fine sand that has thin strata of sandy loam. In places the surface layer is dark grayish brown and is less than 10 inches thick. In places the underlying material is loam till, and in places the slope is more than 2 percent.

Included with this soil in mapping are small areas of somewhat poorly drained Darroch soils in slight depressions. The included soils make up about 8 percent of this map unit.

Permeability of this soil is moderate, and the available water capacity is high. The organic matter content is moderate. Surface runoff is slow. This soil has a water table at a depth of 3 to 6 feet in winter and spring. It has a friable surface layer that is easy to till under proper moisture conditions.

In most areas this soil is used for cultivated crops. In some areas it is used for hay or pasture.

This soil is well suited to corn, soybeans, and small grains. Conservation practices such as conservation tillage that leaves crop residue on the surface help maintain or improve tilth and the organic matter content of the soil.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing reduces plant density and hardiness. Proper stocking rates, rotation grazing, and restricted use during wet periods help reduce surface compaction and maintain good tilth and plant density.

The suitability of this soil for trees has not been determined because of the lack of satisfactory stands for site index studies. There are few trees on this soil because it formed under prairie grasses and small shrubs.

The capability class is I; a woodland suitability subclass was not assigned.

Gf—Gilford fine sandy loam. This is a deep, very poorly drained, nearly level and depressional soil. It is frequently ponded by surface runoff from adjacent areas (fig. 5). Areas range from 2 to more than 1,000 acres in size. Typically, the large areas are about 800 acres in size, and the small irregularly shaped areas are about 40 acres.

Typically, the upper part of the surface layer is black fine sandy loam about 10 inches thick, and the lower part is black, mottled fine sandy loam about 4 inches thick. The subsoil is about 21 inches thick. The upper part is dark gray, mottled, friable fine sandy loam; the middle part is gray, mottled, friable sandy clay loam; and the lower part is light gray, mottled, friable fine sandy loam. The underlying material is light gray, mottled fine sand and mottled light gray and yellowish brown fine sand to a depth of 50 inches and light gray, mottled fine sand to a depth of 60 inches. In some places the surface layer is 8 to 10 inches thick, and in some places it is thicker, mainly in depressions. In places the surface layer is loamy fine sand, or the subsoil is stratified loamy fine sand and fine sandy loam. In some places, loam till is below a depth of 35 inches.

Included with this soil in mapping are small slightly convex areas of somewhat poorly drained Seafield soils and a few areas of Gilford, limestone substratum, soils. Small undrained areas of very poorly drained soils in the lowest part of depressions are also included. The included soils make up 10 to 12 percent of the map unit.

The permeability of this soil is moderately rapid in the surface layer and subsoil and rapid in the underlying material. The available water capacity is moderate, and the organic matter content is moderate. Surface runoff is very slow. This soil has a friable surface layer that is easy to till under proper moisture conditions. It has a water table at or above the surface in winter and spring. Some depressional areas are ponded early in spring.

In most areas, this soil is drained and is used for cultivated crops. In some areas, it is used for hay, pasture, or trees.

If adequately drained, this soil is well suited to corn, soybeans, and small grains. Wetness is the main limitation. Soil blowing also affects the use and

Figure 5.—Water ponded on Gilford fine sandy loam. Wind quickly dries the surface of Seafield fine sandy loam and Chelsea fine sand, 2 to 6 percent slopes, (in the background) and causes soil blowing.

management of this soil. Excess water can be removed by open ditches, subsurface drains, surface drains, or a combination of these. Overdrainage can cause droughtiness. Soil blowing can be controlled by windbreaks or by conservation tillage that leaves crop residue on the surface. Conservation tillage also helps maintain or increase the organic matter content of the soil.

This soil is well suited to grasses and legumes for hay or pasture. This soil must be drained to obtain high yields of forage or pasture. The legume selection depends on the degree of drainage. Overgrazing reduces plant density and hardiness. Proper stocking rates and rotation grazing help maintain plant density and hardiness. Grasses and legumes effectively control soil blowing.

This soil is poorly suited to trees. The use of equipment is severely restricted. Also, seedling mortality, the windthrow hazard, and plant competition are severe. Prolonged seasonal wetness hinders planting and harvesting. Replanting may be necessary. Trees are usually harvested when the soil is dry or frozen. Species of trees that are tolerant of wetness are best suited to this soil. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling.

The capability subclass is IIw; the woodland suitability subclass is 4w.

Gv—Gilford fine sandy loam, limestone substratum. This is a deep, very poorly drained, nearly level or depressional soil. It is in large areas and smaller, irregularly shaped areas. This soil is frequently ponded by surface runoff from adjacent areas. Areas range from 10 to 100 acres in size but are typically about 40 acres.

Typically, the surface layer is black fine sandy loam about 10 inches thick. The subsoil is about 32 inches thick. The upper part is dark gray, mottled, friable fine sandy loam; the middle part is gray, friable fine sandy loam; and the lower part is light gray, friable fine sandy loam that has thin strata of loam, sandy loam, and gravelly sandy loam. Limestone bedrock is at a depth of 42 inches. In a few places the surface layer is more than 10 inches thick and in places there is 25 to 30 inches of fine sandy loam over fine sand. In some places there is loam till over the bedrock, or there is loose, partially weathered rock between the soil and the bedrock.

Included with this soil in mapping are a few areas of moderately well drained Seafield Variant soils on slight rises. Also included are a few areas that have bedrock at a depth of 24 to 40 inches. The included areas make up 10 to 15 percent of the map unit.

The permeability of this soil is moderately rapid, and the available water capacity is moderate. The organic matter content is moderate. Surface runoff is very slow. This soil has a water table at or above the surface in winter and spring. Some depressional areas are ponded early in spring. This soil has a friable surface layer that is easy to till under proper moisture conditions.

In most areas this soil is drained and is used for cultivated crops. In some areas it is used for hay, pasture, or trees.

If adequately drained, this soil is well suited to corn, soybeans, and small grains. Wetness is the main limitation, and soil blowing affects the use and management of this soil. Additional drainage is necessary in some areas. Excess water can be removed by open ditches, subsurface drains, surface drains, or a combination of these. Excess drainage may cause droughtiness. In some places it is difficult or impractical to install subsurface drains at the grade and depth required. Soil blowing can be controlled by windbreaks or conservation tillage that leaves crop residue on the surface. Conservation tillage also helps maintain tilth and the organic matter content of the soil.

This soil is well suited to grasses and legumes for hay or pasture. Drainage is needed for high yields of forage or pasture. The legume selection depends on the degree of drainage. Overgrazing reduces plant density and hardiness. Proper stocking rates and rotation grazing help maintain plant density and hardiness. Grasses and legumes effectively control soil blowing.

This soil is poorly suited to trees. The use of equipment is severely limited, seedling mortality is high, windthrow is a severe hazard, and plant competition is severe. Prolonged seasonal wetness hinders harvesting and the planting and survival of seedlings. Replanting may be necessary. Trees are usually harvested during extremely dry seasons or when the ground is frozen. Species tolerant of wetness are best suited to this soil. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling.

The capability subclass is IIw; the woodland suitability subclass is 4w.

MaA—Martinsville silt loam, 0 to 2 percent slopes. This is a deep, well drained, nearly level soil in broad, slightly convex areas. It is also in irregularly shaped areas intermingled with areas of somewhat poorly drained soils. Areas range from 3 to 200 acres in size but typically are about 30 acres.

Typically, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsoil is about 40 inches thick. The upper part is brown, firm silt loam and silty clay loam, and the lower part is brown, friable sandy loam. The underlying material to a depth of 60 inches is yellowish brown silt loam with thin strata of loamy fine sand, fine sand, and sandy loam. In some places the surface layer is very dark grayish brown loam or gravelly loam. In some places the subsoil is gravelly clay loam. In a few places the slope is more than 2 percent, and the underlying material is loam till.

Included with this soil in mapping are areas of well drained Alvin soils that have more sand than the Martinsville soils and are on slightly higher lying ridges and knolls. A few slightly concave areas of somewhat poorly drained Whitaker soils are also included. The included soils make up 10 to 15 percent of the map unit.

The permeability is moderate, and the available water capacity is high. The organic matter content is moderate. Surface runoff is slow. This soil has a friable surface layer that is easy to till under proper moisture conditions.

This soil is used mostly for cultivated crops. In some areas it is used for hay or pasture, and in a few areas it is used as woodland.

This soil is well suited to corn, soybeans, and small grains. Conservation practices such as conservation tillage that leaves crop residue on the surface help improve or maintain the tilth and organic matter content of the soil.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing reduces plant density and hardiness. Proper stocking rates, rotation grazing, and restricted use during wet periods help reduce surface compaction and maintain good tilth and plant density.

This soil is well suited to trees. The hazard of plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling.

The capability class is I; the woodland suitability subclass is 1o.

MaB2—Martinsville silt loam, 2 to 8 percent slopes, eroded. This is a deep, well drained, gently sloping and moderately sloping soil on small knolls and on side slopes of natural drainageways. Areas range from 3 to 80 acres in size but typically are 10 acres.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil is about 45 inches thick. The upper part is brown, firm clay loam; the upper middle part is strong brown, firm clay loam; the lower middle part is strong brown, friable sandy loam; and the lower part is dark yellowish brown, friable sandy loam or gravelly sandy clay loam. The underlying material to a depth of 60 inches is brown or dark brown, stratified sandy clay loam and gravelly sandy clay loam. In places the surface layer is gravelly loam, or the underlying material is loam till. In some places there is gravelly sand in the lower part of the profile. There are also places where slopes are more than 8 percent or less than 2 percent.

Included with this soil in mapping are small, flat areas of somewhat poorly drained Whitaker soils and small areas of very poorly drained Rensselaer soils in depressions. These included soils make up about 10 to 12 percent of the map unit.

The permeability of this soil is moderate, and the available water capacity is high. The organic matter content is moderate. Surface runoff is medium. This soil has a friable surface layer that is easy to till under proper moisture conditions.

This soil is well suited to corn, soybeans, and small grains. Erosion affects the use and management of this soil. Erosion can be controlled by crop rotation, contour farming, grassed waterways, or a combination of these. Conservation tillage that leaves crop residue on the surface also helps control erosion and helps maintain or improve tilth and the organic matter content of the soil.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing reduces plant density and hardiness. Proper stocking rates, rotation grazing, and restricted use during wet periods help reduce surface compaction and maintain good tilth and plant density. Grasses and legumes effectively control erosion.

This soil is well suited to trees. It is limited to a moderate degree by plant competition. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling.

The capability subclass is IIe; and the woodland suitability subclass is 1o.

Mb—Maumee loamy fine sand. This is a deep, very poorly drained, nearly level or depressional soil. It is in large uniform areas and small, irregularly shaped concave areas that are intermingled with areas of lighter colored soils (fig. 6). This soil is frequently ponded by surface runoff from adjacent areas. Areas range from 3 to over 1,000 acres in size. Typically, the large areas are about 700 acres in size, and the small irregularly shaped areas are about 80 acres.

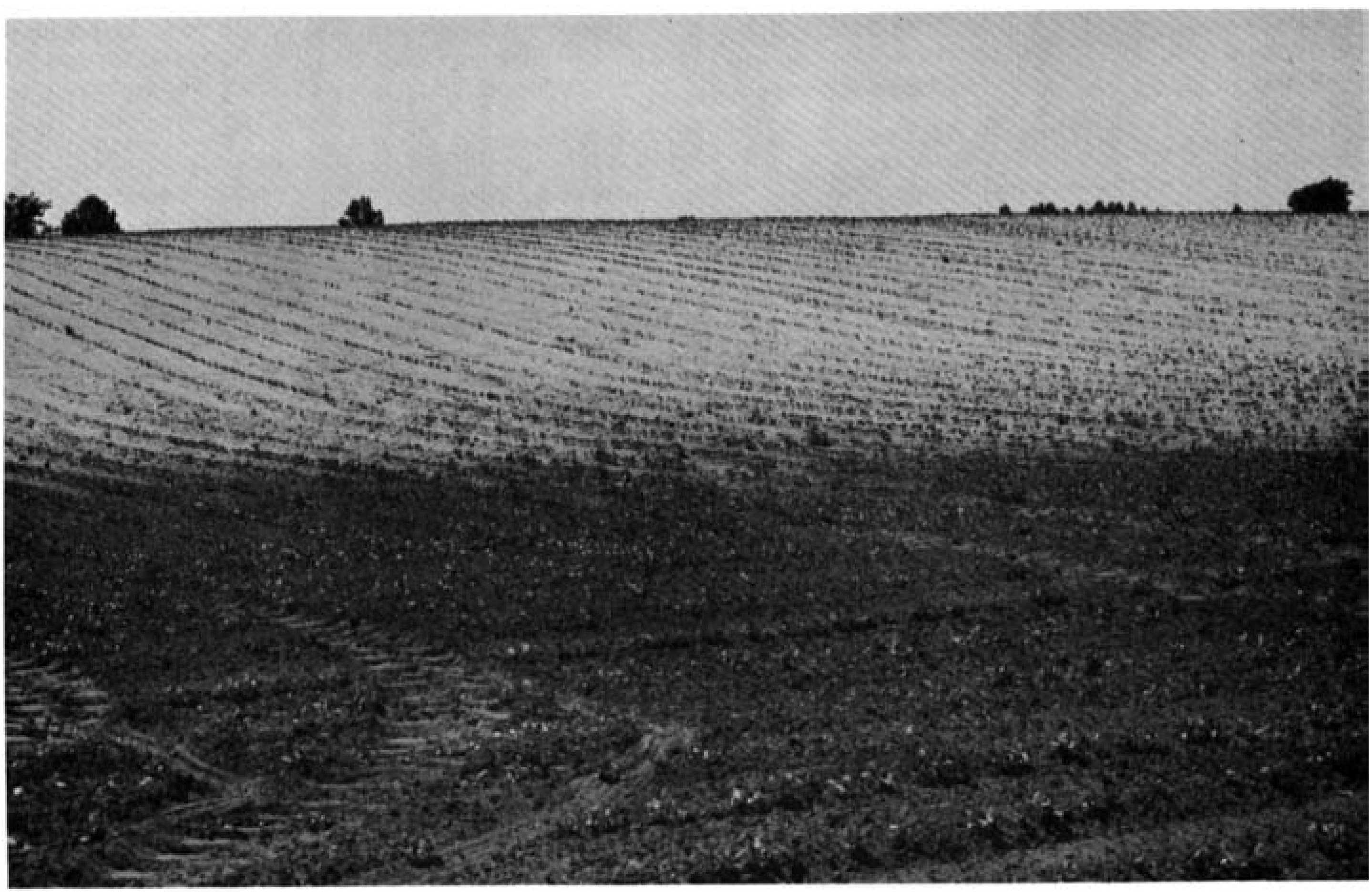


Figure 6.—Areas of Maumee loamy fine sand are commonly intermingled with areas of Chelsea fine sand, 6 to 15 percent slopes, the lighter colored soils.

Typically, the surface layer is black loamy fine sand about 9 inches thick. The subsurface layer is black, mottled loamy fine sand about 10 inches thick. The underlying material is gray, mottled fine sand to a depth of 28 inches and is yellowish brown, mottled fine sand to a depth of 60 inches. In places the surface layer is 8 to 14 inches thick. In some areas the surface layer is fine sandy loam. In some places, the subsurface layer has alternating black and dark gray layers that are 1/2 inch to 2 inches thick.

Included with this soil in mapping are small slightly convex areas of lighter colored, somewhat poorly drained Morocco soils and more mucky Ackerman soils that stay wet for long periods of time. Also included are a few areas of Gilford, limestone substratum, soils. The included soils make up 8 to 12 percent of the map unit.

The permeability of this soil is rapid, and the available water capacity is low. The organic matter content is moderate. Surface runoff is very slow. This soil has a water table at or above the surface in winter and spring. Some depressional areas are ponded early in spring. This soil has a very friable surface layer that is easy to till under proper moisture conditions.

In many areas this soil is drained. In most areas this soil is used for cultivated crops. In a few areas it is used for mint, hay, or pasture, and in a few small areas it is used for trees.

If adequately drained, this soil is well suited to corn, soybeans, small grains, and mint. Wetness is the main limitation, and soil blowing affects the use and management of this soil. Drainage is necessary in many areas, especially small isolated areas. Excess water can be removed by open ditches, subsurface drains, surface drains, pumping, or a combination of these. Overdrainage may cause droughtiness. Soil blowing can be controlled by windbreaks, proper use of crop residue, conservation tillage, or a combination of these. Conservation tillage that leaves crop residue on the surface helps maintain or increase the organic matter content of the soil.

This soil is well suited to grasses and legumes for hay or pasture. Drainage is needed for high yields of forage or pasture. The legume selection depends on the degree of drainage. Overgrazing reduces plant density and hardiness. Proper stocking rates and rotation grazing help maintain plant density and hardiness. Grasses and legumes effectively control soil blowing.

This soil is poorly suited to trees. The use of equipment is severely limited, and windthrow is a severe hazard. Prolonged seasonal wetness hinders harvesting and the planting of seedlings. Trees are usually harvested during extremely dry seasons or when the ground is frozen. Species tolerant of wetness are best suited to this soil.

The capability subclass is IIIw; the woodland suitability subclass is 4w.

MoA—Montmorenci loam, 0 to 2 percent slopes. This is a deep, moderately well drained, nearly level soil in irregularly shaped slightly convex areas. Areas range from 2 to 30 acres in size but typically are about 10 acres.

Typically, the surface layer is very dark gray loam about 9 inches thick. The subsoil is about 31 inches thick. The upper part is brown, friable loam; the upper middle part is brown, firm clay loam; the lower middle part is yellowish brown, mottled, firm clay loam; and the lower part is brown, firm loam. The underlying material to a depth of 60 inches is yellowish brown loam. In places the surface layer is 12 inches thick. In a few places the underlying material is clay loam and may be stratified. In a few places the depth to the underlying material is more than 40 inches, and in a few areas it is less than 24 inches.

Included with this soil in mapping are well drained Octagon soils in more strongly sloping, slightly higher areas. The included soils make up 8 to 12 percent of the map unit.

Permeability of this soil is moderately slow, and the available water capacity is high. The organic matter content is moderate. Surface runoff is slow. This soil has a water table that is at a depth of 3 to 6 feet in winter and spring. It has a friable surface layer that is easy to till under proper moisture conditions.

In most areas this soil is used for cultivated crops. In some areas it is used for hay and pasture.

This soil is well suited to corn, soybeans, and small grains. Conservation practices such as conservation tillage that leaves crop residue on the surface help maintain or improve tilth and the organic matter content of the soil.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing reduces plant density and hardiness. Proper stocking rates, rotation grazing, and restricted use during wet periods help reduce surface compaction and maintain good tilth and plant density.

The suitability of this soil for trees has not been determined because of the lack of satisfactory stands for site index studies. There are very few trees on this soil because it formed under prairie grasses and small shrubs.

The capability class is I; a woodland suitability subclass was not assigned.

Mr—Morocco fine sand. This is a deep, somewhat poorly drained, nearly level soil in irregularly shaped areas. Areas range from 3 to 40 acres in size but typically are about 15 acres.

Typically, the surface layer is very dark grayish brown fine sand about 9 inches thick. The subsoil is about 22 inches thick. The upper part is yellowish brown, mottled, loose fine sand; the lower part is light gray, mottled, loose fine sand. The underlying material to a depth of 60 inches is grayish brown, mottled fine sand. In places the soil is slightly acid, in places the surface layer is brown or black, in some areas there is a thin layer of sandy loam or sandy clay loam in the subsoil, and in a few places there is loam till above a depth of 60 inches.

Included with this soil in mapping are a few small areas of moderately well drained Brems soils and well drained Oakville, wet substratum, soils on slightly convex rises. Some small slightly concave areas of very poorly drained Maumee soils are also included. The included soils make up 8 to 12 percent of the map unit.

The permeability of this soil is rapid, and the available water capacity is low. The organic matter content is low. Surface runoff is very slow. This soil has a water table that is at a depth of 1 to 2 feet. It has a very friable surface layer that is easily tilled.

This soil is used mainly for corn, soybeans, and wheat, and in some areas it is used for hay, pasture, or trees.

If adequately drained, this soil is suited to corn, soybeans, and small grains. Wetness is the main limitation, and soil blowing is a hazard if this soil is cultivated. Droughtiness is a hazard, especially for row crops, during extended dry periods. Excess water can be removed by open ditches, subsurface drains, or a combination of these. Overdrainage may cause droughtiness. Soil blowing can be controlled by the use of windbreaks and conservation tillage that leaves crop residue on the surface. Conservation tillage helps maintain or increase the organic matter content of the soil.

This soil is suited to grasses and legumes for hay or pasture. This soil must be drained to obtain high yields of forage or pasture. The legume selection depends on the degree of drainage. Overgrazing reduces plant density and hardiness. Proper stocking rates and rotation grazing help maintain plant density and hardiness. Grasses and legumes effectively control soil blowing.

This soil is suited to trees. Seedling mortality is severe. Replanting may be necessary. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling.

The capability subclass is IVs; the woodland suitability subclass is 3o.

MuA—Mundelein silt loam, 0 to 2 percent slopes. This is a deep, somewhat poorly drained, nearly level soil in small irregularly shaped areas. Areas range from 3 to 160 acres in size but typically are 20 acres.

Typically, the surface layer and subsurface layer are very dark silt loam. They have a combined thickness of about 15 inches. The subsoil is about 24 inches thick. The upper part is brown, mottled, firm silty clay loam; the middle part is grayish brown, mottled, firm silt loam; and the lower part is light gray, mottled, friable silt loam. The underlying material to a depth of 60 inches is light gray, stratified silt loam and silt. In places, the subsoil is clay loam. In a few small areas on slightly convex rises there are no mottles in the upper part of the subsoil.

Included with this soil in mapping are a few small depressional areas of poorly drained Pella soils that make up about 10 percent of the map unit.

The permeability of this soil is moderately slow, and the available water capacity is high. The organic matter content is moderate. Surface runoff is slow. This soil has a water table at a depth of 1 to 3 feet in winter and spring. It has a friable surface layer that is easy to till under proper moisture conditions.

In most areas this soil is used for cultivated crops. In a few areas it is used for hay or pasture.

If adequately drained, this soil is well suited to corn, soybeans, and small grains. Wetness is the main limitation of this soil. Additional drainage is necessary in many areas. Excess water can be removed by open ditches, subsurface drains, or a combination of these. Conservation practices such as conservation tillage that leaves crop residue on the surface help maintain or improve tilth and the organic matter content of the soil.

This soil is well suited to grasses and legumes for hay or pasture. Drainage is necessary, however, for high yields. The legume selection depends on the degree of drainage. Overgrazing reduces plant density and hardiness. Proper stocking rates, rotation grazing, and restricted use during wet periods reduce surface compaction and maintain good tilth and plant density.

The suitability of this soil for trees has not been determined because of the lack of satisfactory stands for site index studies. There are very few trees on this soil because it formed under prairie grasses and small shrubs.

The capability class is I; a woodland suitability subclass was not assigned.

Mw—Muskego muck. This is a very deep, very poorly drained, nearly level and depressional soil. It is mainly in irregularly shaped areas. Some areas are circular, and some are elongated. This soil is in small depressional areas and natural drainageways and is frequently ponded by surface runoff from adjacent areas. Areas range from 2 to 80 acres in size but typically are about 5 acres.

Typically, the surface layer is black muck about 9 inches thick. The organic layers are black, very friable muck to a depth of about 28 inches. The underlying material is dark gray and olive gray, mottled, friable sedimentary peat to a depth of 60 inches. In a few areas this soil has a thin layer of fibrous material, including wood and sedges, below a depth of 16 inches. In places, the muck is less than 16 inches deep, or it is more than 50 inches deep and there is no sedimentary peat. In some places marl is at a depth of 10 to 50 inches. In some areas, at the outer edge of the map unit, the muck and sedimentary peat are less than 51 inches deep. There are scattered iron concretions, up to 4 inches in diameter, in some areas. Many of these concretions are on the surface.

Included with this soil in mapping are small narrow areas of very poorly drained Maumee soils, which developed in mineral material, in slightly higher positions. Also included are a few undrained soils that are in lower positions. The included soils make up 10 to 15 percent of the map unit.

The permeability of this soil is moderate in the upper part of the profile and slow in the lower part. The available water capacity is high, and the organic matter content is very high. Surface runoff is very slow. This soil has a water table at or above the surface in winter and spring. Many areas are ponded early in spring. This soil has a very friable surface layer that is very easy to till under proper moisture conditions.

In most areas this soil is drained and used for cultivated crops. In a few areas it has been developed for wetland wildlife, and in a few areas it is abandoned cropland.

If adequately drained, this soil is well suited to corn and soybeans. Wetness is the main limitation, and soil blowing affects the use and management of this soil. Additional drainage is necessary in many areas. Excess water can be removed by open ditches, subsurface drains, pumping, or a combination of these. Subsidence and unstable soil material can cause subsurface drains to settle and move out of line. Intense cultivation over a period of many years causes substantial decomposition of the organic matter. In many areas this decomposition exposes the sedimentary peat. If this peat is worked and brought to the surface, it dries quickly and then absorbs water very slowly. Working the peat causes the formation of very firm clods on the surface, which make it difficult to prepare a good seedbed. Soil blowing can be controlled by windbreaks and conservation tillage that leaves crop residue on the surface.

This soil is well suited to grasses and legumes for hay. It is poorly suited to pasture. This soil must be drained to obtain high yields of hay. The legume selection depends on the degree of drainage. Grasses and legumes effectively control soil blowing.

This soil is poorly suited to trees. The use of equipment is severely limited and plant competition is severe. Seedling mortality is high, and windthrow is a severe hazard. Prolonged seasonal wetness hinders harvesting, planting, and the survival of seedlings. Replanting may be necessary. Trees are usually harvested when the ground is frozen. Species tolerant of wetness and those that have a fibrous root system are best suited to this soil. Seedlings survive and grow well if competing vegetation is controlled.

The capability subclass is IVw; the woodland suitability subclass is 4w.

OaA—Oakville fine sand, wet substratum, 0 to 3 percent slopes. This is a deep, well drained, nearly level or gently sloping soil in slightly convex areas that are irregularly shaped. Many areas are at the base of gently sloping sand ridges. Areas range from 3 to 25 acres in size but typically are about 5 acres.

Typically, the surface layer is dark brown fine sand about 9 inches thick. The subsoil is about 29 inches thick. The upper part is brown, loose fine sand, and the lower part is yellowish brown, loose fine sand. The upper part of the underlying material to a depth of 48 inches is brownish yellow fine sand. It is fine sand with bright-colored mottles to a depth of 60 inches. In places the subsoil and the underlying material are mottled, or there is a thin layer of sandy loam in the subsoil. In a few places there are strong brown bands of loamy sand in the underlying material.

Included with this soil in mapping are a few areas of somewhat poorly drained Morocco soils in lower positions. The included soils make up about 5 percent of this map unit.

The permeability of this soil is very rapid, and the available water capacity is low. The organic matter content is very low. Surface runoff is very slow. This soil has a water table at a depth of 4 to 6 feet in winter and spring. It has a very friable surface layer that is easily tilled.

In most areas this soil is used for cultivated crops. In a few areas it is used for hay or pasture, and in some areas it is used for trees.

This soil is suited to small grains and is poorly suited to corn and soybeans. Droughtiness is a hazard, especially for row crops, during extended dry periods. Soil blowing is a severe hazard if these soils are cultivated. Soil blowing can be controlled by windbreaks and conservation tillage that leaves crop residue on the surface. Conservation tillage helps maintain or increase the organic matter content and conserves moisture.

This soil is suited to grasses and legumes for hay or pasture. Overgrazing reduces plant density and hardiness. Proper stocking rates and rotation grazing help maintain plant density and hardiness. Grasses and legumes effectively control soil blowing.

This soil is suited to trees. Seedling mortality is severe. Replanting may be necessary. Conserving soil moisture helps seedlings survive.

The capability subclass is IVs; the woodland suitability subclass is 3s.

OcB—Octagon silt loam, 2 to 6 percent slopes. This is a deep, well drained, gently sloping soil in irregularly shaped areas and on small knolls. Areas range from 2 to 40 acres in size but typically are about 10 acres.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsoil is about 29 inches thick. The upper part is brown, friable silt loam; the middle part is brown, yellowish brown, and dark yellowish brown, firm clay loam; and the lower part is yellowish brown, firm loam. The underlying material to a depth of 60 inches is yellowish brown loam. In places the surface layer is loam, and in a few areas it is dark grayish brown. In a few places there is as much as 30 inches of loamy outwash material over the loam till. In some places the slope is less than 2 percent and there are mottles below a depth of 25 inches. In a few places the depth to free carbonates is more than 42 inches.

Included with this soil in mapping are areas of moderately well drained Montmorenci soils and somewhat poorly drained Conover soils in lower positions on the landscape. These included soils make up 10 to 15 percent of the map unit.

The permeability of this soil is moderate, and the available water capacity is high. The organic matter content is moderate. Surface runoff is medium. This soil has a friable surface layer that is easy to till under proper moisture conditions.

In most areas this soil is used for cultivated crops. In some areas it is used for pasture.

This soil is well suited to corn, soybeans, and small grains. Erosion affects the use and management of this soil. Erosion can be controlled by crop rotation, conservation tillage, contour farming, grassed waterways, or a combination of these. Conservation tillage that leaves crop residue on the surface helps maintain or improve tilth and the organic matter content of the soil.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing reduces plant density and hardiness. Proper stocking rates, rotation grazing, and restricted use during wet periods help reduce surface compaction and maintain good tilth and plant density. Grasses and legumes effectively control erosion.

The suitability of this soil for trees has not been determined because of the lack of satisfactory stands for site index studies. There are very few trees on this soil because it formed under prairie grasses and small shrubs.

The capability subclass is IIe; a woodland suitability subclass was not assigned.

OcC2—Octagon silt loam, 6 to 12 percent slopes, eroded. This is a deep, well drained, moderately sloping soil on narrow ridges, on small knolls, and adjacent to drainageways. Areas range from 3 to 20 acres in size but typically are about 10 acres.

Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsoil is about 29 inches thick. The upper part is yellowish brown, friable loam, and the lower part is yellowish brown, firm clay loam. The underlying material to a depth to 60 inches is yellowish brown loam. In places the surface layer is loam, and in some areas it is dark grayish brown. In a few places the surface layer is severely eroded and is brown or yellowish brown. In a few areas the depth to free carbonates is more than 42 inches.

Included with this soil in mapping are moderately well drained Montmorenci soils in lower areas and on ridgetops and somewhat poorly drained Conover soils in flat areas. Also included are areas adjacent to drainageways where slopes are 12 to 20 percent. These included areas make up 10 to 15 percent of the map unit.

The permeability of this soil is moderate, and the available water capacity is high. The organic matter content is moderate. Surface runoff is medium. This soil has a friable surface layer that is easy to till under proper moisture conditions.

In most areas this soil is used for cultivated crops. In some areas it is used for pasture.

This soil is suited to corn, soybeans, and small grains. Erosion affects the use and management of this soil. Erosion can be controlled by crop rotation, contour farming, grassed waterways, or a combination of these. Conservation tillage that leaves crop residue on the surface helps maintain or improve tilth and the organic matter content of the soil.

This soil is well suited to grasses and legumes for hay and pasture. Overgrazing reduces plant density and hardiness. Proper stocking rates, rotation grazing, and restricted use during wet periods reduce surface compaction and maintain good tilth and plant density. Grasses and legumes effectively control erosion.

The suitability of this soil for trees has not been determined because of the lack of satisfactory stands for site index studies. There are very few trees on this soil because it formed under prairie grasses and small shrubs.

The capability subclass is IIIe; a woodland suitability subclass was not assigned.

OeA—Odell loam, 0 to 1 percent slopes. This is a deep, somewhat poorly drained, nearly level soil in slightly convex, irregularly shaped areas. Areas of this soil range from 2 to 60 acres in size but typically are about 15 acres.

Typically, the upper part of the surface layer is black loam about 10 inches thick, and the lower part is black loam about 3 inches thick. The subsoil is about 29 inches thick. The upper part is brown, mottled, firm loam; the middle part is yellowish brown, mottled, firm clay loam; and the lower part is yellowish brown, mottled, firm loam. The underlying material to a depth of 60 inches is yellowish brown, mottled loam. In some places the surface layer is less than 10 inches thick, in places the subsoil is silty clay loam, in some areas there is a layer of sandy loam between the subsoil and underlying material, and in a few areas the underlying material is stratified.

Included with this soil in mapping are areas of very poorly drained Wolcott soils in depressions. The included soils make up 10 percent of the map unit.

The permeability of this soil is moderately slow, and the available water capacity is high. The organic matter content is moderate. Surface runoff is slow. This soil has a water table at a depth of 1 to 3 feet in winter and spring. It has a friable surface layer that is easy to till under proper moisture conditions.

In most areas this soil is used for cultivated crops. In some areas it is used for hay or pasture.

If adequately drained, this soil is well suited to corn, soybeans, and small grains. Wetness is the main limitation of this soil. Additional drainage is necessary in many areas. Excess water can be removed by open ditches, subsurface drains, or a combination of these. Conservation tillage that leaves crop residue on the surface helps maintain or improve tilth and the organic matter content of the soil.

This soil is well suited to grasses and legumes for hay or pasture. This soil must be drained to obtain high yields of forage or pasture. Overgrazing reduces plant density and hardiness. Proper stocking rates, rotation grazing, and restricted use during wet periods help reduce surface compaction and maintain good tilth and plant density.

The capability subclass is IIw; a woodland suitability subclass was not assigned.

OwA—Owosso fine sandy loam, 1 to 3 percent slopes. This is a deep, well drained, nearly level and gently sloping soil on slightly convex rises. Areas range from 3 to 40 acres in size but typically are about 5 acres.

Typically, the surface layer is dark grayish brown fine sandy loam about 10 inches thick. The subsoil is about 50 inches thick. The upper part is yellowish brown, friable fine sandy loam; the middle part is yellowish brown, firm sandy clay loam; and the lower part is yellowish brown, firm loam. The underlying material to a depth of 75 inches is brownish yellow, firm loam. In places the surface layer and the upper part of the subsoil are loamy fine sand or fine sand, the lower part of the subsoil is mottled, or the subsoil is clay loam. In a few places the subsoil and the underlying material are stratified loam, sandy loam, and silt loam, or the underlying material is sandy loam till.

Included with this soil in mapping are small areas of somewhat poorly drained Aubbeenaubbee and Crosier soils in flat areas and small areas of very poorly drained Gilford soils in depressions. The included soils make up 10 to 15 percent of the map unit.

The permeability of this soil is moderately rapid in the upper part of the solum and moderately slow in the lower part and in the underlying material. The available water capacity is moderate, and the organic matter content is low. Surface runoff is slow. This soil has a very friable surface layer that is easily tilled.

In most areas this soil is used for cultivated crops. In a few areas it is used for hay or pasture, and in some areas it is used for trees.

This soil is well suited to corn, soybeans, and small grains. Droughtiness is a hazard, especially for row crops, during extended dry periods. Soil blowing is a hazard if these soils are cultivated. Soil blowing can be controlled by windbreaks and conservation tillage that leaves crop residue on the surface. Conservation tillage also helps maintain or increase the organic matter content of the soil.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing reduces plant density and hardiness. Proper stocking rates and rotation grazing help maintain plant density and hardiness. Grasses and legumes effectively control soil blowing.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling.

The capability subclass is IIs; the woodland suitability subclass is 1o.

Pa—Pella silty clay loam. This is a deep, poorly drained, nearly level or depressional soil. This soil is rarely ponded by surface runoff from adjacent areas. The mapped areas of this soil range from 60 to more than 1,000 acres in size but typically are about 600 acres.

Typically, the surface layer is black silty clay loam in the upper 9 inches and black, mottled silty clay loam in the lower 6 inches. The subsoil is about 17 inches thick. It is grayish brown, mottled, firm silty clay loam in the upper part and light olive gray, mottled, firm silt loam in the lower part. The underlying material to a depth of 40 inches is light gray, mottled silt loam. To a depth of 60 inches, it is light gray, mottled silt loam with thin strata of sandy loam. In places the depth to the underlying material is less than 30 inches, and in a few places the underlying material is loam till.

Included with this soil in mapping are a few areas of somewhat poorly drained Mundelein soils on slightly convex rises. The included soils make up about 10 percent of the map unit.

The permeability of this soil is moderate, and the available water capacity is high. The organic matter content is high. Surface runoff is very slow. This soil has a water table at or above the surface in winter and spring. Some depressional areas are ponded early in spring. This soil has a friable surface layer that is easy to till under proper moisture conditions. Tilling this soil when it is too wet will cause the formation of large clods that become very firm when dry. These clods make it difficult to prepare a good seedbed.

In most areas this soil is drained and used for cultivated crops. In a few areas it is used for hay or pasture.

If adequately drained, this soil is well suited to corn, soybeans, and small grains. Wetness is the main limitation. Excess water can be removed by open ditches, subsurface drains, surface drains, or a combination of these. Conservation practices such as conservation tillage that leaves crop residue on the surface help maintain or improve tilth and the organic matter content of the soil.

This soil is well suited to grasses and legumes for hay or pasture. Drainage is necessary, however for high yields. The selection of a legume should depend on the degree of drainage. Overgrazing reduces plant density and hardiness. Proper stocking rates, rotation grazing, and restricted use during wet periods help reduce surface compaction and maintain good tilth and plant density.

This soil is suited to trees, but there are few trees in areas of this soil because it formed under prairie vegetation.

The capability subclass is IIw; the woodland suitability subclass is 2w.

Ph—Pella silty clay loam, till substratum. This is a deep, poorly drained, nearly level and depressional soil. It is on long, narrow drainageways and in elongated, irregularly shaped areas. This soil is frequently ponded by surface runoff from adjacent areas. Areas of this soil range from 10 to 320 acres in size but typically are 160 acres.

Typically, the upper part of the surface layer is black silty clay loam about 10 inches thick, and the lower part is black, mottled silty clay loam about 5 inches thick. The subsoil is about 32 inches thick. It is gray, mottled, firm silty clay loam. The underlying material to a depth of 60 inches is light olive brown, mottled silty clay loam. In a few places the subsoil is clay loam, and in some areas the underlying material is loam. Also, in a few places the subsoil and underlying material are stratified.

Included with this soil in mapping are a few small areas of somewhat poorly drained Elliott soils in slightly higher positions. The included soils make up about 10 percent of the map unit.

The permeability is moderate in the solum and moderately slow in the till substratum. The available water capacity is high, and the organic matter content is high. Surface runoff is very slow. This soil has a water table at or above the surface in winter and spring. Some depressional areas are ponded early in spring. This soil has a friable surface layer that is easy to till under proper moisture conditions. Tilling this soil when it is too wet causes the formation of large clods that are very firm when dry. These clods make it difficult to prepare a good seedbed.

In most areas this soil is drained and used for cultivated crops.

If drained, this soil is well suited to corn, soybeans, and small grains. Wetness is the main limitation. Excess water can be removed by open ditches, subsurface drains, surface drains, or a combination of these. Conservation tillage that leaves crop residue on the surface helps maintain or improve tilth and the organic matter content of the soil.

This soil is well suited to grasses and legumes for hay or pasture. Drainage is necessary, however, for high yields. The legume selection depends on the degree of drainage. Overgrazing reduces plant density and hardiness. Proper stocking rates, rotation grazing, and restricted use during wet periods help reduce surface compaction and maintain good tilth and plant density.

The suitability of this soil for trees has not been determined because of the lack of satisfactory stands for site index studies. There are very few trees on this soil beause it formed under prairie grasses and shrubs.

The capability subclass is IIw; a woodland suitability subclass was not assigned.

Pt—Pits, quarries. These quarries are areas from which limestone bedrock has been removed. Limestone from the quarries is crushed and used for roads and agricultural limestone. The resulting pits are approximately 85 feet deep, have nearly vertical walls, and range from 4 to 110 acres in size (fig. 7).

Included in mapping are areas where the crushed limestone has been stockpiled. These areas are up to 40 feet high and make up less than 40 percent of the map unit.

The soils in these pits support very little vegetation. They are severely limited for all engineering uses. Abandoned pits, under proper management, could be used for recreation or as wildlife areas.

Re—Rensselaer clay loam. This is a deep, very poorly drained, nearly level and depressional soil. This soil is in large areas, natural sluiceways, and small irregularly shaped areas. This soil is frequently ponded by surface runoff from adjacent areas (fig. 8). Areas range from 3 to over 1,000 acres in size. The large areas are typically about 600 acres in size, and the small irregularly shaped areas are about 40 acres.

Typically, the upper part of the surface layer is black clay loam about 10 inches thick and the lower part is black, mottled clay loam about 5 inches thick. The subsoil is about 26 inches thick. The upper part is gray, mottled, firm clay loam, and the lower part is gray, mottled, very friable loamy fine sand. The underlying material to a depth of 46 inches is olive gray, mottled loam. To a depth of 60 inches, it is olive gray, mottled, stratified loam, sandy loam, or loamy sand. In places the surface layer is fine sandy loam, and in a few depressional areas the surface layer is as much as 35 inches thick. In some areas the subsoil is fine sandy loam or silty clay loam. In places free carbonates are above a depth of 35 inches or the underlying material is loam till or fine sand.

Included with this soil in mapping are a few slightly convex areas of somewhat poorly drained Darroch, Seafield, and Whitaker soils in slightly higher positions on the landscape (fig. 9), a few areas of very poorly drained Rensselaer, sandy substratum, soils in lower positions, and a few areas where the surface layer and subsoil are calcareous. Also included are small depressional areas of very poorly drained soils that stay wet for long periods of time. The included soils make up 12 to 15 percent of the map unit.

The permeability of this soil is slow in the upper part of the subsoil and moderate or rapid in the lower part of the subsoil and in the underlying material. The available water capacity is high, and the organic matter content is high. Surface runoff is very slow. This soil has a water table at or above the surface in winter and spring. Some depressional areas are ponded early in spring. This soil has a friable surface layer that is easy to till under proper moisture conditions.

In most areas this soil is drained and used for cultivated crops. In a few areas it is used for hay, pasture, or trees.

Figure 7.—Exposed limestone in an inactive quarry. Areas of Pits, quarries, are severely limited for all but recreation and wildlife uses.

If adequately drained, this soil is well suited to corn, soybeans, and small grains. Wetness is the main limitation of this soil. Additional drainage is necessary in some areas. Excess water can be removed by open ditches, subsurface drains, surface drains, or a combination of these. Conservation tillage that leaves crop residue on the surface helps maintain or improve tilth and the organic matter content of the soil.

This soil is well suited to grasses and legumes for hay or pasture. This soil must be drained to obtain high yields. The legume selection depends on the degree of drainage. Overgrazing reduces plant density and hardiness. Proper stocking rates, rotation grazing, and restricted use during wet periods help reduce surface compaction and maintain good tilth and plant density.

This soil is suited to trees, however, the use of equipment is severely limited, seedling mortality is high, plant competition is severe, and windthrow is a severe hazard. Prolonged seasonal wetness hinders harvesting, planting, and the survival of seedlings. Replanting may be necessary. Trees are usually harvested during extremely dry seasons or when the ground is frozen. Species tolerant of wetness are best suited to this soil. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling.

The capability subclass is IIw; the woodland suitability subclass is 2w.

Rg—Rensselaer loam, sandy substratum. This is a deep, very poorly drained, nearly level soil in large flat areas and drainageways. Areas range from 5 to 400 acres in size but typically are about 180 acres.

Typically, the upper part of the surface layer is black loam about 10 inches thick, and the lower part is very dark gray, mottled clay loam about 11 inches thick. The subsoil is about 21 inches thick. The upper part is gray, mottled, firm clay loam. The lower part is olive gray and gray, mottled, firm loam. The underlying material to a depth of 60 inches is grayish brown sand. In a few places the surface layer is thinner than is typical, and in some places the depth to the underlying material is less than 42 inches. In a few areas the underlying material is stratified, and in places it is loam till.

Included with this soil in mapping are a few areas of somewhat poorly drained Whitaker soils in slightly higher positions, more mucky Ackerman soils in depressions, and well drained Martinsville soils on higher ridges and in sloping areas. The included soils make up 10 to 15 percent of the map unit.

The permeability of this soil is slow in the subsoil and rapid in the underlying material. The available water capacity is moderate, and the organic matter content is high. Surface runoff is very slow or ponded. This soil has a water table at or above the surface in winter and spring. Some depressional areas are ponded early in spring. This soil has a friable surface layer that is easy to till under proper moisture conditions.

In most areas this soil is drained and used for cultivated crops. In some areas it is used for hay or pasture.

If adequately drained, this soil is well suited to corn, soybeans, and small grains. Wetness is the main limitation of this soil. Additional drainage is necessary in some areas. Excess water can be removed by open ditches, subsurface drains, surface drains, or a combination of these. Conservation tillage that leaves crop residue on the surface helps maintain or improve tilth and the organic matter content of the soil.

Figure 8.—Depressions on very poorly drained Rensselaer clay loam frequently impound water during winter and spring.

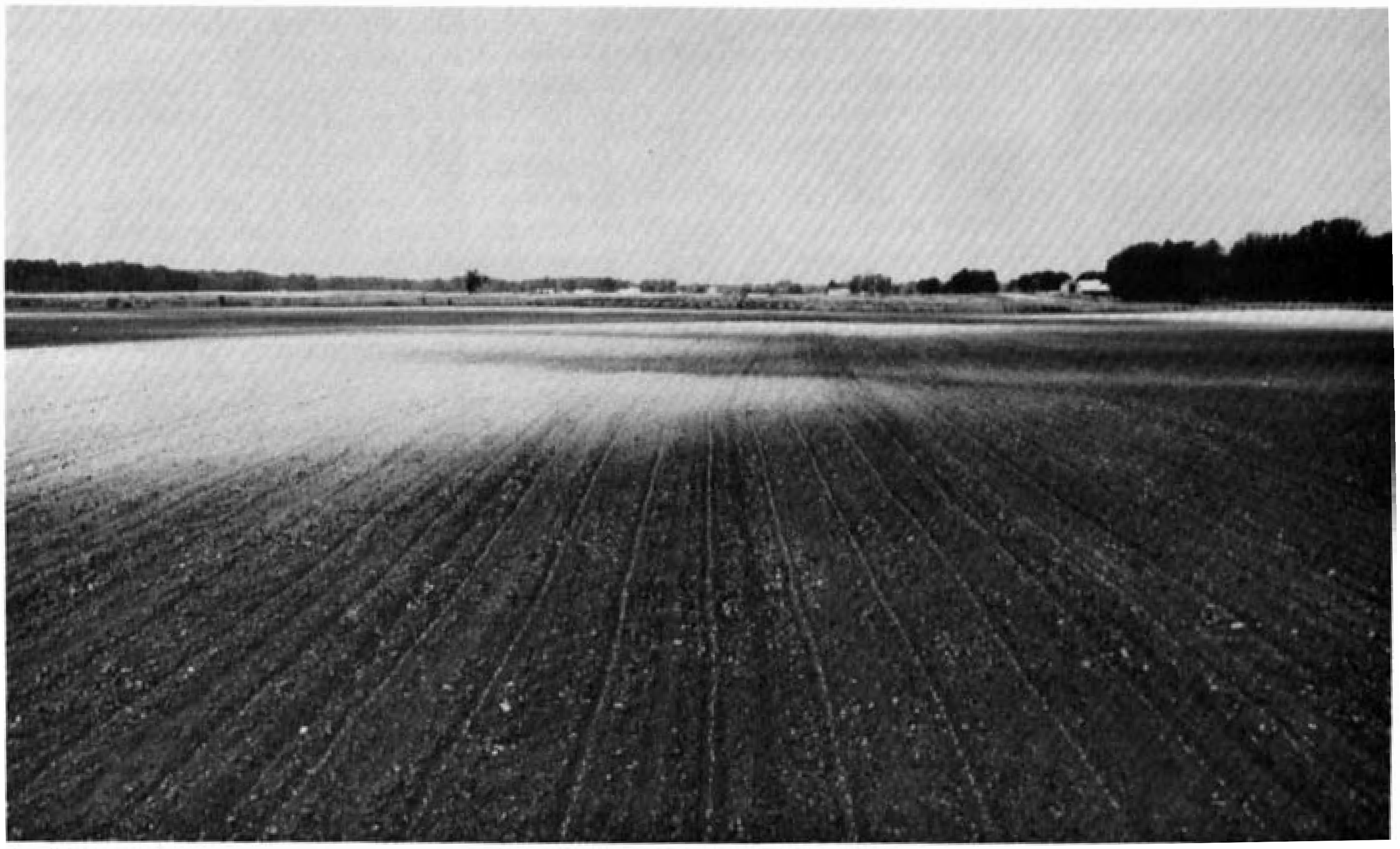


Figure 9.—Islandlike areas of the lighter colored Whitaker silt loam are included in areas of Rensselaer clay loam.

This soil is well suited to grasses and legumes for hay or pasture. This soil must be drained to obtain high yields. The legume selection depends on the degree of drainage. Overgrazing reduces plant density and hardiness. Proper stocking rates, rotation grazing, and restricted use during wet periods help reduce surface compaction and maintain good tilth and plant density.

This soil is suited to trees, however, the use of equipment is severely limited, seedling mortality is high, plant competition is severe, and windthrow is a severe hazard. Prolonged seasonal wetness hinders harvesting, planting, and the survival of seedlings. Replanting may be necessary. Trees are usually harvested when the soil is dry or frozen. Species tolerant of wetness are best suited to this soil. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling.

The capability subclass is IIw; the woodland suitability subclass is 2w.

Rm—Rensselaer Variant loam. This is a deep, very poorly drained, nearly level and depressional soil in large flat areas. This soil is frequently ponded by surface runoff from adjacent areas. Areas range from 3 to 300 acres in size but typically are about 160 acres.

Typically, the surface layer is black loam about 10 inches thick. The subsoil is about 9 inches thick. The upper part is gray, mottled, firm silty clay loam, and the lower part is gray, mottled, friable fine sandy loam. The underlying material to a depth of 42 inches is grayish brown or yellowish brown, mottled fine sand. To a depth of 56 inches, it is yellowish brown very fine sand, and to a depth of 60 inches, it is gray fine sand. In places the surface layer is 8 or 9 inches thick, in some places it is silt loam or clay loam, and in some areas it has a very high organic matter content. In a few places the subsoil extends to a depth of 40 inches. In some areas the substratum has layers of silt loam and very fine sandy loam.

Included with this soil in mapping are areas of somewhat poorly drained Seafield and Whitaker soils in slightly higher positions. The included soils make up 8 to 12 percent of the map unit.

The permeability of this soil is slow in the subsoil and rapid in the underlying material. The available water capacity is moderate, and the organic matter content is high. Surface runoff is very slow or ponded. This soil has a water table at or above the surface in winter and spring. Some depressional areas are ponded early in spring. This soil has a friable surface layer that is easy to till under proper moisture conditions.

In most areas this soil is drained and used for cultivated crops. In some areas it is used for hay or pasture.

If adequately drained, this soil is well suited to corn, soybeans, and small grains. Wetness is the main limitation. Excess water can be removed by open ditches, subsurface drains, surface drains, or a combination of these. Conservation tillage that leaves crop residue on the surface helps maintain or improve tilth and the organic matter content of the soil.

This soil is well suited to grasses and legumes for hay or pasture. It must be drained for high yields of forage or pasture. The legume selection depends on the degree of drainage. Overgrazing reduces plant density and hardiness. Proper stocking rates, rotation grazing, and restricted use during wet periods help reduce surface compaction and maintain good tilth and plant density.

This soil is suited to trees, however, the use of equipment is severely limited, seedling mortality is high, plant competition is severe, and windthrow is a severe hazard. Prolonged seasonal wetness hinders harvesting, planting, and the survival of seedlings. Replanting may be necessary. Trees are usually harvested during extremely dry seasons or when the ground is frozen. Species tolerant of wetness are best suited to this soil. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling.

The capability subclass is IIw; the woodland suitability subclass is 2w.

RsA—Riddles silt loam, 0 to 2 percent slopes. This is a deep, well drained, nearly level soil. It is in broad irregularly shaped areas and is adjacent to gently sloping soils. Areas range from 3 to 80 acres in size but typically are 30 acres.

Typically, the upper part of the surface layer is brown silt loam about 10 inches thick, and the lower part is yellowish brown silt loam about 3 inches thick. The subsoil is about 40 inches thick. The upper part is yellowish brown, firm silt loam, and the lower part is yellowish brown, firm loam. The underlying material to a depth of 60 inches is yellowish brown, firm loam. In places the surface layer is loamy fine sand, and in some areas the subsoil and underlying material are mottled or are more sandy. In a few places the depth to free carbonates is less than 40 inches, and in some places the underlying material is stratified sandy clay loam or fine sandy loam.

Included with this soil in mapping are areas of somewhat poorly drained Crosier and Whitaker soils in slightly concave areas. These included soils make up 8 to 12 percent of the map unit.

The permeability of this soil is moderate, and the available water capacity is high. The organic matter content is low. Surface runoff is slow. This soil has a friable surface layer that is easy to till under proper moisture conditions.

In most areas this soil is used for cultivated crops. In some areas it is used for hay, pasture, or trees.

This soil is well suited to corn, soybeans, and small grains. Conservation tillage that leaves crop residue on the surface helps maintain or improve tilth and the organic matter content of the soil.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing reduces plant density and hardiness. Proper stocking rates, rotation grazing, and restricted use during wet periods help reduce surface compaction and maintain good tilth and plant density.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling.

The capability class is I; the woodland suitability subclass is 1o.

RsB2—Riddles silt loam, 2 to 8 percent slopes, eroded. This is a deep, well drained, gently sloping and moderately sloping soil. It is on small knolls and slopes adjacent to drainageways. Areas range from 2 to 60 acres in size but typically are 15 acres.

Typically, the surface layer is about 7 inches thick. It is dark grayish brown silt loam. The subsoil is about 59 inches thick. The upper part is brown, friable silt loam; the middle part is brown and dark yellowish brown, firm clay loam; and the lower part is yellowish brown, friable loam. The underlying material to a depth of 70 inches is yellowish brown loam. In places the surface layer is dark brown, and in some places it is loamy fine sand. In a few places the lower part of the subsoil and the underlying material are mottled, have less clay, or are stratified sandy clay loam or fine sandy loam. In some areas, especially the more sloping areas, the depth to free carbonates is between 30 and 40 inches.

Included with this soil in mapping are long narrow areas of well drained soils, generally adjacent to drainageways, that have slopes of 8 to 20 percent. Also included are a few areas of somewhat poorly drained Crosier soils. Severely eroded soils in areas that are less than 5 acres in size are also included. The included areas make up 8 to 12 percent of the map unit.

The permeability of this soil is moderate, and the available water capacity is high. The organic matter content is low. Surface runoff is medium. This soil has a friable surface layer that is easy to till under proper moisture conditions.

In most areas this soil is used for cultivated crops. In many areas it is used for hay or pasture, and in some areas it is used for trees.

This soil is well suited to corn, soybeans, and small grains. Erosion affects the use and management of this soil. Erosion can be controlled by crop rotation, conservation tillage, contour farming, grassed waterways, or a combination of these. Conservation tillage that leaves crop residue on the surface helps maintain or improve tilth and the organic matter content of the soil.

This soil is well suited to grasses and legumes for hay and pasture. Overgrazing reduces plant density and hardiness. Proper stocking rates, rotation grazing, and restricted use during wet periods help reduce surface compaction and maintain good tilth and plant density. Grasses and legumes effectively control erosion.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling.

The capability subclass is IIIe; the woodland suitability subclass is 1o.

Se—Seafield fine sandy loam. This is a deep, somewhat poorly drained, nearly level soil in irregularly shaped areas. Areas range from 2 to 80 acres in size but typically are about 20 acres.

Typically, the surface layer is very dark grayish brown fine sandy loam about 8 inches thick. The subsoil is about 18 inches thick. The upper part is brown, friable fine sandy loam; the middle part is grayish brown, friable sandy clay loam; and the lower part is grayish brown, friable fine sandy loam. The underlying material to a depth of 60 inches is light brownish gray, light gray, and gray, mottled fine sand. In places the surface layer is dark grayish brown, and in places it is more than 10 inches thick. In a few places the surface layer is loamy fine sand or loamy sand. In a few places 30 to 40 inches of fine sand overlies sandy loam or loamy sand, and there are a few areas that have loam till at a depth of 40 to 60 inches.

Included with this soil in mapping are areas of well drained Alvin soils in higher positions on the landscape. Also included are very poorly drained Maumee and Gilford soils in slightly concave areas at an elevation lower than that of the Seafield soil. The included soils make up 10 to 15 percent of the map unit.

The permeability of this soil is moderately rapid over very rapid. The available water capacity is moderate, and the organic matter content is low. Surface runoff is slow. This soil has a water table at a depth of 1 to 2 feet in winter and spring. It has a friable surface layer that is easy to till under proper moisture conditions.

In most areas this soil is used for cultivated crops. In some areas it is used for hay, pasture, or trees.

If drained, this soil is well suited to corn, soybeans, and small grains. Wetness is the main limitation, and soil blowing is a hazard if these soils are cultivated. Additional drainage is necessary in many areas. Excess water can be removed by open ditches, subsurface drains, or a combination of these. Excess drainage may cause droughtiness. Soil blowing can be controlled by windbreaks and conservation tillage that leaves crop residue on the surface. Conservation tillage also helps maintain or increase the organic matter content of the soil.

This soil is well suited to grasses and legumes for hay or pasture. This soil must be drained to obtain high yields. The legume selection depends on the degree of drainage. Overgrazing reduces plant density and hardiness. Proper stocking rates and rotation grazing help maintain plant density and hardiness. Grasses and legumes effectively control soil blowing.

This soil is suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling.

The capability subclass is IIw; the woodland suitability subclass is 3o.

Sf—Seafield Variant fine sandy loam. This is a deep, moderately well drained, nearly level soil in irregularly shaped areas. Areas range from 2 to 60 acres in size but are typically about 20 acres.

Typically, the surface layer is very dark gray fine sandy loam about 9 inches thick. The subsoil is about 33 inches thick. The upper part is brown, mottled loamy fine sand, and the lower part is yellowish brown, mottled, friable fine sandy loam and loamy fine sand. Limestone bedrock is at a depth of 42 inches. In some places the surface layer is up to 13 inches thick; in a few areas it is loam; and in some areas it is loamy fine sand. In a few places the surface layer is dark grayish brown. In a few places the subsoil is not mottled. There is a layer of loam till above the limestone bedrock in places, and there is as much as 6 inches of loose, partially weathered rock between the soil and the bedrock in some places. Limestone bedrock is at a depth of 60 inches or more in many areas.

Included with this soil in mapping are well drained Oakville soils in higher areas, somewhat poorly drained Morocco soils in flat areas, and very poorly drained Wolcott and Gilford, limestone substratum, soils in depressions. The included soils make up 10 to 15 percent of the map unit.

The permeability of this soil is moderately rapid, and the available water capacity is moderate. The organic matter content is moderate. Surface runoff is slow. This soil has a water table at a depth of 1 to 2.5 feet in winter and spring. It has a friable surface layer that is easy to till under proper moisture conditions.

In most areas this soil is used for cultivated crops. In some areas it is used for hay, pasture, or trees.

If adequately drained, this soil is well suited to corn, soybeans, and small grains. Wetness is the main limitation, and soil blowing is a hazard if these soils are cultivated. Additional drainage is necessary in many areas. Excess water can be removed by open ditches, subsurface drains, or a combination of these. Overdrainage can cause droughtiness. In some areas bedrock makes it difficult or impractical to install subsurface drains at the grade and depth required. Soil blowing can be controlled by windbreaks and conservation tillage that leaves crop residue on the surface. Conservation tillage also helps improve or maintain the organic matter content of the soil.

This soil is well suited to grasses and legumes for hay or pasture. This soil must be drained to obtain high yields of forage or pasture. The legume selection depends on the degree of drainage. Overgrazing reduces plant density and hardiness. Proper stocking rates and rotation grazing help maintain plant density and hardiness. Grasses and legumes effectively control soil blowing.

This soil is suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling.

The capability subclass is IIw; the woodland suitability subclass is 3o.

SpA—Sparta fine sand, 0 to 3 percent slopes. This is a deep, excessively drained, nearly level and gently sloping soil. It is in irregularly shaped areas on slightly convex rises and long narrow ridges. The areas range from 3 to 40 acres in size but typically are 10 acres.

Typically, the upper part of the surface layer is very dark grayish brown fine sand about 10 inches thick, and the lower part is very dark grayish brown loamy fine sand about 5 inches thick. The subsoil is dark yellowish brown, very friable loamy fine sand about 11 inches thick. The underlying material to a depth of 60 inches is yellowish brown and light yellowish brown, mottled fine sand. In places the surface layer is less than 10 inches thick, and the soil is more strongly sloping. Also, in places, bands of loamy fine sand are below a depth of 40 inches, loam till is below a depth of 40 inches, or the underlying material is stratified silt loam.

Included with this soil in mapping are a few areas of somewhat poorly drained Seafield soils in lower positions. The included soils make up about 6 to 8 percent of the map unit.

The permeability of this soil is rapid, and the available water capacity is low. The organic matter content is low. Surface runoff is slow. This soil has a very friable surface layer that is easily tilled.

In most areas this soil is used for cultivated crops. In some areas it is used for hay or pasture, and in a few areas it is used for trees.

This soil is suited to small grains but is poorly suited to corn and soybeans. Droughtiness is a hazard, especially for row crops, during extended dry periods. Soil blowing is a severe hazard if these soils are cultivated. Soil blowing can be controlled by windbreaks and by tillage that leaves crop residue on the surface. Conservation tillage helps maintain or increase organic matter content of the soil and conserves moisture.

This soil is suited to grasses and legumes for hay and pasture. Overgrazing reduces plant density and hardiness. Proper stocking rates and rotation grazing help maintain plant density and hardiness. Grasses and legumes effectively control soil blowing.

This soil is suited to trees. Seedling mortality is severe, however, and replanting may be necessary. Conserving soil moisture helps seedlings survive.

The capability subclass is IVs; the woodland suitability subclass is 3s.

ToA—Toronto silt loam, 0 to 1 percent slopes. This is a deep, somewhat poorly drained, nearly level soil in small, circular areas and larger, irregularly shaped areas. The areas range from 5 to 70 acres in size but typically are about 20 acres.

Typically, the surface layer is black silt loam about 9 inches thick. The subsoil is about 44 inches thick. The upper part is dark gray, mottled, friable silt loam; the middle part is brown, yellowish brown, or pale brown, mottled, firm silty clay loam; and the lower part is pale brown, mottled, firm loam. The underlying material to a depth of 60 inches is light yellowish brown, mottled, firm silt loam. In places the surface layer is more than 10 inches thick, and in places the solum is stratified. In some places the subsoil has more clay than is typical, and in some areas the underlying material is silty clay loam or loam till.

Included with this soil in mapping are a few small areas of very poorly drained Chalmers soils in slight depressions and small areas of moderately well drained Foresman, Montmorenci, and Wingate Variant soils on slight rises or breaks into drainageways. The included soils make up 12 to 15 percent of this map unit.

The permeability of this soil is moderately slow, and the available water capacity is high. The organic matter content is moderate. Surface runoff is slow. This soil has a water table at a depth of 1 to 3 feet in winter and spring. It has a friable surface layer that is easy to till under proper moisture conditions.

This soil is used mainly for cultivated crops.

If adequately drained, this soil is well suited to corn, soybeans, and small grains. Wetness is the main limitation, but excess water can be removed by open ditches, subsurface drains, or a combination of these. Conservation tillage that leaves crop residue on the surface helps maintain or improve tilth and the organic matter content of the soil.

This soil is well suited to grasses and legumes for hay or pasture. Drainage is necessary, however, for high yields of forage or pasture. Overgrazing reduces plant density and hardiness. Proper stocking rates, rotation grazing, and restricted use during wet periods help reduce surface compaction and maintain good tilth and plant density.

The suitability of this soil for trees has not been determined because of the lack of satisfactory stands for site index studies. There are very few trees on this soil because it formed under prairie grasses and small shrubs.

The capability subclass is IIw; a woodland suitability subclass was not assigned.

VaB2—Varna silt loam, 1 to 6 percent slopes, eroded. This is a deep, moderately well drained, nearly level or gently sloping soil. It is in long, narrow areas, in irregularly shaped areas, and on small convex knolls. The areas range from 3 to 100 acres in size but typically are 30 acres.

Typically, the surface layer is very dark grayish brown silt loam about 10 inches thick. The subsoil is about 27 inches thick. The upper part is yellowish brown, friable silty clay loam; the middle part is yellowish brown silty clay; and the lower part is yellowish brown, mottled, firm silty clay loam. The underlying material to a depth of 60 inches is brown, mottled silty clay loam. In places, the surface layer is less than 10 inches thick, the soils are more sloping, or there is more clay in the subsoil. In a few places the depth to the underlying material is more than 40 inches.

Included with this soil in mapping are a few areas of somewhat poorly drained Elliott soils on flats and small areas of poorly drained Pella soils in depressions. The included soils make up 12 to 15 percent of the map unit.

The permeability of this soil is moderately slow, and the available water capacity is high. The organic matter content is moderate. Surface runoff is medium. This soil has a high water table at a depth of 3 to 6 feet early in spring. It has a friable surface layer that is easy to till under proper moisture conditions.

This soil is used mainly for cultivated crops. In a few areas it is used for hay or pasture.

This soil is well suited to corn, soybeans, and small grains. Erosion is a hazard, but it can be controlled by crop rotation, conservation tillage, contour farming, grassed waterways, or a combination of these. Conservation tillage that leaves crop residue on the surface helps maintain or improve tilth and the organic matter content of the soil.

The soil is well suited to grasses and legumes for hay and pasture. Overgrazing reduces plant density and hardiness. Proper stocking rates, rotation grazing, and restricted use during wet periods help reduce surface compaction and maintain good tilth and plant density.

The suitability of this soil for trees has not been determined because of the lack of satisfactory stands for site index studies. There are very few trees on this soil because it formed under prairie grasses and small shrubs.

The capability subclass is IIe; a woodland suitability subclass was not assigned.

Wa—Watseka loamy fine sand. This is a deep, somewhat poorly drained, nearly level soil. It is in small, irregularly shaped convex areas and at the base of gently sloping sandy ridges. The areas range from 3 to 40 acres in size but typically are about 10 acres.

Typically, the surface layer is black loamy fine sand about 10 inches thick. The subsoil is about 26 inches thick. The upper part is brown, yellowish brown, and light brownish gray, mottled, loose fine sand; the lower part is light brownish gray, mottled, very friable loamy fine sand. The underlying material to a depth of 60 inches is gray, mottled fine sand. In places, the surface layer is less than 10 inches thick, and in places thin layers of sandy loam or sandy clay loam are in the subsoil.

Included with this soil in mapping are areas of the more clayey Seafield soils on slight rises, areas of very poorly drained Maumee and Gilford soils in slight depressions, and a few slightly convex areas of moderately well drained Brems soils. The included soils make up 10 to 15 percent of the map unit.

The permeability of this soil is rapid, and the available water capacity is low. The organic matter content is low. Surface runoff is very slow. This soil has a water table at a depth of 1 to 3 feet in winter and spring. It has a very friable surface layer that is easy to till under proper moisture conditions.

This soil is used mainly for cultivated crops. In some areas it is used for hay or pasture.

If adequately drained, this soil is suited to corn, soybeans, and small grains. Wetness is the main limitation and soil blowing is a hazard if these soils are cultivated. Droughtiness is a hazard during extended dry periods. Excess water can be removed by open ditches, subsurface drains, tile, or a combination of these. Overdrainage can cause droughtiness. Soil blowing can be controlled by windbreaks and tillage that leaves crop residue on the surface. Conservation tillage helps maintain or increase the organic matter content of the soil.

This soil is suited to grasses and legumes for hay or pasture. Drainage is necessary, however, for high yields of forage or pasture. The selection of legumes for this soil should be determined by drainage. Overgrazing reduces plant density and hardiness. Proper stocking rates and rotation grazing help maintain plant density and hardiness. Grasses and legumes effectively control soil blowing.

The suitability of this soil for trees has not been determined because of the lack of satisfactory stands for site index studies. There are very few trees on this soil because the soil formed under prairie grasses and small shrubs.

The capability subclass is IIIs; a woodland suitability subclass was not assigned.

Wh—Whitaker silt loam. This is a deep, somewhat poorly drained, nearly level soil in large elongated areas and small irregularly shaped areas. The areas range from 2 to 160 acres in size but typically are about 20 acres.

Typically, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsoil is about 41 inches thick. In the upper part it is yellowish brown and grayish brown, firm loam. Below that, it is grayish brown, firm fine sandy loam; gray, firm very fine sandy loam; gray, friable fine sandy loam; and gray, friable loam. The subsoil is mottled throughout. The underlying material to a depth of 60 inches is gray, mottled, stratified loamy sand, silt loam, and sandy loam. In places, the surface layer is very dark grayish brown. Also, in places the subsoil and underlying material are not stratified. In a few areas the underlying material is gravelly coarse sand, fine sand, or loam till.

Included with this soil in mapping are areas of well drained Martinsville soils on slightly convex rises and very poorly drained Rensselaer soils in slightly concave areas. The included soils make up 10 to 15 percent of the map unit.

The permeability of this soil is moderate, and the available water capacity is high. The organic matter content is low. Surface runoff is slow. This soil has a high water table at a depth of 1 to 3 feet in winter and spring. It has a friable surface layer that is easy to till under proper conditions.

This soil is used mainly for cultivated crops. In some areas it is used for hay, pasture, or trees.

If adequately drained, this soil is well suited to corn, soybeans, and small grains. Wetness is the main limitation, but the excess water can be removed by open ditches, subsurface drains, or a combination of these. Conservation tillage that leaves crop residue on the surface helps maintain or improve tilth and the content of organic matter.

This soil is well suited to grasses and legumes for hay or pasture. This soil must be drained, however, to obtain high yields of forage or pasture. The legume selection depends on the degree of drainage. Overgrazing reduces plant density and hardiness. Proper stocking rates, rotation grazing, and restricted use during wet periods help reduce surface compaction and maintain tilth and plant density.

This soil is suited to trees. Plant competition is moderate and can be controlled by cutting, spraying, or girdling. Seedlings survive and grow well if the competing vegetation is controlled.

The capability subclass is IIw; the woodland suitability subclass is 3o.

WnB2—Wingate Variant silt loam, 1 to 6 percent slopes, eroded. This is a deep, moderately well drained, nearly level or gently sloping soil on slight rises or breaks into drainageways. The areas range from 5 to 65 acres in size but typically are about 15 acres.

Typically, the surface layer is very dark gray silt loam about 9 inches thick. The subsoil is about 43 inches thick. The upper part is brown, friable silt loam; the middle part is yellowish brown and brown, mottled, firm silty clay loam; and the lower part is brown, mottled, firm clay loam. The underlying material is light olive brown, mottled, firm silt loam to a depth of 68 inches. In places the surface layer is more than 10 inches thick. Also, in some places, the solum is stratified, the subsoil is more clayey than normal, or the underlying material is silty clay loam or loam till.

Included with this soil in mapping are a few small areas of very poorly drained Chalmers soils and poorly drained Pella soils in slight depressions. Also included are small areas of nearly level, somewhat poorly drained Toronto soils and small areas of well drained soils. The included soils make up 10 to 15 percent of the map unit.

Permeability of this soil is moderately slow, and the available water capacity is high. The organic matter content is moderate. Surface runoff is medium. This soil has a water table at a depth of 2 to 3 feet early in spring. It has a friable surface layer that is easy to till under proper moisture conditions.

In most areas, this soil is used for cultivated crops. In a few areas it is used for hay or pasture.

This soil is well suited to corn, soybeans, and small grains. Erosion is a hazard, but it can be controlled by crop rotation, conservation tillage, contour farming, grassed waterways, or a combination of these. Conservation tillage that leaves crop residue on the surface helps maintain or improve tilth and the organic matter content of the soil.

This soil is well suited to grasses and legumes for hay and pasture. Overgrazing reduces plant density and hardiness. Proper stocking rates, rotation grazing, and restricted use during wet periods help reduce surface compaction and maintain soil tilth and plant density.

The suitability of this soil for trees has not been determined because of the lack of satisfactory stands for site index studies. There are very few trees on this soil because it formed under prairie grasses and small shrubs.

The capability subclass is IIe; a woodland suitability subclass was not assigned.

Wo—Wolcott clay loam. This is a deep, very poorly drained, nearly level and depressional soil. Some areas are in drainageways, and some small, irregularly shaped areas are surrounded by lighter colored soils that are at a slightly higher elevation. This soil is frequently ponded by surface runoff from the adjacent soils. The areas of this soil range from 3 to more than 1,000 acres in size. Typically, the large areas are about 800 acres in size, and the small irregularly shaped areas are about 40 acres in size.

Typically, the upper part of the surface layer is black clay loam about 10 inches thick, and the lower part is black, mottled clay loam about 5 inches thick. The subsoil is about 32 inches thick. The upper part is grayish brown, friable clay loam, and the lower part is gray, mottled, firm loam. The underlying material to a depth of 60 inches is light gray, mottled loam. In some of the large depressions the lower part of the subsoil and the underlying material are stratified loam and sandy loam. In a few places in the north central part of the county, as much as 36 inches of sandy loam overlies the subsoil. In a few areas there is a thin layer of loamy sand between the subsoil and the underlying material. In some areas, the subsoil extends to a depth of more than 60 inches, the subsoil is less than 40 inches thick, or the subsoil has less sand and more silt.

Included with this soil in mapping are a few small convex areas of the somewhat poorly drained Conover, Crosier, and Odell soils. These soils are at a slightly higher elevation than the Wolcott soil. Also included are small undrained areas of very poorly drained soils that stay wet for long periods and a few areas where stones and boulders on the surface range from 10 to 36 inches in diameter (fig. 10). The included areas make up 12 to 15 percent of the map unit.

The permeability of this soil is moderate, and the available water capacity is high. The organic matter content is high. Surface runoff is very slow. This soil has a water table at or above the surface in winter and spring. Some depressional areas are ponded early in spring. This soil has a friable surface layer that is easy to till under proper moisture conditions. Tilling the soil when it is too wet will cause large clods to form. The clods become very firm when they dry and make it difficult to prepare a good seedbed.

Most areas of this soil are drained and are used for cultivated crops (fig. 11). A few areas are used for hay, pasture, or trees.

If adequately drained, this soil is well suited to corn, soybeans, and small grains. Wetness is the main limitation, but excess water can be removed by open ditches, subsurface drains, surface drains, or a combination of these. Conservation tillage that leaves crop residue on the surface helps maintain or improve tilth and the content of organic matter.

This soil is well suited to grasses and legumes for hay or pasture. Drainage is necessary, however, for high yields of forage or pasture. Overgrazing reduces plant density and hardiness. Proper stocking rates, rotation grazing, and restricted use during wet periods help reduce surface compaction and maintain soil tilth and plant density.

This soil is suited to trees. The use of equipment, however, is severely restricted. Furthermore, seedling mortality and plant competition are severe, and windthrow is a moderate hazard. Prolonged seasonal wetness hinders harvesting, planting, and the survival of seedlings. Replanting may be necessary. Trees are usually harvested either during extremely dry seasons or

Figure 10.—A few small areas of Wolcott clay loam have stones and boulders that were deposited during glaciation.

Figure 11.—Young soybean plants on Wolcott clay loam. Soybeans are one of the main crops in White County.

when the ground is frozen. Species tolerant of wetness are best suited to this soil. Seedlings survive and grow well if competing vegetation is controlled. This can be done by cutting, spraying, or girdling.

The capability subclass is IIw; the woodland suitability subclass is 2w.

Wv—Wolcott clay loam, limestone substratum. This is a deep, very poorly drained, nearly level and depressional soil. It is in broad areas and in small irregularly shaped areas. This soil is frequently ponded by surface runoff from adjacent areas. The areas range from 10 to 300 acres in size but typically are about 80 acres in size.

Typically, the surface layer is black clay loam in the upper 10 inches and black, mottled clay loam in the lower 4 inches. The subsurface layer is very dark gray, mottled loam about 4 inches thick. The subsoil is olive gray and gray, mottled loam and friable fine sandy loam about 28 inches thick. The underlying material below a depth of 46 inches is limestone bedrock. In places the surface layer is fine sandy loam, and in places the lower part of the subsoil is stratified loam, fine sandy loam, and loamy fine sand. In some areas there is a thin layer of gravelly loam in the lower part of the subsoil, and in a few areas there is as much as 6 inches of loose, partly weathered rock between the soil material and bedrock.

Included with this soil in mapping are a few areas of somewhat poorly drained Odell and Conover soils in higher areas. Also included are a few areas of soils that have bedrock at a depth of 24 to 40 inches. The included soils make up 8 to 12 percent of the map unit.

The permeability of this soil is moderate, and the available water capacity is moderate. The organic matter content is high. Surface runoff is very slow. This soil has a water table at or above the surface in winter and spring. Some depressions are ponded early in spring.

This soil has a friable surface layer that is easy to till under proper moisture conditions. Tilling the soil when it is too wet will cause large clods to form. The clods become very firm when they dry and make it difficult to prepare a good seedbed.

Most areas of this soil are drained and used for cultivated crops. A few areas are used for hay, pasture, or trees.

If adequately drained, this soil is well suited to corn, soybeans, and small grains. Wetness is the main limitation, but excess water can be removed by open ditches, subsurface drains, surface drains, or a combination of these. In some areas, bedrock makes it difficult or impractical to install subsurface drains at the grade and depth required. Conservation tillage that leaves crop residue on the surface helps improve and maintain tilth and the organic matter content of the soil.

This soil is well suited to grasses and legumes for hay or pasture. This soil must be drained, however, to obtain high yields of forage or pasture. Overgrazing reduces plant density and hardiness. Proper stocking rates, rotation grazing, and restricted use during wet periods help reduce surface compaction and maintain soil tilth and plant density.

This soil is suited to trees. The use of equipment, however, is severely restricted. Furthermore, seedling mortality and plant competition are severe, and windthrow is a moderate hazard. Prolonged seasonal wetness hinders harvesting, planting, and the survival of seedlings. Replanting may be necessary. Trees are usually harvested either during extremely dry seasons or when the ground is frozen. Species tolerant of wetness are best suited to this soil. Seedlings survive and grow well if competing vegetation is controlled. This can be done by cutting, spraying, or girdling.

The capability subclass is IIw; the woodland suitability subclass is 2w.

prime farmland

In this section, prime farmland is defined and discussed, and the prime farmland soils in White County are listed.

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in providing the nation's short- and long-range needs for food and fiber. The acreage of high-quality farmland is limited, and the U.S. Department of Agriculture recognizes that government at local, state, and federal levels, as well as individuals, must encourage and facilitate the use of our nation's prime farmland.

Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to producing food, feed, forage, fiber, and oilseed crops. Such soils have soil properties that are favorable for the economic production of sustained high yields of crops. The soils need only to be treated and managed using acceptable farming methods. The moisture supply, of course, must be adequate, and the growing season has to be sufficiently long. Prime farmland soils produce the highest yields with minimal inputs of energy and economic resources, and farming these soils results in the least damage to the environment.

Prime farmland soils may presently be used as cropland, pasture, or woodland, or they may be in other uses. They are either used for producing food or fiber or are available for these uses. Urban and built-up land or water areas cannot be considered prime farmland.

Prime farmland soils usually get an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The acidity or alkalinity level of the soils is acceptable. The soils have few or no rocks and are permeable to water and air. They are not excessively erodible or saturated with water for long periods and are not flooded frequently during the growing season. The slope ranges mainly from 0 to 6 percent.

Some soils that have a high water table may qualify as prime farmland soils if this limitation is overcome by drainage measures. Onsite evaluation is necessary to determine the effectiveness of corrective measures. More information on the criteria for prime farmland soils can be obtained at the local office of the Soil Conservation Service.

prime farmland in White County

About 265,000 acres, or nearly 83 percent of the county, is prime farmland. Areas that don't qualify as prime farmland are scattered throughout the county, but most are in the northern part mainly in the general soil map units 2, 4, and 6. Nearly all of the prime farmland in the county is used for crops.

A recent trend in land use in some parts of the county has resulted in the loss of some prime farmland to urban and industrial uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are wet, more erodible, droughty, or difficult to cultivate and are less productive than prime farmland.

The following map units, or soils, make up prime farmland in White County. Limitations are shown in parentheses after the name of the map unit. The location of each map unit is shown on the detailed soil maps at the back of this publication. The extent of each unit is given in table 5. The soil qualities that affect use and management are described in the section "Detailed soil map units." This list does not constitute a recommendation for a particular land use.

AsA Alvin fine sandy loam, 0 to 2 percent slopes
AsB Alvin fine sandy loam, 2 to 6 percent slopes
AuA Aubbeenaubbee fine sandy loam, 0 to 1 percent slopes (where drained)
Ca Chalmers silty clay loam (where drained)
CnA Conover loam, 0 to 1 percent slopes (where drained)
CsA Crosier silt loam, 0 to 2 percent slopes (where drained)
Dc Darroch silt loam (where drained)
ElA Elliott silt loam, 0 to 2 percent slopes (where drained)
FoA Foresman silt loam, 0 to 2 percent slopes
Gf Gilford fine sandy loam (where drained)
Gv Gilford fine sandy loam, limestone substratum (where drained)
MaA Martinsville silt loam, 0 to 2 percent slopes
MaB2 Martinsville silt loam, 2 to 8 percent slopes, eroded
Mb Maumee loamy fine sand (where controlled drainage is used)
MoA Montmorenci loam, 0 to 2 percent slopes (where drained)
MuA Mundelein silt loam, 0 to 2 percent slopes (where drained)

OcB Octagon silt loam, 2 to 6 percent slopes
OeA Odell loam, 0 to 1 percent slopes (where drained)
OwA Owosso fine sandy loam, 1 to 3 percent slopes
Pa Pella silty clay loam (where drained)
Ph Pella silty clay loam, till substratum (where drained)
Re Rensselaer clay loam (where drained)
Rg Rensselaer loam, sandy substratum (where drained)
Rm Rensselaer Variant loam (where drained)
RsA Riddles silt loam, 0 to 2 percent slopes
RsB2 Riddles silt loam, 2 to 8 percent slopes, eroded
Se Seafield fine sandy loam (where drained)
Sf Seafield Variant fine sandy loam (where drained)
ToA Toronto silt loam, 0 to 1 percent slopes (where drained)
VaB2 Varna silt loam, 1 to 6 percent slopes, eroded
Wh Whitaker silt loam (where drained)
WnB2 Wingate Variant silt loam, 1 to 6 percent slopes, eroded
Wo Wolcott clay loam (where drained)
Wv Wolcott clay loam, limestone substratum (where drained)

use and management of the soils

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

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

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

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

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

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

crops and pasture

Carl D. Koch, district conservationist, Soil Conservation Service, helped prepare this section.

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

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

According to the 1967 Conservation Needs Inventory, approximately 90 percent of the survey area was used for crops and pasture: 70 percent was used for corn or soybeans; 10 percent was pasture; 4 percent was in small grains, mainly wheat; and the rest was in conservation practices.

There is very little potential for significantly increasing the acreage of cropland in White County. About 2 percent of the county that is potentially good cropland is used as woodland and about 3 percent as pasture. In addition to the reserve productive capacity represented by this land, food production could also be increased considerably by using the latest crop production technology on all cropland in the county.

The optimal and most beneficial use of the land requires careful planning and good management. Soil limitations and hazards need to be controlled so that the land can be utilized to its fullest potential. In the following paragraphs, the common soil limitations and hazards in the county are discussed. Soil tilth, fertility, and specialty crops are also discussed.

Soil drainage is the major conservation need in White County. Approximately 70 percent of the cropland and pasture in the county needs drainage to improve crop yield. Without adequate drainage, excess water can severely damage or destroy crops.

In most soils the water table is highest during winter and spring and lowest in July and August. Plants use more water in summer, and evaporation is greatest in summer. Most crops have roots that use the desirable mixture of water and air just above the water table.

In spring the water table is high in soils that are not drained, and the roots are confined to the upper part of the soil. In summer when the water table is lower, many roots do not grow fast enough to reach the water that may be several feet down. In a dry summer, plants may be damaged by the lack of water. Plants on soils that have been drained generally have an extensive root system. In spring the roots grow to the water table, which, because of the drainage system, is several feet below the surface. The water supply is usually adequate for these plants throughout the growing season, even in most dry summers.

Many areas of very poorly drained soils, including Cohoctah, Chalmers, Gilford, Maumee, Muskego, Pella, Rensselaer, Rensselaer Variant, and Wolcott soils, have been drained for cultivation. Many more areas need to be drained. Water ponds in many small depressions after heavy rains. Some of these areas can be drained by surface ditches. Other areas need tile drainage that has a water inlet on the surface. These inlets quickly remove ponded water so it does not have to percolate through the soil to reach the tile. A few depressions are difficult to drain because an adequate outlet is not available. This condition exists in many areas of Ackerman and Muskego soils. Many areas of these soils can be drained by a pumping system that lifts the water to an outlet.

Most somewhat poorly drained soils are adequately drained. These include the Aubbeenaubbee, Conover, Crosier, Darroch, Elliott, Morocco, Mundelein, Odell, Seafield, Watseka, and Whitaker soils. Draining these soils lowers the seasonal high water table and protects plant roots from excess water.

All well drained and moderately well drained soils have good natural drainage and do not need artificial drainage. Some natural drainageways and small depressions on these soils, however, are very wet. These areas may need artificial drainage.

Most farm drainage systems consist of a combination of surface drains, tile, and open ditches. Surface drains are used to channel standing water to an outlet. Tile drains in most places are installed at a depth of 3 to 4 feet, but the depth varies with the topography. Some fields need a complete system of evenly spaced tile. Other fields simply need randomly placed tile to drain the wettest areas. The type of drainage system depends on many factors including the availability of outlets, the kind of soils, and the soil distribution in the field. The distance between tile drains depends on the permeability of the soil.

Tile placed in soils that have layers of fine sand, for example, Gilford, Maumee, Rensselaer, sandy substratum, and Rensselaer Variant soils, needs a protective covering so the sand will not clog the spaces where water enters the tiles. After the tile is placed in these soils, it is recommended that part of the surface layer or some organic matter be placed directly over the tile and its protective covering. This helps to keep sand from clogging the openings and the protective covering.

Approximately 500 miles of open ditches in the county provide outlets for tile drains and transport large quantities of excess surface water.

Many factors need to be considered in draining organic soils. The initial removal of water from these soils will cause some subsidence. Subsidence and the unstable soil material can cause tile to settle and move out of line. In some areas of Muskego soils, some water inlets to the tile will quickly plug up with material as a result of chemical and biological reactions within the soil.

In organic soils, continuous lines of tile seem to stay in place better than individual small sections. Tile lines with large holes are less likely to plug up than those with small holes. The oxidation of organic soils is minimized by drainage systems that keep the water table at the level required by crops during the growing season and raise it to the surface during other parts of the year. Information about drainage design for any soil is available at the local office of the Soil Conservation Service.

Soil erosion is a hazard on about 5 percent of the cropland and pastureland in White County. Soils that have a loamy surface layer and slope greater than 2 percent are susceptible to erosion.

Loss of the surface layer through erosion is damaging for two reasons. First, productivity is reduced because the nutrients and the friable consistency of the surface layer are lost. Second, soil erosion produces sediment that is deposited on lower lying soils or enters ditches and streams.

In a few undulating fields there are small areas where the original surface layer has been severely eroded. In these areas the clay loam subsoil is exposed. The subsoil is difficult to till, and a good seedbed is difficult to prepare.

Erosion can be controlled by crop residue management, grasses and legumes in a crop rotation, conservation tillage, contour farming, grassed waterways, tile outlet terraces, or a combination of these practices. Grasses and legumes can effectively control erosion.

Sloping soils need a cover of vegetation to reduce erosion caused by water. On such soils, the residue from previous crops should be left on the surface. Tillage that does not invert the soil should be used. Crop rotation also helps reduce soil loss.

Terracing and farming on the contour help control erosion. Contour tillage is used on many small knolls and on short narrow slopes. Terraces and contour tillage can be used in only a few areas in White County because most slopes are short and irregular. Also, good outlets are not available for terraces. Therefore, cropping systems that provide substantial vegetative cover are needed in most areas of White County. No tillage cultivation for corn is effective in reducing erosion and can be adapted to most soils in the county.

Grassed waterways are needed on a few sloping areas of Alvin, Martinsville, Montmorenci, Octagon, Riddles, and Varna soils. Drainageways are necessary in many areas of somewhat poorly drained and very poorly drained soils, where large watersheds drain. Tile drainage is generally needed under grassed waterways and drainageways.

Many grade stabilization structures are needed for the large number of open ditches in the county. These structures help reduce erosion by slowing the movement of surface water.

Soil blowing occurs when wind dislodges soil particles with enough velocity that they become airborne. The distance that soil particles travel depends on the wind velocity and the size, density, and shape of the soil particle. The most erodible soil particles are sand-size particles 0.1 millimeter in diameter. Fine sand and very fine sand consist mostly of this size particle. Once soil blowing has started, other particles become airborne. Some particles of silt and clay become suspended in the atmosphere until rain falls or the wind calms.

In White County, soil blowing occurs most often on soils that have a surface layer of fine sandy loam, loamy fine sand, or fine sand. These soils are mainly in the northern part of the county.

Soil blowing occurs mainly in spring when winds are strong. Soils in fields that have little vegetative cover are susceptible to soil blowing. Early in spring, soil blowing occurs most often on cultivated soils. Later in spring, it occurs in fields of young crops. Soil blowing severely damages young crops, especially soybeans.

Soil blowing can be controlled by windbreaks, proper use of crop residue, minimum tillage, or a combination of these practices. Ridges and furrows made by a field cultivator also effectively control soil blowing, especially when a substantial amount of crop residue is incorporated into the surface layer. Vegetation such as wheat (fig. 12), grasses, and legumes helps reduce or eliminate soil blowing.

Field windbreaks are generally planted on the west side of the field. The spacing between windbreaks depends on several factors including the size of mature trees, the size of the area needing protection, and the amount of protection required. For more information about windbreaks and desirable species of trees to plant, see the section "Windbreaks and environmental plantings."

The use of crop residue and conservation tillage helps reduce soil blowing. The crop residue lowers the wind velocity at the surface of the soil and reduces soil blowing. No tillage cultivation for corn effectively reduces soil blowing and can be used on most soils in the survey area. Information about methods to control soil blowing is available at local offices of the Soil Conservation Service.

Droughtiness is a limitation of the sandy soils in White County. These soils retain sufficient moisture to get crops started. Their moderate or low water holding capacity, however, and insufficient rainfall in summer

Figure 12.—Crop residue or vegetative cover, such as the wheat in the foreground, helps reduce or eliminate soil blowing, which is a hazard in cultivated areas of Morocco fine sand.

cause drought in these soils. Drought can substantially reduce yields.

Irrigation can supply needed water to plants during dry periods. In many areas, large amounts of ground water are within a few feet of the surface and could be a source of water for irrigation.

In areas of wet soils, tile drainage is necessary to lower the water table in spring. In some of these soils where droughtiness is a limitation, water flow could be reversed in the tiles to provide limited subirrigation during dry periods.

Without irrigation, soils that are droughty are poorly suited to many crops. If row crops are grown on these soils, the productivity will be less than the productivity of a soil that has a high available water capacity. In most years, a low or below average yield can be expected from droughty soils.

Soil tilth is important for the germination of seeds and for the infiltration of water into the soil. Soils that have good tilth are friable, granular, and porous.

Most of the soils in the northern part of the county have a friable or very friable surface layer. These soils have good tilth and generally are easy to till. Fall plowing of soils that are susceptible to soil blowing is not recommended. Such soils should be plowed in spring.

Most of the soils in the southern part of the county have a friable surface layer. These soils also have good tilth. Generally they are easy to till under favorable moisture conditions. Some of the very poorly drained soils have a surface layer of clay loam or silty clay loam. If these soils are tilled when they are wet, large clods form. The clods make it difficult to prepare a seedbed. Plowing these soils in fall generally results in good tilth in the spring.

Intensive cultivation of organic soils over a period of many years will cause substantial decomposition of the organic matter. In most areas of Ackerman soils and in many areas of Muskego soils this decomposition exposes coprogenous earth. When this material dries, it is very hard and brittle. Cultivation is difficult, and clods remain on the surface. A seedbed is difficult to prepare under these circumstances.

Soil fertility is low or moderate in the sandy soils in the northern part of the county. Fertility is moderate or high in the loamy soils in the southern part of the county. Available phosphorus and potassium levels are low for most of the soils.

Reaction of the soils in the county varies widely. The very poorly drained soils are normally neutral or slightly acid. Most sandy soils in the northern part of the county are medium acid or strongly acid. Some sandy soils are slightly acid or neutral. The loamy soils in the southern part of the county are typically medium acid. Applications of lime and fertilizer on all the soils should be based on the results of soil tests, on the need of the crop, and on the expected yields. Most fertilizer companies or the Cooperative Extension Service can help determine the kind and amount of fertilizer and lime to apply.

Field crops commonly grown in the survey area are corn, soybeans, and wheat. Also suited to the soils and climate are oats, barley, rye, sunflowers, and sorghums grown for forage. Grass and legume seed could be produced from alfalfa, bromegrass, bluegrass, various clovers, fescue, orchardgrass, and redtop.

Legumes and grasses are used for hay, pasture, and erosion control. Many legumes and grasses are suited to the soils and climate of the survey area. Suitable legumes include alfalfa, birdsfoot trefoil, ladino clover, little red clover, mammoth clover, and sweetclover. Suitable grasses include brome, bluegrass, fescue, orchardgrass, redtop, reed, canarygrass, sudangrass, and sudex.

Specialty crops, for example, popcorn, mint, vegetables, and fruit, are of limited commercial importance in the county and take up only a small acreage. Deep soils that have good natural drainage and that warm up early in spring are especially well suited to many vegetables and small fruit. Martinsville and Riddles soils on slopes of less than 8 percent are well suited. Very poorly drained Maumee soils are well suited to mint. If adequately drained, Muskego muck and Ackerman muck are suited to many vegetable crops. Most of the well drained soils are suited to orchards and nursery plants.

Information on growing specialty crops can be obtained from local offices of the Cooperative Extension Service and Soil Conservation Service.

yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

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

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

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

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

land capability classification

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

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

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

Class I soils have slight limitations that restrict their use.

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

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

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

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

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

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

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

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

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

The acreage of soils in each capability subclass is shown in table 7. The capability classification of each map unit is given in the section "Detailed soil map units."

woodland management and productivity

Mitchell G. Hassler, forester, Soil Conservation Service, helped prepare this section.

Table 8 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

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

In table 8, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

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

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

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

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

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

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

windbreaks and environmental plantings

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

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

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

Table 9 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 9 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a nursery.

recreation

The soils of the survey area are rated in table 10 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 10, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 10 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 13 and interpretations for dwellings without basements and for local roads and streets in table 12.

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

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

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

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

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

wildlife habitat

James D. McCall, wildlife biologist, Soil Conservation Service, helped prepare this section.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 11, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

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

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

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

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

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

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

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

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

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

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

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

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

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

engineering

Max L. Evans, state conservation engineer, Soil Conservation Service, helped prepare this section.

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

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

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

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

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

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

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

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

building site development

Table 12 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

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

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

sanitary facilities

Table 13 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 13 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 13 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 13 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

Table 14 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 14, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

water management

Table 15 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

engineering index properties

Table 16 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

physical and chemical properties

Table 17 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.
2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 17, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

soil and water features

Table 18 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 18 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 18 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 18.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*5*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 19, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

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

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

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

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

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

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

soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*4*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*5*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

Abscota series

The Abscota series consists of deep, moderately well drained, rapidly permeable soils. These soils formed in sandy alluvium on bottom lands. Slopes range from 0 to 3 percent.

Abscota soils are similar to Oakville, wet substratum, soils and are adjacent to Cohoctah soils. Oakville, wet substratum, soils are predominantly fine sand and did not develop in alluvium. Cohoctah soils have a mollic epipedon and are mottled in the subsoil. They are slightly concave and are in a lower position on the landscape.

Typical pedon of Abscota loamy fine sand, occasionally flooded, in a cultivated field, 750 feet north and 1,500 feet west of the southeast corner of sec. 32, T. 25 N., R. 3 W.

Ap—0 to 10 inches; dark brown (10YR 4/3) loamy fine sand, pale brown (10YR 6/3) dry; weak medium granular structure; very friable; slightly acid; abrupt smooth boundary.

B2—10 to 20 inches; yellowish brown (10YR 5/6) loamy fine sand; weak medium subangular blocky structure; very friable; slightly acid; clear wavy boundary.

C1—20 to 35 inches; yellowish brown (10YR 5/4) sand; single grain; loose; slightly acid; clear wavy boundary.

C2—35 to 60 inches; yellowish brown (10YR 5/4) sand; common coarse faint dark yellowish brown (10YR 4/4) mottles; single grain; loose; 3 percent fine gravel; slightly acid.

The solum is slightly acid to mildly alkaline.

The A horizon is dark brown (10YR 4/3), very dark grayish brown (10YR 3/2), or dark grayish brown (10YR 4/2). It is dominantly loamy fine sand but the range includes fine sand, sand, and fine sandy loam. The B horizon has hue of 10YR, value of 5 or 6, and chroma of 3 to 6. It is loamy fine sand, fine sand, or sand. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 6.

Ackerman series

The Ackerman series consists of deep, very poorly drained soils. Ackerman soils formed in organic material over sandy sediment on outwash plains. Permeability is slow in the organic material and rapid in the underlying material. Slopes range from 0 to 2 percent.

Ackerman soils are similar to Rensselaer Variant soils and are adjacent to Maumee soils. Rensselaer Variant and Maumee soils have a mollic epipedon, unlike Ackerman soils. Maumee soils are in slightly higher positions on the landscape.

Typical pedon of Ackerman muck, drained, in a cultivated field, 140 feet south and 1,000 feet west of the northeast corner of sec. 28, T. 28 N., R. 2 W.

Oap—0 to 8 inches; black (N 2/0) broken face and rubbed sapric material, very dark gray (10YR 3/1) dry; less than 5 percent fiber; a trace rubbed; moderate fine granular structure; friable; about 40 percent mineral content; neutral; abrupt irregular boundary.

Lcog—8 to 14 inches; gray (5Y 5/1) coprogenous earth; no fiber; many medium distinct yellowish brown (10YR 5/4) mottles; moderate medium and thick platy structure; friable; common cracks 1 to 2 inches wide filled with surface material; areas around many root channels are strong brown (7.5YR 5/6) and many small root channels are filled with surface material; neutral; abrupt smooth boundary.

IIC1g—14 to 26 inches; light brownish gray (10YR 6/2) fine sand; few medium distinct brown (7.5YR 4/4) mottles; single grain; loose; neutral; clear wavy boundary.

IIC2—26 to 60 inches; brownish yellow (10YR 6/8) fine sand; single grain; loose; strong effervescence; moderately alkaline.

The combined thickness of the sapric material and coprogenous earth ranges from 10 to 16 inches.

The Oap horizon is black (N 2/0 or 10YR 2/1). The mineral content varies from about 10 to 60 percent. In some places, there is an Oa2 horizon that is similar to the Oap horizon. The Lcog horizon has hue of 10YR to 5Y, value of 3 to 5, and chroma of 1 or 2. It has platy structure or is massive. The IIC horizon has hue of 10YR to 5Y, value of 5 or 6, and chroma of 1 to 8. It is very fine sand, fine sand, sand, or loamy sand.

Alvin series

The Alvin series consists of deep, well drained soils that formed in sandy and loamy sediment on outwash plains. Alvin soils are moderately rapidly permeable in the subsoil and rapidly permeable in the underlying material. Slopes range from 0 to 6 percent.

Alvin soils are similar to Owosso and Oakville, wet substratum, soils and are adjacent to Seafield and Whitaker soils. Owosso soils have more clay in the lower part of the solum than Alvin soils. Oakville soils have more sand and less clay throughout the solum. Seafield soils have a mollic epipedon, are mottled in the subsoil, and are in lower lying positions on the landscape. Whitaker soils are mottled in the upper part of the subsoil and are more clayey.

Typical pedon of Alvin fine sandy loam, 0 to 2 percent slopes, in a cultivated field, 1,250 feet west and 890 feet south of the northeast corner of sec. 8, T. 26 N., R. 4 W.

Ap—0 to 10 inches; dark brown (10YR 4/3) fine sandy loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

B1t—10 to 18 inches; yellowish brown (10YR 5/4) loam; weak medium subangular blocky structure; friable; few very fine roots; common root channels filled with surface material; thin continuous dark yellowish brown (10YR 4/4) clay films bridging sand grains; neutral; clear wavy boundary.

B21t—18 to 24 inches; dark yellowish brown (10YR 4/6) fine sandy loam; weak medium subangular blocky structure; friable; few very fine roots; thin continuous dark yellowish brown (10YR 4/4) clay films bridging sand grains and as linings in root channels; slightly acid; clear wavy boundary.

B22t—24 to 35 inches; yellowish brown (10YR 5/6) fine sandy loam; weak coarse subangular blocky structure; friable; few very fine roots; thin continuous dark yellowish brown (10YR 4/4) clay films bridging sand grains; common continuous distinct medium pale brown (10YR 6/3) sand coatings as linings in root channels; slightly acid; clear irregular boundary.

C1—35 to 47 inches; pale brown (10YR 6/3) fine sand; common medium distinct yellowish brown (10YR 5/4) mottles; single grain; loose; few very fine roots; medium acid; clear wavy boundary.

C2—47 to 60 inches; yellowish brown (10YR 5/4) loamy fine sand; massive; friable; common coarse distinct pale brown (10YR 6/3) streaks; medium acid.

The solum is 30 to 55 inches thick.

The Ap horizon is dark grayish brown (10YR 4/2) or dark brown (10YR 4/3). The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is fine sandy loam, loam, or sandy clay loam and is medium acid to neutral. The C horizon is yellowish brown (10YR 5/4 and 5/6) or pale brown (10YR 6/3). It is fine sand or loamy fine sand and is commonly medium acid to moderately alkaline.

Aubbeenaubbee series

The Aubbeenaubbee series consists of deep, somewhat poorly drained soils. These soils are moderately rapidly permeable in the upper part of the subsoil and moderately permeable or moderately slowly permeable in the lower part of the subsoil and in the underlying material. They formed in loamy sediment and the underlying loamy glacial till on till plains. Slopes range from 0 to 1 percent.

Aubbeenaubbee soils are similar to Crosier, Seafield, and Whitaker soils and are adjacent to Owosso soils. Crosier and Whitaker soils have less sand in the surface layer and in the upper part of the subsoil than Aubbeenaubbee soils, and Whitaker soils are stratified in the lower part of the solum. Seafield soils have a mollic epipedon and have less clay in the lower part of the subsoil. Owosso soils do not have mottles in the subsoil and are in slightly higher convex areas.

Typical pedon of Aubbeenaubbee fine sandy loam, 0 to 1 percent slopes, in a cultivated field, 1,800 feet north and 1,300 feet west of the southeast corner of sec. 9, T. 27 N., R. 3 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) fine sandy loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; very friable; common fine roots; neutral; abrupt smooth boundary.

A2—8 to 15 inches; grayish brown (10YR 5/2) fine sandy loam; many medium faint brown (10YR 5/3) and yellowish brown (10YR 5/4) mottles; moderate medium granular structure; very friable; few fine roots; medium acid; clear wavy boundary.

B1—15 to 21 inches; dark yellowish brown (10YR 4/4) fine sandy loam; many medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; few fine roots; thick continuous gray (10YR 6/1) sand coatings on faces of peds; medium acid; clear wavy boundary.

B21tg—21 to 27 inches; dark grayish brown (10YR 4/2) sandy clay loam; many medium distinct brown (7.5YR 4/4) mottles; weak coarse subangular blocky structure; firm; few fine roots; continuous dark gray (10YR 4/1) clay and organic films on faces of peds; few medium distinct black (10YR 2/1) accumulations of iron and manganese oxide; slightly acid; clear wavy boundary.

IIB22t—27 to 32 inches; yellowish brown (10YR 5/6) clay loam; common medium distinct brownish yellow (10YR 6/6) and grayish brown (10YR 6/2) mottles; moderate coarse subangular blocky structure; firm; few fine roots; medium continuous dark gray (10YR 4/1) organic coatings and clay films on faces of peds and as linings in channels; common medium distinct accumulations of brown (7.5YR 4/4) and black (10YR 2/1) iron and manganese oxide; neutral; clear wavy boundary.

IIB23tg—32 to 40 inches; grayish brown (10YR 5/2) clay loam; moderate medium distinct yellowish brown (10YR 5/4) mottles; weak coarse subangular blocky structure; firm; thick continuous dark gray (10YR 4/1) organic coatings and clay films on faces of peds and as linings in channels; 5 percent fine gravel; neutral; abrupt wavy boundary.

IIC—40 to 60 inches; brown (10YR 5/3) loam; many coarse distinct light gray (10YR 6/1 and 7/1) and yellowish brown (10YR 5/6) mottles; massive; firm; 10 percent fine gravel; violent effervescence; moderately alkaline.

The solum is 36 to 50 inches thick. The loamy outwash material is 18 to 36 inches thick.

The A horizon is loamy fine sand, sandy loam, or fine sandy loam. Some pedons do not have an A2 horizon. The B2 horizon has hue of 10YR, value of 4 to 6, and chroma of 2. The IIB2 horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 6. It is medium acid to neutral.

Brems series

The Brems series consists of deep, moderately well drained, rapidly permeable soils. Brems soils formed in sandy sediment on outwash plains. Slopes range from 0 to 2 percent.

These soils have more fine sand and very fine sand than the amount defined for the series. This difference, however, does not affect the use or behavior of these soils.

Brems soils are similar to Morocco, Oakville, wet substratum, and Seafield Variant soils and are adjacent to Morocco soils. Morocco soils are mottled in the upper part of the subsoil, unlike Brems soils, and are in a lower position on the landscape. Oakville, wet substratum, soils do not have low chroma mottles in the solum. Seafield Variant soils have limestone bedrock at a depth of 40 to 84 inches and have a mollic epipedon.

Typical pedon of Brems loamy fine sand, 0 to 2 percent slopes, in a cultivated field, 1,225 feet west and 1,425 feet north of the center of sec. 5, T. 26 N., R. 4 W.

Ap—0 to 9 inches; brown (10YR 4/3) loamy fine sand, pale brown (10YR 6/3) dry; weak medium granular structure; very friable; few very fine roots; neutral; abrupt smooth boundary.

B21—9 to 16 inches; yellowish brown (10YR 5/4) loamy fine sand; massive; friable; few very fine roots; medium acid; clear wavy boundary.

B22—16 to 24 inches; yellowish brown (10YR 5/4) loamy fine sand; common medium faint brown (7.5YR 4/4) mottles; massive; friable; medium acid; clear wavy boundary.

B23g—24 to 31 inches; light gray (10YR 7/2) loamy fine sand; many medium distinct strong brown (7.5YR 5/6) mottles; massive; friable; strongly acid; clear wavy boundary.

B24—31 to 48 inches; yellowish brown (10YR 5/4) loamy fine sand; common medium distinct gray (10YR 6/1), grayish brown (10YR 5/2), and strong brown (7.5YR 5/6) mottles; massive; friable; medium acid; clear wavy boundary.

Cg—48 to 60 inches; mottled gray (10YR 6/1) and yellowish brown (10YR 5/6) loamy fine sand; massive; friable; medium acid.

The solum is 40 to 65 inches thick.

The Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 2 or 3. The B horizon has hue of 10YR or 7.5YR, value of 5 to 7, and chroma of 2 to 6. It is medium acid or strongly acid. The C horizon has hue of 10YR, value of 5 or 6, and chroma of 1 to 8. It is slightly acid or medium acid.

Chalmers series

The Chalmers series consists of deep, very poorly drained soils. These soils are moderately permeable in the solum and moderately slowly permeable in the underlying material. They formed in silty glacial till on till plains and moraines. Slopes range from 0 to 2 percent.

Chalmers soils are similar to Pella and Wolcott soils and are adjacent to Toronto and Wingate Variant soils. Unlike Chalmers soils, Pella soils are stratified in the underlying material. Wolcott soils have a clay loam and loam subsoil, and the underlying material is loam. Toronto soils have a browner subsoil and are in slightly higher convex areas. Wingate Variant soils have a browner subsoil, are not mottled in the upper part of the subsoil, and are on adjacent gently sloping landforms.

Typical pedon of Chalmers silty clay loam, in a cultivated field, 580 feet east and 500 feet north of the southwest corner of sec. 25, T. 25 N., R. 6 W.

Ap—0 to 9 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate medium granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

A12—9 to 13 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; few fine distinct grayish brown mottles; moderate medium granular structure; friable; common fine roots; neutral; clear smooth boundary.

B21g—13 to 18 inches; grayish brown (2.5Y 5/2) silty clay loam; common medium distinct gray (10YR 5/1) and yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin patchy very dark gray (10YR 3/1) organic coatings on faces of peds; thick continuous black (10YR 2/1) surface material in old root channels; few pebbles; neutral; clear wavy boundary.

B22g—18 to 27 inches; grayish brown (2.5Y 5/2) silty clay loam; common medium distinct gray (10YR 5/1) and yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thin continuous dark gray (10YR 4/1) organic and silt coatings on faces of peds; few pebbles; neutral; clear wavy boundary.

IIB23g—27 to 38 inches; grayish brown (2.5YR 5/2) loam; many medium prominent yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thin continuous dark gray (10YR 4/1) organic and silt coatings on faces of peds; 2 percent fine gravel; neutral; clear wavy boundary.

IIB3—38 to 49 inches; yellowish brown (10YR 5/6) silt loam; many medium distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; thin patchy dark gray (10YR 4/1) organic and silt coatings on faces of peds and in old root channels; 2 percent fine gravel; mildly alkaline; clear wavy boundary.

IIC—49 to 60 inches; brown (10YR 5/3) silt loam; common medium faint grayish brown (10YR 5/2) mottles; massive; firm; strong effervescence; moderately alkaline.

The solum is 40 to 60 inches thick.

The Bg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. The IIBg horizon is silty clay loam, clay loam, loam, or silt loam. The Cg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 4.

Chelsea series

The Chelsea series consists of deep, excessively drained, rapidly permeable soils. Chelsea soils formed in sandy sediment or in sand reworked by wind, on outwash plains. Slopes range from 2 to 15 percent.

Chelsea soils are adjacent on the landscape to Morocco and Oakville soils. Morocco and Oakville soils do not have bands in the subsoil and are in lower lying positions than Chelsea soils. Morocco soils are mottled in the upper part of the subsoil.

Typical pedon of Chelsea fine sand, 6 to 15 percent slopes, in a wooded area, 2,610 feet east and 20 feet south of the northwest corner of sec. 27, T. 28 N., R. 2 W.

A1—0 to 5 inches; very dark grayish brown (10YR 3/2) fine sand, grayish brown (10YR 5/2) dry; weak medium granular structure; very friable; many fine roots; slightly acid; abrupt smooth boundary.

A21—5 to 26 inches; dark yellowish brown (10YR 4/4) fine sand; single grain; loose; few fine roots; medium acid; clear irregular boundary.

A22—26 to 37 inches; yellowish brown (10YR 5/4) fine sand; single grain; loose; few fine roots; medium acid; abrupt wavy boundary.

A&B—37 to 80 inches; yellowish brown (10YR 5/4) fine sand (A part); single grain; loose; several thin lamellae of dark brown (7.5YR 4/4) loamy fine sand (B part); very friable; lamellae are 1/4 to 2 inches thick, are spaced 2 to 6 inches apart, and have a cumulative thickness of 5 inches; clay bridges connect sand grains in the bands; medium acid.

The solum is 4 to 15 feet thick.

The A1 horizon has hue of 10YR, value of 3, and chroma of 2 or 3. Cultivated areas have an Ap horizon that has hue of 10YR, value of 3 to 5, and chroma of 2 or 3. The A2 horizon has hue of 10YR, value of 4 or 5, and chroma of 4 to 6. Depth to the uppermost lamellae ranges from 27 to 48 inches. Total thickness of the lamellae above 60 inches ranges from 1/4 to less than 6 inches.

Cohoctah series

The Cohoctah series consists of deep, very poorly drained, moderately rapidly permeable soils. Cohoctah soils formed in loamy alluvium on bottom lands. Slopes range from 0 to 2 percent.

Cohoctah soils are adjacent to Abscota soils. Unlike Cohoctah soils, Abscota soils do not have a mollic epipedon and mottles, and they are in slightly higher positions on the landscape.

Typical pedon of Cohoctah fine sandy loam, occasionally flooded, in a cultivated field, 1,000 feet east and 800 feet south of the northwest corner of sec. 12, T. 28 N., R. 3 W.

Ap—0 to 9 inches; black (10YR 2/1) fine sandy loam, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

A12—9 to 15 inches; black (10YR 2/1) fine sandy loam, dark gray (10YR 4/1) dry; common fine distinct grayish brown (10YR 5/2) mottles; moderate medium granular structure; friable; few fine roots; neutral; clear wavy boundary.

C1g—15 to 22 inches; gray (10YR 5/1) fine sandy loam; many medium distinct yellowish brown (10YR 5/6) mottles; weak medium granular structure; friable; few fine roots; common vertical root channels 1 millimeter in diameter filled with surface material; neutral; clear wavy boundary.

C2g—22 to 30 inches; gray (10YR 5/1) loamy fine sand; many medium distinct yellowish brown (10YR 5/4 and 5/6) mottles; massive; very friable; neutral; clear wavy boundary.

C3g—30 to 39 inches; mottled gray (10YR 5/1) and yellowish brown (10YR 5/8) loamy fine sand; massive; very friable; few accumulations of dark brown (7.5YR 4/4) iron and manganese oxide 2 millimeters in diameter; neutral; clear wavy boundary.

C4g—39 to 60 inches; gray (10YR 5/1) fine sandy loam; few medium distinct yellowish brown (10YR 5/4) mottles; massive; very friable; neutral.

The solum is neutral in the upper part and neutral or mildly alkaline in the lower part.

The A horizon is black (10YR 2/1) or very dark gray (10YR 3/1). It is loam or fine sandy loam. The Cg horizon has hue of 10YR, value of 4 to 6, and chroma of 1. It has faint to prominent mottles.

Conover series

The Conover series consists of deep, somewhat poorly drained, moderately slowly permeable soils. Conover soils formed in loamy glacial till on till plains. Slopes range from 0 to 1 percent.

Conover soils are similar to Montmorenci, Odell, and Toronto soils and are adjacent to Montmorenci and Wolcott soils. Montmorenci soils are in slightly higher convex areas, and, unlike Conover soils, they do not have mottles in the upper part of the subsoil. Odell and Wolcott soils have a mollic epipedon. Wolcott soils have a gray subsoil and are in adjacent lower lying flat areas. Toronto soils have a thicker dark surface layer than that of Conover soils; they have a silty clay loam subsoil and silt loam underlying material.

Typical pedon of Conover loam, 0 to 1 percent slopes, in a cultivated field, 200 feet north and 1,250 feet west of the southeast corner of sec. 36, T. 27 N., R. 6 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; few fine roots; few medium distinct yellowish brown (10YR 5/4) splotches; neutral; abrupt smooth boundary.

B21t—9 to 14 inches; brown (10YR 5/3) clay loam; many fine faint grayish brown (10YR 5/2) and few fine distinct yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; firm; few fine roots; discontinuous dark grayish brown (10YR 4/2) clay and organic films on faces of peds and as linings in channels; 2 percent fine gravel; medium acid; clear wavy boundary.

B22t—14 to 22 inches; brown (10YR 5/3) clay loam; many fine distinct yellowish brown (10YR 5/6) and common fine faint grayish brown (10YR 5/2) mottles; moderate coarse prismatic structure parting to weak coarse subangular blocky; firm; few fine roots; thin patchy dark gray (10YR 4/1) and grayish brown (10YR 5/2) clay films on faces of peds and as linings in channels; common accumulations of fine black (10YR 2/1) iron and manganese oxide; 2 percent fine gravel; medium acid; clear wavy boundary.

B23t—22 to 30 inches; yellowish brown (10YR 5/4) loam; common medium distinct grayish brown (10YR 5/2) mottles; moderate coarse subangular blocky structure; firm; few fine roots; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds and as linings in channels; common accumulations of fine black (10YR 2/1) iron and manganese oxide; 5 percent fine gravel; neutral; clear wavy boundary.

B3g—30 to 35 inches; grayish brown (10YR 5/2) loam; many medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; common accumulations of fine dark brown (7.5YR 4/4) iron oxide; 5 percent fine gravel; neutral; clear wavy boundary.

C—35 to 60 inches; yellowish brown (10YR 5/4) loam; common medium distinct gray (10YR 5/1) mottles; massive; firm; few prominent stains of fine yellowish red (5YR 5/8) iron oxide; 10 percent fine gravel; strong effervescence; moderately alkaline.

The solum is 24 to 40 inches thick.

The Ap horizon is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). It is loam, silt loam, or sandy loam. The B2t horizon has hue of 10YR, value of 5, and chroma of 3 or 4. It is loam, clay loam, or silty clay loam. The C horizon has hue of 10YR, value of 5, and chroma of 3 or 4.

Crosier series

The Crosier series consists of deep, somewhat poorly drained, moderately slowly permeable soils. Crosier soils formed in loamy glacial till on till plains. Slopes range from 0 to 2 percent.

Crosier soils are similar to Aubbeenaubbee and Whitaker soils and are adjacent to Riddles soils. Aubbeenaubbee soils have more sand in the surface layer and in the upper part of the subsoil than Crosier soils. Whitaker soils have stratified loamy sand, sandy loam, and silt loam in the underlying material. Riddles soils do not have mottles in the subsoil and are in adjacent convex areas.

Typical pedon of Crosier silt loam, 0 to 2 percent slopes, in a cultivated field, 1,200 feet north and 85 feet east of the center of sec. 14, T. 27 N., R. 3 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; common fine roots; few accumulations of fine distinct dark brown (7.5YR 3/2) iron and manganese oxide; neutral; abrupt smooth boundary.

A2—9 to 11 inches; light brownish gray (10YR 6/2) silt loam; many medium distinct yellowish brown (10YR 5/4) mottles; moderate medium platy structure; friable; few very fine roots; slightly acid; clear wavy boundary.

B21t—11 to 19 inches; yellowish brown (10YR 5/4) silt loam; many medium distinct light brownish gray (10YR 6/2) mottles; moderate fine subangular blocky structure; friable; few very fine roots; thin continuous grayish brown (10YR 5/2) silt and clay films on faces of peds; slightly acid; clear wavy boundary.

IIB22tg—19 to 27 inches; grayish brown (10YR 5/2) loam; many medium distinct strong brown (7.5YR 5/6) mottles; moderate fine subangular blocky structure; firm; few very fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds and as linings in channels; medium continuous light gray (10YR 7/2) silt coatings on faces of peds; 2 percent fine gravel; medium acid; clear wavy boundary.

IIB23tg—27 to 38 inches; light brownish gray (10YR 6/2) clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few very fine roots; medium continuous very dark gray (10YR 3/1) and dark gray (10YR 4/1) clay films on faces of peds and as linings in channels; 10 percent fine gravel; medium acid; clear wavy boundary.

IIC1—38 to 54 inches; yellowish brown (10YR 5/4) loam; few medium distinct light brownish gray (10YR 6/2) mottles; massive; firm; 5 percent fine gravel; violent effervescence; moderately alkaline; clear wavy boundary.

IIC2—54 to 60 inches; yellowish brown (10YR 5/4) loam; common medium distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) mottles; massive; firm; 5 percent fine gravel; violent effervescence; moderately alkaline.

The solum is 24 to 40 inches thick.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. Dry value is 6 or higher. The Ap horizon is loam, silt loam, or sandy loam. The A2 and B1t horizons are loam or silt loam. Some pedons do not have an A2 horizon. The B2t horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 6. It is silt loam or silty clay loam. The IIB2t horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 6. The C horizon has hue of 10YR, value of 5, and chroma of 3 or 4.

Darroch series

The Darroch series consists of deep, somewhat poorly drained, moderately slowly permeable soils. These soils formed in loamy outwash material on outwash plains. Slopes range from 0 to 2 percent.

The C horizon of these soils is slightly sandier than what is prescribed for the series. Also, it lacks significant stratification and is not calcareous. These differences, however, do not affect the use or behavior of these soils.

Darroch soils are similar to Mundelein, Odell, and Whitaker soils and are adjacent to Martinsville and Rensselaer soils. Mundelein soils are silty clay loam in the upper part of the soil, unlike Darroch soils. Odell soils are not stratified in the underlying material. Rensselaer soils have a gray subsoil and are in adjacent, lower lying flat areas. Whitaker and Martinsville soils do not have a mollic epipedon. Martinsville soils do not have mottles in the subsoil and are in slightly higher convex areas.

Typical pedon of Darroch silt loam, in a cultivated field, 160 feet west and 1,350 feet south of the center of sec. 14, T. 26 N., R. 5 W.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; common fine and medium roots; slightly acid; abrupt smooth boundary.

B1—10 to 13 inches; brown (10YR 5/3) silt loam; few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium granular structure; friable; few fine roots; very dark grayish brown (10YR 3/2) surface material in old root channels; medium acid; clear wavy boundary.

B21tg—13 to 18 inches; grayish brown (10YR 5/2) silt loam; many fine distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin continuous gray (10YR 5/1) clay films on faces of peds; medium acid; clear wavy boundary.

IIB22tg—18 to 31 inches; grayish brown (10YR 5/2) clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thin patchy dark gray (10YR 4/1) clay films on faces of peds and as linings in old root channels; medium acid; clear wavy boundary.

IIB3g—31 to 38 inches; gray (10YR 6/1) fine sandy loam; common medium distinct yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; friable; few fine roots; medium continuous light gray (10YR 7/1) sand coatings on faces of peds; medium acid; clear wavy boundary.

IIC1g—38 to 44 inches; light brownish gray (10YR 6/2) fine sandy loam; common medium distinct yellowish brown (10YR 5/6) mottles; massive; very friable; medium acid; clear wavy boundary.

IIC2g—44 to 60 inches; grayish brown (10YR 5/2) stratified fine sandy loam and loamy sand; many medium distinct strong brown (7.5YR 5/6) mottles; massive; friable; slightly acid.

The solum is 24 to 42 inches thick.

The Ap horizon is black (10YR 2/1), very dark gray (10YR 3/1), or very dark grayish brown (10YR 3/2). It is loam or silt loam. The B2t horizon has hue of 10YR, value of 4 to 6, and chroma of 1 to 4. Some pedons have subhorizons of sandy clay loam, sandy loam, or loam. The C horizon is fine sandy loam or stratified fine sand, sand, loamy sand, sandy loam, or loam. It ranges from medium acid to neutral.

Elliott series

The Elliott series consists of deep, somewhat poorly drained, moderately slowly permeable soils. Elliott soils formed in silty glacial till on upland till plains and moraines. Slopes range from 0 to 2 percent.

Elliott soils are similar to Conover, Mundelein, and Odell soils and are adjacent to Pella, till substratum, and Varna soils. Conover and Odell soils have a loam and clay loam subsoil, which is unlike that of Elliott soils. Mundelein soils are developed in stratified material and have free carbonates at a depth of less than 35 inches. Pella, till substratum, soils have a grayer subsoil and are in slightly lower concave areas. Varna soils do not have mottles in the upper part of the subsoil and are on adjacent gently sloping landforms.

Typical pedon of Elliott silt loam, 0 to 2 percent slopes, in a cultivated field, 2,450 feet north and 155 feet west of the southeast corner of sec. 31, T. 26 N., R. 5 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; common fine roots; slightly acid; abrupt smooth boundary.

A12—9 to 15 inches; dark brown (10YR 3/3) silty clay loam, gray (10YR 5/1) dry; moderate fine granular structure; friable; few fine roots; many continuous distinct thin black (10YR 2/1) organic coatings on faces of peds; 1 percent fine gravel; medium acid; clear wavy boundary.

B21t—15 to 24 inches; brown (10YR 5/3) silty clay; common fine faint dark grayish brown (10YR 4/2) mottles; moderate medium prismatic structure parting to moderate fine angular blocky; firm; few fine roots; thin continuous very dark gray (10YR 3/1) organic coatings and clay films on faces of peds; 2 percent fine gravel; slightly acid; clear wavy boundary.

B22t—24 to 35 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct grayish brown (10YR 5/2) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine and very fine roots; thin continuous dark gray (10YR 4/1) organic coatings and clay films on faces of peds; 2 percent fine gravel; neutral; clear wavy boundary.

Cg—35 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam, yellowish brown (10YR 5/6) adjacent to vertical cracks; few medium distinct light brownish gray (10YR 6/2) mottles; massive; firm; medium continuous light gray (10YR 6/1) coatings in vertical cracks; few pebbles and small shale fragments; 5 percent fine gravel; strong effervescence; moderately alkaline.

The solum is 30 to 40 inches thick.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3. The B2t horizon has hue of 10YR, value of 5, and chroma of 3 or 4.

Foresman series

The Foresman series consists of deep, moderately well drained, moderately permeable soils. Foresman soils formed in loamy sediment on outwash plains. Slopes range from 0 to 2 percent.

Foresman soils in White County do not have the stratification and free carbonates in the upper part of the C horizon as defined for the series. Also, they have a slightly grayer B horizon. These differences, however, do not affect the use or behavior of these soils.

Foresman soils are similar to Montmorenci and Seafield Variant soils and are adjacent to Darroch soils on the landscape. Montmorenci soils have a thinner surface layer than that of Foresman soils and are not stratified in the lower part of the underlying material. Seafield Variant soils have limestone bedrock at a depth of 40 to 84 inches and are not stratified. Darroch soils have mottles in the upper part of the subsoil and are in lower lying positions.

Typical pedon of Foresman silt loam, 0 to 2 percent slopes, in a cultivated field, 1,025 feet west and 150 feet south of the northeast corner of sec. 14, T. 25 N., R. 6 W.

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

B1—10 to 13 inches; yellowish brown (10YR 5/4) silt loam; moderate medium granular structure; friable; few fine roots; thin patchy very dark grayish brown (10YR 3/2) organic coatings on faces of peds; common vertical root channels, 3 millimeters in diameter, filled with surface material; medium acid; clear wavy boundary.

B21t—13 to 19 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine angular and subangular blocky structure; firm; few fine roots; thin continuous very dark grayish brown (10YR 3/2) and dark brown (10YR 3/3) organic coatings and clay films on faces of peds; medium acid; clear wavy boundary.

B22t—19 to 24 inches; brown (10YR 5/3) silty clay loam; many fine distinct yellowish brown (10YR 5/6) and brown (7.5YR 4/4) mottles; moderate fine and medium angular and subangular blocky structure; firm; few fine roots; thin continuous dark grayish brown (10YR 4/2) clay films as linings in channels and few discontinuous clay films on faces of peds; medium acid; clear wavy boundary.

IIB23tg—24 to 29 inches; grayish brown (10YR 5/2) fine sandy loam; many medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable; few fine roots; thin patchy dark grayish brown (10YR 4/2) clay films on faces of peds and as linings in channels; medium acid; clear wavy boundary.

IIC1g—29 to 49 inches; light brownish gray (10YR 6/2) loamy fine sand; many coarse distinct yellowish brown (10YR 5/6) mottles; massive; very friable; few fine roots; common prominent accumulations of coarse brown (7.5YR 4/4) iron oxide; few prominent accumulations of fine black (10YR 2/1) iron and manganese oxide; medium acid; clear wavy boundary.

IIC2g—49 to 60 inches; gray (10YR 6/1) fine sand and thin strata of sandy loam; many coarse distinct yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6) mottles; massive; very friable; slightly acid.

The solum is 24 to 44 inches thick.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is loam or silt loam. Reaction ranges from medium acid to neutral. The IIB2t horizon has hue of 10YR, value of 5 or 6, and chroma of 2 to 4. The B horizon is typically clay loam, but some subhorizons are silty clay loam or sandy clay loam. The C horizon is sandy loam, loamy fine sand, or fine sand.

Gilford series

The Gilford series consists of deep, very poorly drained soils. Gilford soils are moderately rapidly permeable in the surface layer and subsoil and rapidly permeable in the underlying material. They formed in loamy sediment on outwash plains. Slopes range from 0 to 2 percent.

These soils have more fine sand and very fine sand than the amount defined for the series. This difference, however, does not affect the use or behavior of these soils.

Gilford soils are similar to Maumee, Rensselaer, sandy substratum, and Rensselaer Variant soils and are adjacent to Seafield soils. Maumee soils have less clay and more sand in the subsoil than Gilford soils. Rensselaer, sandy substratum, and Rensselaer Variant soils have more clay in the subsoil. Rensselaer Variant soils have a thinner solum. Seafield soils have a browner subsoil and are in slightly higher convex areas.

Typical pedon of Gilford fine sandy loam, in a cultivated field, 530 feet east and 1,350 feet south of the center of sec. 26, T. 27 N., R. 4 W.

Ap—0 to 10 inches; black (10YR 2/1) fine sandy loam, dark gray (10YR 4/1) dry; moderate fine granular structure; friable; medium acid; abrupt smooth boundary.

A12—10 to 14 inches; black (10YR 2/1) fine sandy loam, dark gray (10YR 4/1) dry; common fine prominent light yellowish brown (2.5YR 6/4) mottles; weak medium subangular blocky structure; friable; slightly acid; clear wavy boundary.

B21g—14 to 22 inches; dark gray (10YR 4/1) fine sandy loam; many distinct olive (5Y 5/3) and light olive brown (2/5Y 5/6) mottles; moderate medium subangular blocky structure; friable; slightly acid; clear wavy boundary.

B22g—22 to 28 inches; gray (10YR 5/1) sandy clay loam; many fine distinct light yellowish brown (2.5Y 6/4) and yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable; neutral; clear wavy boundary.

B23g—28 to 35 inches; light gray (10YR 6/1) fine sandy loam; moderate faint gray (10YR 5/1) and moderate medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable; neutral; clear wavy boundary.

IIC1g—35 to 42 inches; light gray (10YR 6/1) fine sand; many medium distinct yellowish brown (10YR 5/6) and brownish yellow (10YR 6/6) mottles; single grain; loose; neutral; clear wavy boundary.

IIC2g—42 to 50 inches; mottled light gray (10YR 6/1) and yellowish brown (10YR 5/6) fine sand; single grain; loose; neutral; clear wavy boundary.

IIC3g—50 to 60 inches; light gray (5Y 6/1) fine sand; few fine distinct light yellowish brown (2.5Y 6/4) and gray (N 5/0) mottles; single grain; loose; strong effervescence; moderately alkaline.

The solum is 25 to 40 inches thick.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1. It is medium acid to neutral. The B horizon has hue of 10YR, value of 4 to 6, and chroma of 1 or 2. The C horizon is fine sand, loamy fine sand, or sand, and in some places it is stratified.

A limestone bedrock phase is recognized.

Martinsville series

The Martinsville series consists of deep, well drained, moderately permeable soils. Martinsville soils formed in loamy sediment on outwash plains. Slopes range from 0 to 8 percent.

Martinsville soils are similar to Owosso and Riddles soils and are adjacent to Rensselaer and Whitaker soils. Owosso soils have less clay in the solum than Martinsville soils. Riddles soils formed in loamy till and are not stratified. Rensselaer soils have a mollic epipedon. Rensselaer and Whitaker soils have mottles in the subsoil and are in lower lying positions on the landscape.

Typical pedon of Martinsville silt loam, 0 to 2 percent slopes, in a cultivated field, 20 feet west and 2,400 feet south of the northeast corner of sec. 30, T. 25 N., R. 3 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; medium acid; abrupt smooth boundary.

B1—9 to 13 inches; brown (10YR 5/3) silt loam; moderate medium subangular blocky structure; firm; strongly acid; clear wavy boundary.

B21t—13 to 20 inches; brown (10YR 4/3) silty clay loam; moderate medium subangular blocky structure; firm; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; strongly acid; clear wavy boundary.

IIB22t—20 to 27 inches; brown (10YR 4/3) sandy loam; moderate coarse subangular blocky structure; firm; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; 3 percent fine gravel; strongly acid; clear wavy boundary.

IIB23t—27 to 33 inches; brown (10YR 4/3) sandy loam; weak coarse subangular blocky structure; friable; thin continuous dark brown (7.5YR 4/2) clay films on faces of peds; 5 percent fine gravel; medium acid; clear wavy boundary.

IIB24t—33 to 39 inches; brown (10YR 4/3) sandy loam; weak coarse subangular blocky structure; friable; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; common coarse distinct strong brown (7.5YR 5/6) iron stains; 5 percent fine gravel; slightly acid; clear wavy boundary.

IIB25t—39 to 49 inches; brown (10YR 4/3) sandy loam; weak coarse subangular blocky structure; friable; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; slightly acid; clear wavy boundary.

IIC—49 to 60 inches; yellowish brown (10YR 5/4) silt loam and thin strata of loamy fine sand, fine sand, and sandy loam; many coarse distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; massive; friable; strong effervescence; moderately alkaline.

The solum is 40 to 60 inches thick.

The Ap horizon is dark grayish brown (10YR 4/2) or dark brown (10YR 4/3) silt loam, loam, or fine sandy loam. The B2t and IIB2t horizons have hue of 10YR or

7.5YR, value of 4 or 5, and chroma of 3 or 4. The B2t horizon is silty clay loam or clay loam. The IIB2t horizon is sandy loam, clay loam, or sandy clay loam.

Maumee series

The Maumee series consists of deep, very poorly drained, rapidly permeable soils. Maumee soils formed in sandy sediment on outwash plains. Slopes range from 0 to 2 percent.

Maumee soils are similar to Gilford soils and are adjacent to Ackerman and Morocco soils. Gilford soils have more clay in the subsoil than Maumee soils. Ackerman soils have more organic matter in the surface layer. Morocco soils do not have a mollic epipedon, have a browner subsoil, and are in slightly higher convex areas.

Typical pedon of Maumee loamy fine sand, in a cultivated field, 440 feet west and 950 feet north of the center of sec. 10, T. 28 N., R. 5 W.

Ap—0 to 9 inches; black (N 2/0) loamy fine sand, very dark grayish brown (10YR 3/2) dry; weak fine granular structure; very friable; slightly acid; abrupt smooth boundary.

A12—9 to 15 inches; black (N 2/0) loamy fine sand, very dark grayish brown (10YR 3/2) dry; common medium distinct dark grayish brown (10YR 4/2) mottles; weak medium granular structure; very friable; neutral; clear wavy boundary.

A13—15 to 19 inches; black (N 2/0) loamy fine sand, very dark grayish brown (10YR 3/2) dry; common medium distinct dark grayish brown (10YR 4/2) mottles; moderate fine subangular blocky structure; friable; neutral; abrupt wavy boundary.

C1g—19 to 23 inches; gray (10YR 5/1) fine sand; many medium distinct black (10YR 2/1) and yellowish brown (10YR 5/4) mottles; massive; very friable; strong effervescence; moderately alkaline; clear wavy boundary.

C2g—23 to 28 inches; gray (10YR 6/1) fine sand; many medium distinct yellowish brown (10YR 5/6) mottles; single grain; loose; strong effervescence; moderately alkaline; clear wavy boundary.

C3—28 to 60 inches; yellowish brown (10YR 5/4) fine sand; common medium faint gray (10YR 6/1) mottles; single grain; loose; violent effervescence; moderately alkaline.

The mollic epipedon is 14 to 20 inches thick.

The A horizon is black (N 2/0 or 10YR 2/1) loamy fine sand or fine sand. It is neutral or slightly acid. The C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 4. It is fine sand or loamy fine sand. In some pedons there are thin subhorizons of fine sandy loam. The C horizon is neutral to moderately alkaline.

Montmorenci series

The Montmorenci series consists of deep, moderately well drained, moderately slowly permeable soils. These soils formed in loamy glacial till on till plains. Slopes range from 0 to 2 percent.

Montmorenci soils are similar to Conover, Foresman, and Varna soils and are adjacent on the landscape to Conover and Wolcott soils. Conover soils have mottles in the upper part of the subsoil, unlike Montmorenci soils, and are in lower lying positions on the landscape. Foresman soils have a thicker surface layer and are stratified in the lower part of the underlying material. Varna soils have a thicker surface layer than Montmorenci soils, and they have a silty clay loam subsoil. Wolcott soils have a gray subsoil and are in lower lying concave areas.

Typical pedon of Montmorenci loam, 0 to 2 percent slopes, in a cultivated field, 500 feet west and 1,915 feet north of the southeast corner of sec. 21, T. 27 N., R. 5 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; common medium and fine roots; neutral; abrupt smooth boundary.

B1—9 to 13 inches; brown (10YR 4/3) loam; weak medium subangular blocky structure; friable; few fine roots; thin discontinuous very dark gray (10YR 3/1) organic coatings on faces of peds; neutral; clear wavy boundary.

B21t—13 to 19 inches; brown (10YR 5/3) clay loam; moderate medium subangular blocky structure; firm; few fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; slightly acid; clear wavy boundary.

B22t—19 to 25 inches; yellowish brown (10YR 5/4) clay loam; common medium distinct gray (10YR 6/1) and yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; medium acid; clear wavy boundary.

B23t—25 to 29 inches; yellowish brown (10YR 5/4) clay loam; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; moderate medium and coarse subangular blocky structure; firm; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; neutral; clear wavy boundary.

B3—29 to 40 inches; brown (10YR 5/3) loam; common medium distinct gray (10YR 5/1) and yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; thin discontinuous grayish brown (2.5Y 5/2) clay films in old root channels; strong effervescence; moderately alkaline; clear wavy boundary.

C—40 to 60 inches; yellowish brown (10YR 5/4) loam; massive; firm; thin patchy dark grayish brown (10YR

4/2) clay films in old cracks; strong effervescence; moderately alkaline.

The solum is 26 to 40 inches thick.

The Ap horizon is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). It is loam or silt loam. The B2t horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The C horizon has hue of 10YR, value of 4, and chroma of 3 or 4.

Morocco series

The Morocco series consists of deep, somewhat poorly drained, rapidly permeable soils. Morocco soils formed in sandy sediment on outwash plains. Slopes range from 0 to 2 percent.

These soils have more fine sand and very fine sand than the amount defined for the series. This difference, however, does not affect the use or behavior of these soils.

Morocco soils are similar to Brems and Watseka soils and are adjacent to Brems, Maumee, and Oakville soils. Unlike Morocco soils, Brems soils do not have mottles in the upper part of the subsoil and are in slightly higher convex areas. Maumee and Watseka soils have a mollic epipedon. Maumee soils also have a grayer subsoil and are in lower lying flat areas. Oakville soils do not have gray mottles and are in slightly higher convex areas.

Typical pedon of Morocco fine sand, in a cultivated field, 1,750 feet south and 215 feet west of the northeast corner of sec. 13, T. 28 N., R. 3 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) fine sand, pale brown (10YR 6/3) dry; weak medium granular structure; very friable; many fine roots; strongly acid; abrupt smooth

B21—9 to 16 inches; yellowish brown (10YR 5/4) fine sand; many medium distinct light brownish gray (10YR 6/2) and yellowish red (5YR 5/6) mottles; single grain; loose; common fine roots; strongly acid; gradual wavy boundary.

B22—16 to 21 inches; yellowish brown (10YR 5/4) fine sand; common medium distinct gray (10YR 5/1), grayish brown (10YR 5/2), and yellowish red (5YR 5/6) mottles; single grain; loose; medium acid; gradual wavy boundary.

B23g—21 to 31 inches; light gray (10YR 7/2) fine sand; many medium distinct yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6) mottles; single grain; loose; medium acid; gradual wavy boundary.

Cg—31 to 60 inches; grayish brown (10YR 5/2) fine sand; many medium distinct yellowish brown (10YR 5/4) mottles; single grain; loose; medium acid.

The solum is 24 to 48 inches thick. The texture is sand, fine sand, or loamy fine sand.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 1 to 3. The B horizon has hue of 10YR, value of 5 to 7, and chroma of 3 to 6 in the upper part and chroma of 2 in the lower part. The C horizon has hue of 10YR, value of 5 to 7, and chroma of 2.

Mundelein series

The Mundelein series consists of deep, somewhat poorly drained, moderately slowly permeable soils. These soils formed in silty lacustrine material. Slopes range from 0 to 2 percent.

Mundelein soils are similar to Darroch and Toronto soils and are adjacent to Pella soils. Darroch and Toronto soils have free carbonates below a depth of 40 inches, unlike Mundelein soils. Darroch soils have clay loam in the subsoil. Pella soils do not have an argillic horizon. Toronto soils developed in glacial till.

Typical pedon of Mundelein silt loam, 0 to 2 percent slopes, in a cultivated field, 290 feet east and 725 feet south of the northwest corner of sec. 35, T. 25 N., R. 5 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; common fine and very fine roots; slightly acid; abrupt smooth boundary.

A12—9 to 15 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; moderate fine and medium granular structure; friable; common very fine roots; slightly acid; clear wavy boundary.

B21t—15 to 25 inches; brown (10YR 5/3) silty clay loam; few fine faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/4 and 5/6) mottles; moderate medium prismatic structure parting to moderate fine angular blocky; firm; common very fine roots; thin discontinuous very dark gray (10YR 3/1) organic coatings and clay films on faces of peds and as linings in channels; slightly acid; clear wavy boundary.

B22tg—25 to 32 inches; grayish brown (10YR 5/2) silt loam; many medium distinct light olive brown (2.5Y 5/4) and yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure parting to weak coarse subangular blocky; firm; common very fine roots; thin discontinuous dark gray (10YR 4/1) organic coatings and clay films on faces of prisms; slightly acid; clear wavy boundary.

B3g—32 to 39 inches; light gray (10YR 7/1) silt loam; many medium distinct brownish yellow (10YR 6/6) mottles; massive; friable; thin patchy gray (10YR 5/1) organic coatings and clay films as linings in root channels; few very fine roots; strong effervescence; moderately alkaline; clear wavy boundary.

Cg—39 to 60 inches; light gray (10YR 7/1) stratified silt loam and silt; massive; friable; strong effervescence; moderately alkaline.

The solum is 24 to 50 inches thick.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The B2t horizon has hue of 10YR or 2.5Y, value of 5, and chroma of 2 or 3. The C horizon is stratified and is silt loam, silt, or loam. Thin strata of very fine sand are also included.

Muskego series

The Muskego series consists of deep, very poorly drained soils. The permeability is moderate in the upper part of the profile and slow in the lower part. Muskego soils formed in organic material and the underlying coprogenous earth on outwash plains. Slopes range from 0 to 2 percent.

Muskego soils are similar to Ackerman soils and are adjacent on the landscape to Maumee soils. Ackerman soils have less than 12 inches of muck over coprogenous earth and are underlain by sandy material, unlike Muskego soils. Maumee soils developed in mineral material and are in slightly higher positions on the landscape.

Typical pedon of Muskego muck, in a cultivated field, 1,700 feet south and 485 feet west of the northeast corner of sec. 3, T. 27 N., R. 2 W.

Oap—0 to 9 inches; black (10YR 2/1) broken face and rubbed sapric material, black (10YR 2/1) dry; about 1 percent fiber, a trace rubbed; moderate medium granular structure; very friable; many very fine roots; neutral; abrupt smooth boundary.

Oa2—9 to 16 inches; black (N 2/0) broken face and rubbed sapric material; about 10 percent fiber, a trace rubbed; weak thick platy structure parting to weak medium granular; very friable; common very fine roots; neutral; abrupt boundary.

Oa3—16 to 28 inches; black (10YR 2/1) broken face and rubbed sapric material; few medium distinct dark grayish brown (10YR 4/2) mottles; about 10 percent fiber, a trace rubbed; moderate thick platy structure; very friable; few very fine roots; common old vertical root channels lined with yellowish brown (10YR 5/8) and dark brown (7.5YR 3/2) sapric material; neutral; abrupt smooth boundary.

Lco1g—28 to 36 inches; dark gray (5Y 4/1) coprogenous earth, very dark grayish brown (2.5Y 3/2) rubbed; about 15 percent fiber, a trace rubbed; weak very thick platy structure; friable; few very fine roots; common yellowish brown (10YR 5/8) iron segregations and dark brown (7.5YR 3/2) iron and manganese oxide segregations in old root channels; many white (N 8/0) threadlike carbonate segregations; strong effervescence; moderately alkaline; clear wavy boundary.

Lco2g—36 to 46 inches; olive gray (5Y 5/2) coprogenous earth, very dark gray (5Y 3/1) rubbed; about 20 percent fiber, a trace rubbed; weak very thick platy structure; friable; few yellowish brown (10YR 5/8) iron segregations and dark brown (7.5YR 3/2) iron and manganese oxide segregations in old root channels; many white (N 8/0) threadlike carbonate segregations; few shells; strong effervescence; moderately alkaline; gradual wavy boundary.

Lco3g—46 to 60; olive gray (5Y 4/2) coprogenous earth, dark gray (5Y 4/1) rubbed; massive; friable; few shells; strong effervescence; moderately alkaline.

The depth to coprogenous earth is 16 to 51 inches.

The surface tier has hue of 10YR, value of 2, and chroma of 1 or 2. The organic part of the subsurface and bottom tiers has hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 1 to 3, or it is neutral and has value of 2 or 3. It is sapric material, but in some areas there are subhorizons of hemic material. The Lco layer has hue of 10YR, 2.5Y, or 5Y, value of 3 to 5, and chroma of 1 to 3.

Oakville series

The Oakville series consists of deep, well drained, very rapidly permeable soils. Oakville soils formed in sandy sediment on outwash plains. Slopes range from 0 to 3 percent.

Oakville soils are similar to Abscota, Alvin, and Brems soils and are adjacent to Chelsea and Morocco soils. Abscota soils developed in alluvium. Alvin soils have more clay in the solum than Oakville soils. Brems soils have mottles in the lower part of the subsoil. Chelsea soils have bands in the subsoil and are on adjacent gently sloping landforms. Morocco soils are mottled in the subsoil and are in lower lying positions.

Typical pedon of Oakville fine sand, wet substratum, 0 to 3 percent slopes, in a cultivated field, 1,675 feet south and 175 feet east of the northwest corner of sec. 23, T. 28 N., R. 2 W.

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

B21—9 to 19 inches; brown (7.5YR 4/4) fine sand; single grain; loose; few fine roots; few root channels filled with surface material; neutral; gradual wavy boundary.

B22—19 to 38 inches; yellowish brown (10YR 5/6) fine sand; single grain; loose; few fine roots; neutral; gradual wavy boundary.

C1—38 to 48 inches; brownish yellow (10YR 6/6) fine sand; single grain; loose; neutral; clear wavy boundary.

C2—48 to 60 inches; pale brown (10YR 6/3) fine sand; common medium and coarse distinct yellowish brown (10YR 5/4) mottles; single grain; loose; few coarse distinct brown (7.5YR 4/4) iron oxide stains; slightly acid.

The solum is 25 to 40 inches thick.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 to 4. The B2 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. The C horizon has hue of 10YR, value of 5 or 6, and chroma of 3 to 6.

Mottles that have chroma of 3 or higher are at a depth of 42 inches in many places. Reaction ranges from neutral to medium acid.

Octagon series

The Octagon series consists of deep, well drained, moderately permeable soils. Octagon soils formed in loamy glacial till on upland till plains. Slopes range from 2 to 12 percent.

Octagon soils are similar to Riddles and Wingate Variant soils and are adjacent on the landscape to Conover and Montmorenci soils. Riddles soils have a thicker solum than that of Octagon soils and do not have a mollic epipedon. Wingate Variant soils have mottles in the subsoil, which is silty clay loam. Conover soils have a mottled subsoil and are in lower positions on the landscape. Montmorenci soils have mottles in the lower part of the subsoil, and they also are in lower positions.

Typical pedon of Octagon silt loam, 6 to 12 percent slopes, eroded, in a cultivated field, 1,280 feet east and 390 feet south of the northwest corner of sec. 3, T. 25 N., R. 4 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; common fine roots; common small yellowish brown (10YR 5/6) blotches of subsoil; neutral; abrupt smooth boundary.

B21t—9 to 15 inches; yellowish brown (10YR 5/6) loam; moderate fine subangular blocky structure; friable; common very fine roots; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; 2 percent fine gravel; medium acid; clear wavy boundary.

B22t—15 to 29 inches; yellowish brown (10YR 5/6) clay loam; moderate medium subangular blocky structure; firm; common very fine roots; many continuous distinct thin yellowish brown (10YR 5/4) silt and clay flows in vertical cracks; thin continuous brown (7.5YR 4/4) clay films on faces of peds; 5 percent fine gravel; medium acid; clear wavy boundary.

B23t—29 to 38 inches; yellowish brown (10YR 5/4) clay loam; moderate coarse subangular blocky structure; firm; few very fine roots; medium continuous very dark grayish brown (10YR 3/2) organic coatings and clay films on faces of peds and as linings in channels; 5 percent fine gravel; neutral; clear wavy boundary.

C—38 to 60 inches; yellowish brown (10YR 5/4) loam; massive; firm; thin continuous very dark grayish brown (10YR 3/2) and dark brown (7.5YR 3/2) clay films as linings in channels and vertical cracks; 8 percent fine gravel; strong effervescence; moderately alkaline.

The solum is 24 to 42 inches thick.

The Ap horizon is very dark grayish brown (10YR 3/2) or dark brown (10YR 3/3). The B horizon is brown (10YR 5/3) or yellowish brown (10YR 5/4 or 5/6).

Odell series

The Odell series consists of deep, somewhat poorly drained, moderately slowly permeable soils. These soils formed in loamy glacial till on uplands. Slopes range from 0 to 1 percent.

Odell soils are similar to Conover, Darroch, and Toronto soils and are adjacent to Wolcott soils. Conover soils have a thinner surface layer than Odell soils. Darroch soils are stratified in the lower part of the underlying material. Toronto soils have a silty clay loam subsoil. Wolcott soils have more clay in the surface layer, have a gray subsoil, and are in adjacent, lower lying flat areas.

Typical pedon of Odell loam, 0 to 1 percent slopes, in a cultivated field, 100 feet east and 2,325 feet south of the northwest corner of sec. 8, T. 26 N., R. 5 W.

Ap—0 to 10 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; moderate medium granular structure; friable; common fine roots; trace of pebbles; neutral; abrupt smooth boundary.

A12—10 to 13 inches; black (10YR 2/1) loam, very dark gray (10YR 3/1) dry; moderate medium granular structure; friable; common fine roots; 1 percent blotches of brown (10YR 5/3) B21 material; trace of pebbles; neutral; clear wavy boundary.

B21t—13 to 17 inches; brown (10YR 5/3) loam; few fine faint grayish brown (10YR 5/2) and common medium distinct yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; thin patchy very dark grayish brown (10YR 3/2) organic coatings on faces of peds; trace of pebbles; slightly acid; clear wavy boundary.

B22t—17 to 22 inches; yellowish brown (10YR 5/4) clay loam; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; thin patchy very dark grayish brown (10YR 3/2) organic coatings in old root channels; 1 percent coarse fragments; medium acid; clear wavy boundary.

B23t—22 to 33 inches; yellowish brown (10YR 5/4) clay loam; many medium distinct grayish brown (10YR

5/2) and yellowish brown (10YR 5/8) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; 2 percent coarse fragments; slightly acid; clear wavy boundary.

B3—33 to 42 inches; yellowish brown (10YR 5/4) loam; many coarse distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; firm; thin patchy dark grayish brown (10YR 4/2) clay films on faces of peds; 2 percent coarse fragments; slight effervescence; mildly alkaline; clear wavy boundary.

C—42 to 60 inches; yellowish brown (10YR 5/4) loam; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; weak thick platy structure; firm; 2 percent coarse fragments; strong effervescence; moderately alkaline.

The solum is 24 to 42 inches thick. The mollic epipedon is 10 to 16 inches thick and includes part of the argillic horizon in some areas.

The Ap horizon is loam or silt loam. It is neutral or slightly acid. In some places there is no A12 horizon. The B horizon has hue of 10YR, value of 5 to 6, and chroma of 3 or 4. In some places there is no B3 horizon. The C horizon has hue of 10YR, value of 5, and chroma of 3 to 6.

Owosso series

The Owosso series consists of deep, well drained soils. Permeability is moderately rapid in the upper part of the profile and moderately slow in the lower part. These soils formed in a thin layer of loamy outwash and the underlying glacial till on uplands. Slopes range from 1 to 3 percent.

Owosso soils are similar to Martinsville and Riddles soils and are adjacent to Aubbeenaubbee, Crosier, and Gilford soils. Martinsville soils are more clayey and silty than Owosso soils and are stratified in the underlying material. Riddles soils are less sandy in the upper part of the solum. Aubbeenaubbee and Crosier soils are nearly level and have mottles in the upper part of the solum. Gilford soils have a mollic epipedon, have chroma of 2 or less in the solum, and are in depressions and drainageways.

Typical pedon of Owosso fine sandy loam, 1 to 3 percent slopes, in a cultivated field, 775 feet east and 2,250 feet north of the southwest corner of sec. 23, T. 27 N., R. 2 W.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) fine sandy loam, light brownish gray (10YR 6/2) dry; weak medium granular structure; friable; common fine and very fine roots; slightly acid; abrupt smooth boundary.

B1—10 to 12 inches; yellowish brown (10YR 5/4) fine sandy loam; weak medium granular structure; friable; common very fine roots; slightly acid; clear wavy boundary.

B21—12 to 20 inches; yellowish brown (10YR 5/4) fine sandy loam; weak medium granular structure; friable; few very fine roots; medium acid; clear wavy boundary.

B22t—20 to 26 inches; yellowish brown (10YR 5/4) fine sandy loam; moderate medium subangular blocky structure; friable; few fine roots; 1 percent coarse fragments; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; strongly acid; clear wavy boundary.

IIB23t—26 to 40 inches; yellowish brown (10YR 5/6) sandy clay loam; moderate medium subangular blocky structure; firm; 4 percent coarse fragments; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; strongly acid; clear wavy boundary.

IIB24t—40 to 52 inches; yellowish brown (10YR 5/4) loam; weak coarse subangular blocky structure; firm; 3 percent coarse fragments; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds and old root channels; medium acid; clear wavy boundary.

IIB3t—52 to 60 inches; yellowish brown (10YR 5/4) loam; weak coarse subangular blocky structure; firm; 3 percent coarse fragments; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds and old root channels; slightly acid; clear wavy boundary.

IIC—60 to 75 inches; brownish yellow (10YR 6/6) loam; weak medium platy structure; firm; 10 percent coarse fragments; strong effervescence; moderately alkaline.

The solum is 40 to 60 inches thick.

The Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. It is fine sandy loam or loamy fine sand. The B2 horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The IIB2t horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. It is sandy clay loam, loam, or clay loam. The IIC horizon has hue of 10YR, value of 4 to 6, and chroma of 3 to 6.

Pella series

The Pella series consists of deep, poorly drained, moderately permeable soils. These soils formed in silty lacustrine material or in glacial till on old lakebeds and till plains. Slopes range from 0 to 2 percent.

Pella soils are similar to Chalmers soils and are adjacent to Mundelein soils. Unlike Pella soils, Chalmers soils have free carbonates below a depth of 40 inches. Mundelein soils have a browner B horizon and are in slightly higher, adjacent areas.

Typical pedon of Pella silty clay loam, in a cultivated field, 1,850 feet south and 560 feet east of the northwest corner of sec. 35, T. 25 N., R. 5 W.

Ap—0 to 9 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; common fine roots; neutral; abrupt smooth boundary.
A12—9 to 15 inches; black (10YR 2/1) silty clay loam, grayish brown (10YR 5/2) dry; common fine faint grayish brown (2.5Y 5/2) mottles; moderate medium granular structure; friable; common fine roots; neutral; clear wavy boundary.
B21g—15 to 23 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine distinct light olive brown (2.5Y 5/4) mottles; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; common very fine roots; thin patchy black (10YR 2/1) organic coatings on faces of peds and as linings in channels; neutral; clear wavy boundary.
B22g—23 to 32 inches; light olive gray (5Y 6/2) silt loam; many medium distinct light olive brown (2.5Y 5/4) and yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure parting to weak coarse subangular blocky; firm; common very fine roots; thin discontinuous black (10YR 2/1) organic coatings on faces of prisms; neutral; clear wavy boundary.
C1g—32 to 40 inches; light gray (5Y 7/2) silt loam; common medium distinct olive yellow (2.5Y 6/6) mottles; massive; friable; few very fine roots; slight effervescence; mildly alkaline; clear wavy boundary.
C2g—40 to 60 inches; light gray (5Y 7/1) silt loam and few thin strata of sandy loam; many medium distinct brownish yellow (10YR 6/6) mottles; massive; friable; strong effervescence; moderately alkaline.

The solum is 30 to 40 inches thick.

The A horizon is silty clay loam or silt loam. The B2 horizon has hue of 2.5Y or 5Y, value of 5 or 6, and chroma of 1 or 2. It is silty clay loam; some subhorizons are silt loam. The C horizon has hue of 5Y, value of 6 or 7, and chroma of 1 or 2. A silty clay loam, till substratum, phase is recognized.

Rensselaer series

The Rensselaer series consists of deep, very poorly drained soils that formed in loamy sediment on outwash plains and lacustrine lakebeds. Permeability is slow in the upper part of the subsoil and moderate or rapid in the lower part and in the underlying layer. Slopes range from 0 to 2 percent.

Rensselaer soils are similar to Gilford, Rensselaer Variant, and Wolcott soils and are adjacent to Darroch and Whitaker soils. Gilford soils have less clay in the subsoil. Rensselaer Variant soils have a thinner subsoil and free carbonates above a depth of 25 inches. Wolcott soils have more clay in the surface layer, less clay in the subsoil, and are not stratified in the lower part of the underlying material. Whitaker soils do not have a mollic epipedon and are in slightly higher convex areas.

Typical pedon of Rensselaer clay loam, in a cultivated field, 2,200 feet north and 690 feet west of the southeast corner of sec. 34, T. 26 N., R. 6 W.

Ap—0 to 10 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; neutral; abrupt smooth boundary.
A12—10 to 15 inches; black (10YR 2/1) clay loam, dark gray (10YR 4/1) dry; few fine faint dark grayish brown (10YR 4/2) mottles; moderate medium granular structure; firm; neutral; clear wavy boundary.
B21tg—15 to 24 inches; gray (10YR 5/1) clay loam; common medium distinct strong brown (7.5YR 5/6) and yellowish brown (10YR 5/4) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; firm; yellowish red (5YR 4/8) areas 1 millimeter thick surrounding many old root channels; medium continuous black (10YR 2/1) organic coatings and clay films on faces of prisms and as linings in channels; slightly acid; clear wavy boundary.
B22tg—24 to 34 inches; gray (5Y 5/1) clay loam; common medium distinct yellowish brown (10YR 5/4) mottles; moderate medium prismatic structure parting to moderate medium angular and subangular blocky; firm; yellowish red (5YR 4/8) areas 1 millimeter thick surrounding many old root channels; medium continuous black (10YR 2/1) organic coatings and clay films on faces of prisms and as linings in channels; neutral; abrupt wavy boundary.
IIB3tg—34 to 41 inches; gray (5Y 6/1) loamy fine sand; common medium distinct light gray (10YR 6/1) and yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; very friable; black (10YR 2/1) clay loam material 1 centimeter thick in a few old channels; thin discontinuous dark gray (10YR 4/1) organic coatings and clay films on faces of peds and as linings in channels; slight effervescence; mildly alkaline; abrupt wavy boundary.
IIC1g—41 to 46 inches; olive gray (5Y 5/2) loam; few medium distinct strong brown (7.5YR 4/4) areas 1 millimeter thick surrounding old root channels; slight effervescence; mildly alkaline; abrupt wavy boundary.
IIC2g—46 to 60 inches; olive gray (5Y 5/2) stratified loam, sandy loam, or sand; common medium distinct yellowish brown (10YR 5/6) mottles; massive; firm; few dark brown (7.5YR 4/4) areas 1 millimeter thick surrounding old root channels; strong effervescence; moderately alkaline.

The solum is 30 to 60 inches thick.

The A horizon is black (10YR 2/1 or N 2/0) or very dark gray (10YR 3/1). It is loam, clay loam, or silt loam. The B2tg horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 or 6, and chroma of 1 or 2. It is clay loam, sandy clay loam, or loam. The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 or 6, and chroma of 1 or 2. It is stratified. Strata are sandy loam, loamy sand, fine sand, silt loam, loam, or clay loam.

A sandy substratum phase is recognized.

Rensselaer Variant

The Rennselaer Variant consists of deep, very poorly drained, slowly permeable over rapidly permeable soils. These soils formed in loamy sediment over sand on outwash plains and old lakebeds. Slopes range from 0 to 2 percent.

Rennselaer Variant soils are similar to Ackerman, Gilford, Gilford, limestone substratum, and Rennselaer soils and are adjacent to Seafield soils on most landscapes. Ackerman soils have more organic matter in the surface layer than Rensselaer Variant soils and do not have a silty clay loam subsoil. Gilford soils have less clay in the subsoil. Gilford, limestone substratum, soils have limestone bedrock at a depth of 40 to 84 inches. Gilford and Rennselaer soils have a thicker subsoil. Seafield soils have a thinner surface layer, a browner subsoil, and are in slightly higher convex areas.

Typical pedon of Rennselaer Variant loam, in a cultivated field, 1,350 feet north and 700 feet east of the southwest corner of sec. 9, T. 27 N., R. 4 W.

Ap—0 to 10 inches; black (N 2/0) loam, very dark gray (10YR 3/1) dry; weak medium granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

B2tg—10 to 16 inches; gray (5Y 5/1) silty clay loam; common medium distinct dark yellowish brown (10YR 4/4) mottles; moderate fine angular blocky structure; firm; few fine roots; thin continuous black (N 2/0) organic coatings and clay films on faces of peds and as linings in channels; neutral; clear wavy boundary.

IIB3tg—16 to 19 inches; gray (N 5/0) fine sandy loam; common medium distinct yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; friable; thin continuous black (N 2/0) organic coatings and clay films as linings in channels; slight effervescence; mildly alkaline; clear wavy boundary.

IIC1g—19 to 28 inches; grayish brown (10YR 5/2) fine sand; common medium distinct gray (10YR 6/1) and yellowish brown (10YR 5/4) mottles; single grain; loose; thin continuous dark brown (7.5YR 3/2) organic coatings and clay films as linings in channels; strong effervescence; moderately alkaline; clear wavy boundary.

IIC2—28 to 42 inches; yellowish brown (10YR 5/4) fine sand; common medium distinct light brownish gray (10YR 6/2) mottles; single grain; loose; violent effervescence; moderately alkaline; clear wavy boundary.

IIC3—42 to 56 inches; yellowish brown (10YR 5/4) very fine sand; many medium distinct gray (10YR 6/1) mottles; massive; friable; violent effervescence; moderately alkaline; clear wavy boundary.

IIIC4g—56 to 60 inches; gray (10YR 5/1) fine sand; massive; friable; violent effervescence; moderately alkaline.

The solum is 12 to 25 inches thick.

The Ap horizon is black (N 2/0 or 10YR 2/1). The B horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5, and chroma of 1 or hue of N and value of 4 or 5. The B2tg horizon is clay loam or silty clay loam. The C horizon has hue of 10YR, value of 5 or 6, and chroma of 1 to 4. It is fine sand or very fine sand.

Riddles series

The Riddles series consists of deep, well drained, moderately permeable soils. These soils formed in loamy glacial till on uplands. Slopes range from 0 to 8 percent.

Riddles soils are similar to Owosso, Martinsville, Octagon, and Wingate Variant soils and are adjacent to Crosier soils. Owosso soils have less clay in the solum than Riddles soils. Martinsville soils are stratified in the underlying material. Octagon soils have a mollic epipedon and a solum that is less than 42 inches thick. Wingate Variant soils have a very dark gray surface layer, a silty clay loam subsoil, and mottles in the lower part of the subsoil. Crosier soils are mottled in the subsoil and are in lower lying positions on the landscape.

Typical pedon of Riddles silt loam, 0 to 2 percent slopes, in a cultivated field, 1,580 feet south and 125 feet east of the center of sec. 35, T. 27 N., R. 2 W.

Ap—0 to 10 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

A2—10 to 13 inches; yellowish brown (10YR 5/4) silt loam; weak medium platy structure parting to moderate fine granular; friable; few very fine roots; neutral; clear wavy boundary.

B1t—13 to 18 inches; yellowish brown (10YR 5/4) silt loam; moderate fine angular blocky structure; firm; few very fine roots; thin continuous brown (7.5YR 4/4) clay films on faces of peds; 3 percent fine gravel; neutral; clear wavy boundary.

IIB21t—18 to 24 inches; yellowish brown (10YR 5/6) loam; moderate medium subangular blocky structure; firm; few very fine roots; thin continuous brown (7.5YR 4/4) clay films on faces of peds; 5 percent fine gravel; slightly acid; clear wavy boundary.

IIB22t—24 to 41 inches; yellowish brown (10YR 5/6) loam; weak coarse subangular blocky structure; firm; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; 5 percent fine gravel; medium acid; clear wavy boundary.

IIB3t—41 to 53 inches; yellowish brown (10YR 5/4) loam; weak very coarse subangular blocky structure; firm; medium continuous very dark grayish brown (10YR 3/2) clay flows in old root channels; 5 percent fine gravel; neutral; clear wavy boundary.

IIC—53 to 60 inches; yellowish brown (10YR 5/4) loam; massive; firm; 10 percent fine gravel; strong effervescence; moderately alkaline.

The solum is 40 to 70 inches thick.

The Ap horizon is dark grayish brown (10YR 4/2) or dark brown (10YR 4/3). It is silt loam, loam, or fine sandy loam. The B2t horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. It is loam or clay loam and has subhorizons of sandy clay loam or fine sandy loam. The B3t and C horizons are loam or clay loam.

Seafield series

The Seafield series consists of deep, somewhat poorly drained, moderately rapidly permeable over very rapidly permeable soils. Seafield soils formed in loamy and sandy sediment on outwash plains. Slopes range from 0 to 2 percent.

Seafield soils are similar to Aubbeenaubbee and Seafield Variant soils and are adjacent to Alvin and Gilford soils. Unlike Seafield soils, Aubbeenaubbee soils do not have a mollic epipedon and have less sand in the lower part of the subsoil and in the underlying material. Seafield Variant soils have limestone bedrock at a depth of 40 to 84 inches. Alvin soils do not have a mollic epipedon, are not mottled in the subsoil, and are in slightly higher convex areas. Gilford soils have a thicker surface layer, a grayer subsoil, and are in lower flat areas.

Typical pedon of Seafield fine sandy loam, in a cultivated field, 1,150 feet north and 1,200 feet west of the southeast corner of sec. 12, T. 27 N., R. 4 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; common very fine roots; common accumulations of fine distinct black (5Y 5/2) iron and manganese oxide; strongly acid; abrupt smooth boundary.

B21tg—8 to 12 inches; brown (10YR 5/3) fine sandy loam; many medium distinct strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; friable; few very fine roots; common vertical pores 2 millimeters in diameter filled with surface material; thin discontinuous dark grayish brown (10YR 4/2) organic coatings and clay films on faces of peds; strongly acid; clear wavy boundary.

B22tg—12 to 16 inches; grayish brown (10YR 5/2) sandy clay loam; many medium distinct yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; friable; few very fine roots; thin continuous gray (10YR 5/1) organic coatings and clay films on faces of peds; strongly acid; clear wavy boundary.

B23tg—16 to 26 inches; grayish brown (10YR 5/2) fine sandy loam; many medium distinct yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; friable; few very fine roots; thin continuous gray (10YR 5/1) organic coatings and clay films on faces of peds; strongly acid; clear wavy boundary.

C1g—26 to 31 inches; light brownish gray (10YR 6/2) fine sand; common medium distinct gray (10YR 5/1), yellowish brown (10YR 5/4 and 5/6), and strong brown (7.5YR 5/6) mottles; single grain; loose; medium acid; clear wavy boundary.

C2g—31 to 42 inches; light gray (10YR 7/1) fine sand; many medium faint gray (10YR 5/1) and few medium distinct dark brown (7.5YR 4/4) mottles; single grain; loose; slightly acid; clear wavy boundary.

C3g—42 to 60 inches; gray (10YR 5/1) fine sand; common medium distinct dark yellowish brown (10YR 4/4) mottles; single grain; loose; neutral.

The solum is 25 to 35 inches thick.

The Ap horizon has hue of 10YR, value of 3, and chroma of 1 to 3. It is fine sandy loam or sandy loam. It ranges from strongly acid to neutral. The B21t horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. The B22t and B23t horizons have hue of 10YR, value of 5 or 6, and chroma of 1 or 2. The Bt horizons are fine sandy loam, sandy clay loam, or sandy loam. They are strongly acid or medium acid. The C horizon has hue of 10YR, value of 5 to 7, and chroma of 1 or 2. It is fine sand, sand, loamy fine sand, or loamy sand. It ranges from medium acid to neutral.

Seafield Variant

The Seafield Variant consists of deep, moderately well drained, moderately rapidly permeable soils. Seafield Variant soils formed in loamy sediment underlain by limestone bedrock on outwash plains. Slopes range from 0 to 2 percent.

Seafield Variant soils are similar to Brems, Foresman, and Seafield soils and are adjacent to Gilford, limestone substratum, Oakville, and Wolcott, limestone substratum, soils. Brems soils do not have a mollic epipedon and have more sand in the subsoil than Seafield Variant soils. Foresman soils are stratified in the lower part of the underlying material. Seafield soils do not have limestone bedrock at a depth of 40 to 84 inches. Gilford, limestone substratum, and Wolcott, limestone substratum, soils have a thicker surface layer and a grayer subsoil. They are in lower flat areas. Oakville soils do not have a mollic epipedon. They have more sand in the subsoil and are in slightly higher convex areas.

Typical pedon of Seafield Variant fine sandy loam, in a cultivated field, 250 feet west and 60 feet south of the northeast corner of sec. 17, T. 28 N., R. 4 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) fine sandy loam, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; common fine and very fine roots; slightly acid; abrupt smooth boundary.

B1—9 to 17 inches; brown (10YR 5/3) loamy fine sand, dark grayish brown (10YR 4/2) dry; common fine faint yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; very friable; common very fine roots; few root channels 2 millimeters in diameter filled with surface material; slightly acid; abrupt wavy boundary.

B21t—17 to 25 inches; yellowish brown (10YR 5/6) fine sandy loam; few fine distinct gray (10YR 6/1) mottles; moderate medium subangular blocky structure; friable; common very fine roots; few root channels 2 millimeters in diameter filled with surface material; thin continuous grayish brown (10YR 5/2) clay films bridging sand grains; slightly acid; clear wavy boundary.

B22t—25 to 34 inches; yellowish brown (10YR 5/4) loamy fine sand; common medium distinct light brownish gray (10YR 6/2) and many medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; very friable; thin discontinuous grayish brown (10YR 5/2) clay films bridging sand grains and lining root channels; neutral; clear wavy boundary.

B23—34 to 42 inches; yellowish brown (10YR 5/4) fine sandy loam; many medium distinct yellowish brown (10YR 5/6) and light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; friable; slight effervescence; mildly alkaline; abrupt wavy boundary.

R—42 inches; limestone bedrock.

The solum is 20 to 48 inches thick. The depth to limestone bedrock is 40 to 84 inches.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3. It is fine sandy loam or sandy loam and is slightly acid or neutral. Some pedons do not have a B1 horizon. The B horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 6. It is medium acid to mildly alkaline. The C horizon, if present, has hue of 10YR, value of 5 to 7, and chroma of 1 or 2. It is neutral or mildly alkaline.

Sparta series

The Sparta series consists of deep, excessively drained, rapidly permeable soils. Sparta soils formed in sandy sediment on outwash plains. Slopes range from 0 to 3 percent.

Sparta soils are adjacent to Seafield soils. Seafield soils have a thinner surface layer than Sparta soils, are mottled in the subsoil, and are in lower positions on the landscape.

Typical pedon of Sparta fine sand, 0 to 3 percent slopes, in a cultivated field, 70 feet south and 875 feet east of the northwest corner of sec. 24, T. 26 N., R. 6 W.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) fine sand, grayish brown (10YR 5/2) dry; weak medium granular structure; very friable; few very fine roots; neutral; abrupt smooth boundary.

A12—10 to 15 inches; very dark grayish brown (10YR 3/2) loamy fine sand, grayish brown (10YR 5/2) dry; weak medium granular structure; very friable; few very fine roots; many coarse distinct black (10YR 2/1) organic stains; slightly acid; clear wavy boundary.

B2—15 to 26 inches; dark yellowish brown (10YR 4/4) loamy fine sand; weak coarse subangular blocky structure; very friable; few very fine roots; few root channels filled with surface material; medium acid; clear wavy boundary.

C1—26 to 32 inches; yellowish brown (10YR 5/6) fine sand; single grain; loose; strongly acid; clear wavy boundary.

C2—32 to 40 inches; light yellowish brown (10YR 6/4) fine sand; few medium faint yellowish brown (10YR 5/4) mottles; single grain; loose; medium acid; clear wavy boundary.

C3—40 to 60 inches; light yellowish brown (10YR 6/4) fine sand; many medium faint yellowish brown (10YR 5/4) mottles; single grain; loose; medium acid.

The solum is 24 to 40 inches thick. The mollic epipedon is 10 to 20 inches thick.

The A horizon is black (10YR 2/1) or very dark grayish brown (10YR 3/2). The B2 horizon has hue of 10YR, value of 4 to 6, and chroma of 4 to 6. It is fine sand or loamy fine sand. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 4 to 6.

Toronto series

The Toronto series consists of deep, somewhat poorly drained, moderately slowly permeable soils. These soils formed in a thin layer of loess and the underlying silty glacial till on till plains. Slopes range from 0 to 1 percent.

Toronto soils are similar to Conover and Mundelein soils and are adjacent to Chalmers and Wingate Variant soils. Conover soils have more sand in the B2 horizon than Toronto soils. Mundelein soils are stratified in the underlying material. Chalmers soils do not have an argillic horizon and are in lower areas. Wingate Variant soils do not have mottles in the upper part of the B horizon and are more sloping.

Typical profile of Toronto silt loam, 0 to 1 percent slopes, in a cultivated field, 420 feet east and 1,170 feet south of the northwest corner of sec. 13, T. 25 N., R. 6 W.

Ap—0 to 9 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; common fine and very fine roots; slightly acid; abrupt smooth boundary.

B1—9 to 12 inches; dark gray (10YR 4/1) silt loam; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/4) mottles; moderate medium granular structure; friable; few fine roots; medium acid; clear wavy boundary.

B21t—12 to 16 inches; brown (10YR 5/3) silty clay loam; many medium distinct dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin continuous dark gray (10YR 4/1) clay films on faces of peds; medium acid; clear wavy boundary.

B22t—16 to 25 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thick continuous gray (10YR 4/1) clay films on faces of peds; slightly acid; clear wavy boundary.

B23—25 to 32 inches; pale brown (10YR 6/3) silty clay loam; common medium distinct grayish brown (10YR 5/8) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thin continuous dark gray (10YR 4/1) clay films on faces of peds; neutral; clear wavy boundary.

IIB3—32 to 53 inches; pale brown (10YR 6/3) loam; many medium distinct gray (10YR 5/8) mottles; weak coarse subangular blocky structure parting to massive; firm; thin patchy light brownish gray (10YR 6/2) clay films on faces of peds and in cracks; few glacial pebbles; strong effervescence; moderately alkaline; gradual wavy boundary.

IIC—53 to 60 inches; light yellowish brown (10YR 6/4) silt loam; common fine faint gray (10YR 6/1) and yellowish brown (10YR 5/4) mottles; massive; firm; few glacial pebbles; strong effervescence; moderately alkaline.

The solum is 40 to 60 inches thick.

The Ap horizon is black (10YR 2/1) or very dark gray (10YR 3/1), 6 to 9 inches thick, and slightly acid or neutral. The B2t horizon is dark gray (10YR 4/1), grayish brown (10YR 5/2), brown (10YR 5/3), pale brown (10YR 6/3), or yellowish brown (10YR 5/4 or 5/6). The coatings on ped faces have chroma of 2 or less. A IIB23t horizon, if present, is clay loam or silty clay loam. It is yellowish brown (10YR 5/6) or pale brown (10YR 6/3). The coatings on ped faces have chroma of 2 or less. The IIB3 horizon is pale brown (10YR 6/3) or yellowish brown (10YR 5/4) and is loam or clay loam. The coatings have chroma of 2 or less. The IIB3 horizon is neutral or mildly alkaline. The C horizon is yellowish brown (10YR 5/4) or light yellowish brown (10YR 6/4) and has weak thick platy structure or is massive.

Varna series

The Varna series consists of deep, moderately well drained, moderately slowly permeable soils. Varna soils formed in silty glacial till on till plains and moraines. Slopes range from 1 to 6 percent.

Varna soils are similar to Montmorenci, Octagon, and Riddles soils and are adjacent to Elliott and Pella soils. Montmorenci soils have a thinner surface layer than Varna soils and a clay loam subsoil. Octagon soils have a clay loam subsoil and do not have mottles in the subsoil. Riddles soils do not have a mollic epipedon, have a loam or clay loam subsoil, do not have mottles in the subsoil, and have a solum that is more than 40 inches thick. Elliott soils have mottles in the upper part of the subsoil and are in lower positions on the landscape. Pella soils have a gray, mottled subsoil and are in lower slightly concave areas.

Typical pedon of Varna silt loam, 1 to 6 percent slopes, eroded, in a cultivated field, 620 feet south and 400 feet west of the center of sec. 36, T. 26 N., R. 6 W.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; common very fine roots; mixed few small yellowish brown (10YR 5/4) blotches of subsoil; medium acid; abrupt smooth boundary.

B21t—10 to 16 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine angular blocky structure; friable; few very fine roots; many continuous faint thin dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear wavy boundary.

B22t—16 to 22 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium angular and subangular blocky structure; firm; few very fine roots; thin continuous brown (10YR 5/3) clay films on faces of peds; medium acid; clear wavy boundary.

B23t—22 to 37 inches; yellowish brown (10YR 5/4) silty clay loam; many fine distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; moderate coarse prismatic structure parting to moderate medium angular and subangular blocky; firm; few very fine roots mostly concentrated between prisms; medium continuous dark grayish brown (10YR 4/2) clay films on faces of prisms and as linings in channels, patchy on faces of peds; neutral; clear wavy boundary.

C—37 to 60 inches; brown (10YR 5/3) silty clay loam; common medium distinct light gray (10YR 6/1) and yellowish brown (10YR 5/8) mottles; massive; firm;

thin continuous gray (10YR 5/1) clay films in cracks and channels; 5 percent coarse mostly shale fragments; strong effervescence; moderately alkaline.

The solum is 30 to 40 inches thick.

The A horizon is black (10YR 2/1), very dark gray (10YR 3/1), or very dark grayish brown (10YR 3/2). The B2t horizon is brown (10YR 5/3) or yellowish brown (10YR 5/4). Many profiles have clay films in vertical cracks to a depth of more than 70 inches.

Watseka series

The Watseka series consists of deep, somewhat poorly drained, rapidly permeable soils. These soils formed in sandy sediment on outwash plains. Slopes range from 0 to 2 percent.

Watseka soils are similar to Morocco soils and are adjacent to Gilford soils. Unlike Watseka soils, Morocco soils do not have a mollic epipedon. Gilford soils have a grayish, more clayey subsoil and are in lower flat areas.

Typical pedon of Watseka loamy fine sand, in a cultivated field, 130 feet west and 750 feet north of the southeast corner of sec. 13, T. 26 N., R. 6 W.

Ap—0 to 10 inches; black (10YR 2/1) loamy fine sand, gray (10YR 5/1) dry; weak medium granular structure; very friable; neutral; abrupt smooth boundary.

B21—10 to 14 inches; brown (10YR 5/3) fine sand; few fine faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; single grain; loose; thin patchy dark grayish brown (10YR 4/2) organic coatings in channels and on the surface of sand grains; slightly acid; clear wavy boundary.

B22—14 to 20 inches; yellowish brown (10YR 5/4) fine sand; moderate medium distinct grayish brown (10YR 5/2) mottles; single grain; loose; medium acid; clear wavy boundary.

B23g—20 to 27 inches; light brownish gray (10YR 6/2) fine sand; many medium distinct strong brown (7.5YR 5/6) mottles; single grain; loose; medium acid; clear wavy boundary.

B24g—27 to 36 inches; light brownish gray (10YR 6/2) loamy fine sand; many coarse distinct yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; very friable; medium acid; clear wavy boundary.

Cg—36 to 60 inches; gray (10YR 6/1) fine sand; common medium distinct yellowish brown (10YR 5/4) mottles; single grain; loose; neutral.

The solum is 24 to 38 inches thick.

The Ap horizon is black (10YR 2/1) or very dark gray (10YR 3/1). The B horizon has hue of 10YR, value of 4 to 7, and chroma of 2 to 4. The C horizon has hue of 10YR, value of 5 to 7, and chroma of 1 or 2. It is slightly acid or neutral.

Whitaker series

The Whitaker series consists of deep, somewhat poorly drained, moderately permeable soils. These soils formed in loamy outwash material on outwash plains. Slopes range from 0 to 2 percent.

Whitaker soils are similar to Aubbeenaubbee, Crosier, and Darroch soils and are adjacent to Martinsville and Rensselaer soils. Unlike Whitaker soils, Aubbeenaubbee and Crosier soils are not stratified in the underlying material. Darroch soils have a mollic epipedon. Martinsville soils are not mottled in the subsoil and are in slightly higher convex areas. Rensselaer soils have a mollic epipedon, a grayer subsoil, and are in lower flat areas.

Typical pedon of Whitaker silt loam, in a cultivated field, 1,630 feet south and 125 feet west of the northeast corner of sec. 34, T. 27 N., R. 3 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; many fine roots; medium acid; abrupt smooth boundary.

B21t—9 to 12 inches; yellowish brown (10YR 5/4) loam; common medium distinct grayish brown (10YR 5/2) and strong brown (7.5YR 5/6) mottles; moderate fine subangular blocky structure; firm; common fine roots; medium continuous dark grayish brown (10YR 4/2) organic coatings and clay films as linings in channels, discontinuous on faces of peds; medium acid; clear wavy boundary.

IIB22tg—12 to 18 inches; grayish brown (10YR 5/2) loam; many medium distinct yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; common fine roots; thin patchy brown (10YR 4/3) clay films on faces of peds and as linings in channels; medium acid; clear wavy boundary.

IIB23tg—18 to 27 inches; grayish brown (10YR 5/2) fine sandy loam; many medium distinct dark brown (7.5YR 4/4) and strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to weak coarse subangular blocky; firm; few fine roots; medium continuous light gray (10YR 6/1) sand and silt coatings on faces of prisms; common thin patchy faint dark grayish brown (10YR 4/2) clay films on faces of peds and as linings in channels; medium acid; clear wavy boundary.

IIB24tg—27 to 35 inches; gray (10YR 6/1) very fine sandy loam; moderate medium distinct reddish brown (5YR 4/4) and strong brown (7.5YR 5/6) mottles; moderate coarse prismatic structure parting to weak medium subangular blocky; firm; few fine roots; thin discontinuous dark gray (10YR 4/1) organic coatings and clay films on faces of peds and prisms and as linings in channels; slightly acid; clear wavy boundary.

IIB31g—35 to 42 inches; gray (10YR 5/1) fine sandy loam; many fine and medium distinct dark gray (5Y 4/1) and strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; friable; thin continuous dark gray (10YR 4/1) organic coatings and clay films as linings in channels; neutral; clear wavy boundary.

IIB32g—42 to 50 inches; gray (10YR 5/1) loam; many medium prominent strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; friable; thin discontinuous dark gray (10YR 4/1) organic coatings and clay films as linings in channels; neutral; abrupt wavy boundary.

IIC—50 to 60 inches; gray (5Y 5/1) stratified loamy sand, silt loam, or sandy loam; many coarse prominent strong brown (7.5YR 5/6) and yellowish brown (10YR 5/4) mottles; massive; friable; strong effervescence; moderately alkaline.

The solum is 40 to 60 inches thick.

The Ap horizon is loam, silt loam, or fine sandy loam. It is medium acid to neutral. The B2t horizon has hue of 10YR, value of 5 or 6, and chroma of 1 to 4. It is loam; some subhorizons are sandy loam, very fine sandy loam, fine sandy loam, silty clay loam, or sandy clay loam. The C horizon is stratified. It is silt loam, loam, sandy loam, loamy sand, or fine sand.

Wingate Variant

The Wingate Variant consists of deep, moderately well drained, moderately slowly permeable soils. These soils formed in a thin layer of silty sediment and the underlying silty clay till. Slopes range from 1 to 6 percent.

Wingate Variant soils are similar to Foresman, Montmorenci, and Varna soils and are adjacent to Chalmers and Toronto soils. Foresman soils have more sand in the lower part of the solum than Wingate Variant soils and are stratified in the underlying material. Montmorenci soils have more sand throughout the solum and have a mollic epipedon. Varna soils are more clayey. Chalmers soils do not have an argillic horizon and are in lower areas. Toronto soils have brown mottles in the upper part of the solum and are in nearly level areas.

Typical pedon of Wingate Variant silt loam, 1 to 6 percent slopes, eroded, in a cultivated field, 50 feet west and 1,920 feet north of the southeast corner of sec. 34, T. 25 N., R. 6 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

B1—9 to 16 inches; brown (10YR 4/3) silt loam; weak medium subangular blocky structure; friable; few fine roots; thin discontinuous very dark grayish brown (10YR 3/2) organic coatings and clay films on faces of peds; slightly acid; clear wavy boundary.

B21t—16 to 22 inches; yellowish brown (10YR 5/4) silty clay loam; few fine faint gray (10YR 5/1) mottles in lower part; moderate medium subangular blocky structure; firm; few fine roots; thin patchy dark brown (10YR 3/3) organic coatings on faces of peds; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; medium acid; clear wavy boundary.

B22t—22 to 32 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; medium acid; clear wavy boundary.

B23t—32 to 38 inches; brown (10YR 5/3) silty clay loam; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin discontinuous gray (10YR 5/1) clay films on faces of peds; medium acid; clear wavy boundary.

IIB3t—38 to 52 inches; brown (10YR 5/3) clay loam; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; few accumulations of fine very dark brown (10YR 2/2) iron and manganese oxide; thin patchy gray (10YR 5/1) clay films on faces of peds; few glacial pebbles; neutral; clear wavy boundary.

IIC—52 to 68 inches; light olive brown (2.5Y 5/4) silt loam; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; massive; firm; thin patchy gray clay films in old cracks; few glacial pebbles; strong effervescence; moderately alkaline.

The solum is 40 to 60 inches thick.

The Ap horizon is black (10YR 2/1) or very dark gray (10YR 3/1). It is slightly acid or neutral and is 6 to 9 inches thick. The B2t horizon is strongly acid to slightly acid. The IIB3 horizon is clay loam or loam and is neutral or mildly alkaline. The C horizon is light olive brown (2.5YR 5/4) or brown (10YR 5/3) and has weak thick platy structure, or it is massive.

Wolcott series

The Wolcott series consists of deep, very poorly drained, moderately permeable soils. Wolcott soils formed in loamy till on till plains. Slopes range from 0 to 2 percent.

Wolcott soils are similar to Chalmers and Rensselaer soils and are adjacent to Conover and Odell soils on most landscapes. Unlike Wolcott soils, Chalmers soils have a silty clay loam subsoil; Conover and Rensselaer soils have an argillic horizon. Conover and Odell soils have a brownish subsoil and are in slightly higher convex areas. Conover soils have a thinner surface layer. Rensselaer soils are stratified in the lower part of the solum and in the underlying material.

Typical pedon of Wolcott clay loam, in a cultivated field, 1,825 feet east and 550 feet north of the southwest corner of sec. 22, T. 27 N., R. 6 W.

Ap—0 to 10 inches; black (10YR 2/1) clay loam, dark gray (10YR 4/1) dry; common fine distinct grayish brown (2.5Y 5/2) mottles; moderate medium granular structure; friable; common very fine roots; few pebbles; neutral; clear wavy boundary.

A12—10 to 15 inches; black (10YR 2/1) clay loam, dark gray (10YR 4/1) dry; common fine distinct grayish brown (2.5Y 5/2) mottles; moderate medium granular structure; friable; common very fine roots; few pebbles; neutral; clear wavy boundary.

B21g—15 to 21 inches; grayish brown (2.5Y 5/2) clay loam; moderate fine subangular blocky structure; friable; common very fine roots; medium continuous black (10YR 2/1) organic coatings on faces of peds; 5 percent fine gravel; neutral; clear wavy boundary.

B22g—21 to 29 inches; gray (5Y 5/1) loam; many fine distinct olive brown (2.5Y 4/4) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few very fine roots; thin continuous very dark gray (10YR 3/1) organic coatings on faces of prisms, patchy on faces of peds; 5 percent fine gravel; neutral; clear wavy boundary.

B23g—29 to 36 inches; gray (5Y 5/1) loam; many medium distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate coarse subangular blocky; firm; few very fine roots; thin continuous dark gray (10YR 4/1) organic coatings on faces of peds; 5 percent fine gravel; neutral; clear wavy boundary.

B3g—36 to 47 inches; gray (5Y 5/1) loam; many medium distinct yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate coarse subangular blocky; firm; few very fine roots; thin continuous dark gray (10YR 4/1) organic coatings on faces of peds; 10 percent fine gravel; neutral; clear wavy boundary.

Cg—47 to 60 inches; light gray (N 6/0) loam; many coarse distinct olive brown (2.5Y 4/4) and grayish brown (2.5Y 5/2) mottles; massive; firm; 10 percent fine gravel; slight effervescence; mildly alkaline.

The solum is 40 to 60 inches thick.

The A horizon is black (10YR 2/1 or N 2/0) or very dark gray (10YR 3/1 or N 3/0). It is clay loam, loam, silt loam, or silty clay loam. It is neutral or slightly acid. The B2 horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2. It is clay loam, loam, or sandy loam. The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 3 to 6, or it is neutral and has value of 6. It is loam or sandy loam.

A bedrock substratum phase is recognized.

formation of the soils

This section discusses the major factors of soil formation and their importance in the formation of the soils in White County. It also discusses the processes of soil formation that have affected the development of soils in the county.

factors of soil formation

The characteristics of a soil are determined by the physical and mineralogical composition of the parent material, the climate under which the soil material has accumulated and existed since accumulation, the plant and animal life on and in the soil, the relief, or lay of the land, and the length of time the forces of soil formation have acted on the soil material.

Climate and plants and animals, chiefly plants, are the active factors of soil formation. They act on parent material that has accumulated through the weathering of rocks and slowly bring about the formation of a natural body that has genetically related horizons. The effects of climate and of plant and animal life are conditioned by relief. The parent material also affects soil formation, and in extreme cases it determines entirely the kind of soil that is formed. Finally, time is needed for changing the parent material into a horizonal soil. Generally, a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for all five factors.

parent material

Parent material is the unconsolidated mineral material in which a soil forms. The soils in White County formed mainly in four kinds of parent material; glacial drift, or ice-laid material; alluvium, or water-lain deposits; eolian, or wind-deposited material; and organic material.

Glaciation has been important in the formation of the soils in White County. Ice sheets, hundreds of feet thick, covered the county during at least three different ice ages. From the oldest to the most recent, these glacial ice ages were the Kansan, the Illinoian, and the Wisconsinan.

The Wisconsinan glacier completely covered White County about 12,000 to 15,000 years ago. As ice moved southward, it destroyed old hills and made new ones. The unconsolidated material, carried by the ice, filled old preglacial valleys. A mantle of rock, sand, silt, and clay was left when the ice sheets melted and receded. This material, collectively called glacial drift, is part glacial till and part outwash. Till is a heterogeneous deposit of sand, silt, clay, and gravel. Outwash is a water-laid deposit, generally stratified, that consists mainly of sand and has some silt and clay.

The second glacier that entered White County during the Wisconsinan glaciation completely covered the county. As it receded, it deposited calcareous silty and loamy till and outwash material throughout the county. The most recent glacier overrode material deposited by the preceding glacier. It carried sandy material and stopped approximately halfway through the county. As the glacier receded, it deposited a thin layer of sandy drift throughout the northern part of the county. The texture of this till is mostly sandy loam or loam. After the glacier receded there was very little or no vegetation to protect the glacial drift from the effects of the climate. Strong winds blew the fine sand and formed many of the ridges and knolls in the northern part of the county.

Glacial till is material laid down directly by glaciers with a minimum of water action. It consists of particles of different sizes that are mixed together. The glacial till in White County is calcareous and firm. The texture is loam, silt loam, silty clay loam, or sandy loam. Soils in White County that formed in glacial till are the Owosso, Riddles, and Varna soils.

Outwash materials consist of particles that were deposited by running water from melting glaciers. The size of the particles varies according to the source of the material and the velocity of the water that carried them. Generally, outwash deposits in White County consist of similar sized particles, and the texture ranges from stratified silt loam to sand. The coarser materials are generally in the lower part of the soil. Martinsville soils formed in outwash material.

Other outwash materials were deposited in large, broad areas by ponded glacial melt water and water in old, shallow lakes. The water entering these areas carried particles such as fine sand, silt, and clay. The coarser particles settled first and then the finer particles.

Most of the fine sandy material in the northern part of the county was deposited by running water from the most recent glacier. Seafield and Maumee soils formed in this loamy and sandy outwash material. In the northern part of the county the loamy outwash is so thin in some places that some soils there developed in the loamy material and in the underlying loamy glacial till.

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Aubbeenaubbee soils, for example, formed in these materials.

After the glacier receded from the county, water was left standing in depressions, some of which were very deep. Grasses and sedges grew around these areas of water, and when they died their remains fell into the water. The submerged plant remains decomposed very slowly, creating an accumulation of plant material around the edge of the water. Later, water-tolerant trees grew in these areas, and their remains also fell into the water. The deep depressions eventually filled with organic material, and organic soils developed. Plant materials, animals, climate, the order of deposition, and the amount of decomposition determine whether the organic material is peat, muck, marl, or coprogenous earth. Muskego soils formed in organic material.

Alluvial material has been deposited in recent time by floodwaters of streams and rivers. The texture of this material is determined by the source of the material and the velocity of water that deposited the material. The coarser material carried by slower moving water settled first. Abscota and Cohoctah soils are examples of alluvial soils.

climate

Climate is important in the formation of soils. It influences the kind of plant and animal life on and in the soil. It determines the amount of water available for the weathering of minerals and affects the transportation of soil materials. Through its influence on the temperature of the soil, climate determines the rate of chemical reaction in the soil.

Climate acting alone on parent material would be largely destructive. Rain and melting snow, for example, would wash soluble materials out of the soil. Climate is a constructive force only in combination with the activities of plants and animals. Plants draw nutrients from the lower part of the soil. When the plants die, the nutrients are restored to the soil, in varying degrees, by the accumulated decaying vegetation in the upper part. In White County the climate is such that the leaching of plant nutrients progresses faster than replacement. For that reason, most of the soils in the county are leached and are acid in the subsoil.

White County is in a transition zone between soils that formed under the vegetation of the prairie to the west and soils that formed under the vegetation of the forests to the east. The climate throughout the county is very similar; nonetheless, climatic factors influenced the growth of prairie grasses in the west and the growth of deciduous trees in the east. For more information on climate, see the section "General nature of the county."

plant and animal life

Plants have been the principal organisms influencing the soils in White County; however, bacteria, fungi, earthworms, and man have also been important. Plants and animals contribute organic matter and nitrogen to the soil. The remains of plants accumulate on the surface; they decay and eventually become organic matter. The amount of organic matter in the soil depends on the kind of plants on the soil. Plant roots also add organic matter and provide channels for the downward movement of water through the soil. Bacteria on the roots of legumes convert nitrogen from the air into a form that can be used by plants.

The native vegetation in White County consists mainly of prairie grasses and deciduous forests. The kinds of animals vary with the vegetation.

The native vegetation in the eastern part of the county consists of many species of trees and shrubs. The native vegetation on the well drained soils is mainly white oak, red oak, hickory, and walnut. On the wet soils, it is water tolerant grasses, shrubs, and trees. In most wet areas in the forest the vegetation is so thick that it is difficult for large animals to travel through the undergrowth. The organic material in the soils is mainly from the leaves of trees and shrubs. The organic matter in the well drained soils, for example, Oakville, wet substratum, soils, decomposes about as quickly as it is deposited; therefore, these soils have a low content of organic matter and their surface layer is light colored.

Prairie grasses are dominant in the western part of the county. Their fibrous root system and dense foliage add large amounts of organic matter to the soils. The organic matter is added faster than it decomposes, and as a result the soils in this area, for example, Darroch soils, have a thick, dark surface layer.

Some areas of prairie grasses are adjacent to a deciduous forest, and shrubs and trees are growing in the grasses in many places. Most of the very poorly drained soils in the eastern part of the county have a thick, dark surface layer. This is because large amounts of organic matter have been deposited by the grasses, and water has slowed the decomposition of the organic matter. Gilford soils, for example, are very poorly drained soils that have a dark surface layer.

relief

Relief has had an important effect on the formation of the soils in White County. Internal soil drainage, runoff, depth to the water table, leaching, and accumulation or decay of organic matter are affected by relief. The relief in White County is predominantly level to gently sloping; it is steep only in a few small areas.

Different kinds of soil have developed from the same kind of parent material mainly because of differences in relief. For example, Martinsville, Whitaker, and Rensselaer soils developed in the same kind of parent material. Martinsville soils formed in nearly level or gently sloping areas above the water table. They are well drained and have a brown or dark brown subsoil. Whitaker soils formed in nearly level areas where the water table is seasonally high. They are somewhat poorly drained and have a mottled subsoil that is yellowish brown in the upper part, grayish brown in the middle part, and gray in the lower part. Rensselaer soils formed in nearly level or depressional areas. They also have a seasonally high water table that is somewhat higher than that of Whitaker soils. Rensselaer soils are very poorly drained and have a gray, mottled subsoil.

In White County, erosion is caused mainly by runoff, and the velocity of runoff is determined by the relief. Water erosion on the nearly level soils in the county is slight because runoff is slow. On the sloping soils, runoff has greater velocity and can loosen and carry more soil particles. Wind erosion, on the other hand, is a serious problem on nearly level sandy soils. Many fields that are not protected by a vegetative cover are subject to soil blowing.

time

The length of time that soil material remains in place and is acted on by the soil forming processes largely determines whether a soil is fully developed (mature) or undeveloped (young). Some of the sandy soils in the northern part of the county show very little development even though the soil forming processes have been active there for the same length of time as in other parts of the county where the soils are well developed. Sandy soils have very little silt and clay, which are needed for the formation of strongly developed horizons. Oakville, wet substratum, soils have essentially undeveloped horizons and are considered to be young soils. Riddles soils have well developed A and B horizons that are a result of the natural processes of soil formation. They are considered to be mature soils. Most of the mature soils formed in loamy parent material.

Alluvial soils are young and show little or no horizon development. Fresh material is periodically deposited on these soils, and the material has not been in place long enough for distinct horizons to form. Soils of this kind are Abscota and Cohoctah soils.

In White County there is little difference in the age of the soils and the age of the parent material in which they formed. Every soil in the county, except the alluvial soils, started developing after the glaciers receded.

processes of soil formation

Several processes are involved in the formation of soils. These processes are the accumulation of organic matter; the solution, transfer, loss, and reprecipitation of calcium carbonates and bases; the liberation, reduction, transfer, and loss of iron; and the formation and translocation of silicate clay minerals. In most soils, more than one of these processes has been active in horizon differentiation.

Some organic matter has accumulated in the surface layer of all the soils in White County. The organic matter content of these soils is medium or high. Generally, the mineral soils that have the most organic matter, for example, Wolcott and Gilford soils, have a thick, black surface layer.

Carbonates and bases have been leached from the upper horizons in nearly all the soils in the county. This leaching indirectly affects horizon differentiation. It is generally believed to precede the translocation of silicate clay minerals. Most of the carbonates and bases have been leached from the A and B horizons of well drained soils. Even in the wettest soils some leaching is indicated by the absence of carbonates and by an acid reaction. Leaching of wet soils is slow because water moves slowly through the soils.

Leaching of bases and translocation of silicate clays are two of the most important processes in horizon differentiation in the soils in this county. Clay particles accumulate in pores and form a film on the surfaces along which water moves. Martinsville soils are an example of soils in which translocated silicate clays have formed clay films on the B2t horizon.

The reduction, transfer, and removal of iron, or gleying, has occurred in all of the very poorly drained, poorly drained, and somewhat poorly drained soils in the county. In these naturally wet soils, this process has been significant in horizon differentiation. The gray color of the subsoil indicates the reduction of iron oxides. The reduction is commonly accompanied by some transfer of iron either from upper horizons to lower horizons or completely out of the profile. Mottles in a horizon indicate segregation of iron.

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glossary

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	More than 12

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A tillage system that does not invert the soil and that leaves all or part of the crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms. The Lco horizon is a limnic layer that contains many fecal pellets.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Drainage, subsurface. Removal of excess ground water through buried drains installed within the soil profile. The drains collect the water and convey it to a gravity or pump outlet.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Fine textured soil. Sandy clay, silty clay, and clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial melt water.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine*, *medium*, and *coarse*; and contrast—*faint*, *distinct*, and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by glacial melt water.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A1, A2, A3) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A horizon. Includes all subdivisions of this horizon (A1, A2, A3).

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Underlying material. (See Substratum).

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1951-74 at Delphi, Indiana]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	35.2	17.5	26.4	62	-14	19	1.93	.92	2.75	5	4.5
February---	39.4	21.1	30.3	64	-9	26	1.89	.96	2.64	4	5.4
March------	49.5	29.1	39.3	79	4	131	2.71	1.64	3.67	6	3.5
April------	64.0	40.2	52.2	86	20	366	4.01	2.26	5.42	8	.7
May--------	74.0	49.3	61.7	92	29	673	3.82	2.32	5.17	7	.0
June-------	83.2	58.8	71.1	98	41	933	3.97	2.22	5.39	6	.0
July-------	86.1	62.3	74.2	98	46	1,060	4.79	2.64	6.55	6	.0
August-----	84.2	60.0	72.1	96	43	995	3.06	2.00	4.02	5	.0
September--	78.8	53.3	66.1	95	33	783	2.94	1.28	4.28	5	.0
October----	67.9	42.4	55.2	87	22	471	2.47	1.12	3.57	5	.0
November---	51.2	32.2	41.7	76	11	108	2.63	1.61	3.54	5	2.1
December---	39.1	23.0	31.1	66	-8	46	2.57	.88	3.92	6	5.2
Year-----	62.7	40.8	51.8	100	-14	5,611	36.79	32.13	41.31	68	21.4

[1]A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-74 at Delphi, Indiana]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 15	May 3	May 18
2 years in 10 later than--	April 12	April 27	May 13
5 years in 10 later than--	April 4	April 16	May 3
First freezing temperature in fall:			
1 year in 10 earlier than--	October 20	October 7	September 22
2 years in 10 earlier than--	October 24	October 13	September 27
5 years in 10 earlier than--	November 1	October 22	October 6

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-74 at Delphi, Indiana]

Probability	Length of growing season if daily minimum temperature is--		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	192	163	139
8 years in 10	198	172	145
5 years in 10	209	188	156
2 years in 10	221	205	167
1 year in 10	226	213	173

TABLE 4.--POTENTIAL AND LIMITATIONS OF MAP UNITS ON THE GENERAL SOIL MAP

Map unit	Extent of area	Cultivated crops	Woodland	Urban uses
	Percent			
1. Gilford, limestone substratum-Seafield Variant-Wolcott, limestone substratum	2	Good	Fair: wetness.	Poor: wetness, ponding.
2. Chelsea-Morocco-Oakville	13	Poor: droughtiness, soil blowing.	Fair: droughtiness.	Good.
3. Gilford-Seafield	18	Good	Fair: wetness.	Poor: wetness.
4. Maumee-Ackerman	2	Fair: wetness, soil blowing.	Poor: wetness.	Poor: wetness, ponding.
5. Rensselaer, sandy substratum-Gilford	5	Good	Fair: wetness.	Poor: wetness, ponding.
6. Maumee-Morocco	5	Fair: wetness, soil blowing.	Fair: wetness.	Poor: wetness.
7. Aubbeenaubbee-Gilford-Owosso	4	Good	Good	Fair: wetness.
8. Martinsville-Whitaker-Alvin	15	Good	Good	Good.
9. Wolcott-Conover	14	Good	Fair: wetness.	Poor: wetness.
10. Rensselaer, sandy substratum-Whitaker	2	Good	Fair: wetness.	Poor: wetness.
11. Rensselaer-Darroch	8	Good	Fair: wetness.	Poor: wetness.
12. Pella-Mundelein	5	Good	Fair: wetness.	Poor: wetness.
13. Pella, till substratum-Elliott-Varna	5	Good	Good	Fair: wetness.
14. Chalmers-Toronto-Wingate Variant	2	Good	Good	Fair: wetness.

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
Ab	Abscota loamy fine sand, occasionally flooded	935	0.3
An	Ackerman muck, drained	2,486	0.8
AsA	Alvin fine sandy loam, 0 to 2 percent slopes	4,007	1.3
AsB	Alvin fine sandy loam, 2 to 6 percent slopes	2,158	0.7
AuA	Aubbeenaubbee fine sandy loam, 0 to 1 percent slopes	5,458	1.7
BmA	Brems loamy fine sand, 0 to 2 percent slopes	7,843	2.5
Ca	Chalmers silty clay loam	6,167	1.9
ChB	Chelsea fine sand, 2 to 6 percent slopes	11,114	3.5
ChC	Chelsea fine sand, 6 to 15 percent slopes	4,251	1.3
Ck	Cohoctah fine sandy loam, occasionally flooded	2,407	0.8
CnA	Conover loam, 0 to 1 percent slopes	15,615	4.9
CsA	Crosier silt loam, 0 to 2 percent slopes	3,285	1.0
Dc	Darroch silt loam	8,130	2.6
ElA	Elliott silt loam, 0 to 2 percent slopes	4,466	1.4
FoA	Foresman silt loam, 0 to 2 percent slopes	3,039	1.0
Gf	Gilford fine sandy loam	39,761	12.5
Gv	Gilford fine sandy loam, limestone substratum	1,973	0.6
MaA	Martinsville silt loam, 0 to 2 percent slopes	11,598	3.7
MaB2	Martinsville silt loam, 2 to 8 percent slopes, eroded	6,078	1.9
Mb	Maumee loamy fine sand	19,392	6.1
MoA	Montmorenci loam, 0 to 2 percent slopes	1,875	0.6
Mr	Morocco fine sand	12,466	3.9
MuA	Mundelein silt loam, 0 to 2 percent slopes	2,566	0.8
Mw	Muskego muck	1,501	0.5
OaA	Oakville fine sand, wet substratum, 0 to 3 percent slopes	7,458	2.3
OcB	Octagon silt loam, 2 to 6 percent slopes	765	0.2
OcC2	Octagon silt loam, 6 to 12 percent slopes, eroded	146	*
OeA	Odell loam, 0 to 1 percent slopes	1,119	0.4
OwA	Owosso fine sandy loam, 1 to 3 percent slopes	3,580	1.1
Pa	Pella silty clay loam	11,775	3.7
Ph	Pella silty clay loam, till substratum	4,784	1.5
Pt	Pits, quarries	207	0.1
Re	Rensselaer clay loam	27,991	8.8
Rg	Rensselaer loam, sandy substratum	12,164	3.8
Rm	Rensselaer Variant loam	2,325	0.7
RsA	Riddles silt loam, 0 to 2 percent slopes	779	0.2
RsB2	Riddles silt loam, 2 to 8 percent slopes, eroded	1,127	0.4
Se	Seafield fine sandy loam	15,279	4.8
Sf	Seafield Variant fine sandy loam	1,702	0.5
SpA	Sparta fine sand, 0 to 3 percent slopes	1,169	0.4
ToA	Toronto silt loam, 0 to 1 percent slopes	1,759	0.6
VaB2	Varna silt loam, 1 to 6 percent slopes, eroded	3,004	0.9
Wa	Watseka loamy fine sand	470	0.1
Wh	Whitaker silt loam	8,451	2.7
WnB2	Wingate Variant silt loam, 1 to 6 percent slopes, eroded	1,681	0.5
Wo	Wolcott clay loam	30,286	9.5
Wv	Wolcott clay loam, limestone substratum	1,281	0.4
	Water	207	0.1
	Total	318,080	100.0

* Less than 0.1 percent.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grass-legume hay	Tall fescue
	Bu	Bu	Bu	Ton	AUM*
Ab------------------------ Abscota	70	---	28	3.0	6.0
An------------------------ Ackerman	75	28	36	3.5	7.0
AsA----------------------- Alvin	98	33	48	4.3	8.6
AsB----------------------- Alvin	92	31	45	4.0	8.0
AuA----------------------- Aubbeenaubbee	110	38	50	3.6	7.2
BmA----------------------- Brems	70	24	32	2.3	4.6
Ca------------------------ Chalmers	150	53	60	5.0	10.0
ChB----------------------- Chelsea	57	21	---	2.0	4.0
ChC----------------------- Chelsea	50	19	---	1.5	3.0
Ck------------------------ Cohoctah	100	45	40	4.5	9.0
CnA----------------------- Conover	130	40	65	4.0	8.0
CsA----------------------- Crosier	120	42	54	4.0	8.0
Dc------------------------ Darroch	135	46	52	4.3	8.6
ElA----------------------- Elliott	130	45	55	5.0	10.0
FoA----------------------- Foresman	125	42	60	4.0	8.0
Gf------------------------ Gilford	120	42	54	4.0	8.0
Gv------------------------ Gilford	120	42	49	4.0	8.0
MaA----------------------- Martinsville	120	42	48	4.0	8.0
MaB2---------------------- Martinsville	115	40	46	3.8	7.6
Mb------------------------ Maumee	110	38	50	3.6	7.2
MoA----------------------- Montmorenci	125	40	52	3.8	7.6

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grass-legume hay	Tall fescue
	Bu	Bu	Bu	Ton	AUM*
Mr----- Morocco	80	28	36	2.6	5.2
MuA----- Mundelein	141	44	57	5.0	10.0
Mw----- Muskego	90	35	---	3.5	7.0
OaA----- Oakville	60	---	30	2.5	5.0
OcB----- Octagon	115	40	52	3.8	7.6
OcC2----- Octagon	100	35	45	3.3	6.6
OeA----- Odell	135	46	58	4.3	8.6
OwA----- Owosso	105	35	55	4.5	9.0
Pa----- Pella	148	48	56	5.0	10.0
Ph----- Pella	140	40	50	4.5	7.5
Pt. Pits					
Re----- Rensselaer	150	53	60	5.0	10.0
Rg----- Rensselaer	140	50	---	4.5	9.0
Rm----- Rensselaer Variant	130	46	52	4.3	8.6
RsA----- Riddles	115	42	48	4.0	8.0
RsB2----- Riddles	110	40	46	3.8	7.6
Se----- Seafield	95	35	41	3.1	6.2
Sf----- Seafield Variant	85	30	38	3.1	6.2
SpA----- Sparta	55	---	---	2.5	5.0
ToA----- Toronto	135	47	54	4.4	8.8
VaB2----- Varna	122	41	52	4.8	9.6
Wa----- Watseka	92	31	43	3.7	7.4
Wh----- Whitaker	130	46	52	4.3	8.6

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grass-legume hay	Tall fescue
	Bu	Bu	Bu	Ton	AUM*
WnB2 Wingate Variant	125	43	49	4.0	8.0
Wo, Wv Wolcott	150	53	60	5.0	10.0

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

TABLE 7.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Dashes indicate no acreage]

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I	19,857	---	---	---
II	225,044	13,686	203,771	7,587
III	23,542	1,273	21,799	470
IV	45,072	---	3,987	41,085
V	---	---	---	---
VI	4,251	---	---	4,251
VII	---	---	---	---
VIII	---	---	---	---

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
Ab: Abscota	1s	Slight	Slight	Moderate	Slight	Northern red oak	83	Eastern white pine, yellow-poplar.
						White ash	80	
						Silver maple	---	
						Eastern cottonwood	---	
						American sycamore	---	
An: Ackerman	4w	Slight	Severe	Severe	Severe	Red maple	46	
						Silver maple	---	
						White ash	---	
						Quaking aspen	---	
						Eastern cottonwood	---	
AsA, AsB: Alvin	2o	Slight	Slight	Slight	Slight	White oak	80	Green ash, black walnut, yellow-poplar, white oak, eastern white pine, American sycamore, sugar maple.
						Northern red oak	80	
						Black walnut	---	
						Yellow-poplar	90	
AuA: Aubbeenaubbee	2o	Slight	Slight	Slight	Slight	White oak	75	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore, green ash, white ash.
						Pin oak	85	
						Yellow-poplar	85	
						Northern red oak	75	
BmA: Brems	3s	Slight	Slight	Moderate	Slight	Northern red oak	70	Eastern white pine, red pine, jack pine.
						Red pine	72	
						Eastern white pine	65	
						Jack pine	70	
Ca: Chalmers	---	--------	--------	--------	--------	------------------	---	Red maple, white ash, eastern white pine.
ChB, ChC: Chelsea	3s	Slight	Slight	Moderate	Slight	White oak	70	Eastern white pine, red pine, jack pine.
						Red pine	72	
						Eastern white pine	83	
						Jack pine	70	
						Quaking aspen	72	
						Northern red oak	70	
Ck: Cohoctah	2w	Slight	Severe	Severe	Severe	Red maple	72	Eastern white pine, white ash, green ash, red maple.
						Silver maple	95	
						White ash	72	
						Green ash	70	
						Eastern cottonwood	---	
CnA: Conover	3o	Slight	Slight	Slight	Slight	Northern red oak	75	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
						Pin oak	85	
						Yellow-poplar	85	
CsA: Crosier	3o	Slight	Slight	Slight	Slight	White oak	75	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
						Pin oak	85	
						Yellow-poplar	85	
						Northern red oak	75	
Dc: Darroch	---	--------	--------	--------	--------	------------------	---	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
ElA: Elliott	---	---	---	---	---	---	---	White oak, northern red oak, green ash, sugar maple, eastern white pine.
FoA: Foresman	---	---	---	---	---	---	---	Eastern white pine, red pine, black walnut, yellow-poplar, white ash.
Gf: Gilford	4w	Slight	Severe	Severe	Severe	Pin oak Eastern white pine Bigtooth aspen Red maple	70 55 70 60	Eastern white pine, European larch, white spruce, white ash.
Gv: Gilford	4w	Slight	Severe	Severe	Severe	Pin oak Eastern white pine Bigtooth aspen Red maple	70 75 70 70	Eastern white pine, European larch, white spruce, white ash.
MaA, MaB2: Martinsville	1o	Slight	Slight	Slight	Slight	White oak Yellow-poplar	90 98	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
Mb: Maumee	4w	Slight	Severe	Slight	Severe	Pin oak Eastern white pine Bigtooth aspen Silver maple	70 55 70 ---	European larch, silver maple, pin oak.
MoA: Montmorenci	---	---	---	---	---	---	---	Eastern white pine, white ash, yellow-poplar, black walnut.
Mr: Morocco	3o	Slight	Slight	Slight	Slight	Northern red oak Pin oak Eastern white pine	70 85 65	Eastern white pine, European larch, red maple, American sycamore, northern red oak.
MuA: Mundelein	---	---	---	---	---	---	---	American sycamore, eastern cottonwood, red pine, green ash, bur oak, common hackberry.
Mw: Muskego	4w	Slight	Severe	Severe	Severe	Tamarack Red maple White ash Green ash Black willow Quaking aspen Silver maple	50 51 52 --- --- 56 ---	
OaA: Oakville	3s	Slight	Slight	Severe	Slight	White oak Red pine Eastern white pine Jack pine	70 78 85 68	Eastern white pine, red pine, jack pine.
OcB, OcC2: Octagon	---	---	---	---	---	---	---	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
OeA: Odell	---	---	---	---	---	---	---	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Trees to plant
OwA: Owosso	1o	Slight	Slight	Slight	Slight	White oak Yellow-poplar	90 98	Eastern white pine, red pine, black walnut, yellow-poplar, white ash.
Pa: Pella	2w	Slight	Severe	Moderate	Moderate	Pin oak White oak Northern red oak	85 75 75	Eastern white pine, Norway spruce, red maple, white ash.
Ph: Pella	---	---	---	---	---	---	---	Pin oak, green ash, white ash, eastern white pine, red maple.
Re: Rensselaer	2w	Slight	Severe	Severe	Severe	Pin oak White oak Northern red oak	86 75 76	Eastern white pine, Norway spruce, red maple, white ash.
Rg: Rensselaer	2w	Slight	Severe	Severe	Severe	Pin oak White oak Northern red oak	86 75 ---	Eastern white pine, Norway spruce, red maple, white ash.
Rm: Rensselaer Variant	2w	Slight	Severe	Severe	Severe	Pin oak White oak Northern red oak	--- --- ---	Eastern white pine, Norway spruce, red maple, white ash.
RsA, RsB2: Riddles	1o	Slight	Slight	Slight	Slight	White oak Yellow-poplar Northern red oak	90 98 90	Eastern white pine, red pine, white ash, yellow-poplar, black walnut, white oak.
Se: Seafield	3o	Slight	Slight	Slight	Slight	White oak Pin oak Yellow-poplar Northern red oak	65 80 80 70	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore, green ash.
Sf: Seafield Variant	3o	Slight	Slight	Slight	Slight	White oak Pin oak Yellow-poplar Northern red oak	65 80 80 70	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore, green ash.
SpA: Sparta	3s	Slight	Slight	Severe	Slight	Northern red oak Red pine Eastern white pine Jack pine	70 --- --- ---	Eastern white pine, red pine, jack pine.
ToA: Toronto	---	---	---	---	---	---	---	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
VaB2: Varna	---	---	---	---	---	---	---	White oak, black walnut, northern red oak, green ash, sugar maple, eastern white pine.
Wa: Watseka	---	---	---	---	---	---	---	Eastern white pine, red pine.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
Wh----------------- Whitaker	3o	Slight	Slight	Slight	Slight	White oak----------- Pin oak------------- Yellow-poplar-------- Northern red oak----	70 85 85 75	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
WnB2--------------- Wingate Variant	---	--------	--------	--------	--------	--------------------	---	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
Wo----------------- Wolcott	2w	Slight	Severe	Severe	Moderate	Pin oak------------- White oak----------- Northern red oak---- Silver maple-------- Red maple-----------	90 75 --- --- ---	Eastern white pine, Norway spruce, red maple, white ash.
Wv----------------- Wolcott	2w	Slight	Severe	Severe	Moderate	Pin oak------------- White oak----------- Northern red oak---- Silver maple-------- Red maple-----------	90 75 78 --- ---	Eastern white pine, red maple, white ash.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil]

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Ab: Abscota	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
An: Ackerman	Common ninebark, whitebelle honeysuckle.	Amur honeysuckle, Amur privet, silky dogwood, nannyberry viburnum, Tatarian honeysuckle.	Tall purple willow	Golden willow, black willow.	Imperial Carolina poplar.
AsA, AsB: Alvin	---	Amur privet, Washington hawthorn, Amur honeysuckle, American cranberrybush, Tatarian honeysuckle.	Austrian pine, northern white-cedar, osageorange, eastern redcedar.	Eastern white pine, red pine, Norway spruce.	---
AuA: Aubbeenaubbee	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
BmA: Brems	Siberian peashrub	Eastern redcedar, radiant crabapple, Washington hawthorn, autumn-olive, Amur honeysuckle, lilac, Tatarian honeysuckle.	Austrian pine, jack pine, red pine.	Eastern white pine	---
Ca: Chalmers	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
ChB, ChC: Chelsea	Siberian peashrub	Eastern redcedar, radiant crabapple, Washington hawthorn, autumn-olive, Amur honeysuckle, lilac, Tatarian honeysuckle.	Austrian pine, jack pine, red pine.	Eastern white pine	---
Ck: Cohoctah	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Northern white-cedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
CnA: Conover	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
CsA: Crosier	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, blue spruce, northern white-cedar, Washington hawthorn, white fir.	Norway spruce	Eastern white pine, pin oak.
Dc: Darroch	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
ElA: Elliott	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
FoA: Foresman	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Gf: Gilford	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Norway spruce, northern white-cedar, Washington hawthorn, blue spruce, white fir, Austrian pine.	Eastern white pine	Pin oak.
Gv: Gilford	---	Washington hawthorn, silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Norway spruce, northern white-cedar, blue spruce, white fir, Austrian pine.	---	Pin oak, eastern white pine.
MaA, MaB2: Martinsville	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Mb: Maumee	---	Washington hawthorn, Tatarian honeysuckle, nannyberry viburnum.	Green ash, osageorange, northern white-cedar, white spruce, eastern redcedar.	Black willow	---
MoA: Montmorenci	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Mr: Morocco	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
MuA: Mundelein	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
Mw: Muskego	Common ninebark, whitebelle honeysuckle.	Amur privet, nannyberry viburnum, silky dogwood, Tatarian honeysuckle, Amur honeysuckle.	Tall purple willow	Golden willow, black willow.	Imperial Carolina poplar.
OaA: Oakville	Siberian peashrub	Eastern redcedar, lilac, radiant crabapple, autumn-olive, Washington hawthorn, Amur honeysuckle, Tatarian honeysuckle.	Red pine, Austrian pine, jack pine.	Eastern white pine	---
OcB, OcC2: Octagon	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
OeA: Odell	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, Austrian pine, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
OwA: Owosso	---	Amur honeysuckle, Amur privet, American cranberrybush, Washington hawthorn, Tatarian honeysuckle.	Eastern redcedar, Austrian pine, northern white-cedar, osageorange.	Eastern white pine, Norway spruce, red pine.	---
Pa: Pella	---	Amur privet, silky dogwood, American cranberrybush, Amur honeysuckle.	White fir, northern white-cedar, blue spruce, Austrian pine, Washington hawthorn, Norway spruce.	Eastern white pine	Pin oak.
Ph: Pella	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Pt. Pits					
Re----------------- Rensselaer	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Northern white-cedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
Rg----------------- Rensselaer	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Northern white-cedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine.	Pin oak.
Rm----------------- Rensselaer Variant	---	Washington hawthorn, nannyberry viburnum, Tatarian honeysuckle.	Northern white-cedar, eastern redcedar, white spruce, osage-orange, green ash.	Black willow------	---
RsA, RsB2---------- Riddles	---	Amur privet, Amur honeysuckle, American cranberrybush, Washington hawthorn, Tatarian honeysuckle.	Eastern redcedar, Austrian pine, northern white-cedar, osageorange.	Eastern white pine, Norway spruce, red pine.	---
Se----------------- Seafield	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
Sf----------------- Seafield Variant	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
SpA---------------- Sparta	Siberian peashrub	Eastern redcedar, radiant crabapple, Washington hawthorn, autumn-olive, Amur honeysuckle, lilac, Tatarian honeysuckle.	Austrian pine, jack pine, red pine.	Eastern white pine	---
ToA---------------- Toronto	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
VaB2: Varna	---	Eastern redcedar, Washington hawthorn, Amur honeysuckle, Amur privet, arrowwood, Tatarian honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
Wa: Watseka	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
Wh: Whitaker	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, Austrian pine, blue spruce, Washington hawthorn, northern white-cedar.	Norway spruce	Eastern white pine, pin oak.
WnB2: Wingate Variant	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Pin oak, eastern white pine.
Wo, Wv: Wolcott	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.

TABLE 10.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Ab: Abscota	Severe: floods.	Slight	Moderate: floods.	Slight	Moderate: floods, droughty.
An: Ackerman	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
AsA: Alvin	Slight	Slight	Slight	Slight	Slight.
AsB: Alvin	Slight	Slight	Severe: slope.	Slight	Slight.
AuA: Aubbeenaubbee	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
BmA: Brems	Moderate: wetness.	Moderate: wetness.	Moderate: small stones.	Slight	Moderate: droughty.
Ca: Chalmers	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
ChB: Chelsea	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty.
ChC: Chelsea	Severe: too sandy.	Severe: too sandy.	Severe: too sandy, slope.	Severe: too sandy.	Moderate: slope, droughty.
Ck: Cohoctah	Severe: floods, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
CnA: Conover	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
CsA: Crosier	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Dc: Darroch	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
ElA: Elliott	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
FoA: Foresman	Slight	Slight	Slight	Slight	Slight.
Gf, Gv: Gilford	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
MaA: Martinsville	Slight	Slight	Slight	Severe: erodes easily.	Slight.
MaB2: Martinsville	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.
Mb: Maumee	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
MoA: Montmorenci	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Slight.
Mr: Morocco	Severe: wetness, too sandy.	Severe: too sandy.	Severe: too sandy, wetness.	Severe: too sandy.	Moderate: wetness, droughty.
MuA: Mundelein	Severe: wetness, excess humus.	Severe: excess humus.	Severe: excess humus, wetness.	Severe: excess humus.	Moderate: wetness.
Mw: Muskego	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.
OaA: Oakville	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty.
OcB: Octagon	Slight	Slight	Moderate: slope.	Slight	Slight.
OcC2: Octagon	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
OeA: Odell	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
OwA: Owosso	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Slight	Slight.
Pa: Pella	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Ph: Pella	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Pt. Pits					
Re, Rg: Rensselaer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Rm: Rensselaer Variant	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
RsA: Riddles	Slight	Slight	Moderate: small stones.	Slight	Slight.
RsB2: Riddles	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Se: Seafield	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Sf: Seafield Variant	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
SpA: Sparta	Slight	Slight	Moderate: small stones.	Slight	Moderate: droughty.
ToA: Toronto	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
VaB2: Varna	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
Wa: Watseka	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
Wh: Whitaker	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.
WnB2: Wingate Variant	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight	Slight.
Wo, Wv: Wolcott	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.

TABLE 11.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Ab: Abscota	Poor	Fair	Good	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
An: Ackerman	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
AsA: Alvin	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
AsB: Alvin	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
AuA: Aubbeenaubbee	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
BmA: Brems	Fair	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Fair.
Ca: Chalmers	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
ChB: Chelsea	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
ChC: Chelsea	Very poor.	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Ck: Cohoctah	Fair	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
CnA: Conover	Good	Good	Good	Good	Fair	Fair	Fair	Good	Good	Fair.
CsA: Crosier	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Dc: Darroch	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
ElA: Elliott	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
FoA: Foresman	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Gf: Gilford	Fair	Poor	Poor	Poor	Poor	Good	Good	Fair	Poor	Good.
Gv: Gilford	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
MaA, MaB2: Martinsville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Mb: Maumee	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
MoA: Montmorenci	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Mr: Morocco	Poor	Poor	Good	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hardwood trees	Conif-erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
MuA: Mundelein	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Mw: Muskego	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good.
OaA: Oakville	Poor	Poor	Fair	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
OcB: Octagon	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
OcC2: Octagon	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
OeA: Odell	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
OwA: Owosso	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Pa: Pella	Good	Good	Good	Fair	Fair	Good	Good	Good	Fair	Good.
Ph: Pella	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Pt. Pits										
Re, Rg: Rensselaer	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Rm: Rensselaer Variant	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
RsA, RsB2: Riddles	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Se: Seafield	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Sf: Seafield Variant	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
SpA: Sparta	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
ToA: Toronto	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
VaB2: Varna	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Wa: Watseka	Fair	Fair	Good	Good	Good	Fair	Poor	Fair	Good	Poor.
Wh: Whitaker	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
WnB2: Wingate Variant	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Wo, Wv: Wolcott	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.

TABLE 12.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Ab-----Abscota	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods, droughty.
An-----Ackerman	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding, excess humus.
AsA-----Alvin	Severe: cutbanks cave.	Slight-----	Slight-----	Slight-----	Moderate: frost action.	Slight.
AsB-----Alvin	Severe: cutbanks cave.	Slight-----	Slight-----	Moderate: slope.	Moderate: frost action.	Slight.
AuA-----Aubbeenaubbee	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
BmA-----Brems	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: droughty.
Ca-----Chalmers	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
ChB-----Chelsea	Severe: cutbanks cave.	Slight-----	Slight-----	Slight-----	Slight-----	Moderate: droughty.
ChC-----Chelsea	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope, droughty.
Ck-----Cohoctah	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, frost action, wetness.	Severe: wetness.
CnA-----Conover	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
CsA-----Crosier	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, low strength.	Moderate: wetness.
Dc-----Darroch	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
ElA-----Elliott	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
FoA-----Foresman	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: wetness.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Gf-----Gilford	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
Gv-----Gilford	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: frost action, ponding.	Severe: ponding.
MaA-----Martinsville	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, frost action.	Slight.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
MaB2---------------- Martinsville	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, frost action.	Slight.
Mb------------------ Maumee	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
MoA----------------- Montmorenci	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
Mr------------------ Morocco	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: wetness, droughty.
MuA----------------- Mundelein	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Mw------------------ Muskego	Severe: excess humus, ponding.	Severe: low strength, ponding.	Severe: low strength, ponding.	Severe: low strength, ponding.	Severe: frost action, low strength, ponding.	Severe: excess humus, ponding.
OaA----------------- Oakville	Severe: cutbanks cave.	Slight---------	Moderate: wetness.	Slight---------	Slight---------	Moderate: droughty.
OcB----------------- Octagon	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
OcC2---------------- Octagon	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
OeA----------------- Odell	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
OwA----------------- Owosso	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Pa------------------ Pella	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, low strength, frost action.	Severe: ponding.
Ph------------------ Pella	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Pt. Pits						
Re, Rg-------------- Rensselaer	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Rm------------------ Rensselaer Variant	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
RsA----------------- Riddles	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, frost action.	Slight.
RsB2---------------- Riddles	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Moderate: low strength, frost action.	Slight.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Se----------------- Seafield	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
Sf----------------- Seafield Variant	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
SpA---------------- Sparta	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
ToA---------------- Toronto	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
VaB2--------------- Varna	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
Wa----------------- Watseka	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: wetness, droughty.
Wh----------------- Whitaker	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
WnB2--------------- Wingate Variant	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
Wo----------------- Wolcott	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Wv----------------- Wolcott	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.

TABLE 13.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ab------------------ Abscota	Severe: floods, wetness, poor filter.	Severe: floods, seepage, wetness.	Severe: floods, seepage, wetness.	Severe: floods, seepage, wetness.	Poor: too sandy, seepage.
An------------------ Ackerman	Severe: ponding, poor filter.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
AsA, AsB------------ Alvin	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: thin layer.
AuA----------------- Aubbeenaubbee	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: seepage, wetness.	Poor: wetness.
BmA----------------- Brems	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
Ca------------------ Chalmers	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
ChB----------------- Chelsea	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
ChC----------------- Chelsea	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
Ck------------------ Cohoctah	Severe: wetness, floods.	Severe: floods, seepage, wetness.	Severe: seepage, floods, wetness.	Severe: seepage, floods, wetness.	Poor: wetness.
CnA----------------- Conover	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
CsA----------------- Crosier	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Dc------------------ Darroch	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too sandy.	Severe: wetness.	Poor: too sandy, wetness.
ElA----------------- Elliott	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
FoA----------------- Foresman	Severe: wetness.	Severe: wetness.	Severe: wetness, too sandy.	Severe: wetness.	Poor: too sandy.
Gf------------------ Gilford	Severe: ponding, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Gv----------------- Gilford	Severe: ponding.	Severe: seepage, ponding.	Severe: seepage, depth to rock, ponding.	Severe: seepage, ponding.	Poor: ponding.
MaA---------------- Martinsville	Slight-----------	Moderate: seepage.	Moderate: too clayey.	Slight-----------	Fair: too clayey, thin layer.
MaB2--------------- Martinsville	Slight-----------	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey, thin layer.
Mb----------------- Maumee	Severe: ponding, poor filter.	Severe: seepage, ponding.	Severe: seepage, too sandy, ponding.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
MoA---------------- Montmorenci	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Mr----------------- Morocco	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, too sandy, wetness.	Severe: seepage, wetness.	Poor: too sandy, wetness, seepage.
MuA---------------- Mundelein	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too sandy.	Severe: wetness.	Poor: too sandy, wetness.
Mw----------------- Muskego	Severe: percs slowly, ponding.	Severe: seepage, excess humus, ponding.	Severe: excess humus, ponding.	Severe: seepage, ponding.	Poor: hard to pack, ponding.
OaA---------------- Oakville	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
OcB---------------- Octagon	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
OcC2--------------- Octagon	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
OeA---------------- Odell	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
OwA---------------- Owosso	Severe: percs slowly.	Moderate: slope.	Slight-----------	Severe: seepage.	Good.
Pa----------------- Pella	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Ph----------------- Pella	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Pt. Pits					

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Re----- Rensselaer	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too sandy.	Severe: ponding.	Poor: too sandy, ponding.
Rg----- Rensselaer	Severe: ponding, percs slowly.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: ponding.	Poor: seepage, too sandy, ponding.
Rm----- Rensselaer Variant	Severe: ponding, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: too sandy, ponding.
RsA----- Riddles	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight-----	Fair: too clayey.
RsB2----- Riddles	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
Se----- Seafield	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: too sandy, wetness.
Sf----- Seafield Variant	Severe: wetness.	Severe: wetness, seepage.	Severe: depth to rock, seepage, wetness.	Severe: seepage, wetness.	Poor: too sandy, wetness.
SpA----- Sparta	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
ToA----- Toronto	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
VaB2----- Varna	Severe: wetness, percs slowly.	Severe: wetness.	Moderate: wetness, too clayey.	Slight-----	Fair: too clayey, wetness.
Wa----- Watseka	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: wetness, seepage, too sandy.	Severe: seepage, wetness.	Poor: too sandy, wetness, seepage.
Wh----- Whitaker	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.
WnB2----- Wingate Variant	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Wo----- Wolcott	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Wv----- Wolcott	Severe: ponding.	Severe: ponding.	Severe: depth to rock, ponding.	Severe: ponding.	Poor: ponding.

TABLE 14.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Ab: Abscota	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
An: Ackerman	Poor: wetness.	Probable	Improbable: too sandy.	Poor: excess humus, wetness.
AsA, AsB: Alvin	Good	Probable	Improbable: too sandy.	Good.
AuA: Aubbeenaubbee	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
BmA: Brems	Fair: wetness.	Probable	Improbable: too sandy.	Fair: too sandy, small stones.
Ca: Chalmers	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
ChB, ChC: Chelsea	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Ck: Cohoctah	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
CnA: Conover	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones.
CsA: Crosier	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Dc: Darroch	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
ElA: Elliott	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
FoA: Foresman	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
Gf: Gilford	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness.
Gv: Gilford	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
MaA, MaB2: Martinsville	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Mb: Maumee	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness.
MoA: Montmorenci	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Mr: Morocco	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
MuA: Mundelein	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, thin layer.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Mw: Muskego	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: wetness, excess humus.
OaA: Oakville	Good	Probable	Improbable: too sandy.	Poor: too sandy.
OcB: Octagon	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
OcC2: Octagon	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
OeA: Odell	Fair: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
OwA: Owosso	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Pa, Ph: Pella	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Pt. Pits				
Re: Rensselaer	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Rg: Rensselaer	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness.
Rm: Rensselaer Variant	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
RsA, RsB2: Riddles	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Se: Seafield	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
Sf: Seafield Variant	Fair: area reclaim, thin layer, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
SpA: Sparta	Good	Probable	Improbable: too sandy.	Fair: too sandy.
ToA: Toronto	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
VaB2: Varna	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Wa: Watseka	Fair: wetness.	Probable	Improbable: too sandy.	Fair: too sandy.
Wh: Whitaker	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
WnB2: Wingate Variant	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Wo, Wv: Wolcott	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

TABLE 15.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
Ab: Abscota	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Floods, cutbanks cave.	Too sandy, soil blowing, wetness.	Droughty.
An: Ackerman	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: slow refill, cutbanks cave.	Ponding, percs slowly, frost action.	Ponding, too sandy, soil blowing.	Wetness, percs slowly.
AsA, AsB: Alvin	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Soil blowing	Favorable.
AuA: Aubbeenaubbee	Moderate: seepage.	Severe: wetness.	Severe: slow refill.	Frost action	Wetness, soil blowing.	Wetness.
BmA: Brems	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Cutbanks cave	Wetness, too sandy, soil blowing.	Droughty, rooting depth.
Ca: Chalmers	Moderate: seepage.	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Ponding	Wetness.
ChB: Chelsea	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.
ChC: Chelsea	Severe: slope, seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Slope, too sandy, soil blowing.	Slope, droughty.
Ck: Cohoctah	Severe: seepage.	Severe: piping, wetness.	Slight	Floods, frost action.	Wetness, soil blowing.	Wetness.
CnA: Conover	Moderate: seepage.	Severe: piping, wetness.	Severe: slow refill.	Percs slowly, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
CsA: Crosier	Slight	Severe: piping, wetness.	Severe: slow refill.	Frost action	Wetness	Wetness.
Dc: Darroch	Moderate: seepage.	Severe: piping, wetness.	Severe: slow refill, cutbanks cave.	Frost action, cutbanks cave.	Wetness, too sandy.	Wetness.
ElA: Elliott	Slight	Moderate: piping, wetness.	Severe: no water.	Frost action	Wetness	Wetness.
FoA: Foresman	Moderate: seepage.	Severe: piping.	Severe: cutbanks cave.	Deep to water	Erodes easily, too sandy.	Erodes easily.
Gf: Gilford	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, frost action, cutbanks cave.	Ponding, too sandy, soil blowing.	Wetness.
Gv: Gilford	Severe: seepage.	Severe: piping, ponding.	Moderate: depth to rock.	Frost action, ponding.	Ponding, soil blowing.	Wetness.
MaA: Martinsville	Moderate: seepage.	Severe: thin layer.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
MaB2: Martinsville	Moderate: seepage, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
Mb----------------- Maumee	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, cutbanks cave.	Ponding, too sandy, soil blowing.	Wetness, droughty.
MoA--------------- Montmorenci	Slight----------	Severe: piping.	Severe: slow refill.	Deep to water	Favorable------	Rooting depth.
Mr----------------- Morocco	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, too sandy, soil blowing.	Wetness, droughty.
MuA--------------- Mundelein	Moderate: seepage.	Severe: seepage, piping, wetness.	Severe: slow refill, cutbanks cave.	Frost action, cutbanks cave.	Erodes easily, wetness, too sandy.	Wetness, erodes easily.
Mw----------------- Muskego	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Percs slowly, subsides, ponding.	Ponding, soil blowing, percs slowly.	Wetness, percs slowly.
OaA--------------- Oakville	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Deep to water	Too sandy, soil blowing.	Droughty.
OcB--------------- Octagon	Moderate: seepage, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Favorable------	Rooting depth.
OcC2-------------- Octagon	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope-----------	Slope, rooting depth.
OeA--------------- Odell	Slight----------	Severe: piping, wetness.	Severe: slow refill.	Frost action---	Wetness, erodes easily.	Wetness, erodes easily.
OwA--------------- Owosso	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Soil blowing---	Erodes easily.
Pa----------------- Pella	Moderate: seepage.	Severe: ponding.	Severe: slow refill.	Frost action---	Ponding---------	Wetness.
Ph----------------- Pella	Slight----------	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Ponding---------	Wetness.
Pt. Pits						
Re----------------- Rensselaer	Moderate: seepage.	Severe: piping, ponding.	Severe: slow refill, cutbanks cave.	Ponding, percs slowly, frost action.	Ponding, too sandy.	Wetness, percs slowly.
Rg----------------- Rensselaer	Moderate: seepage.	Severe: seepage, ponding, piping.	Severe: slow refill, cutbanks cave.	Ponding, percs slowly, frost action.	Erodes easily, ponding, too sandy.	Wetness, erodes easily, percs slowly.
Rm----------------- Rensselaer Variant	Severe: seepage.	Severe: piping, ponding.	Severe: slow refill, cutbanks cave.	Ponding, percs slowly, frost action.	Erodes easily, ponding, too sandy.	Wetness, erodes easily, percs slowly.
RsA--------------- Riddles	Moderate: seepage.	Slight----------	Severe: no water.	Deep to water	Favorable------	Favorable.
RsB2-------------- Riddles	Moderate: seepage, slope.	Slight----------	Severe: no water.	Deep to water	Favorable------	Favorable.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
Se: Seafield	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness, too sandy, soil blowing.	Wetness.
Sf: Seafield Variant	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Wetness, too sandy, soil blowing.	Wetness.
SpA: Sparta	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.
ToA: Toronto	Moderate: seepage.	Severe: wetness.	Severe: slow refill.	Frost action	Wetness	Wetness.
VaB2: Varna	Moderate: slope.	Moderate: piping.	Severe: no water.	Deep to water	Percs slowly	Percs slowly.
Wa: Watseka	Severe: seepage.	Severe: piping, seepage, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, too sandy, soil blowing.	Wetness, droughty.
Wh: Whitaker	Moderate: seepage.	Severe: wetness.	Moderate: slow refill, cutbanks cave.	Frost action	Erodes easily, wetness.	Wetness, erodes easily.
WnB2: Wingate Variant	Moderate: seepage, slope.	Moderate: thin layer, wetness.	Severe: slow refill.	Frost action, slope.	Erodes easily, wetness.	Erodes easily.
Wo: Wolcott	Moderate: seepage.	Severe: ponding.	Moderate: slow refill.	Ponding, frost action.	Erodes easily, ponding.	Wetness, erodes easily.
Wv: Wolcott	Moderate: seepage, depth to rock.	Severe: ponding.	Moderate: slow refill, depth to rock.	Ponding, frost action.	Erodes easily, ponding.	Wetness, erodes easily.

TABLE 16.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Ab---------------- Abscota	0-20	Loamy fine sand--	SM	A-2-4	0	95-100	95-100	50-75	15-30	---	NP
	20-60	Sand-------------	SP, SM, SP-SM	A-2-4, A-1, A-3	0	95-100	95-100	45-65	0-15	---	NP
An---------------- Ackerman	0-8	Sapric material	Pt	A-8	0	---	---	---	---	---	---
	8-14	Coprogenous earth	OH, OL	A-8	0	---	---	---	---	---	---
	14-60	Fine sand, very fine sand, loamy sand.	SM, SP-SM	A-2-4	0	100	100	85-95	10-20	---	NP
AsA, AsB---------- Alvin	0-10	Fine sandy loam	SM, ML	A-4, A-2	0	100	100	80-95	30-60	<25	NP-4
	10-35	Fine sandy loam, sandy loam, loam.	SM, SC, CL, ML	A-2, A-4, A-6	0	100	100	90-100	20-80	15-38	NP-13
	35-60	Stratified sandy loam to fine sand.	SM, SP, SP-SM	A-2, A-3	0-5	95-100	90-100	70-95	4-35	<20	NP-4
AuA--------------- Aubbeenaubbee	0-15	Fine sandy loam	SM, SM-SC	A-2-4, A-4	0	100	90-100	50-80	30-50	<25	NP-6
	15-21	Fine sandy loam, loam.	SM, ML	A-2-4, A-4	0	100	90-100	55-90	30-70	<20	NP
	21-40	Sandy clay loam, clay loam, loam.	CL, SC	A-6	0	95-100	95-100	75-95	35-70	25-35	11-16
	40-60	Loam-------------	CL, CL-ML, ML	A-4, A-6	0-3	85-100	80-100	70-95	50-70	20-35	2-14
BmA--------------- Brems	0-9	Loamy fine sand	SM, SP-SM	A-2-4	0	100	85-100	50-85	10-30	---	NP
	9-48	Sand, fine sand, loamy fine sand.	SM, SP-SM	A-3, A-2-4	0	100	80-100	50-85	5-25	---	NP
	48-60	Sand, fine sand, loamy fine sand.	SP-SM	A-3, A-2-4	0	100	80-100	50-85	5-10	---	NP
Ca---------------- Chalmers	0-13	Silty clay loam	CL	A-4, A-6	0	100	95-100	85-100	70-95	25-40	8-20
	13-27	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	95-100	85-100	70-95	30-45	10-20
	27-49	Loam, silt loam, silty clay loam.	CL	A-4, A-6	0	95-100	90-100	85-100	60-85	25-40	8-18
	49-60	Silt loam---------	CL-ML, CL	A-4, A-6	0	95-100	90-100	85-100	65-90	20-35	5-15
ChB, ChC---------- Chelsea	0-5	Fine sand---------	SM, SP-SM	A-2-4	0	100	100	65-80	10-35	---	NP
	5-80	Fine sand, sand, loamy fine sand.	SP, SM, SP-SM	A-3, A-2-4	0	100	100	65-80	3-15	---	NP
Ck---------------- Cohoctah	0-15	Fine sandy loam	ML, SM	A-4, A-2	0	100	100	65-95	30-75	<30	NP-6
	15-60	Fine sandy loam, loamy fine sand.	ML, SM, SC, CL	A-4, A-2	0	95-100	80-100	70-90	30-70	<30	NP-10
CnA--------------- Conover	0-9	Loam-------------	ML, CL, CL-ML	A-4	0-5	95-100	90-100	80-95	55-90	20-30	3-10
	9-22	Clay loam, silty clay loam.	CL	A-6	0-5	95-100	90-100	80-95	50-90	29-40	15-25
	22-60	Loam, silt loam, clay loam.	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	80-95	50-75	25-34	6-14
CsA--------------- Crosier	0-19	Silt loam---------	CL	A-4, A-6	0	100	95-100	85-95	60-80	22-33	8-15
	19-38	Clay loam, loam, sandy clay loam.	CL	A-6, A-7	0	90-95	85-95	75-90	60-70	33-47	15-26
	38-60	Loam, sandy loam	CL, ML	A-4, A-6	0-3	85-90	80-90	70-85	50-60	25-35	2-12

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
Dc---------------- Darroch	0-10	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	10-18	Loam, silt loam	CL	A-6	0	100	100	85-95	60-75	20-35	10-20
	18-31	Clay loam, sandy clay loam.	CL	A-6, A-7	0	100	100	90-100	70-80	35-50	15-25
	31-60	Stratified fine sand to loam.	SC, CL-ML, CL, SM-SC	A-4	0	100	100	75-90	35-85	<30	5-10
ElA--------------- Elliott	0-9	Silt loam--------	CL	A-6, A-4	0	95-100	95-100	95-100	80-100	30-40	8-18
	9-35	Silty clay, silty clay loam.	CH, CL	A-6, A-7	0-5	95-100	95-100	90-100	75-100	30-52	11-26
	35-60	Silty clay loam, clay loam.	CL	A-6, A-7	0-5	95-100	95-100	90-100	70-95	28-45	11-24
FoA--------------- Foresman	0-13	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	13-24	Clay loam, silty clay loam, sandy clay loam.	CL	A-6, A-7	0	100	100	90-100	70-80	35-50	15-25
	24-60	Fine sandy loam, loamy fine sand, fine sand.	SC, SM-SC, CL-ML, CL	A-4	0	100	100	75-90	35-85	<30	5-10
Gf---------------- Gilford	0-14	Fine sandy loam	SM, SC, SM-SC	A-4	0	95-100	90-100	65-80	35-45	<25	2-10
	14-35	Sandy clay loam, fine sandy loam.	SM, SC, SM-SC	A-2-4	0	90-100	90-100	55-70	20-35	15-30	NP-8
	35-60	Loamy sand, sand	SM, SP, SP-SM	A-3, A-1-B, A-2-4	0	90-100	85-100	18-60	3-20	---	NP
Gv---------------- Gilford	0-10	Fine sandy loam	SM, SC, SM-SC	A-4	0	95-100	90-100	65-80	35-45	<25	2-10
	10-42	Fine sandy loam	SM, SC, SM-SC	A-2-4	0	90-100	90-100	55-70	20-35	15-30	NP-8
	42	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
MaA, MaB2--------- Martinsville	0-13	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	90-100	80-100	60-90	22-33	4-12
	13-20	Clay loam, silty clay loam.	CL, SC	A-4, A-6	0	100	90-100	65-90	40-90	20-35	8-20
	20-49	Sandy loam, sandy clay loam, loam.	SM, ML	A-2-4, A-4	0	100	90-100	60-80	30-60	30-40	2-8
	49-60	Stratified sand to silt loam.	CL, SC, CL-ML, SM-SC	A-4	0	95-100	85-100	80-95	40-60	<25	4-9
Mb---------------- Maumee	0-19	Loamy fine sand	SM, SP-SM	A-2-4, A-3	0	95-100	90-100	50-75	5-30	<30	NP-5
	19-60	Sand, loamy fine sand.	SP, SP-SM, SM	A-1-B, A-3, A-2-4	0	85-100	75-95	35-70	3-25	<30	NP
MoA--------------- Montmorenci	0-13	Loam-------------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	13-29	Clay loam--------	CL	A-6, A-7	0	95-100	90-95	75-95	65-95	35-50	15-30
	29-60	Loam-------------	CL, CL-ML	A-4, A-6	0-3	85-95	80-90	75-85	50-65	20-30	5-15
Mr---------------- Morocco	0-9	Fine sand--------	SM, SM-SC	A-2-4	0	100	100	65-85	20-35	<20	NP-5
	9-60	Fine sand--------	SM, SP-SM	A-3, A-2-4	0	100	80-100	50-85	5-25	---	NP
MuA--------------- Mundelein	0-15	Silt loam--------	ML	A-4, A-6, A-7	0	95-100	95-100	95-100	85-95	30-50	5-20
	15-39	Silty clay loam, silt loam.	CL	A-7, A-6	0	95-100	95-100	95-100	75-95	35-50	15-25
	39-60	Stratified silt loam to fine sand.	SC, SM, ML, CL	A-2, A-4, A-6	0	90-100	90-100	60-90	10-75	<35	NP-20
Mw---------------- Muskego	0-28	Sapric material	Pt	A-8	0	---	---	---	---	---	---
	28-60	Coprogenous earth	OH, OL	A-8	0	---	---	---	---	---	---

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
OaA-------------- Oakville	0-9	Fine sand--------	SM, SP, SP-SM	A-2, A-3	0	100	100	50-85	0-35	---	NP
	9-60	Fine sand, sand, loamy fine sand.	SM, SP, SP-SM	A-2, A-3	0	100	95-100	65-95	0-25	---	NP
OcB, OcC2-------- Octagon	0-9	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	9-38	Clay loam, loam	CL	A-6, A-7	0	95-100	90-95	75-95	65-95	35-50	15-30
	38-60	Loam-------------	CL, CL-ML	A-4, A-6	0-3	85-95	80-90	75-85	50-65	20-30	5-15
OeA-------------- Odell	0-13	Loam-------------	ML, CL	A-4, A-6	0	100	100	90-100	70-95	30-40	8-14
	13-33	Clay loam, loam	CL	A-6, A-7	0	90-100	90-95	80-90	65-75	35-50	17-31
	33-60	Loam, clay loam	CL, ML	A-4, A-6	0-3	85-95	80-90	75-85	50-65	25-40	2-16
OwA-------------- Owosso	0-10	Fine sandy loam	SM, SM-SC, SC	A-2, A-4	0-5	95-100	75-100	50-70	20-45	12-29	NP-10
	10-26	Sandy loam, loam, fine sandy loam.	SM, SC, SM-SC	A-2, A-4	0-5	95-100	75-100	60-90	25-45	15-30	NP-10
	26-75	Loam, sandy clay loam.	CL, CL-ML	A-4, A-6	0-5	95-100	90-95	85-95	60-90	25-40	6-21
Pa--------------- Pella	0-15	Silty clay loam	CL	A-6	0	100	100	95-100	75-95	30-40	15-25
	15-32	Silty clay loam, silt loam.	CL, CH, ML, MH	A-7	0	100	100	95-100	80-100	40-55	15-25
	32-60	Stratified silt loam to sandy loam.	CL	A-6	0	100	100	95-100	75-95	25-40	10-20
Ph--------------- Pella	0-15	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-50	15-25
	15-47	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	30-50	11-26
	47-78	Silty clay loam	CL	A-6, A-7	0-5	95-100	95-100	90-100	70-95	30-45	10-24
Pt. Pits											
Re--------------- Rensselaer	0-10	Clay loam--------	CL, ML	A-4, A-6	0	100	100	90-100	70-90	27-36	4-12
	10-34	Clay loam, sandy clay loam, loam.	CL	A-6, A-7	0	95-100	90-100	80-100	60-80	33-47	15-26
	34-60	Stratified loamy sand to clay loam.	CL, SC, CL-ML, SM-SC	A-4, A-2	0	95-100	90-100	60-95	20-70	<30	4-9
Rg--------------- Rensselaer	0-21	Loam-------------	CL	A-6, A-7	0	100	100	90-100	70-80	35-50	18-30
	21-42	Clay loam, loam	CL	A-6, A-7	0	100	100	90-100	70-80	35-50	18-30
	42-60	Sand-------------	SP-SM, SM	A-3, A-2-4	0	100	100	50-70	5-15	<20	NP
Rm--------------- Rensselaer Variant	0-10	Loam-------------	CL	A-4, A-6	0	100	100	90-100	65-90	20-30	8-15
	10-19	Clay loam, silty clay loam.	CL	A-6	0	100	100	95-100	90-95	30-45	12-24
	19-42	Fine sand--------	SC, SM-SC	A-2-4	0	100	100	65-80	20-35	<20	NP
	42-60	Fine sand, very fine sand.	SM	A-2-4, A-4	0	100	100	70-95	25-50	<20	NP
RsA, RsB2-------- Riddles	0-18	Silt loam--------	CL	A-4, A-6	0	95-100	85-95	80-90	60-75	20-35	8-15
	18-41	Clay loam, loam	CL	A-6, A-7	0	90-100	80-95	75-95	65-75	35-50	15-30
	41-60	Clay loam, loam	CL, SM, SC, ML	A-4, A-6, A-2	0-3	85-95	80-90	50-90	30-70	15-30	2-15
Se--------------- Seafield	0-8	Fine sandy loam	SM	A-4, A-2-4	0	100	100	60-85	30-50	<30	NP-5
	8-26	Fine sandy loam, sandy loam, sandy clay loam.	SM-SC, SC, CL-ML, CL	A-4, A-6, A-2-4, A-2-6	0	100	100	60-95	30-60	15-30	5-15
	26-60	Fine sand, sand, loamy fine sand.	SM	A-2-4	0	100	100	65-85	15-35	<20	NP

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
Sf---------------- Seafield Variant	0-9	Fine sandy loam	SM	A-4, A-2-4	0	100	100	60-85	30-50	<30	NP-5
	9-42	Fine sandy loam, sandy loam, loamy fine sand.	SM-SC, SC, CL-ML, CL	A-4, A-6, A-2-4, A-2-6	0	100	100	60-95	30-60	15-30	5-15
	42	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
SpA--------------- Sparta	0-10	Fine sand--------	SM	A-2, A-4	0	85-100	85-100	50-95	15-50	---	NP
	10-26	Loamy fine sand, fine sand.	SP-SM, SM	A-2, A-3, A-4	0	85-100	85-100	50-95	5-50	---	NP
	26-60	Fine sand--------	SP-SM, SM, SP	A-2, A-3	0	85-100	85-100	50-95	2-30	---	NP
ToA--------------- Toronto	0-12	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	12-32	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	35-50	20-30
	32-53	Clay loam, loam	CL	A-6, A-7	0	95-100	90-95	85-95	65-75	35-50	15-25
	53-60	Silt loam--------	CL, CL-ML	A-4, A-6	0-3	85-95	80-90	75-85	50-65	15-30	5-15
VaB2-------------- Varna	0-10	Silt loam--------	CL	A-6, A-4	0-5	95-100	95-100	95-100	85-95	25-40	8-20
	10-37	Silty clay, silty clay loam.	CL, CH	A-7, A-6	0-10	95-100	85-100	85-98	80-98	35-56	15-29
	37-60	Silty clay loam	CL	A-7, A-6	0-10	95-100	85-100	85-98	80-95	30-45	13-26
Wa---------------- Watseka	0-10	Loamy fine sand	SM, SM-SC	A-2	0	100	95-100	80-100	17-35	<25	NP-5
	10-60	Fine sand, loamy fine sand.	SP, SM, SP-SM	A-3, A-2	0	90-100	90-100	60-80	3-25	<20	NP-4
Wh---------------- Whitaker	0-9	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	60-90	22-33	4-12
	9-27	Clay loam, loam, silty clay loam.	CL	A-6, A-7	0	100	95-100	90-100	70-80	30-47	12-26
	27-60	Stratified sand to silt loam.	CL, SC, ML, SM	A-4	0	98-100	98-100	60-85	40-60	15-25	3-9
WnB2-------------- Wingate Variant	0-16	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	16-38	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	35-55	20-30
	38-52	Clay loam, loam	CL	A-6, A-7	0	95-100	90-95	80-90	65-75	35-50	15-30
	52-68	Silt loam--------	CL, CL-ML	A-4, A-6	0-3	85-95	80-90	75-85	50-65	20-30	5-15
Wo---------------- Wolcott	0-15	Clay loam--------	CL, ML	A-6, A-7	0	100	90-100	90-100	70-90	38-50	10-20
	15-47	Clay loam, loam	CL	A-6, A-7	0	90-100	85-100	85-98	60-90	35-50	18-30
	47-60	Loam, sandy loam	CL, CL-ML	A-4	0	90-100	80-95	80-95	55-95	20-30	4-10
Wv---------------- Wolcott	0-18	Clay loam, loam	CL	A-6, A-7	0	100	95-100	80-95	60-80	25-45	10-22
	18-46	Loam, fine sandy loam.	CL	A-4, A-6	0	100	90-95	75-90	55-75	20-35	7-15
	46	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH					Pct
Ab--------------- Abscota	0-20	2-15	1.20-1.60	6.0-20	0.08-0.12	6.1-7.3	Low-----------	0.17	5	2	0.5-3
	20-60	0-10	1.25-1.60	6.0-20	0.05-0.11	6.1-7.8	Low-----------	0.17			
An--------------- Ackerman	0-8	---	0.20-0.80	0.2-0.6	0.35-0.45	6.6-7.3	--------------	----	---	3	30-40
	8-14	---	0.50-1.20	0.06-0.2	0.18-0.24	6.6-7.3	--------------	----			
	14-60	2-5	1.55-1.60	6.0-20	0.06-0.08	6.6-8.4	Low-----------	0.15			
AsA, AsB--------- Alvin	0-10	10-15	1.45-1.65	2.0-6.0	0.14-0.20	5.1-6.5	Low-----------	0.24	5	3	0.5-1
	10-35	15-18	1.45-1.65	2.0-6.0	0.12-0.20	5.6-7.3	Low-----------	0.24			
	35-60	3-10	1.55-1.75	6.0-20	0.05-0.13	5.6-8.4	Low-----------	0.24			
AuA-------------- Aubbeenaubbee	0-15	8-15	1.30-1.45	0.6-6.0	0.16-0.18	5.6-7.3	Low-----------	0.24	5	3	1-2
	15-21	7-15	1.40-1.60	0.6-6.0	0.09-0.14	5.1-6.5	Low-----------	0.24			
	21-40	22-30	1.40-1.55	0.2-2.0	0.16-0.18	5.6-7.3	Moderate-----	0.32			
	40-60	8-30	1.40-1.55	0.2-2.0	0.10-0.19	7.4-8.4	Low-----------	0.32			
BmA-------------- Brems	0-9	3-7	1.50-1.65	6.0-20	0.10-0.12	5.1-6.5	Low-----------	0.17	5	2	0.5-1
	9-48	2-6	1.60-1.75	6.0-20	0.05-0.08	5.1-6.0	Low-----------	0.17			
	48-60	2-6	1.60-1.75	6.0-20	0.05-0.07	5.6-6.5	Low-----------	0.17			
Ca--------------- Chalmers	0-13	22-33	1.25-1.45	0.6-2.0	0.21-0.23	6.1-7.3	Moderate-----	0.28	5	6	3-8
	13-27	20-33	1.45-1.60	0.6-2.0	0.18-0.21	6.6-7.8	Moderate-----	0.28			
	27-49	15-25	1.40-1.55	0.6-2.0	0.17-0.20	6.6-7.8	Moderate-----	0.28			
	49-60	12-18	1.35-1.55	0.2-0.6	0.17-0.19	7.4-8.4	Low-----------	0.28			
ChB, ChC--------- Chelsea	0-5	8-15	1.50-1.55	6.0-20	0.10-0.15	5.6-7.3	Low-----------	0.17	5	2	0.5-2
	5-80	5-10	1.55-1.70	6.0-20	0.06-0.08	5.1-6.0	Low-----------	0.17			
Ck--------------- Cohoctah	0-15	5-20	1.12-1.59	2.0-6.0	0.13-0.22	6.1-7.8	Low-----------	0.28	5	3	3-7
	15-60	5-27	1.48-1.80	2.0-6.0	0.12-0.20	6.1-8.4	Low-----------	0.28			
CnA-------------- Conover	0-9	11-22	1.40-1.55	0.6-2.0	0.18-0.24	5.6-7.3	Low-----------	0.28	5	5	2-4
	9-22	25-35	1.45-1.65	0.2-0.6	0.15-0.18	5.6-7.3	Moderate-----	0.28			
	22-60	15-32	1.55-1.90	0.2-0.6	0.05-0.19	6.6-8.4	Low-----------	0.37			
CsA-------------- Crosier	0-19	7-18	1.30-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low-----------	0.32	5	5	1-3
	19-38	20-33	1.40-1.60	0.2-0.6	0.15-0.19	5.1-7.3	Moderate-----	0.32			
	38-60	10-20	1.40-1.60	0.2-0.6	0.10-0.19	6.1-8.4	Low-----------	0.32			
Dc--------------- Darroch	0-10	10-22	1.30-1.45	0.6-2.0	0.20-0.24	4.5-7.3	Low-----------	0.32	5	5	2-5
	10-18	18-25	1.35-1.50	0.6-2.0	0.17-0.19	4.5-6.5	Low-----------	0.32			
	18-31	20-32	1.40-1.60	0.2-0.6	0.15-0.19	4.5-6.5	Moderate-----	0.32			
	31-60	5-20	1.50-1.70	0.2-0.6	0.19-0.21	5.6-7.3	Low-----------	0.32			
ElA-------------- Elliott	0-9	24-27	1.10-1.30	0.6-2.0	0.22-0.24	5.6-7.3	Moderate-----	0.28	4	6	4-5
	9-35	35-45	1.30-1.60	0.2-0.6	0.11-0.20	5.6-7.8	Moderate-----	0.28			
	35-60	27-35	1.50-1.70	0.2-0.6	0.14-0.20	7.4-8.4	Moderate-----	0.28			
FoA-------------- Foresman	0-13	10-22	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.3	Low-----------	0.28	5	5	2-5
	13-24	18-32	1.40-1.60	0.6-2.0	0.19-0.21	5.6-6.5	Moderate-----	0.28			
	24-60	5-20	1.50-1.70	0.6-2.0	0.19-0.21	5.6-7.3	Low-----------	0.43			
Gf--------------- Gilford	0-14	10-20	1.50-1.70	2.0-6.0	0.16-0.18	5.6-7.3	Low-----------	0.20	4	3	2-4
	14-35	8-17	1.60-1.80	2.0-6.0	0.12-0.14	5.6-7.3	Low-----------	0.20			
	35-60	3-12	1.70-1.90	6.0-20	0.05-0.08	6.6-8.4	Low-----------	0.15			
Gv--------------- Gilford	0-10	5-15	1.45-1.55	2.0-6.0	0.16-0.18	6.1-7.3	Low-----------	0.20	4	3	2-4
	10-42	10-20	1.50-1.60	2.0-6.0	0.12-0.14	6.1-7.3	Low-----------	0.20			
	42	---	---	---	---	---	--------------	----			
MaA, MaB2-------- Martinsville	0-13	8-17	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.3	Low-----------	0.37	5	5	1-3
	13-20	18-30	1.40-1.60	0.6-2.0	0.17-0.20	5.1-6.0	Moderate-----	0.37			
	20-49	10-25	1.40-1.60	0.6-2.0	0.12-0.14	5.1-6.5	Low-----------	0.24			
	49-60	3-23	1.50-1.70	0.6-2.0	0.19-0.21	7.4-8.4	Low-----------	0.24			

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm^3	In/hr	In/in	pH					Pct
Mb-------------- Maumee	0-19	2-10	1.60-1.75	6.0-20	0.10-0.12	6.1-7.3	Low----------	0.17	5	2	2-4
	19-60	2-10	1.60-1.75	6.0-20	0.05-0.07	6.1-8.4	Low----------	0.17			
MoA------------- Montmorenci	0-13	18-27	1.30-1.50	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.32	5	5	2-4
	13-29	25-34	1.40-1.60	0.2-0.6	0.15-0.20	5.6-7.8	Moderate-----	0.32			
	29-60	18-30	1.45-1.75	0.2-0.6	0.05-0.19	7.9-8.4	Low----------	0.32			
Mr-------------- Morocco	0-9	1-6	1.45-1.65	6.0-20	0.07-0.09	5.1-6.5	Low----------	0.17	5	1	0.5-2
	9-60	1-6	1.50-1.70	6.0-20	0.05-0.07	4.5-6.0	Low----------	0.17			
MuA------------- Mundelein	0-15	20-27	1.15-1.30	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.28	5	6	4-5
	15-39	25-35	1.20-1.45	0.2-0.6	0.18-0.20	5.6-8.4	Moderate-----	0.43			
	39-60	10-30	1.50-1.70	0.2-2.0	0.05-0.22	6.1-8.4	Low----------	0.43			
Mw-------------- Muskego	0-28	2-4	0.10-0.21	0.2-6.0	0.35-0.45	5.6-7.3	-------------	----	---	3	50-77
	28-60	---	0.10-0.40	0.06-0.2	0.18-0.24	6.6-8.4	-------------	----			
OaA------------- Oakville	0-9	0-10	1.30-1.55	>20	0.07-0.09	5.6-7.3	Low----------	0.15	5	1	0.5-2
	9-60	0-10	1.30-1.65	>20	0.06-0.08	5.6-7.3	Low----------	0.15			
OcB, OcC2-------- Octagon	0-9	18-27	1.30-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.32	5	5	2-4
	9-38	27-35	1.40-1.60	0.6-2.0	0.15-0.20	5.6-8.4	Moderate-----	0.32			
	38-60	14-25	1.45-1.75	0.6-2.0	0.05-0.19	7.9-8.4	Low----------	0.32			
OeA------------- Odell	0-13	20-27	1.30-1.50	0.6-2.0	0.21-0.24	5.6-7.3	Low----------	0.28	5	5	3-5
	13-33	25-35	1.50-1.70	0.2-0.6	0.15-0.19	5.6-6.5	Moderate-----	0.37			
	33-60	18-30	1.50-1.70	0.2-0.6	0.05-0.19	6.6-8.4	Low----------	0.37			
OwA------------- Owosso	0-10	5-18	1.10-1.65	2.0-6.0	0.13-0.18	5.1-7.3	Low----------	0.24	5	3	1-2
	10-26	10-22	1.10-1.65	2.0-6.0	0.09-0.17	5.1-7.3	Low----------	0.24			
	26-75	18-35	1.30-1.75	0.2-0.6	0.14-0.20	5.1-8.4	Moderate-----	0.37			
Pa-------------- Pella	0-15	27-35	1.15-1.35	0.6-2.0	0.21-0.23	6.6-7.3	Moderate-----	0.28	5	7	3-5
	15-32	27-35	1.25-1.45	0.6-2.0	0.18-0.20	6.1-7.8	Moderate-----	0.28			
	32-60	22-35	1.30-1.50	0.6-2.0	0.18-0.22	7.4-8.4	Moderate-----	0.28			
Ph-------------- Pella	0-15	27-35	1.35-1.50	0.6-2.0	0.21-0.23	6.6-7.3	Moderate-----	0.28	5	6	3-6
	15-47	27-40	1.40-1.55	0.6-2.0	0.18-0.20	6.6-8.4	Moderate-----	0.28			
	47-78	27-35	1.40-1.55	0.2-0.6	0.18-0.20	7.4-8.4	Moderate-----	0.28			
Pt. Pits											
Re-------------- Rensselaer	0-10	18-27	1.30-1.45	0.2-0.6	0.20-0.24	6.6-7.3	Low----------	0.28	5	5	3-6
	10-34	27-35	1.40-1.60	0.06-0.2	0.15-0.19	6.1-7.3	Moderate-----	0.28			
	34-60	2-30	1.50-1.70	0.6-2.0	0.19-0.21	7.4-8.4	Low----------	0.28			
Rg-------------- Rensselaer	0-21	27-35	1.30-1.50	0.2-0.6	0.17-0.19	6.1-7.3	Moderate-----	0.28	5	5	3-6
	21-42	27-35	1.40-1.55	0.06-0.2	0.15-0.19	6.6-7.8	Moderate-----	0.37			
	42-60	1-10	1.50-1.65	6.0-20	0.05-0.07	7.9-8.4	Low----------	0.15			
Rm-------------- Rensselaer Variant	0-10	13-23	1.35-1.50	0.2-0.6	0.20-0.22	6.6-7.8	Low----------	0.24	5	5	3-8
	10-19	27-35	1.40-1.60	0.06-0.2	0.15-0.19	6.6-7.8	Moderate-----	0.37			
	19-42	1-5	1.55-1.70	6.0-20	0.05-0.07	7.4-8.4	Low----------	0.15			
	42-60	1-7	1.50-1.65	2.0-6.0	0.06-0.08	7.9-8.4	Low----------	0.15			
RsA, RsB2-------- Riddles	0-18	8-16	1.30-1.50	0.6-2.0	0.20-0.24	6.1-7.3	Low----------	0.32	5	5	0.5-2
	18-41	20-35	1.40-1.60	0.6-2.0	0.15-0.19	5.1-7.3	Moderate-----	0.32			
	41-60	8-25	1.40-1.60	0.6-2.0	0.05-0.19	6.6-8.4	Low----------	0.32			
Se-------------- Seafield	0-8	5-14	1.40-1.50	2.0-6.0	0.13-0.18	5.1-7.3	Low----------	0.24	4	3	1-3
	8-26	10-18	1.40-1.60	2.0-6.0	0.13-0.18	5.1-7.8	Low----------	0.24			
	26-60	4-8	1.50-1.60	>20	0.06-0.08	5.6-7.3	Low----------	0.15			
Sf-------------- Seafield Variant	0-9	5-14	1.40-1.50	2.0-6.0	0.13-0.15	5.1-7.3	Low----------	0.24	4	3	2-3
	9-42	10-18	1.40-1.60	2.0-6.0	0.13-0.18	5.1-7.8	Low----------	0.24			
	42	---	---	---	---	---	-------------	----			

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH					Pct
SpA------------- Sparta	0-10	3-10	1.20-1.40	2.0-6.0	0.09-0.12	5.1-7.3	Low----------	0.17	5	2	1-2
	10-26	1-8	1.40-1.60	6.0-20	0.05-0.11	5.1-6.5	Low----------	0.17			
	26-60	0-5	1.50-1.70	6.0-20	0.04-0.07	5.1-6.0	Low----------	0.17			
ToA------------- Toronto	0-12	18-27	1.30-1.45	0.6-2.0	0.22-0.24	5.1-6.5	Low----------	0.32	5	5	3-5
	12-32	27-35	1.35-1.50	0.2-0.6	0.18-0.20	4.5-7.3	Moderate-----	0.32			
	32-53	27-35	1.50-1.70	0.2-0.6	0.15-0.19	5.6-8.4	Moderate-----	0.32			
	53-60	18-27	1.50-1.70	0.2-0.6	0.05-0.19	7.9-8.4	Low----------	0.32			
VaB2------------ Varna	0-10	20-30	1.10-1.30	0.6-2.0	0.22-0.24	6.1-7.3	Low----------	0.32	4	6	3-4
	10-37	35-48	1.30-1.60	0.2-0.6	0.09-0.19	5.6-7.3	Moderate-----	0.32			
	37-60	27-40	1.50-1.70	0.2-0.6	0.14-0.20	6.6-8.4	Low----------	0.32			
Wa-------------- Watseka	0-10	8-13	1.35-1.55	6.0-20	0.10-0.12	6.1-7.3	Low----------	0.17	5	2	1-3
	10-60	1-10	1.70-2.00	6.0-20	0.05-0.10	5.1-7.3	Low----------	0.17			
Wh-------------- Whitaker	0-9	8-17	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.37	5	5	1-3
	9-27	18-30	1.40-1.60	0.6-2.0	0.15-0.19	5.1-6.0	Moderate-----	0.37			
	27-60	3-18	1.50-1.70	0.6-6.0	0.19-0.21	6.1-8.4	Low----------	0.37			
WnB2------------ Wingate Variant	0-16	18-27	1.30-1.45	0.6-2.0	0.22-0.24	6.1-7.3	Low----------	0.32	5	5	2-4
	16-38	27-35	1.35-1.50	0.6-2.0	0.18-0.20	5.1-6.5	Moderate-----	0.43			
	38-52	18-35	1.35-1.55	0.2-0.6	0.15-0.19	6.6-7.8	Moderate-----	0.43			
	52-68	18-27	1.35-1.45	0.2-0.6	0.05-0.19	7.9-8.4	Low----------	0.43			
Wo-------------- Wolcott	0-15	27-33	1.40-1.55	0.6-2.0	0.17-0.19	6.1-7.3	Moderate-----	0.28	5	7	3-7
	15-47	27-35	1.55-1.65	0.6-2.0	0.15-0.19	6.1-7.3	Moderate-----	0.37			
	47-60	11-25	1.50-1.65	0.6-2.0	0.17-0.19	7.4-8.4	Low----------	0.37			
Wv-------------- Wolcott	0-18	18-30	1.55-1.65	0.6-2.0	0.17-0.22	6.1-7.3	Moderate-----	0.24	5	6	3-6
	18-46	18-27	1.40-1.60	0.6-2.0	0.17-0.19	6.6-7.3	Moderate-----	0.37			
	46	---	---	---	---	---	-------------	----			

TABLE 18.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "occasional," "brief," "apparent," and "perched" are explained in the text. The symbol > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated]

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
Ab----------------- Abscota	A	Occasional	Brief-----	Mar-Jun	2.5-5.0	Apparent	Dec-May	>60	---	Low------	Low------	Low.
An*---------------- Ackerman	A/D	None--------	---	---	+5-1.0	Apparent	Nov-May	>60	---	High-----	High-----	Low.
AsA, AsB----------- Alvin	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	High.
AuA---------------- Aubbeenaubbee	B	None--------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.
BmA---------------- Brems	A	None--------	---	---	2.0-3.0	Apparent	Jan-Apr	>60	---	Low------	Low------	High.
Ca*---------------- Chalmers	B/D	None--------	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High-----	High-----	Low.
ChB, ChC----------- Chelsea	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	Low.
Ck----------------- Cohoctah	B/D	Occasional	Brief to long.	Jan-Dec	0-1.0	Apparent	Sep-May	>60	---	High-----	High-----	Low.
CnA---------------- Conover	B	None--------	---	---	1.0-2.0	Apparent	Nov-May	>60	---	High-----	High-----	Moderate.
CsA---------------- Crosier	C	None--------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Low.
Dc----------------- Darroch	C	None--------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	High.
ElA---------------- Elliott	C	None--------	---	---	1.0-3.0	Perched	Mar-May	>60	---	High-----	High-----	Moderate.
FoA---------------- Foresman	B	None--------	---	---	3.0-6.0	Apparent	Mar-Apr	>60	---	Moderate	High-----	Moderate.
Gf*---------------- Gilford	B/D	None--------	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High-----	High-----	Moderate.
Gv*---------------- Gilford	B/D	None--------	---	---	+.5-1.0	Apparent	Dec-May	40-84	Hard	High-----	High-----	Moderate.
MaA, MaB2---------- Martinsville	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Mb*---------------- Maumee	A/D	None--------	---	---	+.5-1.0	Apparent	Dec-May	>60	---	Moderate	High-----	Moderate.

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
MoA---------------- Montmorenci	B	None---------	---	---	3.0-6.0	Apparent	Mar-Apr	>60	---	High-----	High-----	Moderate.
Mr----------------- Morocco	B	None---------	---	---	1.0-2.0	Apparent	Jan-Apr	>60	---	Moderate	Low------	High.
MuA---------------- Mundelein	B	None---------	---	---	1.0-3.0	Apparent	Mar-Jun	>60	---	High-----	High-----	Moderate.
Mw*---------------- Muskego	A/D	None---------	---	---	+1-1.0	Apparent	Nov-Aug	>60	---	High-----	Moderate	Moderate.
OaA---------------- Oakville	A	None---------	---	---	4.0-6.0	Apparent	Nov-Apr	>60	---	Low------	Low------	Moderate.
OcB, OcC2---------- Octagon	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
OeA---------------- Odell	B	None---------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.
OwA---------------- Owosso	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Pa*---------------- Pella	B/D	None---------	---	---	+.5-2.0	Apparent	Mar-Jun	>60	---	High-----	High-----	Low.
Ph*---------------- Pella	C	None---------	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High-----	High-----	Low.
Pt. Pits												
Re*---------------- Rensselaer	B/D	None---------	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High-----	High-----	Low.
Rg*---------------- Rensselaer	D	None---------	---	---	+1-1.0	Apparent	Dec-May	>60	---	High-----	High-----	Low.
Rm*---------------- Rensselaer Variant	D	None---------	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High-----	High-----	Low.
RsA, RsB2---------- Riddles	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Se----------------- Seafield	B	None---------	---	---	1.0-2.0	Apparent	Jan-Apr	>60	---	High-----	Moderate	High.
Sf----------------- Seafield Variant	B	None---------	---	---	1.0-2.5	Apparent	Jan-Apr	40-84	Hard	High-----	Moderate	High.
SpA---------------- Sparta	A	None---------	---	---	>6.0	---	---	>60	---	Low------	Low------	Moderate.

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
ToA--------------- Toronto	C	None--------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	High.
VaB2-------------- Varna	C	None--------	---	---	3.0-6.0	Perched	Mar-May	>60	---	High-----	Moderate	Moderate.
Wa---------------- Watseka	B	None--------	---	---	1.0-3.0	Apparent	Feb-May	>60	---	Moderate	Low------	High.
Wh---------------- Whitaker	C	None--------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.
WnB2-------------- Wingate Variant	B	None--------	---	---	2.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.
Wo*--------------- Wolcott	B/D	None--------	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High-----	High-----	Low.
Wv*--------------- Wolcott	B/D	None--------	---	---	+.5-1.0	Apparent	Dec-May	40-84	Hard	High-----	High-----	Low.

* In the "High water table--Depth" column, a plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water table rises above the surface. The second numeral indicates the depth below the surface.

TABLE 19.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Abscota	Mixed, mesic Typic Udipsamments
Ackerman	Sandy, mixed, mesic Histic Humaquepts
Alvin	Coarse-loamy, mixed, mesic Typic Hapludalfs
Aubbeenaubbee	Fine-loamy, mixed, mesic Aeric Ochraqualfs
*Brems	Mixed, mesic Aquic Udipsamments
Chalmers	Fine-silty, mixed, mesic Typic Haplaquolls
Chelsea	Mixed, mesic Alfic Udipsamments
Cohoctah	Coarse-loamy, mixed, mesic Fluvaquentic Haplaquolls
Conover	Fine-loamy, mixed, mesic Udollic Ochraqualfs
Crosier	Fine-loamy, mixed, mesic Aeric Ochraqualfs
*Darroch	Fine-loamy, mixed, mesic Aquic Argiudolls
Elliott	Fine, illitic, mesic Aquic Argiudolls
*Foresman	Fine-loamy, mixed, mesic Typic Argiudolls
*Gilford	Coarse-loamy, mixed, mesic Typic Haplaquolls
Martinsville	Fine-loamy, mixed, mesic Typic Hapludalfs
Maumee	Sandy, mixed, mesic Typic Haplaquolls
Montmorenci	Fine-loamy, mixed, mesic Aquollic Hapludalfs
*Morocco	Mixed, mesic Aquic Udipsamments
Mundelein	Fine-silty, mixed, mesic Aquic Argiudolls
Muskego	Coprogenous, euic, mesic Limnic Medisaprists
Oakville	Mixed, mesic Typic Udipsamments
Octagon	Fine-loamy, mixed, mesic Mollic Hapludalfs
Odell	Fine-loamy, mixed, mesic Aquic Argiudolls
Owosso	Fine-loamy, mixed, mesic Typic Hapludalfs
Pella	Fine-silty, mixed, mesic Typic Haplaquolls
Rensselaer	Fine-loamy, mixed, mesic Typic Argiaquolls
Rensselaer Variant	Fine loamy over sandy or sandy skeletal, mixed, mesic Typic Argiaquolls
Riddles	Fine-loamy, mixed, mesic Typic Hapludalfs
Seafield	Coarse-loamy, mixed, mesic Udollic Ochraqualfs
Seafield Variant	Coarse-loamy, mixed, mesic Aquollic Hapludalfs
Sparta	Sandy, mixed, mesic Entic Hapludolls
Toronto	Fine-silty, mixed, mesic Udollic Ochraqualfs
Varna	Fine, illitic, mesic Typic Argiudolls
Watseka	Sandy, mixed, mesic Aquic Hapludolls
Whitaker	Fine-loamy, mixed, mesic Aeric Ochraqualfs
Wingate Variant	Fine silty, mixed, mesic Aquollic Hapludalfs
Wolcott	Fine-loamy, mixed, mesic Typic Haplaquolls

* The soil is a taxadjunct to the series. See text for description of those characteristics of the soil that are outside the range of the series.

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