SOIL SURVEY OF

Lake County, Ohio

United States Department of Agriculture
Soil Conservation Service
in cooperation with
Ohio Department of Natural Resources
Division of Lands and Soil and
Ohio Agricultural Research and Development Center

How To Use This Soil Survey

General Soil Map

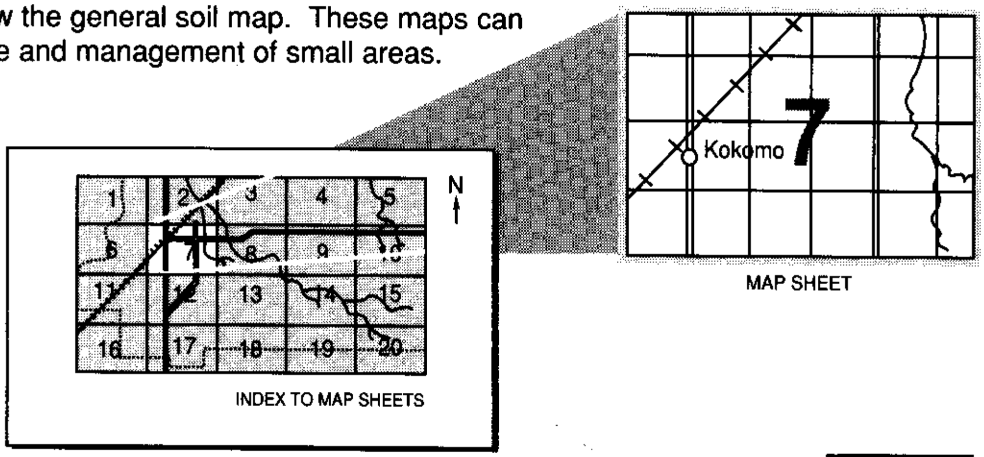
The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

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

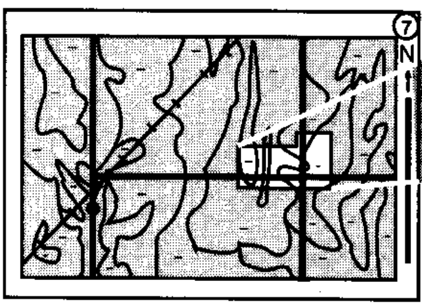
Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.

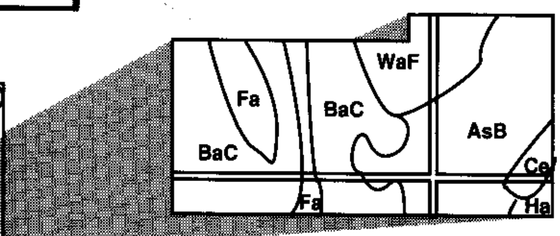
To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.



Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** (see Contents), which lists the map units by symbol and name and shows the page where each map unit is described.



MAP SHEET



AREA OF INTEREST

NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

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

Major fieldwork for this soil survey was completed in the period 1967-73. Soil names and descriptions were approved in 1976. Unless otherwise indicated, statements in the publication refer to conditions in the survey area in 1976. This survey was made cooperatively by the Soil Conservation Service, the Ohio Department of Natural Resources, Division of Lands and Soil, and the Ohio Agricultural Research and Development Center. It is part of the technical assistance furnished to the Lake Soil and Water Conservation District. The survey was materially aided by funds provided by the Lake County Commissioners.

Soil maps in this survey may be copied without permission, but any enlargement of these maps can cause misunderstanding of the detail of mapping and result in erroneous interpretations. Enlarged maps do not show small areas of contrasting soils that could have been shown at a larger mapping scale.

Contents

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Index to soil map units

Summary of Tables

Summary of Tables—Continued

Foreword

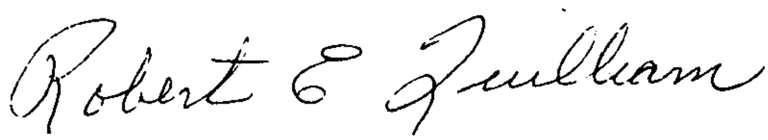
We introduce the Soil Survey of Lake County. You will find herein basic information useful for any land planning program. Of prime importance are the predictions of soil behavior for selected land uses. Also highlighted are land use limitations and hazards that are inherent in the soil, improvements needed to overcome these limitations, and the impact that selected land use may have on the environment.

This soil survey has been prepared to fit the needs of different users. Farmers, ranchers, foresters, and agronomists can use it to determine the potential of the soil and the management practices required for food and fiber production. Planners, community decisionmakers, engineers, developers, builders, and homebuyers can use it to plan use of land, select sites for construction, develop soil resources, and identify special practices that may be needed to assure proper performance. Conservationists, recreationists, teachers, students, and specialists in wildlife management, waste disposal, and pollution control can use the soil survey to understand, protect, and enhance the environment.

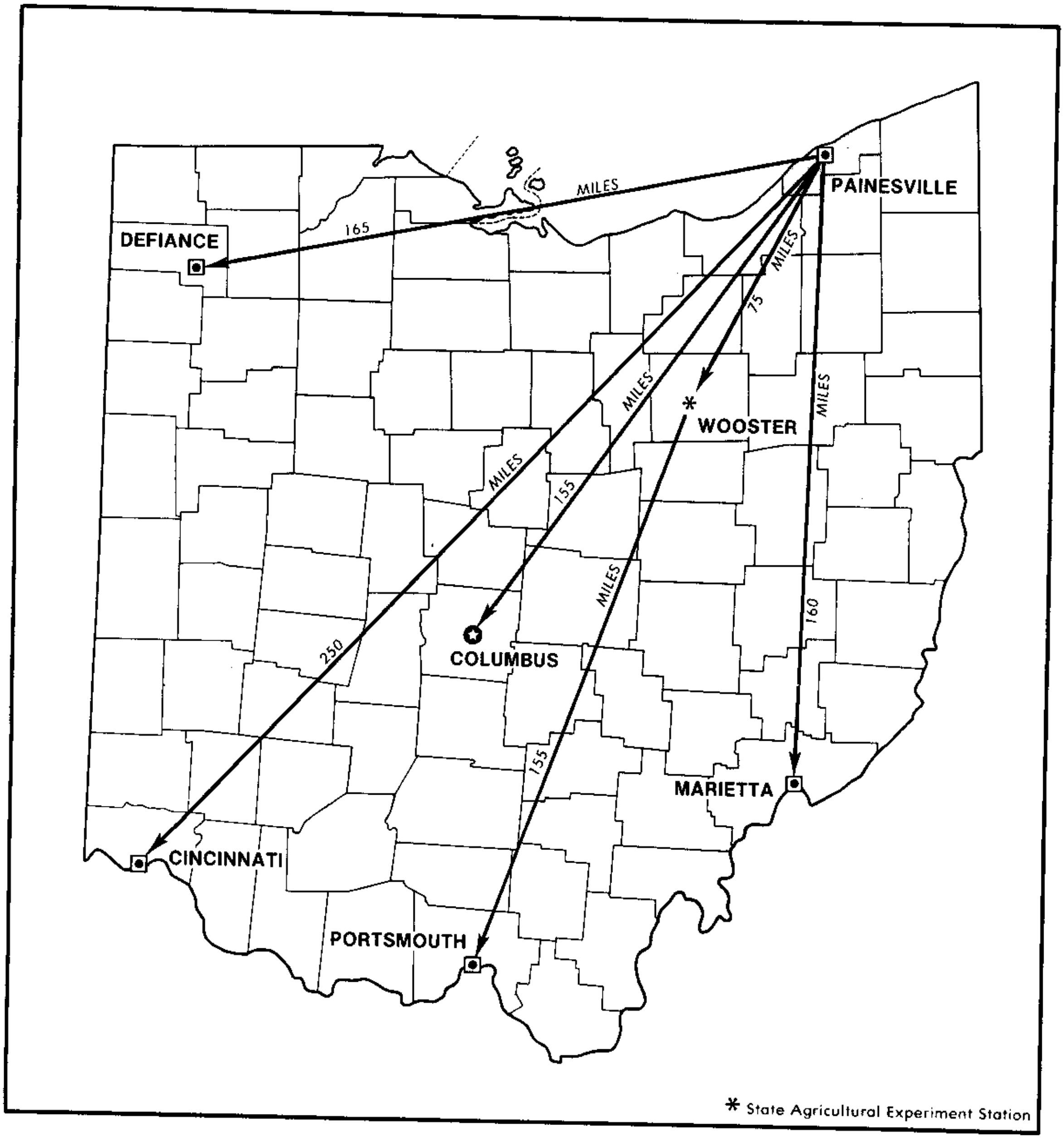
Many people assume that soils are all somewhat alike. They are unaware that great differences in soil properties can occur even within short distances. Soils may be seasonally wet or subject to flooding. They may be shallow to bedrock. They may be too unstable to be used as a foundation for buildings or roads. Very clayey or wet soils are poorly suited to 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. This publication also shows, on the general soil map, the location of broad groups of soils; the location of each kind of soil is shown on detailed soil maps at the back. It provides descriptions of each kind of soil in the survey area and gives much information about each soil for specific uses. Additional information or assistance in using this publication is available from the local office of the Soil Conservation Service or the Cooperative Extension Service.

We believe that this soil survey will help us have a better environment and a better life. The widespread use of this information can greatly assist us in the conservation, development, and productive use of our soil, water, and related resources.



Robert E. Quilliam
State Conservationist



Location of Lake County in Ohio.

SOIL SURVEY OF LAKE COUNTY, OHIO

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Division of Lands and Soil

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United States Department of Agriculture, Soil Conservation Service,
in cooperation with Ohio Department of Natural Resources,
Division of Lands and Soil, and the
Ohio Agricultural Research and Development Center

LAKE COUNTY is in northeastern Ohio adjacent to Lake Erie (see map on facing page). It is about 231 square miles, or 148,032 acres, in size. Painesville, the county seat, is in the center of the county about 32 miles northeast of Cleveland. In 1970 the total population of the county was 197,200.

General nature of the county

Lake County occupies parts of two physiographic provinces: the Glaciated Allegheny Plateau of the Appalachian Plateaus province in the south and the Eastern lake section of the Central Lowland province in the north (*4*). The line between the two provinces is the Portage Escarpment which crosses the county roughly in a northeast-southwest line. The Chagrin and Grand Rivers and Arcola Creek drain Lake County into the Great Lakes Basin.

Most of Lake County was once used for agriculture, and a large part was in horticultural crops. The county now forms a part of the expanding metropolitan area of northeastern Ohio. Housing developments, highways, factories, shopping centers, and other nonfarm uses are competing with agriculture for use of the land. This has resulted in gradually declining acreage used for agriculture, particularly in the western part of the county. Wholesale nurseries that specialize in ornamental shrubs and trees are the major horticultural enterprise on the land still used for agriculture.

Industries are concentrated mainly in the western and central parts of the county in the cities of Wickliffe, Mentor, Painesville, and Willoughby. Machinery and chemicals are the leading industrial products. Other manufactured goods include fabricated metals, rubber and plastic products, textiles, and clothing.

Climate

Lake County has warm summers and cold winters. Precipitation is well distributed during the year and is adequate for most cultivated crops. From late fall through winter, snow squalls are frequent and total snowfall is normally heavy. In some years a single prolonged storm can leave more than 2 feet of snow on the ground, and strong winds can cause deep drifts.

Tables 1 and 2 give data on temperature and precipitation for the county, as recorded at Painesville and Chardon. The climate of Painesville represents the climate of the parts of the county near Lake Erie. The climate of Chardon is more representative of the southern part of the county. Tables 3 and 4 provide data on the length of the growing season.

In Painesville the average temperature in winter is 30 degrees F, and the average daily low is 23 degrees. The lowest temperature on record at Painesville was 15 degrees below zero on January 24, 1963. In summer the average temperature is 70 degrees, and the average daily high is 79 degrees. The highest temperature on record was 96 degrees on June 20, 1963.

In Chardon the average temperature in winter is 27 degrees F, and the average daily low is 19 degrees. The lowest temperature on record at Chardon was 20 degrees below zero on January 24, 1963. In summer the average temperature is 69 degrees, and the average daily high is 79 degrees. The highest temperature on record was 98 degrees on September 2, 1953. The average temperature in summer is cooler in Chardon than in Painesville because of the higher elevation—1,130 feet.

Growing-degree days, shown in Tables 1 and 2, are equivalent to "heat units." Beginning in spring, growing-degree days accumulate by the amount that the average temperature each day exceeds a base temperature of 40 degrees F, which commonly is used to calculate growth of small grain and grass crops. Corn and soybeans require a higher base temperature for growth. The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first in fall. Tables 5 and 6 give probabilities of the dates of the last freeze in spring and the first in fall.

Of the total annual precipitation, about 55 percent generally falls between April and September; this period includes the growing season for most crops. Two years in ten, the April to September rainfall is less than 20 inches in Chardon and 16 inches in Painesville. The heaviest one-day rainfall during the period of record was 4.00 inches at Chardon on August 15, 1962, and at Painesville on July 17, 1968. There are about 36 thunderstorms each year, 18 of which are in summer.

Average seasonal snowfall is 40 inches in Painesville and 113 inches in Chardon. The greatest snow depth at any one time during the period of record was 15 inches in Painesville and 34 inches in Chardon. On the average, 18 days have at least 1 inch of snow on the ground in Painesville, and 43 days have at least 1 inch of snow on the ground in Chardon. The number of days, however, varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night in all seasons, and the average at dawn is about 80 percent. The percentage of possible sunshine is 70 percent in summer and 30 percent in winter. The prevailing wind direction is from the south. Average windspeed is highest, 13 miles per hour, in March.

Crop development early in the growing season is slowed by frequent cool winds off a cold lake. This slowing is important for fruit crops which generally do not blossom until after the chance of a freeze in spring passes. Fall winds, which blow off a relatively warm lake, delay the first freeze in fall and prolong the growing season for all crops.

History and economic development

Lake County was a part of the Connecticut Western Reserve. It was formed in 1840 from Geauga and Cuyahoga Counties and named because it borders Lake Erie.

The first permanent settlement in the county was near Mentor about 1799 (*7*). The early settlers emigrated from New England, principally Connecticut.

Farming, the basis of the pioneer economy, began by clearing land for crops. Initially, the products derived from the land were for self-support. During the 1800's settlement in the county increased, and dairy farming was introduced. Until 1900 milk was produced primarily for the manufacture of cheese. The amount of land used for farming in the county has decreased since World War II.

Since the first nursery stock was produced in Lake County between 1845 and 1850, the nursery industry has gradually become a major enterprise. In 1971, 145 nurseries raised 3,299 acres of many types of trees. Evergreens were predominant (*6*).

Before 1940 there was relatively little industry in Lake County. Since then, industry, particularly chemical production, has grown. Along with this industrial expansion, urbanization has forced many nurseries and farms to discontinue operations or to make more intensive use of their land.

The mineral resources of Lake County contribute to its industrial base. Deep wells and shaft mines produce brine and rock salt for the local chemical industries. Gravel pits on beach ridges and outwash-terrace deposits of glacial origin produce sand and gravel for construction.

Water for public, domestic, and industrial use comes from two principal sources in Lake County: surface water and ground water. Industrial and public supplies of water are obtained mostly from Lake Erie. Local wells in beach-ridge deposits and underlying shale and sandstone bedrock produce water for domestic use and irrigation. Deep drilling in the shale bedrock commonly strikes sulphur water or brine.

How this survey was made

Soil scientists made this survey to learn what kinds of soil are in the survey area, where they are, and how they can be used. The soil scientists went into the area knowing they likely would locate many soils they already knew something about and perhaps identify some they had never seen before. 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; the kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material, which has been changed very little by leaching or by the action of plant roots.

The soil scientists recorded the characteristics of the profiles they studied, and they compared those profiles with others in counties nearby and in places more distant. Thus, through correlation, they classified and named the soils according to nationwide, uniform procedures.

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

The areas shown on a soil map are called soil map units. Some map units are made up of one kind of soil, others are made up of two or more kinds of soil, and a few have little or no soil material at all. Map units are discussed in the sections "General soil map for broad land use planning" and "Soil maps for detailed planning."

While a soil survey is in progress, samples of soils are taken as needed for laboratory measurements and for engineering tests. The soils are field tested, and interpretations of their behavior are modified as necessary during the course of the survey. New interpretations are added to meet local needs, mainly through field observations of different kinds of soil in different uses under different levels of management. Also, data are assembled from other sources, such as test results, records, field experience, and information available from state and local specialists. For example, data on crop yields under defined practices 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 is readily available to different groups of users, among them farmers, managers of rangeland and woodland, engineers, planners, developers and builders, homebuyers, and those seeking recreation.

General soil map for broad land use planning

The general soil map at the back of this publication shows, in color, map units that have a distinct pattern of soils and of relief and drainage. Each map unit 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 provides a broad perspective of the soils and landscapes in the survey area. It provides a basis for comparing the potential of large areas for general kinds of land use. Areas that are, for the most part, suited to certain kinds of farming or to other land uses can be identified on the map. Likewise, areas of soils having properties that are distinctly unfavorable for certain land uses can be located.

Because of its small scale, the map does not show the kind of soil at a specific site. Thus, it 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 kinds of soil in any one map unit differ from place to place in slope, depth, stoniness, drainage, or other characteristics that affect their management.

Descriptions of the map units

The soils in the survey area vary widely in their potential for major land uses. The ratings of soil potential in the map units are based on the assumption that practices in common use in the survey area are being used to overcome soil limitations. These ratings reflect the ease of overcoming the soil limitations and the probability of soil problems persisting after such practices are used.

Soils on the lake plain and offshore bars

These poorly drained and somewhat poorly drained soils are on broad flats on the lake plain and on offshore bars. These nearly level and gently sloping soils formed in silty and loamy lakebed sediment and outwash material. Most of the acreage in these map units is used for farming and natural shrubs and trees. Seasonal wetness is the major limitation.

1. Conneaut-Painesville

Nearly level and gently sloping, poorly drained and somewhat poorly drained soils that formed in silty glacial till or loamy material over silty glacial till; on the lake plain

This map unit is on slightly undulating broad flats on the lake plain. It covers about 26 percent of the county. This unit is about 50 percent Conneaut soils and 15 percent Painesville soils. The remaining 35 percent is soils of minor extent.

Conneaut soils are somewhat poorly drained and poorly drained, and Painesville soils are somewhat poorly drained. The surface layer of Conneaut soils is silt loam, and the surface layer of Painesville soils is fine sandy loam. The Painesville soils commonly are adjacent to beach ridges, and the Conneaut soils are on flats and slight rises on the lake plains.

Minor soils in this map unit include Tyner, Otisville, and Conotton soils in small areas on beach ridges and outwash terraces and Swanton soils in scattered areas in depressions. Red Hook soils are on offshore bars and the lower part of sides of beach ridges. An extensive area of Allis soils adjacent to the Cuyahoga County line is mapped in this unit.

The soils are mostly covered by natural brush and trees, except where residential or urban development has taken place. Most undeveloped areas are not drained. Some adequately drained areas are used for nursery crops. Wetness is the main limitation for farming and for most other uses.

If adequately drained, most soils in this map unit have fair potential for most cultivated crops. Because of the difficulty of overcoming wetness, most areas have poor potential for residential or other urban use. The potential for wetland wildlife habitat is good or fair.

2. Red Hook

Nearly level, somewhat poorly drained soils that formed in loamy outwash deposits underlain by stratified material; on the lake plain and offshore bars

This map unit is on very slightly undulating offshore bars and foot slopes of beach ridges on the lake plain. It covers about 6 percent of the county. This unit is about 60 percent Red Hook soils. The remaining 40 percent is soils of minor extent.

Red Hook soils are somewhat poorly drained and are moderately or moderately slowly permeable. They have a loamy surface layer and subsoil.

Minor soils in this map unit include small areas of Granby soils on flats and in depressions. Strips of Tyner and Otisville soils are on beach ridges.

This map unit is used mainly for cultivated crops and nursery stock. Most areas of Red Hook soils have been drained. The very poorly drained minor soils are commonly in undrained, swampy areas. Wetness is the main limitation for farming and for many other uses.

Red Hook soils have fair potential for cultivated crops. The very poorly drained Granby soils have poor potential for residential and urban development. The well drained and excessively drained Tyner and Otisville soils have good potential for residential and urban development.

Soils on beach ridges, terraces, and offshore bars

These somewhat poorly drained to excessively drained soils are mainly on ridges and flats on beach ridges, terraces, and offshore bars. These soils are sandy and gravelly; therefore, internal drainage is good and most of the soils are droughty during extended dry periods. Supplemental irrigation is needed. The soils are mainly used for community development and farming. Some areas are used for nurseries.

3. Elnora-Stafford

Nearly level and gently sloping, moderately well drained and somewhat poorly drained soils that formed in water- or wind-deposited material; on beach ridges and offshore bars

This map unit is on slightly undulating beach ridges and offshore bars. It covers about 7 percent of the county. This unit is about 50 percent Elnora soils and 30 percent Stafford soils. The remaining 20 percent is soils of minor extent.

Elnora soils are moderately well drained and are on the higher parts of the landscape. Stafford soils are somewhat poorly drained and are in the more nearly level areas between the beach ridges and offshore bars. Elnora and Stafford soils have a sandy surface layer and subsoil and have a seasonal high water table.

Minor soils in this map unit include Colonie soils in strips on beach ridges. Kingsville and Minoa soils are on low beach ridges and flats between beach ridges.

Use of this map unit is diverse and includes cultivated crops, nursery stock, shrubs and trees, and residential and urban development. Wetness limits most soils in this unit for farming and for many other uses.

The soils in this map unit have fair potential for cultivated crops and nursery crops. Because of the wetness, most of the soils have poor potential for residential and urban use. The Stafford and Kingsville soils in this unit have good potential for wetland wildlife habitat.

4. Tyner-Otisville

Nearly level to moderately sloping, well drained and excessively drained soils that formed in water-sorted sediment; mostly on beach ridges

This map unit is on long, narrow, nearly level to moderately steep beach ridges. It covers about 9 percent of the county. This unit is about 60 percent Tyner soils and 20 percent Otisville soils. The remaining 20 percent is soils of minor extent.

Tyner soils are well drained, and Otisville soils are excessively drained. The subsoil of the Otisville soils contains 35 percent or more gravel. Tyner and Otisville soils are underlain by sandy or gravelly sediment. Available water capacity in most of the soils is low or very low.

Minor soils in this map unit include Colonie soils in small areas on ridges and Red Hook soils on the lower parts of sides of the beach ridges and offshore bars.

Use of this map unit is diverse and includes cultivated crops, nurseries, shrubs and trees, and residential and urban development, particularly in areas adjacent to highways. Most soils have few limitations for building site development but the hazard of polluting underground water supplies limits sanitary facilities. The low or very low available water capacity limits farming.

The soils in this map unit have good potential for nursery crops if they are irrigated. They also have good potential for residential and urban development if community sewage disposal systems are available.

5. Conotton-Oshtemo

Nearly level to moderately steep, somewhat excessively drained and well drained soils that formed in sand and gravel; on outwash terraces

This map unit is on broad flats on outwash terraces that have been dissected by drainageways. It covers 2 percent of the county. This unit is about 60 percent Conotton soils and 35 percent Oshtemo soils. The remaining 5 percent is soils of minor extent.

Conotton soils are somewhat excessively drained, and Oshtemo soils are well drained. The subsoil is loamy in these soils and contains a significant amount of gravel. Available water capacity is low, and permeability is very rapid to moderately rapid. Erosion is a hazard.

Minor soils in this map unit include Gosport and Ellsworth soils along streams and on slope breaks to the uplands.

This map unit is used for cultivated crops, nursery stock, natural shrubs and trees, and residential or urban development. It has fair potential for farming, good potential for building site development, and poor potential for sanitary facilities. Sand and gravel are mined from areas of this map unit.

The soils in this map unit have good potential for nursery crops and for general farm crops that need supplemental irrigation. They also have a good potential for residential and urban development if community sewage disposal systems are available.

Soils on till plains

These somewhat poorly drained and moderately well drained soils are on broad flats and in dissected areas on till plains. They formed in silty and loamy glacial till. Some of the soils have a fragipan that restricts internal drainage and rooting depth. Use of these map units is quite diverse; many areas are used for farming, community development, and natural shrubs and trees. Erosion, seasonal wetness, and slow or very slow permeability are the major limitations for use.

6. Platea-Pierpont

Nearly level to moderately steep, somewhat poorly drained and moderately well drained soils that formed in silty or loamy glacial till; on till plains

This map unit is in nearly level to moderately steep areas on till plains and moraines. The most sloping areas are on moraines and along drainageways. This map unit covers 18 percent of the county. It is about 55 percent Platea soils and 20 percent Pierpont soils. The remaining 25 percent is soils of minor extent.

Platea soils are somewhat poorly drained and are on broad flats and slightly convex side slopes. Pierpont soils are moderately well drained and are on knolls, ridges, and convex hillsides. These soils have a seasonal high water table, but Platea soils are wet longer than Pierpont soils. These soils also have a silt loam surface layer and very slow or slow permeability. Erosion is a hazard in most areas.

Minor soils in this map unit include Gosport soils in deeply entrenched valleys. Lobdell and Orrville soils are in long, narrow areas on flood plains along streams.

Use of this map unit is diverse and includes cultivated crops, natural shrubs and trees, and residential or urban development. Wetness and the hazard of erosion limit these soils for farming and for other purposes. Local ponding is common in nearly level areas.

If adequately drained, the soils in this map unit have fair potential for cultivated crops. Wetness and the slow or very slow permeability are so difficult to overcome that the potential for residential and other urban development is poor.

7. Darien-Mahoning

Nearly level to sloping, somewhat poorly drained soils that formed in silty or loamy glacial till; on till plains

This map unit is on broad flats and in dissected areas along drainageways. It covers 16 percent of the county. This unit is about 45 percent Darien soils and 20 percent Mahoning soils. The remaining 35 percent is soils of minor extent.

Darien and Mahoning soils are somewhat poorly drained and have a silt loam surface layer, slow or very slow permeability, and a seasonal high water table. These soils are soft and sticky when wet. Bedrock commonly is at a depth of 40 to 60 inches.

Minor soils in this map unit include small areas of Gosport soils, Ellsworth soils, shale substratum, and Lordstown soils in dissected areas. Small areas of Platea and Mitiwanga soils are in flat to gently undulating areas.

Most areas are in natural shrubs and trees, but some areas are used for cultivated crops, pasture, and residential development. Wetness and slow or very slow permeability severely limit most uses. Water commonly ponds in depressions following heavy rainfall. Erosion is a hazard in sloping areas that are used for cultivated crops. Seasonal wetness and bedrock at a depth of 40 to 60 inches severely limit sanitary facilities. Because of the seasonal wetness, generally low productivity, and acid reaction, some areas in this unit are no longer farmed. Other areas are used for residential and urban development.

The soils in this map unit have fair potential for farming. Wetness and restricted permeability are such severe limitations and are so difficult to overcome that the potential for residential and other urban development is poor. The potential for wetland wildlife habitat is fair.

8. Mahoning-Ellsworth

Nearly level to very steep, somewhat poorly drained and moderately well drained soils that formed in silty or loamy glacial till; on till plains

This map unit is on long, gently sloping and short, undulating side slopes and broad flats in dissected areas along drainageways. It covers about 7 percent of the county. This unit is about 55 percent Mahoning soils and 20 percent Ellsworth soils. The remaining 25 percent is soils of minor extent.

Mahoning soils are nearly level and gently sloping and somewhat poorly drained. Ellsworth soils are moderately well drained and are on knolls and hillsides. Mahoning and Ellsworth soils have a silt loam surface layer and a seasonal high water table. They have slow or very slow permeability. These soils are soft and compressible when wet.

Minor soils in this map unit are Lobdell and Orrville soils in long, narrow areas on the flood plains.

Use of this map unit is diverse and includes residential and urban development, cultivated crops, and natural shrubs and trees. Wetness and the erosion hazard limit these soils for cultivated crops. Wetness also limits residential and urban land development.

If adequately drained, the soils in this map unit have fair potential for cultivated crops. Wetness is such a severe limitation that the potential for residential and urban development is poor.

Soils on flood plains, terraces, and marshes

These well drained to very poorly drained soils are on broad flats and in long, narrow areas with very little undulation. They formed in lake bed sediment, recent alluvium, and organic deposits. Land use is quite diverse. The Glenford-Fitchville map unit is used mainly for farming, community development, and woodland. Because of flooding, the Tioga-Euclid-Orrville map unit is used mainly for farming and woodland. Because the Carlisle map unit is so wet, it is used for wetland wildlife habitat.

9. Glenford-Fitchville

Nearly level and gently sloping, moderately well drained and somewhat poorly drained soils that formed in silty and loamy glacial lake sediment; on terraces and old lake beds

This map unit is on nearly level and gently sloping terraces and old lake beds. It covers about 2 percent of the county. This unit is about 35 percent Glenford soils and 30 percent Fitchville soils. The remaining 35 percent is soils of minor extent.

Glenford soils are moderately well drained and are on slight rises and long, very gentle side slopes. Fitchville soils are somewhat poorly drained and are on the lower part of long side slopes and on flats. Glenford and Fitchville soils have a silt loam surface layer and moderately slow permeability. They are soft and sticky when wet. These soils have a seasonal high water table; it lasts longer in the Fitchville soils than in the Glenford soils.

Minor soils in this map unit include small areas of Ellsworth soils on hillsides and Orrville soils along streams. Small areas of Oshtemo soils are on ridges. Platea soils are included in nearly level areas.

Use of this map unit is diverse and includes residential and urban development, cultivated crops, and naturally reestablished shrubs and trees. Wetness and the hazard of erosion limit these soils for cultivated crops. Wetness also limits residential and urban development.

If adequately drained, the soils in this map unit have good potential for cultivated crops. Wetness limits the Fitchville soils so severely that the potential for residential and urban development is relatively poor.

10. Tioga-Euclid-Orrville

Nearly level, well drained and somewhat poorly drained soils that formed in alluvial deposits; on flood plains and terraces

This map unit is on commonly flooded flood plains and rarely flooded terraces. It covers about 6 percent of the county. This unit is about 25 percent Tioga soils, 20 percent Euclid soils, and 15 percent Orrville soils. The remaining 40 percent is soils of minor extent.

Tioga soils are well drained and are on flood plains. Euclid and Orrville soils are somewhat poorly drained and have a seasonal high water table near the surface. Euclid soils are on terraces and are rarely flooded. Orrville soils are on flood plains and are commonly flooded. Tioga, Euclid, and Orrville soils have a loam or silt loam surface layer.

Minor soils in this map unit are the well drained Gosport soils, the somewhat excessively drained Conotton soils, and the Tioga Variant soils, which are in narrow strips on low stream terraces.

Accessible areas where flooding is not excessive are used for cultivated crops. Inaccessible areas and areas that are subject to crop-damaging floods are in woodland and pasture. Wetness limits the Euclid and Orrville soils for farming and for most other uses.

If adequately drained and protected from flooding, accessible areas have good potential for residential or urban development.

11. Carlisle

Level, very poorly drained soils that formed in accumulated organic material; in marshes

This map unit is in a postglacial drainage channel. It consists of one area, known locally as the Mentor Marsh. It is swampy and supports only water-tolerant reeds, sedges, and brush. This map unit covers less than 1 percent of the county. Carlisle muck makes up about 70 percent of this map unit and minor soils make up the rest.

Carlisle muck is very poorly drained. It formed in thick layers of organic material.

Minor soils in this map unit are very poorly drained soils that formed in thinner deposits of organic material over mineral material.

This map unit is used as a natural wetland wildlife preserve. A continuous high water table and the low strength of the organic material severely limit this unit for other uses. This soil receives runoff from higher adjacent areas and is subject to pollution from nearby industrial and residential developments. This map unit has natural basins that collect water.

The soil in this map unit has good potential for wetland wildlife habitat.

Broad land use considerations

Deciding which land should be used for urban development is an important issue in Lake County. Each year a considerable amount of land is developed for this purpose, particularly on the west side of the county and around Painesville. It is estimated that about 57,000 acres, or more than one-third of the county, is presently urban or built-up land. The general soil map is most helpful in planning the general outline of urban areas; it cannot be used, however, for the selection of sites for specific urban structures. In general, the soils that have good potential for cultivated crops also have good potential for urban development. The data about specific soils in this survey can be helpful in planning land use.

Areas where the soils are so unfavorable that urban development is impossible are not extensive in the survey area. However, large areas of the Tioga-Euclid-Orrville general soil map unit are on flood plains in which flooding and ponding are severe limitations. Also, urban development is very costly on the soft, wet organic soils in the Carlisle map unit.

In large areas of the county, there are soils that can be developed for urban use at lower cost than can the flood plain soils or the organic soils. These include parts of the Tyner-Otisville and Conotton-Oshtemo map units on beach ridges. These map units also have good potential for nurseries, which should not be overlooked in planning.

Some soils have good potential for farming but only fair or poor potential for residential and urban development. The Red Hook, Elnora-Stafford, Glenford-Fitchville, and Tioga-Euclid-Orrville map units have poor to fair potential for residential and urban development.

Wetness is the principal limitation for residential and urban development on the Red Hook, Stafford, Fitchville, Euclid, and Orrville soils.

The high seasonal water table in the Red Hook and Elnora-Stafford map units is usually difficult to control. Effective drainage and septic tank filter fields are not easily established. However, irrigation ponds are relatively easy to establish.

Nursery and other specialty crops are suited to most soils in the Red Hook, Elnora-Stafford, Tyner-Otisville, and Conotton-Oshtemo map units. Red Hook and Stafford soils require adequate drainage. The soils in the Tyner-Otisville and Conotton-Oshtemo map units are well drained and warm earlier in spring than heavier, wetter soils.

Most of the soils in the county have good or fair potential for woodland. An exception is the Carlisle map unit, in which trees either do not grow naturally or produce poorly. Commercially valuable trees are less common and generally do not grow rapidly on the soils in the Conneaut-Painesville and Darien-Mahoning map units as they do on other soils in the county.

The steep areas of the Platea-Pierpont, Darien-Mahoning, and Tioga-Euclid-Orrville map units have excellent potential as sites for parks and extensive recreation areas. Hardwood forests enhance the beauty of much of these map units. Undrained marshes in the Carlisle map unit are suitable for nature study areas. All of these map units provide habitat for many important species of wildlife.

Soil maps for detailed planning

The map units shown on the detailed soil maps at the back of this publication represent the kinds of soil in the survey area. They are described in this section. The descriptions together with the soil maps can be useful in determining the potential of a soil and in managing it for food and fiber production; in planning land use and developing soil resources; and in enhancing, protecting, and preserving the environment. More information for each map unit, or soil, is given in the section "Use and management of the soils."

Preceding the name of each map unit is the symbol that identifies the soil on the detailed soil maps. Each soil description includes general facts about the soil and a brief description of the soil profile. In each description, the principal hazards and limitations are indicated, and the management concerns and practices needed are discussed.

The map units on the detailed soil maps represent an area on the landscape made up mostly of the soil or soils for which the unit is named. Most of the delineations shown on the detailed soil map are phases of soil series.

Soils that have a profile that is almost alike make up a *soil series.* Except for allowable differences in texture of the surface layer or of the underlying substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement in the profile. A soil series commonly is named for a town or geographic feature near the place where a soil of that series was first observed and mapped. The Ellsworth series, for example, was named for the town of Ellsworth in Mahoning County, Ohio.

Soils of one series can differ in texture of the surface layer or in the underlying substratum and in slope, erosion, stoniness, salinity, wetness, or other characteristics that affect their use. On the basis of such differences, a soil series is divided into phases. The name of a *soil phase* commonly indicates a feature that affects use or management. For example, Pierpont silt loam, 6 to 12 percent slopes, moderately eroded, is one of several phases within the Pierpont series.

Some map units are made up of two or more dominant kinds of soil. Such map units are called soil complexes. A *soil complex* consists of areas of two or more soils that are so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area includes some of each of the two or more dominant soils, and the pattern and proportion are somewhat similar in all areas. Lordstown-Rock outcrop complex, 25 to 70 percent slopes, is an example.

Most map units include small, scattered areas of soils other than those that appear in the name of the map unit. Some of these soils have properties that differ substantially from those of the dominant soil or soils and thus could significantly affect use and management of the map unit. These soils are described in the description of each map unit. Some of the more unusual or strongly contrasting soils that are included are identified by a special symbol on the soil map.

Most mapped areas include places that have little or no soil material and support little or no vegetation. Such places are called *miscellaneous areas*; they are delineated on the soil map and given descriptive names. Pits, gravel, is an example. Some of these areas are too small to be delineated and are identified by a special symbol on the soil map.

The acreage and proportionate extent of each map unit are given in table 7, and additional information on properties, limitations, capabilities, and potentials for many soil uses is given for each kind of soil in other tables in this survey. (See "Summary of tables.") Many of the terms used in describing soils are defined in the Glossary.

Ad—Adrian muck. This deep, level, very poorly drained organic soil is in depressional areas on the lake plain. It is subject to frequent flooding. Slope is generally less than 2 percent. Most areas are elongate in shape and are 5 to 20 acres in size.

Typically, the surface layer is black, very friable muck about 14 inches thick. The next layer is black, friable muck 7 inches thick. The substratum, to a depth of about 60 inches, is grayish brown and gray, loose loamy sand and sand.

Included with this soil in mapping are small areas of Carlisle soils. Also included are a few areas of very poorly drained soils that have an organic layer less than 16 inches thick.

This soil has a seasonal high water table near the surface, and the surface is ponded for long periods in winter, spring, and early summer. Permeability is rapid. Rooting depth is strongly influenced by the depth to the water table. The rooting zone is mainly the upper 12 inches. Available water capacity is high, and organic matter content is very high. The organic layers are strongly acid to slightly acid.

Most of the acreage of this soil is in natural vegetation, such as sedges and water-tolerant trees. This soil has poor potential for farming, building sites, and sanitary facilities. Undrained areas have good potential for wetland wildlife habitat.

The major limitations for farming are the flooding hazard and high water table. If the soil is drained, it is suited to some cultivated crops and vegetables. This soil is seldom used for pasture or hay. Ditches and subsurface drains may both be used in most areas, but in some areas drainage outlets are difficult to establish. Subsidence or shrinkage occurs after draining. Drainage that is controlled so the water table can be raised or lowered will reduce the amount of shrinkage. Tilling and harvesting at proper moisture levels are important management practices.

This soil is suited to trees. Use of harvesting equipment is limited during wet seasons. Trees that tolerate wetness should be selected for reforestation. Reforestation with desirable species is difficult, however, because of the high seedling mortality and severe plant competition.

Flooding, wetness, and rapid permeability seriously limit the use of this soil for building sites and sanitary facilities. Sloughing is a concern when making excavations. Some areas provide good sites for dugout ponds or wildlife marshes. Capability subclass IVw; woodland suitability subclass 4w.

As—Allis silt loam. This moderately deep, nearly level, poorly drained soil is on broad flats on the lake plain. Slope ranges from 0 to 2 percent. This soil is mainly in two large areas; each is larger than 1,000 acres.

Typically, the surface layer is dark grayish brown, friable silt loam about 6 inches thick. The subsoil is about 26 inches thick. The upper part of the subsoil is gray, mottled, friable silt loam; the middle part is gray, mottled, firm silty clay loam; and the lower part is gray, mottled, firm silty clay. The substratum is gray, mottled, firm silty clay. Weathered shale bedrock is at a depth of about 34 inches.

Included with this soil in mapping are small areas of Darien soils that have bedrock at a depth of 40 to 60 inches.

This soil has a seasonal high water table near the surface for long periods in winter, spring, and early summer. It is slow to dry in spring. Permeability and runoff are slow. The rooting zone is mainly above the water table. In drained areas, the rooting zone is moderately deep. Available water capacity is low. Organic matter content is moderately low. The surface layer and subsoil are strongly acid or very strongly acid, except where the surface layer has been limed.

Trees have been cleared from most areas of this soil. Because of wetness, only a few areas are cultivated. This soil has poor potential for cultivated crops, building sites, and sanitary facilities. It has potential for hay, pasture, woodland, and wildlife habitat.

Excessive wetness, slow permeability, and moderate depth to bedrock are major limitations for farming. Undrained areas are too wet for cultivated crops. Surface and subsurface drainage are needed; however, the shale bedrock commonly hinders the installation of subsurface drains, and outlets are not available in most areas. If tillage or harvesting operations are performed when the soil is wet, the soil is subject to surface crusting, compaction, and hard clodding. Tillage and harvesting operations should be performed at optimum moisture level with the kind of equipment that minimizes soil compaction. Use of crop residue and cover crops improve the organic matter content and tilth, help to control erosion, and increase water infiltration. Periodic application of lime is needed. This soil has potential for growing wetness-tolerant grasses and legumes for hay and pasture. To avoid compaction, grazing should be limited to periods when the surface layer is not soft and sticky.

This soil is fairly well suited to woodland. Reforestation with desirable species is difficult because of high seedling mortality and severe plant competition. Use of harvesting equipment is limited during wet seasons.

Seasonal wetness, slow permeability, moderate depth to bedrock, and high shrink-swell potential severely limit use of this soil for building sites and sanitary facilities. This soil is better suited to homesites without basements than to those with basements. The shale bedrock hinders excavations. Surface drains and storm sewers can be used to remove surface water. Local roads can be improved by using artificial drainage and suitable base material. Extensive drainage is needed for such intensive recreational uses as baseball diamonds and tennis courts. This soil is suited to hiking paths during the drier part of the year. Capability subclass IVw; woodland suitability subclass 4w.

Bs—Beaches. Beaches consist of sand and gravel washed and rewashed by waves along the shore of Lake Erie. They are partly covered by water during periods of high runoff. A fairly steep escarpment borders the land side of most beaches. Permeability is very rapid, and available water capacity is very low.

Most beaches are used for recreation, wildlife habitat, and aesthetic or scenic purposes. Not placed in a capability subclass or woodland suitability subclass.

Cg—Carlisle muck. This deep, level, very poorly drained organic soil is in a marsh. It is subject to frequent flooding. Slope is less than 2 percent. This soil is in one large, elongate area about 800 acres in size.

Typically, the surface layer is black, friable muck about 8 inches thick. The next layer is black, friable muck in the upper part and dark reddish brown, friable muck to a depth of about 54 inches. The substratum, to a depth of about 72 inches, is gray, firm silt loam.

Included with this soil in mapping are small areas of soils that have 16 to 51 inches of muck over mineral material. These soils are on the periphery of the marsh and make up about 20 percent of the area.

This soil has water near the surface, and the surface is ponded for long periods. Permeability is moderately rapid in the organic layer and moderately slow in the substratum. Rooting depth is related to the depth of the water table. The rooting zone is mainly the upper 10 to 12 inches. Available water capacity and organic matter content are very high. The organic material is medium acid to neutral.

This soil is used as a natural area with cattails, reeds, sedges, and some water-tolerant trees near the periphery. It has poor potential for most uses other than wetland wildlife habitat.

Flooding and wetness seriously limit the use of this soil for farming. This soil is difficult to drain because of its position on the landscape. Subsidence or shrinkage occurs after draining.

The high water table limits survival of most tree species. Some trees grow on those included soils that have a thinner organic deposit.

Flooding, wetness, and low strength seriously limit use of this soil for building sites and sanitary facilities. This soil provides good habitat for ducks, muskrats, and other wetland wildlife. Capability subclass VIIIw; woodland suitability subclass 4w.

CoB—Colonie loamy fine sand, 2 to 6 percent slopes. This deep, gently sloping, somewhat excessively drained soil is on beach ridges. Most areas are long and narrow in shape and range from 5 to 100 acres in size.

Typically, the surface layer is dark grayish brown, loose loamy fine sand about 3 inches thick. The subsoil is about 62 inches thick. The upper part of the subsoil is yellowish brown, very friable fine sand; and the lower part is pale brown, loose fine sand with thin bands of dark brown loamy sand below a depth of about 20 inches. The substratum, to a depth of about 80 inches, is brown, loose fine sand.

Included with this soil in mapping are small areas of moderately well drained Elnora soils in nearly level areas and on the lower part of side slopes. These soils make up 5 to 20 percent of some of the larger areas.

Permeability is rapid, and the soil dries quickly after rains. This causes shallow rooted plants to wilt after a few days without rain. Roots are not restricted. Available water capacity and organic matter content are low. Runoff is slow. The subsoil is strongly acid to neutral, but the surface layer varies widely in reaction, depending on the amount of liming.

Most of the acreage of this soil is used for farming. Competition is strong between agriculture and urban uses. Some areas are used for houses and sand pits. This soil has fair potential for farming and woodland and good potential for building sites.

This soil is suited to cultivated crops, hay, pasture, and specialty crops such as orchards, berries, and nursery stock. Deep-rooted crops are especially well suited to this soil. Droughtiness is the main limitation for farming, but this soil is well suited to irrigation. Crops can be planted on this soil earlier in spring than on most other soils in the county. This soil is not naturally highly productive, but it responds well to good management. Because nutrients are rapidly leached, this soil generally responds better to smaller but more frequent or more timely applications of fertilizer than to one large application. The sandy surface layer and upper part of the subsoil do not hold together for easy balling of nursery stock. Soil blowing and water erosion are hazards. The abrasive action of blowing sand damages plant seedlings. Use of crop residue and cover crops helps to maintain organic matter content and reduce erosion.

Only a small acreage of this soil is wooded. This soil is moderately suited to woodland. Seedling mortality is severe during dry years.

This soil is well suited to building sites. Sanitary facilities are limited by the possible contamination of ground water because of seepage. Sloughing is a hazard in excavations. Soil blowing and water erosion are also hazards. As much plant cover as possible should be maintained on the site during construction to reduce erosion. Lawn seedings made during the drier part of the growing season commonly fail. Seeding should be done early in spring; if seeded during dry periods, lawns should be mulched and watered. The sandy surface layer limits most recreational uses. Capability subclass IIIs; woodland suitability subclass 4s.

CoD—Colonie loamy fine sand, 6 to 18 percent slopes. This deep, moderately sloping and moderately steep, somewhat excessively drained soil is on sandy ridges or dunes of postglacial beach ridges. Most areas are long and narrow in shape and range from 5 to 50 acres in size.

Typically, the surface layer is very dark grayish brown, loose loamy fine sand about 3 inches thick. The subsoil is about 62 inches thick. The upper part of the subsoil is yellowish brown, very friable fine sand; and the lower part is pale brown, loose fine sand with thin bands of dark brown loamy sand below a depth of about 20 inches. The substratum, to a depth of about 65 inches, is brown, loose fine sand.

Included with this soil in mapping are small spots of eroded soils. These spots are difficult to protect from further erosion.

Permeability is rapid, and available water capacity is low. This soil dries quickly after rains and is droughty. Roots are not restricted. The organic matter content is low. Runoff is medium. The subsoil is strongly acid to neutral, but the surface layer varies widely in reaction, depending on the amount of liming.

Competition is strong between agriculture, woodland, and community development on this soil. Some areas are used for sand pits. This soil has fair potential for farming, woodland, and building sites but poor potential for most sanitary facilities.

Droughtiness and slope are the major limitations for farming. This soil is suited to hay, pasture, and other crops, such as orchards that are maintained in permanent sod. The erosion hazard limits the use of irrigation for clean-cultivated crops. This soil is better suited to deep-rooted crops, such as alfalfa, than to most other crops. Conservation of moisture is very important. Because nutrients are rapidly leached, this soil generally responds better to smaller but more frequent or more timely applications of fertilizer than to one large application. Use of crop residue and cover crops helps to maintain organic matter content and reduce erosion.

Only a small acreage of this soil is wooded. This soil is moderately suited to woodland. Seedling mortality is severe during dry years.

Although slope limits use of this soil for building sites, most areas are good homesites. Soil blowing and water erosion are serious hazards during construction. As much plant cover as possible should be maintained on the site during construction to reduce erosion. Because this soil is droughty, lawns are difficult to maintain. Seeding should be done early in spring; if seeded during dry periods, lawns should be mulched and watered. Sloughing is a hazard in excavations. Sanitary facilities are limited by possible contamination of ground water because of seepage. The sandy surface layer and slope limit most recreational uses. Capability subclass IVe; woodland suitability subclass 4s.

CoF—Colonie loamy fine sand, 25 to 50 percent slopes. This deep, very steep, somewhat excessively drained soil is along drainageways that cut through beach ridges. Most areas are long and narrow in shape and range from 5 to 200 acres in size.

Typically, the surface layer is very dark grayish brown, loose loamy fine sand about 2 inches thick. The subsoil is about 48 inches thick. The upper part of the subsoil is yellowish brown, loose fine sand; and the lower part is pale brown, loose fine sand that has thin bands of dark brown loamy sand. The substratum, to a depth of about 60 inches, is brown, loose fine sand.

Included with this soil in mapping are small areas of Otisville, Tyner, and Oshtemo soils. Small seep areas are included on the lower part of some side slopes.

Permeability is rapid, and the soil dries quickly after rains. Available water capacity is low in the deep rooting zone. The organic matter content is low. Runoff is rapid. The surface layer is strongly acid to slightly acid, and the subsoil is strongly acid to neutral.

Slope controls the use of this soil. Most of the acreage is used for woodland and wildlife habitat. This soil has poor potential for farming, building sites, and sanitary facilities.

This soil is poorly suited to farming because it is very steep and droughty. Use of tillage equipment is very difficult. The hazard of erosion is very severe if plant cover is removed.

This soil is moderately suited to poorly suited to woodland. Slope severely limits use of equipment.

The very steep slope severely limits use of this soil for building sites and sanitary facilities. The hazard of erosion is very severe if vegetation is removed. Sloughing is a hazard in excavations. Trails in recreational areas should be protected from erosion and established across the slope where possible. Capability subclass VIIe; woodland suitability subclass 4s.

CtA—Conneaut silt loam, 0 to 1 percent slopes. This deep, level, poorly drained soil is the dominant soil on the lake plain. Areas are 1/2 to 1 mile wide.

Typically, the surface layer is dark grayish brown, firm silt loam about 9 inches thick. The subsoil is mottled, firm silty clay loam about 45 inches thick; it is gray and grayish brown in the upper part and yellowish brown in the lower part. The substratum, to a depth of about 60 inches, is yellowish brown and light olive brown, mottled, firm silty clay loam. In a few areas the soil has a dark gray surface layer about 8 inches thick with moderate organic matter content. These areas are mainly between State Route 84 and Interstate 90 west of Madison Village.

Included with this soil in mapping are small areas of Swanton soils that have a loam or sandy loam surface layer. These soils are more easily tilled.

This soil has a seasonal high water table near the surface for long periods in winter, spring, and early summer. It dries and warms slowly in spring. Permeability is slow, and available water capacity is high in the rooting zone. Rooting depth is related to the depth of the water table. The rooting zone is deep in drained areas. Organic matter content is moderately low. The surface layer and subsoil are very strongly acid to neutral.

Most of the acreage of this soil is in meadow or natural shrubs and trees. Some areas are drained and used for farming. This soil has fair potential for farming and good potential for woodland. It has poor potential for building sites and sanitary facilities.

The major limitations for farming are slow permeability and seasonal wetness. If this soil is drained, it is suited to crops, hay, and pasture. Undrained areas can be used for hay and pasture, but maintaining tilth and desirable forage stands is difficult. Because of the slow permeability, a combination of surface and subsurface drains is needed in many areas. This soil is subject to surface crusting, compaction, and hard clodding if tillage or harvesting operations are performed when the soil is wet. Using crop residue and cover crops increases water infiltration and improves organic matter content and tilth.

This soil is well suited to woodland. Use of harvesting equipment is limited during wet seasons. Reforestation with desirable species is difficult because of severe plant competition.

Seasonal wetness and slow permeability severely limit use of this soil for building sites and sanitary facilities (fig. 1). Surface drains and storm sewers can be used to remove surface water. Local roads can be improved by using artificial drainage and suitable base material. Capability subclass IIIw; woodland suitability subclass 2w.

CtB—Conneaut silt loam, 1 to 4 percent slopes. This deep, gently sloping, somewhat poorly drained soil is along drainageways on the lake plain. Slopes are typically short. Slope is generally 2 to 4 percent. Most areas are long and narrow in shape and range from 10 to 100 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 12 inches thick. The subsoil is mottled, firm silty clay loam about 28 inches thick; it is yellowish brown in the upper part and dark yellowish brown in the lower part. The substratum, to a depth of about 80 inches, is dark yellowish brown, firm silt loam. In some small areas the surface layer is loam.

Included with this soil in mapping are a few areas of eroded soils on the upper part of side slopes. These eroded soils have a grayish brown or brown surface layer and commonly have poor tilth. Also included are a few areas adjacent to beach ridges where slope is 5 to 8 percent.

In undrained areas, this soil has a seasonal high water table at a depth of 6 to 18 inches in winter, spring, and early summer. This soil dries and warms slowly in spring. Permeability is slow, and available water capacity is high in the rooting zone. Runoff is slow or medium. Rooting depth is influenced by the water table. The rooting zone is deep in drained areas. Organic matter content is moderately low. The surface layer and subsoil are very strongly acid to neutral.

Most of the acreage of this soil is used for farming, homesites, or natural shrubs and trees. This soil has good potential for farming and woodland but poor potential for building sites and sanitary facilities.

The major limitations for cultivated crops are seasonal wetness and slow permeability. Undrained areas can be used for hay and pasture, but maintaining tilth and desirable forage stands is difficult.

If this soil is drained, it is suited to crops, hay, and pasture. Tillage operations are commonly delayed. The slow internal water movement reduces the effectiveness of subsurface drains. A combination of surface and subsurface drains is needed in most areas. Tilling and grazing when the soil is wet cause the soil to compact. Using crop residue and cover crops increases water infiltration and improves organic matter content and tilth.

This soil is well suited to woodland. Reforestation with desirable species is difficult because of severe plant competition. Use of harvesting equipment is limited during wet seasons.

Slow permeability and seasonal wetness limit use of this soil for building sites and sanitary facilities. It is better suited to houses without basements than to those with basements. Buildings should be landscaped for good surface drainage away from the foundations. Local roads can be improved by using artificial drainage and suitable base material. Capability subclass IIw; woodland suitability subclass 2w.

CwA—Conneaut silt loam, shale substratum, 0 to 2 percent slopes. This deep, nearly level, poorly drained soil is in broad areas on the lake plain. Most areas are long and narrow in shape and range from 10 to 200 acres in size.

Typically, the surface layer is dark gray, friable silt loam about 8 inches thick. The subsoil is mottled, firm silty clay loam about 35 inches thick. It is grayish brown in the upper part and yellowish brown in the lower part. Weathered shale bedrock is below a depth of about 43 inches.

In undrained areas, this soil has a perched seasonal high water table near the surface during winter, spring, and early summer. Permeability is slow, and available water capacity is moderate in the rooting zone. Runoff is slow. Shale bedrock is at a depth of 40 to 60 inches. This soil dries and warms slowly in spring. Rooting depth is influenced by the water table. The rooting zone is deep in drained areas. Organic matter content is moderately low. The surface layer and subsoil are very strongly acid to neutral.

Most of the acreage of this soil is in meadow or natural shrubs and trees. This soil has fair potential for farming and good potential for woodland. It has poor potential for building sites and sanitary facilities.

Excessive wetness and slow permeability are major limitations for farming. These characteristics commonly delay tillage operations. Undrained areas can be used for hay and pasture, but maintaining tilth and desirable forage stands is difficult. Drained areas are suited to crops, hay, and pasture. The slow internal water movement reduces the effectiveness of subsurface drains. Outlets for subsurface drains are not available in many areas. Surface drains can be used to remove surface water. This soil is subject to surface crusting, compaction, and hard clodding if tillage or harvesting operations are performed when the soil is wet. Using crop residue and cover crops increases water infiltration and improves organic matter content and tilth.

This soil is well suited to woodland. Use of harvesting equipment is limited during wet seasons. Reforestation with desirable species is difficult because of severe plant competition.

Seasonal wetness, depth to bedrock, and slow permeability severely limit use of this soil for building sites and sanitary facilities. The bedrock is rippable. Surface drains and storm sewers can be used to remove surface water. Local roads can be improved by using artificial drainage and suitable base material. Wetness also limits recreational use. Capability subclass IIIw; woodland suitability subclass 2w.

CxA—Conotton loam, 0 to 2 percent slopes. This deep, nearly level, somewhat excessively drained soil is mainly on outwash terraces. A few areas are on postglacial beach ridges. Most areas are long and narrow in shape and range from 5 to 30 acres in size.

Typically, the surface layer is dark brown, friable loam about 10 inches thick. The dark brown, friable subsoil is about 32 inches thick; it is gravelly loam in the upper part and very gravelly loam in the lower part. The substratum, to a depth of about 60 inches, is brown, loose gravelly sand.

Included with this soil in mapping are small areas of Oshtemo soils. Also included are some small areas of soils that have a gravelly loam surface layer. The gravel interferes with cultivation.

Permeability is rapid, and available water capacity is low in the deep rooting zone. This soil warms early in spring. Runoff is slow. The organic matter content is low. The subsoil is very strongly acid to neutral, but the surface layer varies widely in reaction, depending on the amount of liming.

Most of the acreage of this soil is in meadow, natural brush and trees, or urban development. This soil has fair potential for farming and woodland and good potential for building sites.

This soil is suited to a wide variety of crops, but because of droughtiness, it is better suited to early-maturing or deep-rooted crops. Irrigation is needed during prolonged dry periods, especially for shallow-rooted crops. Management practices, such as minimum tillage and using crop residue and cover crops, conserve moisture and maintain organic matter content. Because nutrients are rapidly leached, this soil generally responds better to smaller but more frequent or timely applications of fertilizer than to one large application.

This soil is moderately well suited to trees, but only a small acreage is wooded. It is suited to Christmas trees.

This soil is suited to building sites. Possible contamination of ground water limits the use for sanitary facilities. Lawn seedings are difficult to establish during the drier part of the year. Seeding should be done early in spring; if seeded during dry periods, lawns should be mulched and watered. This soil is a good source of gravel. Capability subclass IIIs; woodland suitability subclass 3f.

CyB—Conotton gravelly loam, 2 to 6 percent slopes. This deep, gently sloping, somewhat excessively drained soil is on the upper part of sides and crests of postglacial beach ridges. Most areas are long and narrow in shape and range from 10 to 30 acres in size.

Typically, the surface layer is dark brown, very friable gravelly loam about 10 inches thick. The brown, friable subsoil is about 32 inches thick; the upper part is gravelly loam, and the lower part is very gravelly clay loam. The substratum, to a depth of about 60 inches, is brown, loose gravelly fine sand.

Included with this soil in mapping are small spots of Oshtemo soils. A few of the higher lying areas include small areas in which glacial till is at a depth of 3 to 5 feet.

Permeability is rapid and available water capacity is low in the deep rooting zone. This soil warms early in spring. Runoff is slow or medium. The organic matter content is low. The subsoil is very strongly acid to neutral, but the surface layer varies widely in reaction, depending on the amount of liming.

This soil is used for farming, woodland, urban development, and recreation. It has fair potential for farming and woodland and good potential for building sites.

This soil is suited to crops, hay, and pasture. It is best suited to crops planted early in spring or to winter grain crops unless it is irrigated. If this soil is irrigated, it is well suited to orchards and nursery stock. Droughtiness is the major limitation for farming. Gravel hinders tillage in some areas. Erosion is a hazard in areas that have long slopes. Management practices, such as minimum tillage and using crop residue and cover crops, maintain organic matter content, improve tilth, and reduce the erosion hazard. Because nutrients are rapidly leached, this soil generally responds better to smaller but more frequent or timely applications of fertilizer than to one large application.

Few areas of this soil are wooded. This soil is moderately well suited to woodland. Seedling mortality is moderate.

This soil is well suited to building sites. Possible contamination of ground water limits the use for sanitary facilities. Gravel interferes with most recreational uses. Lawn seedings are difficult to establish during the drier part of the growing season. Seeding should be done early in spring; if seeded during dry periods, lawns should be mulched and watered. Capability subclass IIIs; woodland suitability subclass 3f.

CyC—Conotton gravelly loam, 6 to 15 percent slopes. This deep, sloping and moderately steep, somewhat excessively drained soil is on postglacial beach ridges. Most areas are long and narrow in shape and range from 5 to 15 acres in size.

Typically, the surface layer is dark brown, very friable gravelly loam about 10 inches thick. The brown, friable subsoil is about 32 inches thick; the upper part is gravelly loam, and the lower part is very gravelly clay loam. The substratum, to a depth of about 60 inches, is brown, loose gravelly sand.

Included with this soil in mapping are small areas of severely eroded soils on the upper part of side slopes. In most of these eroded areas, the surface layer is very gravelly loam.

Permeability is rapid, and available water capacity is low in the deep rooting zone. This soil warms early in spring. Runoff is medium or rapid. Organic matter content is low. The subsoil is very strongly acid to neutral, but the surface layer varies widely in reaction, depending on the amount of liming.

Most of the acreage of this soil is used for natural shrubs and trees or for community development. This soil has poor potential for farming and fair potential for woodland and building sites.

This soil is poorly suited to cultivated crops. It can be cropped successfully, but cropping systems should include a high proportion of long-term hay or pasture. This soil is suited to orchards that are maintained in permanent sod. Conservation of moisture is very important because of droughtiness. This soil is better suited to early-maturing crops than to late-maturing crops. Gravel hinders tillage in some areas. Management practices, such as minimum tillage and using crop residue and cover crops, help to control erosion, conserve moisture, and maintain organic matter content. Because nutrients are rapidly leached, this soil generally responds better to smaller but more frequent or more timely applications of fertilizer than to one large application.

This soil is moderately well suited to woodland. Seedling mortality is moderate.

Although slope limits use of this soil for building sites, some areas are good for this use. The possible contamination of ground water limits the use for sanitary facilities. Cover should be maintained on the site as much as possible during construction (fig. 2). Gravel in the surface layer and slope interfere with most recreational uses. Lawn seedings are difficult to establish during the drier part of the growing season. Seeding should be done early in spring; if seeded during dry periods, lawns should be mulched and watered. Capability subclass IVe; woodland suitability subclass 3f.

DaA—Darien silt loam, 0 to 1 percent slopes. This deep, nearly level, somewhat poorly drained soil is on broad flats. Most areas are irregular in shape and are more than 50 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 11 inches thick. The subsoil is about 26 inches thick. The upper part of the subsoil is grayish brown, mottled, firm silt loam; and the lower part is light olive brown, mottled, firm silty clay loam. The substratum is yellowish brown, mottled, firm shaly silty clay loam. Weathered, rippable shale bedrock is at a depth of about 50 inches.

Included with this soil in mapping are large areas of poorly drained soils that are similar to Darien soils but that are grayer in the subsoil. These soils are in depressions and are subject to ponding.

In undrained areas, this soil has a perched seasonal high water table near the surface during winter, spring, and other excessively wet periods. Some areas are ponded during these periods. Permeability is slow. Runoff is very slow. Shale and siltstone bedrock is at a depth of 40 to 60 inches. This soil dries and warms slowly in spring. Rooting depth is influenced by the water table. In spring, the rooting zone is mainly the upper 15 to 20 inches. Roots penetrate to a greater depth as the water table recedes. Available water capacity is moderate. Organic matter content is moderately low. The subsoil is strongly acid or medium acid, but the surface layer varies widely in reaction, depending on the amount of liming.

This soil is used mainly for woodland, hay, and pasture. Some areas are in natural shrubs. This soil has fair potential for farming and woodland. Potential is poor for building sites and sanitary facilities.

Seasonal wetness severely limits the use of this soil for cultivated crops. Drained areas are suited to some cultivated crops and to water-tolerant grasses and legumes for hay and pasture. Even with drainage this soil is commonly too wet for winter wheat. This soil is poorly suited to specialty crops. Tillage operations are commonly delayed. Drainage by subsurface drains is slow. A combination of surface and subsurface drainage can be used to overcome the wetness. Tillage and grazing when the soil is wet causes compaction. Minimum tillage, using crop residue and cover crops, and tilling and harvesting at proper moisture content are important.

This soil is moderately well suited to woodland. Use of harvesting equipment is limited during wet seasons. Reforestation with desirable species is difficult because of severe plant competition. Windthrow is also a hazard.

The seasonal high water table, slow permeability, and depth to bedrock severely limit use of this soil for building site and sanitary facilities. Fill is usually required for construction on this soil. Surface drains and storm sewers can be used to remove surface water. Sanitary facilities should be connected to commercial sewers wherever possible. Wetness also limits the use of this soil for recreation. Capability subclass IIIw; woodland suitability subclass 2w.

DaB—Darien silt loam, 1 to 4 percent slopes. This deep, nearly level and gently sloping, somewhat poorly drained soil is on slightly convex side slopes. Most areas are irregular in shape and are 20 acres to several hundred acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsoil is about 33 inches thick. The upper part of the subsoil is yellowish brown, mottled, firm silt loam; the middle part is brown and dark yellowish brown, mottled, firm silty clay loam; and the lower part is brown, mottled, firm silty clay loam. The substratum is yellowish brown, mottled, firm silty clay loam. Fractured shale and siltstone bedrock is at a depth of about 45 inches.

Included with this soil in mapping are areas of the somewhat poorly drained Mitiwanga soils that are moderately deep to bedrock and some areas along drainageways where slope is 5 to 6 percent.

In undrained areas, this soil has a perched seasonal high water table near the surface during winter, spring, and other excessively wet periods. Permeability is slow. Runoff is slow or medium. Shale and siltstone bedrock is at a depth of 40 to 60 inches. This soil dries and warms slowly in spring. Rooting depth is influenced by the water table. In spring, the rooting zone is mainly the upper 15 to 20 inches of the soil. Roots penetrate to a greater depth as the water table recedes. Available water capacity is moderate. Organic matter content is moderately low. The subsoil is strongly acid or medium acid, but the surface layer varies widely in reaction, depending on the amount of liming.

This soil is used mainly for woodland, hay, and pasture. Some areas are in natural shrubs, and a few areas are used for row crops. This soil has fair potential for farming and woodland. It has poor potential for building sites and sanitary facilities and good potential for openland and woodland wildlife habitat.

Seasonal wetness limits the use of this soil for cultivated crops. If drained, this soil is suited to row crops and forage crops. It is poorly suited to specialty crops. Tillage operations are commonly delayed. The slow or very slow internal water movement reduces the effectiveness of subsurface drains, so a combination of surface and subsurface drainage is needed. Tilling or grazing when the soil is soft and sticky causes the soil to compact. Erosion is a hazard in cultivated, gently sloping areas. Using crop residue and cover crops and tilling and harvesting at proper moisture content are important. A thick plant cover in the gently sloping areas helps to control erosion in pasture and meadow.

This soil is well suited to woodland. Use of harvesting equipment is limited during wet seasons. Reforestation with desirable species is difficult because of severe plant competition.

Seasonal wetness, depth to bedrock, and slow permeability severely limit the use of this soil for building sites and sanitary facilities. The underlying bedrock is mostly rippable. Buildings should be located on the higher parts of the landscape for good surface drainage away from the foundation. Sanitary facilities should be connected to commercial sewers wherever possible. Extensive drainage is needed for intensive recreational uses such as baseball diamonds and tennis courts. This soil is suitable for hiking during the drier part of the year. Capability subclass IIIw; woodland suitability subclass 2w.

DaC—Darien silt loam, 6 to 12 percent slopes. This deep, sloping, somewhat poorly drained soil is on hillsides and on side slopes parallel to drainageways. Most areas are 5 to 15 acres in size and elongate in shape.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsoil is about 33 inches thick. The upper part of the subsoil is yellowish brown, mottled, firm silt loam; the middle part is brown and dark yellowish brown, mottled, firm silty clay loam; and the lower part is brown, mottled, firm silty clay loam. The substratum is yellowish brown, mottled, firm silty clay loam. Fractured shale and siltstone bedrock is at a depth of about 45 inches.

Included with this soil in mapping are areas of soils that have a channery silt loam surface layer. Also included are small areas of Mitiwanga soils that have bedrock at a depth of 20 to 40 inches.

In undrained areas this soil has a perched seasonal high water table near the surface during winter, spring, and other excessively wet periods. Permeability is slow. Runoff is medium. Shale and siltstone bedrock is at a depth of 40 to 60 inches. This soil dries and warms slowly in spring. Rooting depth is influenced by the water table. In spring, the rooting zone is mainly the upper 15 to 20 inches. Roots penetrate to a greater depth as the water table recedes. Available water capacity is moderate. Organic matter content is moderately low. The subsoil is strongly acid or medium acid, but the surface layer varies widely in reaction, as a result of liming.

This soil is used mainly for woodland, hay, and pasture. It has fair potential for farming and woodland. This soil has poor potential for building sites and sanitary facilities and good potential for openland and woodland wildlife habitat.

This soil is better suited to hay and pasture than to cultivated crops. The major limitations for cultivated crops are the erosion hazard and seasonal wetness. This soil is especially susceptible to erosion if it is not protected during winter. Row crops can be grown if adequate precautions are taken to control erosion. Wetness delays planting and limits the choice of crops. Subsurface drainage is needed to remove excess water from the subsoil. Tilling or grazing when the soil is soft and sticky causes the soil to compact. Standard management practices, such as using crop residue and tilling at proper moisture content, improve tilth, reduce erosion, and maintain organic matter content.

This soil is well suited to woodland. Use of harvesting equipment is limited during wet seasons. Reforestation with desirable species is difficult because of severe plant competition.

Seasonal wetness, slow permeability, and depth to bedrock severely limit use of this soil for building sites and sanitary facilities. The bedrock is mostly rippable. Erosion is a hazard during construction. Construction sites should be developed on the contour wherever possible and cover should be maintained on the site as much as possible during construction to reduce erosion. Capability subclass IIIe; woodland suitability subclass 2w.

Dc—Dumps, covered. These miscellaneous areas consist mostly of broken chunks of cement, bricks, and other debris that is mostly nonorganic waste from local construction projects. The fill is calcareous in some areas. Most areas are 2 to 20 acres in size. The depth of the fill varies according to the original landform surface.

These areas commonly do not support plants. Erosion of any existing fine earth material is a hazard unless the area is adequately covered by a suitable soil layer and vegetation is established. Not placed in a capability subclass or woodland suitability subclass.

Du—Dumps, chemical waste. These miscellaneous areas consist of industrial settling basins that have collected alkali chemical wastes. These basins are 50 to 100 acres in size and have dikes 20 to 30 feet high. Some basins contain an accumulation of waste to within 2 to 3 feet of the top of the dikes.

Little or no vegetation grows on these waste sites. Not placed in a capability subclass or woodland suitability subclass.

ElB—Ellsworth silt loam, 2 to 6 percent slopes. This deep, gently sloping, moderately well drained soil is on knolls and on side slopes parallel to drainageways. Most areas are irregular in shape and 5 to 20 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 34 inches thick. The upper part of the subsoil is yellowish brown, firm silty clay loam; and the lower part is dark yellowish brown, mottled, firm clay loam. The substratum, to a depth of about 60 inches, is brown, firm clay loam.

Included with this soil in mapping, particularly in less sloping areas where water from surrounding slopes accumulates, are small areas of somewhat poorly drained Mahoning soils. Also included, where slope is 5 to 6 percent, are small spots of eroded soils that have a more clayey surface layer.

A perched seasonal high water table is between depths of 1.5 and 3.0 feet during winter, spring, and other excessively wet periods. This soil dries slowly in spring. Permeability is slow or very slow. Runoff is slow or medium. The rooting zone is moderately deep over glacial till. Available water capacity is moderate. Organic matter content is moderately low. The surface layer and upper part of the subsoil are very strongly acid to neutral, and the lower part of the subsoil is slightly acid to mildly alkaline.

Most of the acreage of this soil is in woodland. Many of the areas that were formerly cultivated are no longer farmed. This soil has poor potential for specialty crops and fair potential for row crops, hay, pasture, and woodland. It has fair potential for building sites and sanitary facilities.

This soil is suited to cultivated crops, hay, and pasture. It is commonly wet in spring and dry in midsummer. Random subsurface drainage is needed in the included wetter soils and in wet-weather seeps. The hazard of erosion is severe in cultivated areas that are not protected. Hard clods and a crusty surface form if the soil is cultivated when it is soft and sticky. Grazing when this soil is soft and sticky causes the soil to compact and reduces growth. Contour cultivation, minimum tillage, use of cover crops, incorporating crop residue in the soil, and tilling, pasturing, and harvesting at proper moisture content control erosion, improve tilth, and maintain organic matter content.

This soil is moderately well suited to woodland. Machine planting of tree seedlings is practical on this soil.

Wetness, slow or very slow permeability, and shrink-swell potential limit the use of this soil for building sites and sanitary facilities. This soil is better suited to houses without basements than to those with basements. Good surface drainage should be provided around buildings during landscaping. Cover should be maintained on the site as much as possible during construction to prevent erosion. Capability subclass IIIe; woodland suitability subclass 3o.

EIC—Ellsworth silt loam, 6 to 12 percent slopes. This deep, sloping, moderately well drained soil is on hillsides and on side slopes parallel to drainageways. Most areas are irregular in shape and range from 5 to 20 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 34 inches thick. The upper part of the subsoil is yellowish brown, firm silty clay loam; and the lower part is dark yellowish brown, mottled, firm clay loam. The substratum, to a depth of about 60 inches, is brown, firm clay loam.

Included with this soil in mapping are small spots of somewhat poorly drained Mahoning soils and a few spots of eroded soils that have a more clayey surface layer than this Ellsworth soil. Also included are some narrow areas where slope is more than 12 percent.

A perched seasonal high water table is between depths of 1.5 and 3.0 feet during winter, spring, and other excessively wet periods. This soil dries slowly in spring. Permeability is slow or very slow. Runoff is rapid. The rooting zone is moderately deep over glacial till. Available water capacity is moderate. Organic matter content is moderately low. The surface layer and upper part of the subsoil are very strongly acid to neutral, and the lower part of the subsoil is slightly acid to mildly alkaline.

Most of the acreage of this soil is in woodland. Many of the formerly cultivated areas are no longer farmed. This soil has poor potential for cultivated crops and fair potential for hay, pasture, and woodland. It has fair or poor potential for building sites and sanitary facilities.

This soil is suited to hay and pasture. It can be cropped successfully, but cropping systems should include a high proportion of long-term hay or pasture. Erosion is a serious hazard, especially if the slopes are long. Random subsurface drainage may be needed in the included wetter soils. Hard clods and a crusty surface form if the soil is cultivated when it is soft and sticky. Standard management practices, such as minimum tillage, use of cover crops, and tilling at proper moisture content, control erosion, improve tilth, and maintain organic matter content.

This soil is moderately well suited to woodland. Seedling mortality generally is not a problem. Laying out logging roads and skid trails on the contour facilitates the use of equipment and helps to prevent excessive erosion.

Wetness, slope, slow or very slow permeability, and shrink-swell potential limit the use of this soil for building sites and sanitary facilities. Homes without basements are better suited to this soil than those with basements. Erosion is a serious hazard during construction, so cover should be maintained on the site as much as possible during construction. Trails in recreational areas should be protected from erosion and established across the slope wherever possible. Some areas are suitable sites for ponds. Capability subclass IVe; woodland suitability subclass 3o.

EID—Ellsworth silt loam, 12 to 18 percent slopes. This deep, moderately steep, moderately well drained soil is on convex hillsides and on side slopes parallel to drainageways. Most areas are irregular in shape and range from 5 to 30 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 2 inches thick. The subsurface layer is brown, friable silt loam about 4 inches thick. The subsoil is about 30 inches thick. The upper part of the subsoil is yellowish brown, firm silty clay loam; and the lower part is dark yellowish brown, mottled, firm clay loam. The substratum, to a depth of about 60 inches, is brown, firm clay loam.

Included with this soil in mapping are small areas of eroded soils. These soils have a yellowish brown or brown surface layer that is sticky when wet.

A perched seasonal high water table is between depths of 1.5 and 3.0 feet during winter, spring, and other excessively wet periods. This soil dries slowly in spring. Permeability is slow or very slow. Runoff is very rapid. The rooting zone is moderately deep over glacial till. Available water capacity is moderate. Organic matter content is moderately low. The surface layer and upper part of the subsoil are very strongly acid to neutral, and the lower part of the subsoil is slightly acid to mildly alkaline.

Most of the acreage of this soil is in woodland. Some areas are in natural shrubs or are used for pasture. This soil has poor potential for farming, building sites, and sanitary facilities. It has good potential for openland and woodland wildlife habitat.

This soil is suited to grasses and legumes for pasture. It tends to be droughty in summer. The slope and erosion hazard severely limit use of this soil for cultivated crops or specialty crops. Use of tillage equipment, especially large machines, is very difficult. Erosion is difficult to control in new seedings. Minimum tillage, good fertilization, and controlled grazing are important.

This soil is moderately well suited to woodland. Slope limits use of logging equipment.

Slow or very slow permeability, seasonal wetness, slope, and shrink-swell potential limit the use of this soil for building sites and sanitary facilities. Erosion is a serious hazard during construction. Housing developments and construction sites should be developed on the contour wherever possible. Trench absorption fields are difficult to lay out and construct. Controlling the downhill flow of effluent is a serious concern. Capability subclass VIe; woodland suitability subclass 3r.

ElF—Ellsworth silt loam, 25 to 70 percent slopes. This deep, very steep, moderately well drained soil is on hillsides and sides of V-shaped valleys formed by deeply entrenched drainageways. Typically, slopes are short. Most areas are long and narrow in shape and generally are larger than 50 acres in size.

Typically, the surface layer is grayish brown, friable silt loam about 2 inches thick. The subsurface layer is yellowish brown, friable silt loam about 5 inches thick. The subsoil is about 27 inches thick; it is dark yellowish brown, firm silty clay loam and has mottles below a depth of about 20 inches. The substratum, to a depth of 60 inches, is yellowish brown, firm silty clay loam. In places the subsoil is thinner and the glacial till substratum is at a depth of 25 to 30 inches.

Included with this soil in mapping are areas of Gosport soils adjacent to streams.

The water table is generally between depths of 1.5 and 3.0 feet during winter, spring, and other excessively wet periods. This soil dries slowly in spring. Permeability is slow or very slow. Runoff is very rapid. The rooting zone is moderately deep over glacial till. Available water capacity is moderate. Organic matter content is moderately low. The surface layer and upper part of the subsoil are very strongly acid to neutral, and the lower part of the subsoil is slightly acid to mildly alkaline.

Most of the acreage of this soil is in woodland. This soil has poor potential for farming, building sites, and sanitary facilities. It has fair potential for trees and good potential for woodland wildlife habitat. This soil is better suited to woodland and wildlife habitat than to most other uses.

Because of the very steep slope, this soil is very poorly suited to crops and pasture. Soil slippage is a hazard in some places, and the hazard of erosion is very severe unless a thick plant cover is maintained.

This soil is moderately well suited to woodland. The hazard of erosion is severe. The very steep slope limits use of logging equipment. Construction of buildings and sanitary facilities is very difficult because of the very steep slope. Also, the hazard of erosion is very severe when vegetation is removed. Trails in recreational areas should be protected from erosion and established across the slope wherever possible. Capability subclass VIIe; woodland suitability subclass 3r.

EmC—Ellsworth silt loam, shale substratum, 6 to 12 percent slopes. This deep, sloping, moderately well drained soil is on hillsides. Slopes are mostly less than 500 feet long and are dissected by many drainageways. Most areas are 5 to 50 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsoil is about 35 inches thick. The upper part of the subsoil is yellowish brown, firm silty clay loam; and the lower part is yellowish brown and dark brown, mottled, firm silty clay loam. Rippable shale bedrock is at a depth of about 42 inches.

Included with this soil in mapping are a few areas in which shale bedrock is at a depth of 24 to 40 inches. Also included on the upper part of side slopes are small spots of eroded soils that have a brown or yellowish brown surface layer that contains common shale or siltstone fragments.

A perched seasonal high water table is between depths of 1.5 and 3.0 feet during winter, spring, and other excessively wet periods. This soil dries slowly in spring. Permeability is slow. Runoff is rapid. Shale bedrock is at a depth of 40 to 60 inches. The rooting zone is moderately deep over glacial till. Available water capacity is moderate. Organic matter content is moderately low. The subsoil is very strongly acid to slightly acid, but the surface layer varies widely in reaction, depending on the amount of liming.

Most of the acreage of this soil is in woodland and natural shrubs. This soil has poor potential for cultivated crops. It also has poor potential as a site for many kinds of buildings and sanitary facilities. It has fair potential for hay, pasture, and woodland.

This soil is suited to hay and pasture. It can be cropped successfully, but cropping systems should include a high proportion of long-term hay or pasture. The hazard of erosion is severe if this soil is used for cultivated crops. A thick plant cover in pasture and meadow helps to control erosion. Minimum tillage, use of cover crops, incorporating crop residue in the soil, and tilling at proper moisture content improve tilth, maintain organic matter content, and reduce the erosion hazard.

This soil is moderately well suited to woodland. Laying out logging roads and skid trails on the contour facilitates the use of equipment and helps to prevent excessive erosion.

Seasonal wetness, slope, depth to shale bedrock, low strength, and slow permeability limit the use of this soil for building sites and sanitary facilities. If this soil is used as a construction site, the site should be developed on the contour wherever possible. Shale bedrock is at a depth of 40 to 60 inches, and although it is rippable, it hinders excavation. Houses without basements are better suited to this soil than those with basements. Cover should be maintained on the site as much as possible during construction to help to control erosion. Trails in recreational areas should be protected from erosion and established across the slope wherever possible. Capability subclass IVe; woodland suitability subclass 3o.

EmD—Ellsworth silt loam, shale substratum, 12 to 18 percent slopes. This deep, moderately steep, moderately well drained soil is mainly on side slopes adjacent to major drainageways. Most areas are narrow and winding in shape and range from 5 to 20 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 2 inches thick. The subsurface layer is brown, friable silt loam about 4 inches thick. The subsoil is 36 inches thick; it is yellowish brown, firm silty clay loam and has mottles below a depth of about 15 inches. Rippable shale bedrock is at a depth of about 42 inches.

Included with this soil in mapping are a few areas in which shale and siltstone bedrock is at a depth of 20 to 40 inches. Also included are small areas of eroded soils that have a yellowish brown or brown surface layer that is sticky when wet.

A perched seasonal high water table is between depths of 1.5 and 3.0 feet during winter, spring, and other excessively wet periods. This soil dries slowly in spring. Permeability is slow. Runoff is very rapid. Shale bedrock is at a depth of 40 to 60 inches. The rooting zone is moderately deep over glacial till. Available water capacity is moderate. Organic matter content is moderately low. The subsoil is very strongly acid to slightly acid but the surface layer varies widely in reaction, depending on the amount of liming.

Most of the acreage of this soil is in woodland. This soil has poor potential for farming, building sites, and sanitary facilities. It has fair potential for woodland and good potential for openland and woodland wildlife habitat.

This soil is suited to grasses and legumes for pasture. The slope and hazard of erosion severely limit use of this soil for cultivated crops. Use of tillage equipment, especially large machines, is very difficult. This soil tends to be droughty in summer. Erosion is difficult to control in new seedings. Minimum tillage, good fertilization, and controlled grazing are important in helping to control erosion, improve tilth, and maintain organic matter content.

This soil is moderately well suited to woodland. Slope limits use of logging equipment.

Slow permeability, seasonal wetness, slope, low strength, and depth to shale bedrock limit the use of this soil for building sites and sanitary facilities. Shale bedrock is at a depth of 40 to 60 inches, and although it is rippable, it hinders excavations. Housing developments and construction sites should be developed on the contour wherever possible. Cover should be maintained on the site as much as possible during construction to help to prevent erosion. Trench absorption fields are difficult to lay out and construct. Controlling the downhill flow of effluent is a serious concern. Capability subclass VIe; woodland suitability subclass 3r.

EnB—Elnora loamy fine sand, 1 to 5 percent slopes. This deep, nearly level and gently sloping, moderately well drained soil is on knolls and low ridges on the lake plain. Most areas are irregular in shape and range from 5 to 100 acres in size.

Typically, the surface layer is dark grayish brown, friable fine sand about 5 inches thick. The subsoil is very friable loamy fine sand about 27 inches thick; the upper part is strong brown, the middle part is brownish yellow and mottled, and the lower part is yellowish brown and mottled. The substratum, to a depth of about 67 inches, is grayish brown and dark gray, loose fine sand.

Included with this soil in mapping are small areas of somewhat poorly drained Stafford soils on the lower part of side slopes. Also included are small areas of somewhat excessively drained Colonie soils on the tops of knolls and ridges.

A seasonal high water table is at a depth of 18 to 24 inches in late winter, spring, and other extended wet periods. Permeability is moderately rapid or rapid. Runoff is slow. Available water capacity is low in the deep rooting zone. Organic matter content is low. The surface layer and subsoil are very strongly acid to slightly acid.

Most of the acreage of this soil is used for specialty crops or urban development. This soil has fair potential for farming and for specialty crops. It has fair and poor potential for building sites and poor potential for sanitary facilities.

This soil is suited to such specialty crops as nursery stock, orchards, and berries and to cultivated crops, hay, and pasture. Wetness early in spring and droughtiness in summer are major limitations. Irrigation is needed. Random subsurface drains are needed in the included areas of wetter soils if they are intensively cropped. Because nutrients are rapidly leached, this soil generally responds better to smaller but more frequent applications of fertilizer than to one large application. Soil blowing and water erosion are also hazards. The abrasive action of blowing sand damages plant seedlings. The sandy surface layer and upper part of the subsoil do not hold together for easy balling of nursery stock. Using crop residue and cover crops helps to control erosion and improves organic matter content and tilth.

Only a small acreage of this soil is wooded. This soil is moderately well suited to woodland. Seedling mortality is a hazard during dry years.

Seasonal wetness and moderately rapid or rapid permeability limit this soil for building sites and sanitary facilities. It is better suited to houses without basements than to those with basements. Because of seepage, contamination of ground water by sanitary facilities is possible. Sloughing is a hazard in excavations. Seeding should be done early in spring; if seeded during dry periods, lawns should be mulched and watered. The sandy surface layer limits recreational use of this soil. This soil is a good source of sand. Capability subclass IIIs; woodland suitability subclass 3s.

EuA—Euclid silt loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is on broad, low stream terraces adjacent to major streams. It is on positions slightly higher than the adjacent first bottoms, but it is subject to rare flooding. Most areas are long and narrow in shape and range from 5 to 100 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 32 inches thick; it is yellowish brown, dark yellowish brown, and dark brown, mottled, firm silt loam. The substratum, to a depth of about 60 inches, is gray and brown, friable fine sandy loam and silt loam with mottles in the upper part.

Included with this soil in mapping are small areas of Tioga Variant soils on slightly higher positions. Also included are areas of soils that are similar to Euclid soils but have stratified layers of loam and sandy loam in the subsoil. Available water capacity is lower in these soils than in this Euclid soil.

This soil has a seasonal high water table near the surface in winter, spring, and other extended wet periods. Permeability is moderately slow. Runoff is slow. Rooting depth is influenced by the depth to the water table. Available water capacity is high in the deep rooting zone. Organic matter content is moderately low. The surface layer and subsoil are very strongly acid to medium acid.

This soil is mainly in natural shrubs and trees. A few areas are used for specialty crops or meadow. This soil has good potential for farming and woodland but poor potential for building sites and sanitary facilities.

Seasonal wetness is the major limitation for farming. Planting is delayed and the choice of crops is limited in undrained areas. Drained areas are suited to crops, hay, and pasture. Because of ponding, surface drains are needed in some areas. Subsurface drains can also be used to lower the water table. Minimizing soil compaction and maintaining desirable forage stands are difficult in undrained areas that are used for hay and pasture. Management practices, such as tilling at proper moisture levels and using crop residue and cover crops, improve tilth and increase organic matter content. Nursery stock and sweet corn are grown on this soil (fig. 3). Artificial drainage is needed in most areas. This soil has desirable characteristics for digging and balling of nursery stock.

This soil is well suited to woodland. Seasonal wetness and the flooding hazard severely limit the use of this soil for building sites, sanitary facilities, and recreation. Capability subclass IIw; woodland suitability subclass 2w.

FcA—Fitchville silt loam, 1 to 4 percent slopes. This deep, nearly level and gently sloping, somewhat poorly drained soil is on old lake beds. Areas are irregular or oval in shape and range from 10 to 100 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is mottled, firm silt loam about 44 inches thick; it is yellowish brown in the upper part and light olive brown in the lower part. The substratum, to a depth of about 60 inches, is light olive brown, mottled, firm silt loam.

Included with this soil in mapping are a few small areas of Glenford soils on knolls and small areas of poorly drained soils that have a dominantly gray subsoil along waterways and in depressions. Also included are areas of soils in which the surface layer and upper part of the subsoil are fine sandy loam and sandy loam.

This soil has a seasonal high water table near the surface for long periods in winter, spring, and early summer. Runoff is slow. Rooting depth is influenced by the water table. The rooting zone is deep in drained areas. Available water capacity is high. Organic matter content is moderately low. The surface layer and subsoil are very strongly acid to medium acid, except where the surface layer has been limed.

Most of the acreage of this soil is used for urban development and farming. This soil has good potential for farming and woodland and poor potential for building sites and sanitary facilities.

This soil is suited to growing wetness-tolerant grasses and legumes for hay and pasture. If this soil is drained, it is well suited to cultivated crops. Surface drains can be used to remove excess surface water, and subsurface drains can be used to lower the water table. This soil is subject to crusting, compaction, and hard clodding if tillage or harvesting operations are performed when the soil is wet. Erosion is a hazard on a few long slopes. Using crop residue and cover crops improves organic matter content and tilth, helps to control erosion, and increases water infiltration. Because of compaction, grazing should be limited to periods when the surface is not soft and sticky.

This soil is well suited to woodland. Use of harvesting equipment is limited during wet seasons.

The seasonal high water table, moderately slow permeability, and low strength severely limit the use of this soil for sanitary facilities and building sites. Houses without basements are better suited to this soil than those with basements. Storm sewers and ditches can be used to help to control the water table. Local roads can be improved by using artificial drainage and suitable base material. Capability subclass IIw; woodland suitability subclass 2w.

GfA—Glenford silt loam, 0 to 2 percent slopes. This deep, nearly level, moderately well drained soil is on long and narrow ridges between entrenched drainageways. Most areas are irregular in shape and 5 to 25 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 45 inches thick; it is yellowish brown and light olive brown, firm silt loam with mottles below a depth of about 14 inches. The substratum, to a depth of about 60 inches, is light olive brown, mottled, friable fine sandy loam with thin strata of sandy loam.

Included with this soil in mapping are many areas of soils that are similar to Glenford soils but have stratified sand and gravel below a depth of 60 inches; permeability is moderately rapid to very rapid in this stratified material. A few small areas of Fitchville soils are also included on broad ridges.

A perched seasonal high water table is between depths of 1.5 and 3.0 feet during winter, spring, and other extended wet periods. Permeability is moderately slow. Runoff is slow. Available water capacity is high in the deep rooting zone. Organic matter content is moderately low. The surface layer is very strongly acid to neutral, and the subsoil is very strongly acid to medium acid.

Most of the acreage of this soil is used for woodland and homesites. A few areas are in crops and pasture. This soil has good potential for farming and woodland. It has fair and poor potential for building sites and sanitary facilities.

This soil is suited to cultivated crops, hay, pasture, and specialty crops. Preventing crusting after rains and maintaining tilth and organic matter content are primary management concerns. Minimum tillage and using crop residue and cover crops are important. This soil has desirable characteristics for digging and balling of nursery stock.

This soil is very well suited to woodland. Machine planting of tree seedlings is practical on this soil.

Seasonal wetness limits the use of this soil for most sanitary facilities and for building sites. This soil is better suited to houses without basements than to those with basements. Local roads can be improved by using artificial drainage and suitable base material. This soil has good potential for such recreational uses as picnic areas and paths and trails. Capability class I; woodland suitability subclass 1o.

GfB—Glenford silt loam, 2 to 6 percent slopes. This deep, gently sloping, moderately well drained soil commonly is on silty terrace remnants adjacent to the uplands. Most areas are long and narrow in shape and range from 5 to 25 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 8 inches thick. The subsoil is about 45 inches thick; it is yellowish brown and light olive brown, mottled, firm silt loam. The substratum, to a depth of about 60 inches, is light olive brown, mottled, friable silt loam.

Included with this soil in mapping are small areas of somewhat poorly drained Fitchville soils, commonly in the less sloping areas. Also included are some areas where slope is 6 to 10 percent that make up as much as 20 percent of some delineations.

A perched seasonal high water table is between depths of 1.5 and 3.0 feet during winter, spring, and other extended wet periods. Permeability is moderately slow. Runoff is medium. Available water capacity is high in the deep rooting zone. Organic matter content is moderately low. The surface layer is very strongly acid to neutral, and the subsoil is very strongly acid to medium acid.

Most of the acreage of this soil is used for hay, natural shrubs, and woodland. A few areas are in pasture or crops. This soil has good potential for farming and woodland. It has fair and poor potential for building sites and sanitary facilities.

This soil is well suited to cultivated crops, hay, pasture, and specialty crops. It is easily farmed, but is susceptible to surface crusting and erosion. Erosion is difficult to control in cultivated areas where slope is 4 to 6 percent and in the included areas where the slope is 6 to 10 percent. Minimum tillage and using crop residue and cover crops reduce erosion, maintain organic matter content, and improve tilth. This soil has desirable characteristics for digging and balling of nursery stock.

This soil is suited to a wide variety of woodland species. It is very well suited to woodland. Machine planting of tree seedlings is practical on this soil.

Seasonal wetness limits the use of this soil for most sanitary facilities and for building sites. This soil is better suited to houses without basements than to those with basements. Local roads can be improved by using artificial drainage and suitable base material. Cover should be maintained on the site as much as possible during construction to reduce erosion. This soil has good potential for such recreational uses as picnic areas and paths and trails. Capability subclass IIe; woodland suitability subclass 1o.

GoF—Gosport silty clay loam, 25 to 70 percent slopes. This moderately deep, well drained, very steep soil is in dissected areas along streams. Most areas are less than one-quarter mile wide, but some areas extend for 1 mile or more along the deeply entrenched valleys. Slope is dominantly 35 to 70 percent but ranges from 25 to 70 percent.

Typically, the surface layer is very dark brown, friable silty clay loam about 2 inches thick. The subsoil is about 25 inches thick. The upper part of the subsoil is yellowish brown, friable silty clay loam; the middle part is yellowish brown, firm silty clay loam with a few mottles; and the lower part is olive brown, mottled, firm silty clay loam. The substratum is olive brown, mottled, firm, shaly silty clay loam. Shale bedrock is at a depth of about 32 inches.

Included with this soil in mapping on the lower part of side slopes are areas of well drained soils that are similar to Gosport soils but that have colluvium on the surface. These soils commonly have shale bedrock at a depth of 40 to 70 inches. Also included are areas of somewhat excessively drained, shallow soils on the upper part of side slopes.

Permeability is slow, and runoff is very rapid. The rooting depth is restricted by shale bedrock at a depth of 20 to 40 inches. Available water capacity and organic matter content are low. The surface layer is slightly acid to extremely acid, and the subsoil is extremely acid to strongly acid.

Most of the acreage of this soil is in woodland. This soil has fair potential for woodland but poor potential for farming, building sites, and sanitary facilities.

The major limitation for farming is the very steep slope. This soil is highly susceptible to erosion and land slippage. A thick plant cover helps to control erosion.

This soil is suited to woodland and wildlife habitat. The hazard of erosion is severe. The very steep and generally uneven slope limits use of logging equipment.

Construction for urban use is very difficult because of the very steep slopes. The hazard of erosion is high when vegetation is removed. Low strength and moderate depth to bedrock also limit many uses. Trails in recreational areas should be protected from erosion and established across the slope wherever possible. Capability subclass VIIe; woodland suitability subclass 3r.

Gr—Granby sandy loam. This deep, nearly level, very poorly drained soil is in basinlike depressions on the lake plain. Slope ranges from 0 to 2 percent. Most areas are irregular in shape and range from 5 to 100 acres in size.

Typically, the surface layer is black, friable sandy loam about 12 inches thick. The subsoil is about 20 inches thick. The upper part of the subsoil is gray, very friable gravelly coarse sandy loam; and the lower part is gray, loose gravelly loamy coarse sand. The substratum, to a depth of about 60 inches, is olive gray, loose sand and fine sand. Some small areas of soils have a dark grayish brown surface layer.

Included with this soil in mapping are small areas of soils that have a loamy sand surface layer; these soils have very low available water capacity. Some included areas in the lower part of depressions are ponded during extended wet periods. Also included are small areas of slowly or very slowly permeable Swanton soils in which fine textured and moderately fine textured sediment is at a depth of 18 to 40 inches.

Unless artificially drained, this soil has a seasonal high water table near the surface for long periods. Permeability is rapid. The rooting depth is related to the depth of the water table. The rooting zone is moderately deep or deep in most drained areas. Available water capacity is low. Runoff is very slow. Organic matter content is moderate. The surface layer and subsoil are medium acid or strongly acid except where the surface layer has been limed.

Most of the acreage of this soil is used for nursery stock, vegetables, and natural shrubs and trees. This soil has fair potential for specialty crops, row crops, hay, pasture, and woodland. It has poor potential for building sites and sanitary facilities.

Seasonal wetness is the dominant limitation for farming. This soil dries slowly in spring unless it is artificially drained. Undrained areas are too wet for cultivated crops in most years, but drained areas are suited to cultivated crops and specialty crops. This soil is suited to growing wetness-tolerant grasses and legumes for hay and pasture. Grazing should be controlled to reduce soil compaction and increase plant growth. This soil has desirable characteristics for digging and balling of nursery stock. Subsurface drains can be used if outlets are available. Special measures, such as using graded sand and gravel filters or prefabricated filter materials, are needed in some areas to prevent subsurface drains from plugging with fine sand. Surface drains can be used in some of the included areas that are subject to ponding. Using cover crops, incorporating crop residue in the soil, and tilling and harvesting at proper moisture content are important. This soil is moderately well suited to woodland. Wetness limits use of harvesting equipment.

Prolonged wetness severely limits use of this soil for building sites and sanitary facilities. Sloughing is a hazard in excavation. Suitable base material and artificial drainage are commonly required for roads. Capability subclass IIIw; woodland suitability subclass 3w.

Kf—Kingsville fine sand. This deep, nearly level, very poorly drained, sandy soil is adjacent to beach ridges. Slope ranges from 0 to 2 percent. Most areas are long and narrow in shape and range from 5 to several hundred acres in size.

Typically, the surface layer is very dark gray, very friable fine sand about 8 inches thick. The subsoil is grayish brown, mottled, very friable fine sand about 22 inches thick. The substratum, to a depth of about 60 inches, is grayish brown and gray, loose sand. In some areas this soil has a dark gray surface layer with slightly lower organic matter content.

Included with this soil in mapping on slight rises are small areas of Stafford soils that have a lighter colored surface layer.

This soil receives seepage water from the beach ridges. It has a seasonal high water table near the surface in winter, spring, and other extended wet periods. Permeability is rapid, and runoff is very slow. Rooting depth is related to the depth of the water table. Available water capacity is low. Organic matter content is moderate. The subsoil is very strongly acid to slightly acid, but the surface layer varies widely in reaction, depending on the amount of liming.

Most of the acreage of this soil is used for woodland, pasture, crops, and natural shrubs. Drained areas are used for vegetables and nursery stock. This soil has poor potential for farming, building sites, and sanitary facilities. It has good potential for woodland.

The major limitation for farming is seasonal wetness. Undrained areas are too wet for crops, but drained areas are suited to cultivated crops, specialty crops, hay, and pasture. Surface drains can be used to remove excess surface water. Subsurface drains can be used if outlets are available. Special measures, such as using graded sand and gravel filters or prefabricated filter materials, are needed in places to prevent subsurface drains from plugging with fine sand. Tile and jointed pipe may become displaced in this soil. Because plant nutrients are moderately rapidly leached in drained areas, this soil generally responds better to smaller but more frequent or more timely applications of fertilizer than to one large application.

This soil is well suited to woodland. Use of harvesting equipment is limited during wet seasons. Reforestation with desirable species is difficult because of severe seedling mortality and plant competition.

Wetness and rapid permeability severely limit the use of this soil for building sites and sanitary facilities. Sloughing is a hazard in excavations. Wetness also limits recreational use. Capability subclass IVw; woodland suitability subclass 2w.

Lb—Lobdell silt loam. This deep, nearly level, moderately well drained soil is on flood plains and is subject to flooding. Slope ranges from 0 to 2 percent. Most areas are long and narrow in shape and range from 5 to 30 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 10 inches thick. The subsoil is about 26 inches thick; it is yellowish brown, friable silt loam with mottles below a depth of about 20 inches. The substratum, to a depth of about 96 inches, is light brownish gray, mottled, friable silt loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Orrville soils in low areas and old meander channels. Narrow strips of Tioga soils adjacent to the stream are included. Some included areas, particularly in the northern part of the county, have rapidly permeable soils in which the subsoil is mainly fine sandy loam and the substratum is mainly loamy fine sand and fine sand. Also included, dominantly where streams flow on bedrock, are areas of soils that are similar to Lobdell soils but that have stony and gravelly textures in the subsoil and substratum.

A seasonal high water table is between depths of 1.5 and 3.0 feet in winter, spring, and other extended wet periods. Permeability is moderate or moderately rapid. Runoff is slow. Available water capacity is high in the deep rooting zone. Organic matter content is moderately low. The subsoil and substratum are strongly acid to neutral.

Most of the acreage of this soil is in woodland or natural shrubs. A few areas are used for pasture. This soil has good potential for farming and woodland but poor potential for building sites and sanitary facilities.

The major limitation for cultivated crops is flooding. Although the choice of crops is limited, this soil is suited to pasture and well suited to annual field crops. Such crops as winter wheat may be severely damaged by flooding in winter and early spring. Planting is delayed in spring because of wetness. Artificial drainage is needed in the areas of included wetter soils. Using cover crops is important in maintaining organic matter content and in protecting the surface during flooding.

This soil is very well suited to woodland. Machine planting of tree seedlings is practical on this soil.

Flooding and seasonal wetness severely limit use of this soil for sanitary facilities and building sites. Some areas can be used for hiking and golfing. Diking to control flooding is difficult. This soil is a good source of topsoil. Capability subclass IIw; woodland suitability subclass 1o.

LrB—Lordstown channery silt loam, 2 to 6 percent slopes. This moderately deep, gently sloping, well drained soil is on bedrock-controlled landforms on uplands. Most areas are elongate in shape and range from 10 to 50 acres in size.

Typically, the surface layer is very dark grayish brown, friable channery silt loam about 4 inches thick. The subsoil is yellowish brown, friable channery silt loam and channery loam about 16 inches thick. The substratum is brown, friable channery fine sandy loam. Sandstone bedrock is at a depth of about 24 inches.

Included with this soil in mapping are some small areas of moderately deep soils that have a mottled, yellowish brown and gray subsoil and are wetter than this Lordstown soil. These wetter spots make up as much as 20 percent of some of the larger areas. Also, included are a few areas of somewhat excessively drained soils that have bedrock at a depth of 10 to 20 inches.

This soil warms and dries early in spring. Permeability is moderate. The rooting zone is mainly 20 to 30 inches deep over sandstone bedrock. Available water capacity and organic matter content are low. Runoff is medium. The surface layer and subsoil are strongly acid or very strongly acid except where the surface layer has been limed.

Most of the acreage of this soil is wooded (fig. 4). Some areas are in natural shrubs or are used for pasture. This soil has fair potential for farming and woodland but poor potential for most sanitary facilities and for building sites.

This soil is suited to crops and pasture. It is well suited to early grazing. This soil is not naturally highly productive, but it responds well to good management. Such measures as minimum tillage and using crop residue and cover crops conserve moisture, control erosion, and improve tilth.

This soil is moderately well suited to woodland. Machine planting of tree seedlings is practical on this soil.

The hard bedrock at a depth of 20 to 30 inches limits the use of this soil for building sites and sanitary facilities. Blasting of bedrock is generally required for most of these uses. Because of droughtiness, lawns are difficult to establish. Many areas may be used for such recreational uses as picnic and camp areas despite the flat stone fragments. Capability subclass IIe; woodland suitability subclass 3o.

LrC—Lordstown channery silt loam, 6 to 12 percent slopes. This moderately deep, sloping, well drained soil is on the upper part of bedrock-controlled hillsides on the uplands. Slopes are mainly less than 300 feet long. Most areas are long and narrow in shape and less than 10 acres in size.

Typically, the surface layer is very dark grayish brown, friable channery silt loam about 4 inches thick. The subsoil is yellowish brown, friable channery silt loam and channery loam. Sandstone bedrock is at a depth of about 22 inches.

Included with this soil in mapping are a few small areas of moderately deep, wetter soils that have a mottled, yellowish brown and gray subsoil. Also included are some small areas of shallow, somewhat excessively drained soils that have bedrock at a depth of 10 to 20 inches and a few areas where slope is 12 to 18 percent.

This soil warms and dries early in spring and is droughty. Permeability is moderate. The rooting zone is mainly 20 to 30 inches deep over the sandstone bedrock. Available water capacity and organic matter content are low. Runoff is rapid. The surface layer and subsoil are strongly acid or very strongly acid except where the surface layer has been limed.

Most of the acreage of this soil is in woodland. This soil has fair potential for farming and woodland but poor potential for building sites and sanitary facilities.

This soil is suited to crops and pasture. It is especially well suited to pasture for early grazing. Flat stone fragments interfere with tillage. The erosion hazard limits irrigation in clean-cultivated areas and is a major concern on long slopes. Standard management practices, such as minimum tillage and using crop residue and cover crops, reduce erosion, conserve moisture, and maintain organic matter content.

This soil is moderately well suited to woodland. Water bars protect logging roads and skid trails from erosion.

Slope and bedrock at a depth of 20 to 30 inches limit the use of this soil for building sites and sanitary facilities. Blasting of bedrock is generally required for most of these uses. Bedrock also limits landscaping. Because of droughtiness, lawns are difficult to establish. Cover should be maintained on the site as much as possible during construction to reduce erosion. Capability subclass IIIe; woodland suitability subclass 3o.

LxF—Lordstown-Rock outcrop complex, 25 to 70 percent slopes. This complex consists of moderately deep, well drained, very steep Lordstown channery silt loam and areas of exposed bedrock on hillsides. The Lordstown soil is mainly on the lower parts of side slopes and the Rock outcrop is on the upper parts. Slopes are mainly short, rarely more than 200 or 300 feet long. Areas are mostly long and narrow in shape and range from 20 to 50 acres in size. The Lordstown soil makes up about 50 percent of this complex, and Rock outcrop makes up 30 percent. Other soils make up the remaining 20 percent. This soil and the Rock outcrop form such an intricate pattern that they were not separated in mapping.

Typically, the Lordstown soil has a very dark grayish brown, friable channery silt loam surface layer about 4 inches thick. The subsoil is yellowish brown, friable channery silt loam and channery loam. Sandstone bedrock is at a depth of about 24 inches.

Included with the Lordstown soil and Rock outcrop in mapping are many areas of shallow, somewhat excessively drained soils in which bedrock is at a depth of 10 to 20 inches. These included soils are intermingled with the Rock outcrop on the upper parts of side slopes. Some areas of stony or very stony soils and a few seep areas are also included.

The Lordstown soil warms and dries early in spring and is droughty. Permeability is moderate. The rooting zone is mainly 20 to 30 inches of soil over sandstone bedrock. Available water capacity and organic matter content are low. Runoff is very rapid. The surface layer and subsoil are strongly acid or very strongly acid.

Most of the acreage of this complex is in woodland. The very steep slope, Rock outcrop, and moderate depth to bedrock severely limit most uses other than woodland, recreation, and wildlife habitat. Some areas are scenic spots and can be used for recreation.

The Lordstown soil is moderately suited to woodland. Logging and establishing new plantations are very difficult. Logging roads and skid trails may be protected from erosion by water bars.

Construction for urban uses and recreation is difficult and the hazard of erosion is very severe when vegetation is removed. Trails in recreational areas should be protected from erosion and established across the slope wherever possible. Capability subclass VIIe; Lordstown part in woodland suitability subclass 3r, Rock outcrop part not placed in a woodland suitability subclass.

MgA—Mahoning silt loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is on upland flats. Areas are irregular in shape and commonly range from 5 to 20 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 10 inches thick. The subsoil is yellowish brown and dark brown, mottled, firm silty clay loam about 21 inches thick. The substratum, to a depth of about 72 inches, is dark brown and brown, firm silty clay loam.

Included with this soil in mapping are a few narrow areas of poorly drained soils that are more gray in the subsoil than this Mahoning soil.

A perched seasonal high water table is at a depth of 6 to 18 inches during winter, spring, and other extended wet periods. Permeability is slow or very slow. Runoff is slow. This soil warms and dries slowly in spring, even if it is artificially drained. Rooting depth is influenced by the water table. In spring, the rooting zone is mainly the upper 15 to 20 inches. It is moderately deep over glacial till. Available water capacity is moderate. Organic matter content is moderately low. The surface layer is very strongly acid to neutral, and the subsoil is very strongly acid to mildly alkaline.

Most of the acreage of this soil is used for hay, pasture, woodland, and natural shrubs. This soil has fair potential for farming but poor potential for building sites and sanitary facilities.

The major limitation for farming is wetness and slow or very slow permeability. Drained areas are suited to the commonly grown cultivated crops and to water-tolerant grasses and legumes grown for hay and pasture. Planting is delayed and the choice of crops is limited in undrained areas. Both surface and subsurface drains can be used to improve drainage. Subsurface drains must be closely spaced to provide uniform drainage. This soil needs to be cultivated at suitable moisture content because it is sticky and soft when wet. Hard clods and a crusty surface form if the soil is cultivated when wet. Grazing should be controlled to prevent compaction. Returning crop residue and using cover crops increase infiltration and improve organic matter content and tilth.

This soil is well suited to woodland. Reforestation with desirable species is difficult because of severe plant competition. Use of harvesting equipment is limited during wet seasons.

Seasonal wetness, slow or very slow permeability, and low strength severely limit the use of this soil for building sites and sanitary facilities. This soil is better suited to houses without basements than to those with basements. Surface drains and storm sewers can be used to remove surface water. Sanitary facilities should be connected to commercial sewers wherever possible. Local roads can be improved by using artificial drainage and suitable base material. Wetness and slow or very slow permeability also limit the use of this soil for recreation. Capability subclass IIIw; woodland suitability subclass 2w.

MgB—Mahoning silt loam, 2 to 6 percent slopes. This deep, gently sloping, somewhat poorly drained soil is on uplands. Slopes are long and gentle. Areas range from 10 to 100 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 10 inches thick. The subsoil is about 31 inches thick. The upper part of the subsoil is yellowish brown, mottled, firm silt loam and silty clay loam; and the lower part is dark brown, mottled, firm silty clay loam. The substratum, to a depth of about 72 inches, is dark brown and brown, firm silty clay loam.

Included with this soil in mapping are a few small areas of Ellsworth soils on low knolls.

A perched seasonal high water table is at a depth of 6 to 18 inches during winter, spring, and other extended wet periods. Permeability is slow or very slow. Runoff is medium. This soil warms and dries slowly in spring, even if it is artificially drained. Rooting depth is influenced by the water table. In spring, the rooting zone is mainly the upper 15 to 20 inches of the soil. It is moderately deep over glacial till. Available water capacity is moderate. Organic matter content is moderately low. The surface layer is very strongly acid to neutral, and the subsoil is very strongly acid to mildly alkaline.

Most of the acreage is used for hay, pasture, woodland, and natural shrubs. Some areas are used for urban development. This soil has fair potential for farming and good potential for woodland. The potential is poor for building sites and sanitary facilities.

Drained areas of this soil are suited to cultivated crops, hay, and pasture (fig. 5). Wetness and slow or very slow permeability limit the suitability of this soil for crops that are planted early in spring and for specialty crops. Undrained areas can be used for hay and pasture, but minimizing soil compaction and maintaining desirable forage stands are difficult. Both surface and subsurface drains can be used to improve drainage. Subsurface drains must be closely spaced to provide uniform drainage. Hard clods and a crusty surface form if the soil is cultivated when soft and sticky.

Maintaining good tilth and controlling erosion are difficult in intensively cultivated areas. Such practices as tilling and harvesting at proper moisture levels, using cover crops, and incorporating crop residue into the soil, can be used to improve tilth, increase organic matter content, and help control erosion.

This soil is well suited to trees, and some areas have existing stands of the native hardwoods. Reforestation with desirable species is difficult because of severe plant competition. Use of harvesting equipment is limited during wet seasons.

Seasonal wetness, slow or very slow permeability, and low strength severely limit use of this soil for building sites and sanitary facilities. Excavations are limited by wetness during winter and spring. Buildings should be landscaped for good surface drainage away from the foundation. Houses without basements are better suited to this soil than those with basements. Sanitary facilities should be connected to commercial sewers wherever possible. Local roads can be improved by using artificial drainage and suitable base material. Cover should be maintained on the site as much as possible during construction to help to control erosion. Wetness and slow or very slow permeability also limit the use of this soil for recreation. Some areas of this soil are good pond sites. Capability subclass IIIw; woodland suitability subclass 2w.

MhB—Mahoning silt loam, shale substratum, 1 to 6 percent slopes. This deep, nearly level and gently sloping, somewhat poorly drained soil is in relatively flat areas between drainageways and in gently sloping areas near the heads of drainageways. Areas are variable in size but commonly range from 10 to 100 acres.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsoil is about 31 inches thick. The upper part of the subsoil is yellowish brown, mottled, firm silty clay loam; and the lower part is yellowish brown and light brownish gray, mottled, firm silty clay. The substratum is olive, firm silty clay loam. Weathered shale bedrock is at a depth of 45 inches.

Included with this soil in mapping are small areas of soil that is similar to Mahoning soils but in which bedrock is at a depth of 30 to 40 inches.

A perched seasonal high water table is at a depth of 6 to 18 inches during winter, spring, and other extended wet periods. Permeability is slow. Runoff is slow or medium. Depth to rippable bedrock ranges from 40 to 60 inches. This soil warms and dries slowly in spring, even if it is artificially drained. Rooting depth is influenced by the water table. In spring, the rooting zone is mainly the upper 15 to 20 inches of the soil. It is moderately deep over glacial till. Available water capacity is moderate. Organic matter content is moderately low. The surface layer is very strongly acid to neutral, and the subsoil is very strongly acid to mildly alkaline.

About half of the acreage of this soil is in woodland or brush; the other half is used for farming. This soil has fair potential for farming and good potential for woodland. It has poor potential for most sanitary facilities and for building sites.

Seasonal wetness and slow permeability limit farming. Planting is delayed and the choice of crops is limited in undrained areas. These areas can be used for hay and pasture, but maintaining desirable forage stands and tilth is difficult. Drained areas are suited to cultivated crops, hay, and pasture. Both surface and subsurface drains can be used to improve drainage in most areas. This soil needs to be cultivated at suitable moisture content because it is sticky when wet. Hard clods and a crusty surface form if this soil is cultivated when wet. Grazing should be controlled to reduce compaction. Erosion is a hazard where slope is 2 to 6 percent. Returning crop residue, using cover crops, and tilling and harvesting at proper moisture content help to reduce erosion, increase water infiltration, and maintain organic matter content and tilth.

This soil is well suited to woodland. Use of harvesting equipment is limited during wet seasons. Reforestation with desirable species is difficult because of severe plant competition.

Seasonal wetness, slow permeability, and bedrock at a depth of 40 to 60 inches severely limit the use of this soil for most building sites and sanitary facilities. Building sites should be landscaped to provide good surface drainage away from the foundation. Sanitary facilities should be connected to commercial sewers wherever possible. Local roads can be improved by using artificial drainage and suitable base material. This soil can support a good turf for lawns, but the turf is easily damaged when the soil is soft. Capability subclass IIIw; woodland suitability subclass 2w.

Mo—Minoa fine sandy loam. This deep, nearly level, somewhat poorly drained soil is on the lake plain. Slope ranges from 0 to 2 percent. Areas of this soil are irregular in shape and range from 20 to 100 acres in size.

Typically, the surface layer is very dark grayish brown, friable fine sandy loam about 12 inches thick. The subsoil is yellowish brown, mottled, friable and firm loam about 40 inches thick. The substratum, to a depth of about 60 inches, is brown, mottled, firm loam.

Included with this soil in mapping are a few spots of Stafford soils. Also included are some areas along drainageways where the slope is 2 to 4 percent.

A seasonal high water table is at a depth of 6 to 18 inches during winter, spring, and other extended wet periods. In undrained areas the soil dries slowly in spring. Permeability is moderate, and runoff is slow. Rooting depth is influenced by the water table. Drained areas have a deep rooting zone. Available water capacity is high. The organic matter content is moderately low. The surface layer and subsoil are strongly acid to neutral.

Most of the acreage of this soil is used for farming. A few areas are used for nursery stock and orchards. This soil has good potential for farming and woodland but poor potential for building sites and sanitary facilities.

The major limitation for farming is seasonal wetness. If this soil is drained, it is suited to cultivated crops, nursery stock, hay, and pasture (fig. 6). Wetness delays planting and limits the choice of crops. Surface drains help to remove excess surface water; subsurface drains help to control the water table. Undrained areas can be used for hay and pasture, but maintaining desirable forage stands is difficult. Grazing should be controlled to reduce soil compaction and increase plant growth. Management practices, such as using cover crops, incorporating crop residue in the soil, and tilling at proper moisture content, improve tilth and increase organic matter content.

This soil is well suited to woodland. Plant competition is a hazard because tall weeds and brush grow abundantly. Wetness limits the use of planting and harvesting equipment.

The seasonal high water table severely limits the use of this soil for most sanitary facilities and for building sites. Ditches and subsurface drains are fairly effective in controlling the water table. Houses without basements are better suited to this soil than those with basements. Local roads can be improved by using artificial drainage and suitable base material. Capability subclass IIw; woodland suitability subclass 2w.

MtA—Mitiwanga silt loam, 0 to 2 percent slopes. This moderately deep, nearly level, somewhat poorly drained soil is on bedrock-controlled landforms on uplands. Most areas are irregular in shape and range from 5 to 15 acres in size.

Typically, the surface layer is very dark grayish brown, very friable silt loam about 4 inches thick. The subsurface layer is light yellowish brown, friable silt loam about 4 inches thick. The subsoil is about 20 inches thick. The upper part of the subsoil is light olive brown, mottled, friable silt loam; the middle part is light olive brown, mottled, firm clay loam; and the lower part is brown, mottled, firm channery loam. The substratum is strong brown, friable channery sandy loam. Sandstone bedrock is at a depth of about 35 inches.

Included with this soil in mapping are small areas where slope is 2 to 5 percent. Also included are small areas of Darien soils that have bedrock at a depth of 40 to 60 inches.

A seasonal high water table is near the surface for long periods in winter, spring, and other extended wet periods. Runoff is slow, and permeability is moderate. Rooting depth is influenced by the water table. In drained areas the rooting zone is moderately deep over sandstone bedrock at a depth of 20 to 40 inches. Available water capacity is low or moderate in the rooting zone. Organic matter content is moderately low. This soil is sticky when wet. The subsoil is very strongly acid or strongly acid, but the surface layer varies widely in reaction, depending on the amount of liming.

Most of the acreage of this soil is used for woodland and natural shrubs. A few areas are used for pasture. This soil has fair potential for farming and good potential for woodland. It has poor potential for building sites and sanitary facilities.

Seasonal wetness and moderate depth to bedrock limit the use of this soil for farming. Unless artificially drained, this soil is poorly suited to cultivation. Wetness delays planting and limits the choice of crops. Undrained areas can be used for hay and pasture, but maintaining soil tilth and desirable forage stands is difficult. Surface and subsurface drains can be used; however, the hard sandstone bedrock commonly hinders the installation of subsurface drains, and outlets are not available in most areas. This soil is subject to surface crusting, compaction, and hard clodding if tillage or harvesting operations are performed when the soil is soft and sticky. Tillage and harvesting operations should be performed at optimum moisture content with equipment that minimizes soil compaction. Using crop residue and cover crops improves organic matter content and tilth.

This soil is well suited to woodland. Species that tolerate wetness should be selected for reforestation. Use of harvesting equipment is limited during wet seasons.

Seasonal wetness and moderate depth to hard bedrock severely limit the use of this soil for building sites and sanitary facilities. Surface drains and storm sewers can be used to remove surface water. Homesites should be landscaped for surface drainage away from the foundations. Local roads can be improved by using artificial drainage and suitable base material. Wetness also limits the use of this soil for recreation. Capability subclass IIIw; woodland suitability subclass 2w.

Or—Orrville silt loam. This deep, nearly level, somewhat poorly drained soil is on flood plains and is subject to flooding. Slope ranges from 0 to 2 percent. This soil occupies the entire flood plain in some narrow valleys and occurs as long, narrow strips on the flood plain in the larger valleys. Most areas range from 10 to 100 acres in size.

Typically, the surface layer is dark grayish brown, very friable silt loam about 7 inches thick. The subsoil is about 21 inches thick. The upper part of the subsoil is grayish brown, mottled, friable silt loam; and the lower part is brown, mottled, friable gravelly silt loam. The substratum, to a depth of about 62 inches, is gray and brown, mottled, friable silt loam and gravelly loam.

Included with this soil in mapping in slight depressions are small areas of poorly drained soils that have a dominantly gray subsoil. Narrow strips of Lobdell and Tioga soils are included in the wider valleys. Also included are a few areas of soils that are similar to Orrville soils but in which shale or sandstone bedrock is at a depth of 40 to 60 inches.

A seasonal high water table is near the surface for long periods in winter, spring, and early summer. Permeability is moderate, and runoff is very slow. Rooting depth is influenced by the water table. In drained areas the rooting zone is deep and available water capacity is moderate. Organic matter content is moderately low. The subsoil is strongly acid to slightly acid, but the surface layer varies widely in reaction, depending on the amount of liming.

Most of the acreage of this soil is in woodland. This soil has good potential for woodland and fair potential for farming. The potential is poor for building sites and sanitary facilities.

Flooding and seasonal wetness limit farming. Wetness delays planting and limits the choice of crops. Undrained areas can be used for pasture, but maintaining tilth and desirable forage stands is difficult. Drained areas are suited to cultivated crops. Surface drainage can be used to remove excess water. Subsurface drainage is also needed, but suitable outlets are difficult to establish in some areas. Using cover crops is important in maintaining organic matter content and in protecting the surface during flooding.

This soil is well suited to woodland. Use of harvesting equipment is limited during wet seasons. Species that tolerate wetness should be selected for reforestation.

Flooding and seasonal wetness seriously limit the use of this soil for building sites and sanitary facilities. Capability subclass IIw; woodland suitability subclass 2w.

OsA—Oshtemo sandy loam, 0 to 2 percent slopes. This deep, nearly level, well drained soil is on outwash plains. Most areas are irregular in shape and range from 10 to 200 acres in size.

Typically, the surface layer is very dark grayish brown, friable sandy loam about 8 inches thick. The subsoil is about 32 inches thick. The upper part of the subsoil is dark brown, friable and firm gravelly sandy loam; and the lower part is brown, very friable gravelly loamy sand. The substratum, to a depth of about 60 inches, is brown, loose, gravelly loamy sand.

Included with this soil in mapping are small areas of Tyner soils that are more droughty than this Oshtemo soil.

This soil dries and warms early in spring. Permeability is moderately rapid in the subsoil and very rapid in the substratum. Runoff is slow. Available water capacity is low in the deep rooting zone. This soil is droughty during periods of limited rainfall. Organic matter content is low. The subsoil is strongly acid to neutral, but the surface layer varies widely in reaction, depending on the amount of liming.

Most of the acreage of this soil is used for specialty crops and for urban use. This soil has fair potential for farming and woodland and good potential for building sites.

This soil is suited to most field crops commonly grown in the county and is especially well suited to crops planted early in spring and to early spring pasture. It is well suited to such specialty crops as nursery stock and fruit trees if irrigation is available. Growth of pasture is slow in summer because the soil is droughty. Management practices, such as minimum tillage and using crop residue and cover crops, conserve moisture, improve tilth, and maintain organic matter content. Because nutrients are moderately rapidly leached, this soil generally responds better to smaller but more frequent or timely applications of fertilizer than to one large application.

Only a small acreage of this soil is wooded. This soil is moderately well suited to woodland. Machine planting of tree seedlings is practical on this soil.

This soil is well suited to building sites but poorly suited to sanitary facilities because of the possible contamination of ground water from seepage. Sloughing is a hazard in excavations. Lawns that are seeded during the drier part of the growing season should be mulched and watered. This soil is a good source of sand and gravel. Capability subclass IIIs; woodland suitability subclass 3s.

OsB—Oshtemo sandy loam, 2 to 6 percent slopes. This deep, well drained, gently sloping soil is on outwash plains. A few areas are on the upper part of side slopes and crests of postglacial beach ridges. Slopes are commonly short and irregular. Areas range from 10 to 50 acres in size.

Typically, the surface layer is dark grayish brown, friable sandy loam about 8 inches thick. The subsoil is about 32 inches thick. The upper part of the subsoil is dark brown, friable gravelly sandy loam; and the lower part is brown, very friable gravelly loamy sand. The substratum, to a depth of about 60 inches, is brown, loose gravelly loamy sand.

Included with this soil in mapping are small areas of Tyner soils that are more droughty than this Oshtemo soil. Also included are small areas where slope is 6 to 10 percent.

This soil dries and warms early in spring. Permeability is moderately rapid in the subsoil and very rapid in the substratum. Runoff is medium. The rooting zone is deep. Available water capacity is low. This soil is droughty during periods of limited rainfall. Organic matter content is low. The subsoil is strongly acid to neutral, but the surface layer varies widely in reaction, depending on the amount of liming.

Most of the acreage of this soil is used for specialty crops or for urban use. This soil has fair potential for farming and woodland and good potential for building sites.

This soil is well suited to small grain, hay, and early spring pasture. If irrigated, this soil is suited to cultivated and specialty crops. Growth of pasture is slow in summer because the soil is droughty. Management practices, such as minimum tillage and using crop residue and cover crops, conserve moisture, improve tilth, reduce erosion, and maintain organic matter content. Because nutrients are moderately rapidly leached, this soil generally responds better to smaller but more frequent or timely applications of fertilizer than to one large application.

Only a small acreage of this soil is wooded. This soil is moderately well suited to woodland, and machine planting of tree seedlings is practical on this soil.

This soil is suitable for buildings but is poorly suited to sanitary facilities because of the possible contamination of ground water from seepage. If lawns are seeded during the drier part of the year, they should be mulched and watered. Sloughing is a hazard in excavations. This soil is a good source of sand and gravel. Capability subclass IIIs; woodland suitability subclass 3s.

OtB—Otisville gravelly loamy sand, 1 to 6 percent slopes. This deep, nearly level and gently sloping, excessively drained soil is on the upper part of sides and crests of postglacial beach ridges. Most areas are long and narrow in shape and range from 20 to several hundred acres in size.

Typically, the surface layer is very dark grayish brown, very friable gravelly loamy sand about 6 inches thick. The subsoil is about 24 inches thick. The upper part of the subsoil is brown, loose gravelly loamy coarse sand; and the lower part is yellowish brown, loose very gravelly loamy coarse sand. The substratum, to a depth of 60 inches, is dark brown, loose very gravelly sand.

Included with this soil in mapping are small areas of Tyner soils that are less droughty than this Otisville soil.

This soil dries and warms early in spring. Permeability is rapid, and runoff is slow. Available water capacity is very low in the deep rooting zone. This soil is droughty. Organic matter content is low. The surface layer and subsoil are strongly acid or very strongly acid, except where the surface layer has been limed.

This soil is used extensively for nursery stock and orchards. Many areas are used for urban development. This soil has poor potential for farming but fair or good potential for specialty crops if it is irrigated. It has good potential for building sites.

The very low available water capacity is the major limitation for farming. If irrigated, this soil is suited to crops, pasture, vegetables, orchards, and nursery stock. The gravel in the surface layer hinders tillage in some areas. Management practices, such as minimum tillage and using crop residue and cover crops, conserve moisture, maintain organic matter content, and reduce erosion. Because nutrients are rapidly leached, this soil generally responds better to smaller but more frequent or timely applications of fertilizer than to one large application.

This soil is moderately suited to woodland. Seedling mortality is a hazard during dry seasons because of droughtiness.

This soil is suitable for building sites. The possible contamination of ground water limits the use for sanitary facilities. Lawn seedings are difficult to establish during the drier part of the year. Lawns should be seeded early in spring; if seeded during dry periods, they should be mulched and watered. This soil is a good source of sand and gravel. Capability subclass IVs; woodland suitability subclass 4s.

Pa—Painesville fine sandy loam. This deep, nearly level, somewhat poorly drained soil is on sandy, low ridges and slight rises on the lake plain. Slope ranges from 0 to 2 percent. Most areas are several hundred acres in size, but a few are as small as 20 acres.

Typically, the surface layer is dark grayish brown, very friable fine sandy loam about 9 inches thick. The subsoil is about 27 inches thick. The upper part of the subsoil is light yellowish brown and light brownish gray, mottled, very friable and friable fine sandy loam; the middle part is dark yellowish brown, mottled, firm fine sandy loam; and the lower part is olive brown, mottled, very firm silt loam. The substratum, to a depth of about 72 inches, is olive brown, mottled, very firm silt loam.

Included with this soil in mapping are small areas of Stafford soils on slight rises. Small areas of Conneaut soils are also included.

A seasonal high water table is between depths of 6 and 18 inches for long periods in winter, spring, and other extended wet periods. In undrained areas the soil dries slowly in spring. Permeability is slow or moderately slow. Runoff is slow. The rooting zone is mainly above the water table. In drained areas the rooting zone is deep and available water capacity is high. Organic matter content is moderately low. The subsoil is strongly acid to slightly acid.

Many areas of this soil that were cleared of woodland are now in natural shrubs and trees. Drained areas are commonly used for nursery stock. This soil has fair potential for specialty crops and good potential for general farming and woodland. It has poor potential for building sites and sanitary facilities.

Seasonal wetness is the major limitation for farming. Wetness delays planting and limits the choice of crops. Drained areas are suited to general farm crops, pasture, and specialty crops. Undrained areas may be used for hay and pasture, but maintaining desirable forage stands and minimizing soil compaction are difficult, especially in permanent pasture. Subsurface drains may be used to lower the water table. This soil has desirable characteristics for digging and balling of nursery stock. Management practices, such as tilling at proper moisture content and using crop residue and cover crops, improve tilth and increase organic matter content.

This soil is well suited to woodland. The use of logging equipment is limited during wet seasons.

The seasonal high water table severely limits the use of this soil for sanitary facilities and for building sites. Houses without basements are better suited to this soil than those with basements. Mechanical measures may be used to help to prevent wet basements. Local roads can be improved by using artificial drainage and suitable base material. Wetness also limits use of this soil for recreation. Capability subclass IIw; woodland suitability subclass 2w.

PeB—Pierpont silt loam, 2 to 6 percent slopes. This deep, gently sloping, moderately well drained soil is on till plains and moraines. It is on knolls and side slopes parallel to drainageways. Most areas are irregular in shape and range from 5 to 20 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 10 inches thick. The subsoil is about 30 inches thick. The upper part of the subsoil is yellowish brown and dark yellowish brown, mottled, firm silt loam and silty clay loam; and the lower part is a dark yellowish brown and brown, very firm and brittle, silty clay loam fragipan. The substratum, to a depth of about 60 inches, is brown, firm silty clay loam.

Included with this soil in mapping are small areas of somewhat poorly drained Platea soils on foot slopes and in nearly level areas. These soils make up as much as 20 percent of some areas. Also included on knolls are small areas of eroded soils that have a brown surface layer.

A perched seasonal high water table is on the slowly or very permeable fragipan in winter, spring, and other extended wet periods. Runoff is medium. The rooting zone is mainly 18 to 30 inches deep over the fragipan. Available water capacity and organic matter content are low. The subsoil above the fragipan is strongly acid or very strongly acid, but the surface layer varies widely in reaction, depending on the amount of liming.

This soil is used mainly for woodland, forage crops, and pasture. A few areas are used for orchards and vineyards. This soil has good potential for farming and woodland. The potential is fair and poor for building sites and sanitary facilities.

This soil is suited to crops and pasture. Seasonal wetness sometimes delays planting. The moderate hazard of erosion is the major limitation for cultivated crops. This soil tends to erode easily. It is subject to surface crusting and compaction if tillage and harvesting operations are performed when the soil is soft and sticky. Tillage and harvesting operations should be performed at optimum moisture content with equipment that minimizes soil compaction. Using crop residue and cover crops improves organic matter content and tilth, helps to control erosion, and increases water infiltration. Artificial drainage may be needed in seep areas and in the included wetter soils.

This soil is moderately well suited to woodland. Machine planting of tree seedlings is practical on this soil. Plant competition is moderate in new plantings.

The seasonal high water table and slowly or very slowly permeable fragipan limit the use of this soil for most sanitary facilities and for building sites. Buildings should be landscaped for surface drainage away from the foundation. This soil is better suited to houses without basements than to those with basements. Local roads can be improved by using artificial drainage and suitable base material. Good pond sites are available in many areas. This soil has good potential for such recreational uses as picnic areas and paths and trails. Capability subclass IIe; woodland suitability subclass 3o.

PeB2—Pierpont silt loam, 2 to 6 percent slopes, moderately eroded. This deep, gently sloping, moderately well drained soil is on till plains and moraines. Most areas are irregular in shape and range from 5 to 25 acres in size.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. The subsoil is about 28 inches thick. The upper part of the subsoil is dark yellowish brown, mottled, firm clay loam; and the lower part is a dark yellowish brown and brown, very firm and brittle, clay loam fragipan. The substratum, to a depth of about 60 inches, is brown, firm silty clay loam.

Included with this soil in mapping are a few small areas of uneroded soils that have a dark grayish brown surface layer. Small areas of Platea soils on foot slopes and in nearly level areas are also included.

A perched seasonal high water table is on the slowly or very slowly permeable fragipan in winter, spring, and other extended wet periods. Runoff is medium. The rooting zone is mainly 18 to 30 inches deep over the fragipan. Available water capacity is low. Organic matter content is low in the surface layer. The subsoil above the fragipan is strongly acid or very strongly acid, but the surface layer varies widely in reaction, depending on the amount of liming.

Most of the acreage of this soil is used for crops and woodland. A few areas are used for grapes. This soil has fair potential for farming and woodland. It has fair and poor potential for building sites and sanitary facilities.

This soil is suited to crops and pasture. The erosion hazard is the main limitation for cultivated crops. Practices to improve tilth and reduce erosion are needed. This soil is sticky when wet and fairly hard when dry. Hard clods, compaction, and surface crusting occur if tillage and harvesting operations are performed when the soil is soft and sticky. Using minimum tillage and cover crops improves organic matter content and tilth, helps to control erosion, and increases water infiltration. Random subsurface drains may be needed in the included wetter soils.

This soil is moderately well suited to woodland. Machine planting of tree seedlings is practical on this soil. Plant competition is moderate in new plantations.

The seasonal high water table and slowly or very slowly permeable fragipan limit the use of this soil for most sanitary facilities and for building sites. This soil is better suited to houses without basements than to those with basements. Buildings should be landscaped for surface drainage away from the foundation. Local roads can be improved by using artificial drainage and suitable base material. This soil has good potential for such recreational uses as picnic areas and paths and trails. Capability subclass IIe; woodland suitability subclass 3o.

PeC2—Pierpont silt loam, 6 to 12 percent slopes, moderately eroded. This deep, sloping, moderately well drained soil is on hillsides and side slopes parallel to drainageways. Most areas are irregular in shape and range from 10 to 200 acres in size.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. The subsoil is about 32 inches thick. The upper part of the subsoil is yellowish brown and dark yellowish brown, mottled, firm silt loam and silty clay loam; and the lower part is a dark yellowish brown and brown, very firm and brittle, silty clay loam fragipan. The substratum, to a depth of about 60 inches, is brown, firm silty clay loam.

Included with this soil in mapping are small areas of Platea soils on foot slopes, along drainageways, and in seep spots. These soils make up as much as 20 percent of the larger areas.

A perched seasonal high water table is on the slowly or very slowly permeable fragipan in winter, spring, and other extended wet periods. Runoff is rapid. The rooting zone is mainly 18 to 30 inches deep over the fragipan. Available water capacity is low in the rooting zone. Organic matter content is low in the surface layer. The subsoil above the fragipan is strongly acid or very strongly acid, but the surface layer varies widely in reaction, depending on the amount of liming.

Most of the acreage of this soil is used for woodland, hay, and pasture. Many areas that were cleared of woodland are no longer cultivated. This soil has fair potential for farming. It has fair and poor potential for many sanitary facilities and for building sites.

This soil is well suited to hay and pasture. It can be cropped successfully, but cropping systems should include long-term hay and pasture. Erosion is a concern, especially if slopes are long. Hard clods and a crusty surface form if the soil is cultivated when soft and sticky. Using minimum tillage and cover crops improves organic matter content and tilth, helps to control erosion, and increases water infiltration. Random subsurface drainage may be needed in the included wetter soils.

This soil is moderately well suited to woodland. Laying out logging roads and skid trails on the contour facilitates the use of equipment and helps to prevent excessive erosion. Plant competition is moderate in new plantations.

The slowly or very slowly permeable fragipan, slope, and seasonal wetness limit the use of this soil for building sites and sanitary facilities. This soil is better suited to houses without basements than to those with basements. Cover should be maintained on the site as much as possible during construction to reduce the severe hazard of erosion. Local roads can be improved by using artificial drainage and suitable base material. Trails in recreational areas should be protected from erosion and established across the slope wherever possible. Capability subclass IIIe; woodland suitability subclass 3o.

PeD2—Pierpont silt loam, 12 to 18 percent slopes, moderately eroded. This deep, moderately steep, moderately well drained soil is on convex hillsides and side slopes parallel to drainageways. Most areas range from 5 to 20 acres in size.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. The subsoil is about 32 inches thick. The upper part of the subsoil is yellowish brown and dark yellowish brown, firm silt loam and silty clay loam with mottles below a depth of about 16 inches; and the lower part is a dark yellowish brown and brown, very firm and brittle, silty clay loam fragipan. The substratum, to a depth of about 60 inches, is brown, firm silty clay loam.

Included with this soil in mapping are small areas of uneroded soils that have a dark grayish brown surface layer. These areas are used mainly for woodland.

A perched seasonal high water table is on the slowly or very slowly permeable fragipan in winter, spring, and other extended wet periods. Runoff is very rapid. The rooting zone is mainly 18 to 30 inches deep over the fragipan. Available water capacity is low in the rooting zone. The organic matter content is low. The subsoil above the fragipan is strongly acid or very strongly acid, but the surface layer varies widely in reaction, depending on the amount of liming.

Most of the acreage of this soil is in woodland. Many areas that were cleared of woodland are no longer cultivated. This soil has poor potential for farming, building sites, and sanitary facilities. It has fair potential for woodland.

The major limitations for farming are the slope and the severe hazard of erosion. Using tillage equipment, especially large machines, is very difficult. This soil is suited to grasses and legumes for pasture. Erosion is difficult to control in new seedings. A thick plant cover helps to control erosion. This soil is highly susceptible to surface crusting if it is cultivated. Minimum tillage, good fertilization, and controlled grazing are important.

This soil is moderately well suited to woodland. Slope limits use of logging equipment. Logging roads and skid trails should be laid out on the contour as much as possible and protected from erosion by water bars.

Slope, the slowly or very slowly permeable fragipan, and seasonal wetness limit the use of this soil for building sites and sanitary facilities. Erosion is a severe hazard during construction. Development of subdivisions and construction sites on the contour helps to reduce erosion. Cover should be maintained on the site as much as possible during construction to reduce the erosion hazard. Trails in recreational areas should be protected from erosion and established across the slope wherever possible. Capability subclass IVe; woodland suitability subclass 3r.

Po—Pits, gravel. Gravel pits consist of surface-mined areas from which aggregate material has been removed for construction. Gravel pits are on beach ridges and outwash terraces. Typically, they are associated with Conotton, Otisville, Tyner, and other soils that are underlain by gravel and sand outwash. Most pits range from 2 to 50 acres in size. Actively mined pits are continually enlarged. Most pits characteristically have a high wall on one or more sides.

The material that is mined consists of stratified layers of gravel and sand of varying thickness and orientation. The kind and grain size of aggregate are relatively uniform within any one layer but commonly differ from layer to layer. Some layers contain a significant amount of silt and sand. Selectivity in mining is commonly feasible.

The material that remains after mining is poorly suited to plants. The organic matter content and available water capacity are low.

Most unused gravel pits can be developed as wildlife habitat or as recreation areas. They are commonly not used for farming or woodland. Not placed in a capability subclass or woodland suitability subclass.

PsA—Platea silt loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is on broad flats on the uplands. The smaller areas, 5 to 10 acres in size, are oblong to oval in shape. The larger areas, 20 to 100 acres in size, are irregular in shape.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 35 inches thick. The upper part of the subsoil is yellowish brown and dark yellowish brown, mottled, firm silty clay loam; and the lower part is a dark yellowish brown, mottled, very firm and brittle, silty clay loam fragipan. The substratum, to a depth of about 60 inches, is brown, mottled, firm silt loam.

Included with this soil in mapping are small areas of poorly drained soils that are more gray in the subsoil than this Platea soil. These soils are in depressions and receive runoff from the surrounding soils.

A perched seasonal high water table is above the very slowly permeable fragipan in winter, spring, and other extended wet periods. This soil dries slowly in spring. Runoff is slow. The rooting zone is mainly 24 to 28 inches deep over the fragipan. Available water capacity is low in the rooting zone. Organic matter content is moderately low. The subsoil above the fragipan is very strongly acid to medium acid, but the surface layer varies widely in reaction, depending on the amount of liming.

Most of the acreage of this soil is used for general farm crops, pasture, and natural shrubs and trees. This soil has fair potential for farming and good potential for woodland. It has poor potential for building sites and sanitary facilities.

Wetness limits suitability of this soil for crops planted early in spring. Drained areas are suited to crops and pasture. Undrained areas can be used for hay and pasture, but minimizing soil compaction and maintaining desirable forage stands are difficult. Surface drains can be used to remove excess surface water. Subsurface drains should be closely spaced for uniform drainage. This soil is highly susceptible to surface crusting. Using crop residue and cover crops improves organic matter content and tilth and increases water infiltration.

This soil is well suited to woodland. Use of harvesting equipment is limited during wet seasons. Plant competition limits reforestation with desirable species.

Seasonal wetness and very slow permeability severely limit the use of this soil for building sites and sanitary facilities. Houses without basements are better suited to this soil than those with basements. Building sites should be landscaped for surface drainage away from the foundation. Local roads can be improved by using artificial drainage and suitable base material. Wetness also limits use of this soil for recreation. Capability subclass IIIw; woodland suitability subclass 2w.

PsB—Platea silt loam, 2 to 6 percent slopes. This deep, gently sloping, somewhat poorly drained soil is on slightly convex side slopes on the uplands. Most slopes are long with slight irregularities. Many areas are broad and commonly are more than 100 acres in size.

Typically, the surface layer is brown, friable silt loam about 6 inches thick. The subsoil is about 37 inches thick. The upper part of the subsoil is yellowish brown and dark yellowish brown, mottled, firm silty clay loam; and the lower part is a dark yellowish brown, mottled, very firm and brittle, silty clay loam fragipan. The substratum, to a depth of about 60 inches, is brown, mottled, firm silty clay loam and silt loam.

Included with this soil in mapping are small areas of moderately well drained Pierpont soils on knolls. Small areas of eroded soils that have a silty clay loam surface layer are also included. These eroded areas tend to be cloddy and are not so easy to till as this Platea soil.

A perched seasonal high water table is above the very slowly permeable fragipan in winter, spring, and other extended wet periods. This soil dries slowly in spring. Runoff is medium. The rooting zone is mainly 24 to 28 inches deep over the fragipan. Available water capacity is low in the rooting zone. Organic matter content is moderately low. The subsoil above the fragipan is very strongly acid to medium acid, but the surface layer varies widely in reaction, depending on the amount of liming.

About three-fourths of the acreage of this soil has been cleared of woodland. Many of the cleared areas are no longer cultivated. Cultivated areas are used mainly for general farm crops and grapes. This soil has fair potential for farming and good potential for woodland. It has poor potential for building sites and sanitary facilities.

Wetness delays planting and limits the choice of crops. Drained areas are suited to crops, pasture, orchards, and vineyards. Undrained areas can be used for hay and pasture, but minimizing soil compaction and maintaining desirable forage stands are difficult. Subsurface drains should be closely spaced for uniform drainage. Maintaining good tilth is important in reducing surface crusting and erosion. Such practices as using cover crops and crop residue improve organic matter content and tilth, help to control erosion, and increase water infiltration. Rootstock that tolerate wetness should be used when establishing new orchards and vineyards.

This soil is well suited to woodland. Use of harvesting equipment is limited during wet seasons. Plant competition limits reforestation with desirable species.

Seasonal wetness and the very slowly permeable fragipan severely limit the use of this soil for building sites and sanitary facilities (fig. 7). Houses without basements are better suited to this soil than those with basements. Local roads can be improved by using artificial drainage and suitable base material. Some areas are good pond sites. Capability subclass IIIw; woodland suitability subclass 2w.

RhA—Red Hook sandy loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is on low beach ridges and offshore bars on the lake plain. Most areas are long and narrow in shape and range from 10 to 500 acres in size.

Typically, the surface layer is very dark grayish brown, very friable sandy loam about 11 inches thick. The subsoil is light olive brown and light brownish gray, mottled, friable sandy loam about 29 inches thick. The substratum, to a depth of about 62 inches, is layered grayish brown and gray, mottled, very friable and loose gravelly sandy loam, loamy sand, and gravelly fine sand.

Included with this soil in mapping are small areas of the moderately well drained Tyner Variant soils on slight rises. Small spots of Painesville soils are included in some areas. Also included in depressions are areas of soils that are similar to Red Hook soils but that are wetter and have a dominantly gray subsoil.

In undrained areas this soil has a seasonal high water table at a depth of 6 to 18 inches during winter, spring, and other extended wet periods. Permeability is moderate or moderately slow. Runoff is slow. Rooting depth is influenced by the water table. In spring, the rooting zone is mainly the upper 15 to 20 inches. Available water capacity is moderate. Organic matter content is moderately low. The subsoil is medium acid to neutral, but the surface layer varies widely in reaction, depending on the amount of liming.

Most drained areas of this soil are used for general farm crops or nursery stock. Undrained soils are in woodland and brush. This soil has fair potential for farming and specialty crops. It has poor potential for building sites and sanitary facilities.

The major limitation for farming is seasonal wetness. Wetness delays planting and limits the choice of crops. Undrained areas can be used for hay and pasture, but maintaining tilth and desirable forage stands is difficult. Drained areas are suited to cultivated crops, hay, pasture, nursery stock, and specialty crops (fig. 8). Subsurface drains lower the water table. This soil has desirable characteristics for digging and balling of nursery stock. Management practices, such as minimum tillage, use of cover crops, incorporating crop residue, and tilling at proper moisture content, improve tilth and increase organic matter content.

Undrained areas of this soil are well suited to woodland and suited to wildlife habitat. Use of harvest equipment is limited during wet seasons. Reforestation with desirable species is difficult because of severe plant competition.

The seasonal high water table severely limits the use of this soil for most sanitary facilities and for building sites. Ditches to control the water table are effective to some extent if outlets are available. Houses without basements are better suited to this soil than those with basements. Excavation is limited during winter and spring by the high water table and caving of banks. Wetness also limits use of this soil for recreation. Capability subclass IIIw; woodland suitability subclass 2w.

Rv—Riverwash. Riverwash consists of very cobbly and stony areas in the channels of major streams. Most of the rock fragments are shale and sandstone. Included in mapping are a few areas that contain some fine earth material.

Most areas are periodically flooded, depending on the characteristics of the stream. They typically are bare of vegetation, but willow, cattails, marsh grasses, and other water-tolerant plants grow in some areas. Riverwash is used for wildlife habitat. Not placed in a capability subclass or woodland suitability subclass.

St—Stafford loamy fine sand. This deep, nearly level, somewhat poorly drained soil is on low sandy ridges on the lake plain. Slope ranges from 0 to 2 percent. Most areas of this soil are irregular in shape and range from 10 acres to several hundred acres in size.

Typically, the surface layer is dark grayish brown, very friable loamy fine sand about 9 inches thick. The subsoil is about 18 inches thick. The upper part of the subsoil is pale olive, mottled, very friable loamy fine sand; and the lower part is gray, very friable loamy fine sand and loamy coarse sand. The substratum, to a depth of 60 inches, is gray, very friable and loose fine sand and coarse sand.

Included with this soil in mapping are small areas of moderately well drained Elnora soils on the crests of ridges and knolls. Small areas of the very poorly drained Kingsville soils are also included.

A seasonal high water table is near the surface for long periods in winter, spring, and other extended wet periods. Permeability is moderately rapid or rapid. Runoff is slow. Rooting depth is related to the depth of the water table. Drained areas have a deep rooting zone. Available water capacity is very low. The organic matter content is moderately low. The surface layer and subsoil are strongly acid to neutral.

Most of the acreage of this soil is used for cultivated crops or woodland. Some drained areas are used for specialty crops. This soil has fair potential for farming and woodland. It has poor potential for building sites and sanitary facilities.

The major limitations for farming are the seasonal high water table and droughtiness. Wetness delays planting and limits the choice of crops. Undrained areas can be used for growing wetness-tolerant grasses and legumes for hay and pasture, but maintaining desirable forage stands is difficult. Drained areas are suited to crops, pasture, and specialty crops. Nursery stock and vegetables are commonly grown in drained areas. Subsurface drains lower the water table. Subsurface drains may need special measures, such as using graded sand and gravel filters or prefabricated filter materials, to prevent plugging with fine sand. Because plant nutrients are moderately rapidly leached, this soil generally responds better to smaller but more frequent or more timely applications of fertilizer than to one large application. Using cover crops, incorporating crop residue in the soil, and tilling and harvesting at proper moisture content are important.

This soil is moderately well suited to woodland. The use of logging equipment is limited during wet seasons. Species that tolerate wetness should be selected for reforestation.

The seasonal high water table severely limits the use of this soil for building sites and sanitary facilities. Ditches that control the water table are effective to some extent. Houses without basements are better suited to this soil than those with basements. Excavation is limited during winter and spring by the high water table and caving of banks. Local roads can be improved by using artificial drainage. Wetness and the sandy surface layer limit the use of this soil for recreation. Capability subclass IIIw; woodland suitability subclass 3w.

Sw—Swanton fine sandy loam. This deep, nearly level, poorly drained soil is in relatively broad, elongated strips on the lake plain. Slope ranges from 0 to 2 percent. Most areas range from 5 to 100 acres in size.

Typically, the surface layer is black, friable fine sandy loam about 7 inches thick. The subsoil is about 27 inches thick. The upper part of the subsoil is gray, mottled, friable sandy loam; the middle part is yellowish brown, mottled, friable and loose sandy loam; and the lower part is gray, mottled, friable sandy loam. The substratum, to a depth of about 60 inches, is gray, mottled, firm silty clay.

Included with this soil in mapping are a few small areas of very poorly drained Granby soils in depressions.

A seasonal high water table is near the surface for long periods. Permeability is moderately rapid in the subsoil and slow or very slow in the substratum. Runoff is very slow. Rooting depth is influenced by the water table and generally is restricted by the finer textured substratum. Available water capacity is moderate in the rooting zone. Organic matter content is moderate. The surface layer and subsoil are neutral to strongly acid.

Most of the acreage of this soil is used for crops, pasture, woodland, and natural shrubs. Drained areas are used for specialty crops. This soil has fair potential for building sites and sanitary facilities.

The major limitation for farming is the seasonal high water table. Undrained areas are generally too wet for cultivated crops. Drained areas are suited to crops, pasture, and specialty crops, such as nursery stock and vegetables. Both surface and subsurface drains can be used. Special measures, such as using graded sand and gravel filters or prefabricated filter materials, prevent subsurface drains from plugging with fine sand. Using cover crops, incorporating crop residue, and tilling and harvesting at proper moisture content are important. Controlled grazing reduces soil compaction and increases plant growth.

Areas of this soil that are not easily drained are commonly in brush and trees. This soil is moderately suited to woodland. Use of harvesting equipment is severely limited during wet seasons. Reforestation with desirable species is difficult because of high seedling mortality and severe plant competition.

The seasonal high water table severely limits the use of this soil for building sites, sanitary facilities, and recreation. The slow or very slow permeability in the substratum limits some uses. Local roads can be improved by using artificial drainage and suitable base material. Capability subclass IIIw; woodland suitability subclass 4w.

Tg—Tioga loam. This deep, nearly level, well drained soil is on flood plains and is subject to flooding. Slope ranges from 0 to 2 percent. Most areas are long and narrow in shape and range from 50 to 100 acres in size.

Typically, the surface layer is dark grayish brown, friable loam about 6 inches thick. The subsoil is dark yellowish brown, friable loam about 26 inches thick. The substratum, to a depth of about 60 inches, consists of layers of brown, friable loam and loose coarse sand and gravelly coarse sand. In some areas the surface layer is silt loam.

Included with this soil in mapping are spots of somewhat poorly drained Orrville soils in low areas. Also included are areas of soils that are stony and channery below a depth of 2 feet; these soils are mainly in areas where streams flow on bedrock.

A seasonal high water table is in the substratum below a depth of 3 feet. It is controlled by the water level in adjacent streams in most areas. Permeability is moderate in the subsoil and moderately rapid or rapid in the substratum. Runoff is slow. Available water capacity is moderate in the deep rooting zone. Workability is good. Organic matter content is moderately low. The subsoil is strongly acid to neutral, but the surface layer varies widely in reaction, depending on the amount of liming.

Most of this soil is in woodland. A few areas are used for hay and pasture. This soil has good potential for cultivated crops, hay, pasture, and woodland. It has poor potential for building sites and sanitary facilities.

The major limitation for cultivated crops is flooding. Although the choice of crops is limited, this soil is well suited to annual field crops or specialty crops. Crops such as winter wheat may be severely damaged by flooding in winter and early spring. This soil is suited to grasses and legumes for pasture. Using cover crops is important in maintaining organic matter content and in protecting the surface during flooding.

This soil is well suited to woodland. Machine planting of tree seedlings is practical on this soil.

Flooding seriously limits use of this soil for building site development and sanitary facilities. This soil has good potential for such recreational uses as picnicking, hiking, and golfing. Diking to control flooding is difficult. This soil is a good source of topsoil. Capability subclass IIw; woodland suitability subclass 2o.

Th—Tioga Variant silt loam. This deep, nearly level, well drained soil is on low stream terraces along the major rivers. It is on slightly higher positions than the adjacent first bottoms but is subject to rare flooding. Slope ranges from 0 to 2 percent. Most areas are long and narrow in shape and range from 10 to 50 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 12 inches thick. The subsoil is about 22 inches thick. The upper part of the subsoil is dark yellowish brown, friable silt loam; the middle part is yellowish brown, firm silt loam; and the lower part is yellowish brown, mottled, friable loam. The substratum, to a depth of about 60 inches, is brown and yellowish brown, mottled, friable fine sandy loam and firm silt loam.

Included with this soil in mapping are somewhat poorly drained Euclid soils in slightly lower areas. Also included are some long, narrow areas adjacent to first bottoms where slope is 3 or 4 percent.

A seasonal high water table is in the lower part of the subsoil or in the substratum below a depth of 3 feet during winter, spring, and other extended wet periods. Permeability is moderately rapid. Runoff is slow. Available water capacity is high in the deep rooting zone. Workability is good. Organic matter content is moderately low. The surface layer is very strongly acid to slightly acid, and the subsoil is strongly acid or very strongly acid.

Most of the acreage of this soil is used for homesites. Some areas are used for nursery stock, hay, and pasture. This soil has good potential for farming, nursery stock, specialty crops, and woodland. It has poor potential for sanitary facilities and building sites.

This soil is suited to cultivated crops, hay, nursery stock, orchards, and vegetables. Crops are damaged by flooding on rare occasions. This soil is well suited to irrigation, and in most areas nearby streams supply adequate water. This soil has desirable characteristics for digging and balling of nursery stock. Intensive cropping can cause poor tilth; therefore, such measures as minimum tillage, incorporating crop residue in the soil, use of cover crops, and tilling and harvesting at proper moisture content are important.

This soil commonly is not used for woodland even though it is very well suited to woodland. Machine planting of tree seedlings is practical on this soil.

The flooding hazard, seasonal high water table, and moderately rapid permeability limit the use of this soil for building sites and sanitary facilities. Most areas have good potential for such recreational uses as picnicking, golfing, and hiking. Flooding can be prevented by diking. Seepage from sanitary facilities in some areas may pollute ground water. This soil is a good source of topsoil. Capability class I; woodland suitability subclass 1o.

TyB—Tyner loamy sand, 1 to 6 percent slopes. This deep, nearly level and gently sloping, well drained soil is on the upper part of side slopes and crests of postglacial beach ridges. Most areas are long and narrow in shape and range from 20 acres to several hundred acres in size.

Typically, the surface layer is dark grayish brown, very friable loamy sand about 8 inches thick. The subsoil is about 48 inches thick. The upper part of the subsoil is brown, very friable loamy sand; and the lower part is brown, loose coarse sand. The substratum, to a depth of about 66 inches, is brown, loose sand.

Included with this soil in mapping are a few areas of well drained soils that are similar to Tyner soils but that have a sandy loam subsoil. These soils are not so droughty. Small areas of moderately well drained Tyner Variant soils are included on foot slopes and in nearly level areas. Also included are a few areas of Otisville soils.

This soil warms and dries early in spring. Permeability is rapid. Runoff is slow. Available water capacity is low in the deep rooting zone. This soil is droughty. Organic matter content is low. The subsoil is strongly acid to slightly acid, but the surface layer varies widely in reaction, depending on the amount of liming.

Most of the acreage of this soil is used for specialty crops and urban development. This soil has fair potential for farming and woodland and good potential for building sites.

The low available water capacity is the major limitation for farming. Without irrigation, this soil is best suited to early-maturing crops or to such deep-rooted crops as alfalfa. If this soil is irrigated, it is suited to all crops commonly grown in the county, especially specialty crops, such as nursery stock and orchards. Management practices, such as minimum tillage and use of crop residue and cover crops, conserve moisture, increase organic matter content, and reduce erosion. Because nutrients are rapidly leached, this soil generally responds better to smaller but more frequent applications of fertilizer than to one large application.

This soil is moderately well suited to woodland. Because of droughtiness, seedling mortality is a hazard during dry years.

This soil is suitable for building sites. The possible contamination of ground water limits the use of this soil for sanitary facilities. Lawn seedings are difficult to establish during the drier part of the year. Lawns should be seeded early in spring; if seeded during dry periods, they should be mulched and watered. Capability subclass IIIs; woodland suitability subclass 3s.

TyC—Tyner loamy sand, 6 to 12 percent slopes. This deep, sloping, well drained soil is on sides of postglacial ridges. Slopes are short. Most areas are long and narrow in shape and range from 5 to 10 acres in size.

Typically, the surface layer is dark brown, very friable loamy sand about 6 inches thick. The subsoil is brown, very friable loamy sand about 26 inches thick. The substratum, to a depth of about 66 inches, is brown, loose coarse sand.

Included with this soil in mapping are a few areas of Otisville soils.

This soil warms and dries early in spring. Permeability is rapid. Runoff is medium or rapid. This soil is droughty. Available water capacity is low in the deep rooting zone. Organic matter content is low. The subsoil is strongly acid to slightly acid, but the surface layer varies widely in reaction, depending on the amount of liming.

Most of the acreage of this soil is used for urban development. A few areas are used for specialty crops. This soil has poor potential for farming and fair potential for building sites and woodland.

This soil is poorly suited to cultivated crops because it is droughty. It is better suited to early-maturing or deep-rooted crops than to most other crops. Conservation of moisture is very important. Orchards maintained in permanent sod are suited to this soil if irrigation is available. Management practices, such as minimum tillage and use of crop residue and cover crops, help to control erosion, conserve moisture, and maintain organic matter content. Because nutrients are rapidly leached, this soil generally responds better to smaller but more frequent or more timely applications of fertilizer than to one large application.

Only a small acreage of this soil is wooded. This soil is moderately well suited to woodland. Seedling mortality is moderate.

Although slope limits the use of this soil for building sites, many areas are good building sites. The possible contamination of ground water limits the use of this soil for sanitary facilities. Lawn seedings are difficult to establish during the drier part of the growing season unless they are mulched and watered. Capability subclass IVs; woodland suitability subclass 3s.

TzA—Tyner Variant sandy loam. This deep, nearly level, moderately well drained soil is on low ridges on the lake plain. Slope ranges from 0 to 2 percent. Most areas are irregular in shape and range from 5 to 50 acres in size.

Typically, the surface layer is very dark grayish brown, friable sandy loam about 8 inches thick. The subsoil is about 24 inches thick. The upper part of the subsoil is yellowish brown, mottled, friable sandy loam; and the lower part is yellowish brown, mottled, very friable loamy coarse sand. The substratum, to a depth of about 60 inches, is brown and yellowish brown, loose loamy sand, sand, and coarse sand that has mottles in the upper part.

Included with this soil in mapping are small areas of well drained Tyner soils on slight rises. Also included are small areas of the somewhat poorly drained Red Hook soils in slight depressions.

A seasonal high water table is at a depth of 18 to 36 inches in winter, spring, and other extended wet periods. Permeability is rapid. Runoff is slow. This soil is droughty. Available water capacity is low in the deep rooting zone. The organic matter content is low. The subsoil is strongly acid or medium acid, but the surface layer varies widely in reaction, depending on the amount of liming.

Most of the acreage of this soil is used for specialty crops or urban development. This soil has fair potential for farming and woodland. It has poor potential for sanitary facilities and fair or poor potential for building sites.

This soil is suited to crops, pasture, orchards, berries, nursery stock, and sweet corn. Wetness in spring and droughtiness in summer are management concerns. Irrigation is needed, especially for specialty crops. Random subsurface drains are needed in the wetter soils for intensive cropping. Because plant nutrients are moderately rapidly leached, this soil generally responds better to smaller but more frequent applications of fertilizer than to one large application.

Only a small acreage of this soil is used for woodland even though it is moderately well suited to woodland.

Seasonal wetness and rapid permeability limit the use of this soil for building sites and sanitary facilities. It is better suited to houses without basements than to those with basements. Mechanical measures may be used to help to prevent wet basements. Because of seepage, contamination of ground water from sanitary facilities is possible. Sloughing is a hazard in excavations. If lawns are seeded during dry periods, they should be mulched and watered. Capability subclass IIIs; woodland suitability subclass 3s.

UdB—Udorthents, gently sloping. These soils are in cut and fill areas. Where the soil material has been removed, the remaining soil is typically similar to the material in the subsoil or substratum of adjacent soils. In fill or disposal areas, the soil material has more variable characteristics because it usually consists of varying amounts of materials from the subsoil and substratum of nearby soils. Slope ranges from 2 to 6 percent.

Typically, these soils are silty clay loam, clay loam, or silt loam in the upper 60 inches. Available water capacity varies, but is mostly low. Permeability is generally slow. The firm and dense surface layer is commonly littered with shale fragments. The soils have poor tilth. Hard rains tend to seal the surface, reducing infiltration and restricting seedling emergence and growth. A seasonal high water table is in some areas, particularly where grading has resulted in depressed or bowlshape areas. The rooting zone is medium acid to mildly alkaline.

Included with these soils in mapping are many small areas where slope is 0 to 2 percent.

Most areas of these soils are at new construction sites. About half of the areas lack any plant cover. A few areas are in hay or pasture. The hazard of erosion is severe in areas that are bare of vegetation. A suitable plant cover is needed to protect these soils from erosion. The suitability of these soils for building sites and sanitary facilities is quite variable. Not placed in a capability subclass or woodland suitability subclass.

UdD—Udorthents, moderately steep. These soils are in cut and fill areas created by road construction. Where the soil material has been removed, the remaining soil is typically similar to the material in the subsoil or substratum of adjacent soils. In fill or disposal areas, the soil material has more variable characteristics and usually consists of varying amounts of material from the subsoil and substratum of nearby soils. Slope ranges from 12 to 18 percent.

Typically, these soils are shaly silty clay loam, clay loam, or silt loam in the upper 60 inches. Rooting depth varies. Available water capacity varies but is mostly low. Permeability is generally slow. These soils have poor tilth. Hard rains tend to seal the surface, reducing infiltration and restricting seedling emergence and growth. The rooting zone ranges from medium acid to mildly alkaline.

Most of the acreage of these soils is along highways and in borrow pits. About half of the areas lack any plant cover. They are poorly suited to grasses and legumes. The hazard of erosion is severe in areas that are bare of vegetation. A suitable plant cover is needed to reduce erosion. Not placed in a capability subclass or woodland suitability subclass.

Ur—Urban land. Urban land consists of areas 10 acres or more in size that are covered by buildings, pavement, or other man-made surfaces. Included in Urban land are commercial and industrial areas, large factories, shopping centers, warehouses, and railroad yards. Slope ranges from 0 to 6 percent.

Much of the total area is covered by construction, leaving only a limited acreage of natural soil. This results in increased volume and rate of runoff from these areas. Urban land is a potential source of pollution to nearby streams. Not placed in a capability subclass or woodland suitability subclass.

Use and management of the soils

The soil survey is a detailed inventory and evaluation of the most basic resource of the survey area—the soil. It is useful in adjusting land use, including urbanization, to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in uses of the land.

While a soil survey is in progress, soil scientists, conservationists, engineers, and others keep extensive notes about the nature of the soils and about unique aspects of behavior of the soils. These notes include data on erosion, drought damage to specific crops, yield estimates, flooding, the functioning of septic tank disposal systems, and other factors affecting the productivity, potential, and limitations of the soils under various uses and management. In this way, field experience and measured data on soil properties and performance are used as a basis for predicting soil behavior.

Information in this section is useful in planning use and management of soils for crops and pasture and woodland, as sites for buildings, highways and other transportation systems, sanitary facilities, and parks and other recreation facilities, and for wildlife habitat. From the data presented, the potential of each soil for specified land uses can be determined, soil limitations to these land uses can be identified, and costly failures in houses and other structures, caused by unfavorable soil properties, can be avoided. A site where soil properties are favorable can be selected, or practices that will overcome the soil limitations can be planned.

Planners and others using the soil survey can evaluate the impact of specific land uses on the overall productivity of the survey area or other broad planning area and on the environment. Productivity and the environment are closely related to the nature of the soil. Plans should maintain or create a land-use pattern in harmony with the natural soil.

Contractors can find information that is useful in locating sources of sand and gravel, roadfill, and topsoil. Other information indicates the presence of bedrock or wetness that cause difficulty in excavation.

Health officials, highway officials, engineers, and many other specialists also can find useful information in this soil survey. The safe disposal of wastes, for example, is closely related to properties of the soil. Pavements, sidewalks, campsites, playgrounds, lawns, and trees and shrubs are influenced by the nature of the soil.

Crops and pasture

The major management concerns in the use of the soils for crops and pasture are described in this section. In addition, the crops or pasture plants best suited to the soil, including some not commonly grown in the survey area, are discussed; 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 presented for each soil.

This section provides information about the overall agricultural potential of the survey area and about the management practices that are needed. The information is useful to equipment dealers, land improvement contractors, fertilizer companies, processing companies, planners, conservationists, and others. For each kind of soil, information about management is presented in the section "Soil maps for detailed planning." Planners of management systems for individual fields or farms should also consider the detailed information given in the description of each soil.

More than 36,000 acres in the survey area was used for crops and pasture in 1967, according to the Ohio Soil and Water Conservation Needs Inventory *(11)*. Of this total, 2,900 acres was used for permanent pasture; 8,800 acres for row crops, mainly corn and nursery; 1,500 acres for close-grown crops; 4,800 acres for hay; and 2,100 acres for orchards, vineyards, and bush fruit. The remaining acreage was open land that was formerly cropped.

Soil drainage is the major management need on about half of the cropland in the survey area. Unless artificially drained, the poorly drained, somewhat poorly drained, and very poorly drained soils are so wet that crops are damaged during most years. These include Conneaut, Darien, Euclid, Fitchville, Granby, Kingsville, Mahoning, Minoa, Mitiwanga, Orrville, Painesville, Red Hook, Stafford, and Swanton soils.

Ellsworth, Elnora, Glenford, Lobdell, and Pierpont soils have good natural drainage most of the year, but they tend to dry slowly after rain. Small areas of wetter soils along drainageways and in swales are commonly included in the moderately well drained Ellsworth and Pierpont soils, especially where slope is 2 to 6 percent. Artificial drainage is needed in some of these wetter areas.

The design of both surface and subsurface drainage systems varies with the kind of soil. A combination of surface drainage and subsurface drainage is needed in most areas of the poorly drained and very poorly drained soils that are used for intensive cropping. Drains have to be more closely spaced in soils that have slow permeability than in the more permeable soils. Kingsville and Stafford soils are difficult to drain because when the sand in these soils is saturated, it tends to flow and plug subsurface drains. Finding adequate outlets for subsurface drainage systems is difficult in many areas of Granby, Orrville, and Swanton soils.

Erosion control practices are needed on about 15 percent of the acreage used for crops in the survey area. Control of water erosion is needed where slope is much more than 2 percent. The most common soils that are used for crops and generally require erosion control are Darien, Ellsworth, Glenford, Mahoning, Pierpont, and Platea soils. Some of the sandier soils, such as Colonie and Elnora soils, are subject to soil blowing when they are used for crops. Common erosion control practices in this county are grassed waterways, diversions, contour tillage, use of crop residue and cover crops, and maintenance of close-growing crops for cover.

Soil fertility is naturally low in Lake County. The surface layer is strongly acid or very strongly acid in most unlimed areas in the county. Allis, Conneaut, Darien, Pierpont, Platea, and other soils are difficult to lime adequately because they have a high content of free aluminum. The coarser textured soils, such as Colonie, Conotton, Elnora, Oshtemo, Otisville, and Tyner soils, retain only small amounts of plant nutrients. On these soils additions of lime and fertilizer are needed. The amounts should be determined on the basis of soil tests, the needs of the crop, and the level of yield desired. Assistance in determining the kinds and amounts of fertilizer and lime to apply is available from the Ohio Cooperative Extension Service.

Tilth is an important factor in the germination of seeds and in the infiltration of water into the soil. Soils that have good tilth are granular and porous. The texture of the surface layer of the soils in Lake County ranges from fine sand to silty clay loam. For planning of tillage, all of the mineral soils can be placed into one of three general groups which are discussed in the following paragraphs.

Soils that have a loam or coarser surface layer include Colonie, Conotton, Elnora, Granby, Kingsville, Minoa, Oshtemo, Otisville, Painesville, Red Hook, Stafford, Swanton, Tioga, Tioga Variant, Tyner, and Tyner Variant soils. These soils can be tilled safely throughout a wide range of moisture content. Some of the soils, such as Kingsville and Swanton soils, have poor trafficability when they are wet, but they are not seriously damaged if they are tilled when wet. The soils that have a loam surface layer are more susceptible to damage than the coarser textured soils.

Conneaut, Darien, Euclid, Fitchville, Glenford, Lobdell, Lordstown, Mitiwanga, Orrville, Pierpont, and Platea soils have a thick silt loam surface layer. These soils have a narrower range of optimum moisture for tillage than the soils that have a loam or coarser surface layer. Also, they tend to dry more slowly than the coarser textured soils. Most of the soils in this group are moderately low or low in organic matter content and are not so well drained as the coarser textured soils. The soils in this general group have weak or moderate structure in the surface layer. If these soils are cultivated within the range of optimum moisture for tillage, harmful effects on the structure are small and of short duration.

Allis, Ellsworth, and Mahoning soils have the narrowest range of optimum moisture for tillage. The clay content in the surface layer of these soils is generally high enough to cause serious clodding if the soils are tilled when wet. Gosport soils are too steep for cultivation.

Pasture is a minor land use in Lake County. Most pasture is on soils that have potential for crops. Some of the soils that are used for pasture are subject to erosion. These soils are low in fertility, commonly have poor tilth, and generally are moderately eroded. Most areas used for pasture are on soils that require drainage. Soils that require drainage for maximum growth of row crops also require drainage for maximum growth of pasture plants. Erosion control, drainage, addition of lime and fertilizer, reduction of compaction, and brush control are important in pasture management.

Specialty crops

Specialty crops grown for commercial use in Lake County include nursery stock, vegetables, grapes, and orchards. This section does not give specific practices, fertilization rates, or seed varieties for these crops. A high level of management is needed to successfully produce these crops. More complete information can be obtained from the local offices of the Cooperative Extension Service on crop management and the Soil Conservation Service on soil and water management.

The investment in labor and machinery and other costs of growing specialty crops are generally higher than for general farm crops. The high value of the specialty crops requires good soil management and cultural practices.

Approximately one-third of the nursery stock produced in Ohio is grown in Lake County. Lake County is the center of the agricultural industry in northeastern Ohio, and in 1971, 145 farms totaling 3,299 acres were engaged in producing nursery stock. All types of nursery stock are grown in the county; ornamentals predominate. The major problems facing the agricultural industry in Lake County are urbanization and population density.

The excessively drained, somewhat excessively drained, and well drained, nearly level and gently sloping soils commonly used for nursery stock are Colonie, Conotton, Oshtemo, Otisville, Tyner, and Tioga Variant soils. All of these soils, except Tioga Variant, require irrigation for optimum production of nursery stock and lack desirable properties for balling and burlapping. These soils have good aeration. The moderately well drained, nearly level Elnora, Glenford, and Tyner Variant soils are irrigated and used for nursery stock. These soils normally do not require artificial drainage, but may require spot drainage for nursery stock.

The nearly level, somewhat poorly drained Euclid, Fitchville, Minoa, Painesville, and Red Hook soils and the nearly level, poorly drained and very poorly drained Conneaut, Granby, Kingsville, and Swanton soils are used for nursery stock, but artificial drainage of the whole area is needed for optimum production. Euclid, Fitchville, Minoa, Painesville, and Red Hook soils commonly have desirable properties for digging, balling, and burlapping.

Vegetables such as squash, sweet corn, peppers, and tomatoes are grown mainly on sandy soils, such as Elnora, Stafford, Kingsville, and Swanton soils. Artificial drainage is needed on Stafford, Kingsville, and Swanton soils for optimum production. Irrigation generally is needed on Elnora and Stafford soils.

Grapes are most commonly grown on the somewhat poorly drained and poorly drained soils, such as Conneaut, Platea, and Red Hook soils. Artificial drainage on these soils results in longer vine life and higher yields.

Apples are the major orchard crop in the county, and peaches rank second. Lake Erie is important to fruit growers in the survey area because it reduces the danger of frost damage to fruit buds in spring. The orchards within sight of Lake Erie are much less susceptible to damaging frosts than are orchards farther away. Euclid, Tioga Variant, Minoa, Pierpont, and Platea soils are most commonly used for apples. However, the fragipan in the subsoil of the Pierpont and Platea soils hinders proper root development. Erosion control is important on sloping Platea and Pierpont soils. Peaches are most commonly grown on the excessively drained to moderately well drained Tyner, Otisville, and Elnora soils. These soils have good potential for peaches since peaches require good aeration and good drainage. The best quality peaches are produced on these sandy soils.

Irrigation

Rainfall in Lake County generally is adequate for most crops, but it is not always timely or well distributed. Extended dry periods sometimes occur between June and September.

Many soils in the county are suited to irrigation and can be profitably irrigated if water is available. About 2,588 acres in the survey area was irrigated in 1967. Features that affect the suitability of the soil for irrigation are available water capacity, slope, water-intake rate, need for drainage, depth of soil in relation to rooting depth, susceptibility to stream overflow, hazard of erosion, and presence of fragipan or other layers that limit water movement. Soils that have slope of more than 6 percent are highly susceptible to erosion if they are irrigated.

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 8. 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. Absence of an estimated yield indicates that the crop is not suited to or not commonly grown on the soil.

The estimated yields were based mainly on the experience and records of farmers, conservationists, and extension agents. Results of field trials and demonstrations and available yield data from nearby counties were also considered.

The yields were estimated assuming that the latest soil and crop management practices were used. Hay and pasture yields were estimated for the most productive varieties of grasses and legumes suited to the climate and the soil. A few farmers may be obtaining average yields higher than those shown in table 8.

The management needed to achieve the indicated yields of the various crops depends on the kind of soil and the crop. Such management provides drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate tillage practices, including time of tillage and seedbed preparation and tilling when soil moisture is favorable; 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 residues, barnyard manure, and green-manure crops; harvesting crops with the smallest possible loss; and timeliness of all fieldwork.

The estimated yields reflect the productive capacity of the soils 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 8 are grown in the survey area, but estimated yields are not included because the acreage of these crops is small. The local offices of the Soil Conservation Service and the Cooperative Extension Service can provide information about the management concerns and productivity of the soils for these crops.

Capability classes and subclasses

Capability classes and subclasses show, in a general way, the suitability of soils for most kinds of field crops (*10*). The soils are classed according to their limitations when they are used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to horticultural crops or other crops that require special management. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for forest trees or for engineering purposes.

In Lake County, all kinds of soil are grouped at two levels: capability class and subclass. These levels are defined in the following paragraphs. A survey area may not have soils of all classes.

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 few limitations that restrict their use.

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

Class III soils have severe limitations that reduce the choice of plants, 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 landforms 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 too cold or too 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, though they have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is indicated in table 9. All soils in the survey area except those named at a level higher than the series are included. Some of the soils that are well suited to crops and pasture may be in low-intensity use, for example, soils in capability classes I and II. Data in this table can be used to determine the farming potential of such soils.

The capability subclass is identified in the description of each soil mapping unit in the section "Soil maps for detailed planning."

Woodland management and productivity

Nearly all of Lake County was forest at the time of settlement. Red oak, white oak, black oak, hickory, sugar maple, and other native trees grew on the better drained soils. Red maple, white ash, and elm grew on the wetter soils.

The woodland has been reduced to about 38,000 acres, or 20 percent of the county. Most of the remaining areas are in small farm woodlots. Typically, the steepest or wettest parts of the farms remain wooded. Most of the woodland has been cut over, and much of it has been grazed. Beech and trees undesirable for commercial timber production are dominant in many farm woodlots. Fairly extensive wooded tracts are along the Chagrin and Grand Rivers, part of which are owned by metropolitan parks and Holden Arboretum. These areas are extremely rugged and difficult to manage for timber production.

Reforestation of eroded soils of abandoned farms has increased the acreage of coniferous trees during the last 20 to 25 years. White, red, and Austrian pine are most commonly used for planting.

Table 10 contains information useful to woodland owners or forest managers planning use of soils for wood crops. Map unit symbols for soils suitable for wood crops are listed, and the ordination (woodland suitability) symbol for each soil is given. All soils bearing the same ordination symbol require the same general kinds of woodland 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 *w*, indicates excessive water in or on the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates insignificant limitations or restrictions. If a soil has more than one limitation, priority in placing the soil into a limitation class is in the following order: w, s, f, and r.

In table 10 the soils are also rated for a number of factors to be considered in management. *Slight*, *moderate*, and *severe* are used to indicate the degree of major soil limitations.

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

Considered in the ratings of *windthrow hazard* are characteristics of the soil that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that trees in wooded areas are not expected to be blown down by strong winds; *moderate*, that some trees are 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. Common 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 suitable for commercial wood production and that are suited to the soils.

Engineering

This section provides information about the use of soils for building sites, sanitary facilities, construction material, and water management. Among those who can benefit from this information are engineers, landowners, community planners, town and city managers, land developers, builders, contractors, and farmers and ranchers.

The ratings in the engineering tables are based on test data and estimated data in the "Soil properties" section. The ratings were determined jointly by soil scientists and engineers of the Soil Conservation Service using known relationships between the soil properties and the behavior of soils in various engineering uses.

Among the soil properties and site conditions identified by a soil survey and used in determining the ratings in this section were grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock that is within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure or aggregation, in-place soil density, and geologic origin of the soil material. Where pertinent, data about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of absorbed cations were also considered.

On the basis of information assembled about soil properties, ranges of values can be estimated for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, shear strength, compressibility, slope stability, and other factors of expected soil behavior in engineering uses. As appropriate, these values can be applied to each major horizon of each soil or to the entire profile.

These factors of soil behavior affect construction and maintenance of roads, airport runways, pipelines, foundations for small buildings, ponds and small dams, irrigation projects, drainage systems, sewage and refuse disposal systems, and other engineering works. The ranges of values can be used to (1) select potential residential, commercial, industrial, and recreational uses; (2) make preliminary estimates pertinent to construction in a particular area; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for location of sanitary landfills, onsite sewage disposal systems, and other waste disposal facilities; (5) plan detailed onsite investigations of soils and geology; (6) find sources of gravel, sand, clay, and topsoil; (7) plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; (8) relate performance of structures already built to the properties of the kinds of soil on which they are built so that performance of similar structures on the same or a similar soil in other locations can be predicted; and (9) predict the trafficability of soils for cross-country movement of vehicles and construction equipment.

Data presented in this section are useful for land use planning and for choosing alternative practices or general designs that will overcome unfavorable soil properties and minimize soil-related failures. Limitations to the use of these data, however, should be well understood. First, the data are generally not presented for soil material below a depth of 5 or 6 feet. Also, because of the scale of the detailed map in this soil survey, small areas of soils that differ from the dominant soil may be included in mapping. Thus, these data do not eliminate the need for onsite investigations, testing, and analysis by personnel having expertise in the specific use contemplated.

The information is presented mainly in tables. Table 11 shows, for each kind of soil, the degree and kind of limitations for building site development; table 12, for sanitary facilities; and table 14, for water management. Table 13 shows the suitability of each kind of soil as a source of construction materials.

The information in the tables, along with the soil map, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations and to construct interpretive maps for specific uses of land.

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

Building site development

The degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets are indicated in table 11. A *slight* limitation indicates that soil properties generally are favorable for the specified use; any limitation is minor and easily overcome. A *moderate* limitation indicates that soil properties and site features are unfavorable for the specified use, but the limitations can be overcome or minimized by special planning and design. A *severe* limitation indicates that one or more soil properties or site features are so unfavorable or difficult to overcome that a major increase in construction effort, special design, or intensive maintenance is required. For some soils rated severe, such costly measures may not be feasible.

Shallow excavations are made for pipelines, sewerlines, communications and power transmission lines, basements, open ditches, and cemeteries. Such digging or trenching is influenced by soil wetness caused by a seasonal high water table; the texture and consistence of soils; the tendency of soils to cave in or slough; and the presence of bedrock or large stones. In addition, excavations are affected by slope of the soil and the probability of flooding. Ratings do not apply to soil horizons below a depth of 6 feet unless otherwise noted.

In the soil series descriptions, the consistence of each soil horizon is given, and the presence of very firm or extremely firm horizons, usually difficult to excavate, is indicated.

Dwellings and *small commercial buildings* referred to in table 11 are built on undisturbed soil and have foundation loads of a dwelling no more than three stories high. Separate ratings are made for small commercial buildings without basements and for dwellings with and without basements. For such structures, soils should be sufficiently stable that cracking or subsidence of the structure from settling or shear failure of the foundation does not occur. These ratings were determined from estimates of the shear strength, compressibility, and shrink-swell potential of the soil. Soil texture, plasticity and in-place density, potential frost action, soil wetness, and depth to a seasonal high water table were also considered. Soil wetness and depth to a seasonal high water table indicate potential difficulty in providing adequate drainage for basements, lawns, and gardens. Depth to bedrock, slope, and large stones in or on the soil are also important considerations in the choice of sites for these structures and were considered in determining the ratings. Susceptibility to flooding is a serious hazard.

Local roads and streets referred to in table 11 have an all-weather surface that can carry light to medium traffic all year. They consist of a subgrade of the underlying soil material; a base of gravel, crushed rock fragments, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. The roads are graded with soil material at hand, and most cuts and fills are less than 6 feet deep.

The load supporting capacity and the stability of the soil as well as the quantity and workability of fill material available are important in design and construction of roads and streets. The classifications of the soil and the soil texture, density, shrink-swell potential, and potential frost action are indicators of the traffic supporting capacity used in making the ratings. Soil wetness, flooding, slope, depth to hard rock or very compact layers, and content of large stones affect stability and ease of excavation.

Sanitary facilities

Favorable soil properties and site features are needed for proper functioning of septic tank absorption fields, sewage lagoons, and sanitary landfills. The nature of the soil is important in selecting sites for these facilities and in identifying limiting soil properties and site features to be considered in design and installation. Also, those soil properties that affect ease of excavation or installation of these facilities will be of interest to contractors and local officials. Table 12 shows the degree and kind of limitations of each soil for such uses and for use of the soil as daily cover for landfills. It is important to observe local ordinances and regulations.

If the degree of soil limitation is expressed as *slight*, soils are generally favorable for the specified use and limitations are minor and easily overcome; if *moderate*, soil properties or site features are unfavorable for the specified use, but limitations can be overcome by special planning and design; and if *severe*, soil properties or site features are so unfavorable or difficult to overcome that major soil reclamation, special designs, or intensive maintenance is required. Soil suitability is rated by the terms *good*, *fair*, or *poor*, which, respectively, mean about the same as the terms *slight*, *moderate*, and *severe*.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into the natural soil. Only the soil horizons between depths of 18 and 72 inches are evaluated for this use. The soil properties and site features considered are those that affect the absorption of the effluent and those that affect the construction of the system.

Properties and features that affect absorption of the effluent are permeability, depth to seasonal high water table, depth to bedrock, and susceptibility to flooding. Stones, boulders, and shallowness to bedrock interfere with installation. Excessive slope can cause lateral seepage and surfacing of the effluent. Also, soil erosion and soil slippage are hazards if absorption fields are installed on sloping soils.

In some soils, loose sand and gravel or fractured bedrock is less than 4 feet below the tile lines. In these soils the absorption field does not adequately filter the effluent, and ground water in the area may be contaminated.

On many of the soils that have moderate or severe limitations for use as septic tank absorption fields, a system to lower the seasonal water table can be installed or the size of the absorption field can be increased so that performance is satisfactory.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons have a nearly level floor and cut slopes or embankments of compacted soil material. Aerobic lagoons generally are designed to hold 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. Soils that are very high in content of organic matter and those that have cobbles, stones, or boulders are not suitable. Unless the soil has very slow permeability, contamination of ground water is a hazard where the seasonal high water table is above the level of the lagoon floor. In soils where the water table is seasonally high, seepage of ground water into the lagoon can seriously reduce the lagoon's capacity for liquid waste. Slope, depth to bedrock, and susceptibility to flooding also affect the suitability of sites for sewage lagoons or the cost of construction. Shear strength and permeability of compacted soil material affect the performance of embankments.

Sanitary landfill is a method of disposing of solid waste by placing refuse in successive layers either in excavated trenches or on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil material. Landfill areas are subject to heavy vehicular traffic. Risk of polluting ground water and trafficability affect the suitability of a soil for this use. The best soils have a loamy or silty texture, have moderate to slow permeability, are deep to a seasonal water table, and are not subject to flooding. Clayey soils are likely to be sticky and difficult to spread. Sandy or gravelly soils generally have rapid permeability, which might allow noxious liquids to contaminate ground water. Soil wetness can be a limitation, because operating heavy equipment on a wet soil is difficult. Seepage into the refuse increases the risk of pollution of ground water.

Ease of excavation affects the suitability of a soil for the trench type of landfill. A suitable soil is deep to bedrock and free of large stones and boulders. If the seasonal water table is high, water will seep into trenches.

Unless otherwise stated, the limitations in table 12 apply only to the soil material within a depth of about 6 feet. If the trench is deeper, a limitation of slight or moderate may not be valid. Site investigation is needed before a site is selected.

Daily cover for landfill should be soil that is easy to excavate and spread over the compacted fill in wet and dry periods. Soils that are loamy or silty and free of stones or boulders are better than other soils. Clayey soils may be sticky and difficult to spread; sandy soils may be subject to soil blowing.

The soils selected for final cover of landfills should be suitable for growing plants. Of all the horizons, the A horizon in most soils has the best workability, more organic matter, and the best potential for growing plants. Thus, for either the area- or trench-type landfill, stockpiling material from the A horizon for use as the surface layer of the final cover is desirable.

Where it is necessary to bring in soil material for daily or final cover, thickness of suitable soil material available and depth to a seasonal high water table in soils surrounding the sites should be evaluated. Other factors to be evaluated are those that affect reclamation of the borrow areas. These factors include slope, erodibility, and potential for plant growth.

Construction materials

The suitability of each soil as a source of roadfill, sand, gravel, and topsoil is indicated in table 13 by ratings of good, fair, or poor. The texture, thickness, and organic matter content of each soil horizon are important factors in rating soils for use as construction materials. Each soil is evaluated to the depth observed, generally about 6 feet.

Roadfill is soil material used in embankments for roads. Soils are evaluated as a source of roadfill for low embankments, which generally are less than 6 feet high and less exacting in design than high embankments. The ratings reflect the ease of excavating and working the material and the expected performance of the material where it has been compacted and adequately drained. The performance of soil after it is stabilized with lime or cement is not considered in the ratings, but information about some of the soil properties that influence such performance is given in the descriptions of the soil series.

The ratings apply to the soil material between the A horizon and a depth of 5 to 6 feet. It is assumed that soil horizons will be mixed during excavation and spreading. Many soils have horizons of contrasting suitability within their profile. The estimated engineering properties in table 17 provide specific information about the nature of each horizon. This information can help determine the suitability of each horizon for roadfill.

Soils rated *good* are coarse grained. They have low shrink-swell potential, low potential frost action, and few cobbles and stones. They are at least moderately well drained and have slopes of 15 percent or less. Soils rated *fair* have a plasticity index of less than 15 and have other limiting features, such as moderate shrink-swell potential, moderately steep slopes, wetness, or many stones. If the thickness of suitable material is less than 3 feet, the entire soil is rated *poor.*

Sand and *gravel* are used in great quantities in many kinds of construction. The ratings in table 13 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. Descriptions of grain size, kinds of minerals, reaction, and stratification are given in the soil series descriptions and in table 17.

Topsoil is used in areas where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil material in preparing a seedbed and by the ability of the soil material to support plantlife. Also considered is the damage that can result at the area from which the topsoil is taken.

The ease of excavation is influenced by the thickness of suitable material, wetness, slope, and amount of stones. The ability of the soil to support plantlife is determined by texture, structure, and the amount of soluble salts or toxic substances. Organic matter in the A1 or Ap horizon greatly increases the absorption and retention of moisture and nutrients. Therefore, the soil material from these horizons should be carefully preserved for later use.

Soils rated *good* have at least 16 inches of friable loamy material at their surface. They are free of stones and cobbles, are low in content of gravel, and have gentle slopes. They are naturally fertile or respond well to fertilizer. They are not so wet that excavation is difficult during most of the year.

Soils rated *fair* are loose sandy soils or firm loamy or clayey soils in which the suitable material is only 8 to 16 inches thick or soils that have appreciable amounts of gravel, stones, or soluble salt.

Soils rated *poor* are very sandy soils and very firm clayey soils; soils with suitable layers less than 8 inches thick; soils having large amounts of gravel or stones; steep soils; and poorly drained soils.

Although a rating of *good* is not based entirely on high content of organic matter, a surface horizon is generally preferred for topsoil because of its organic matter content. This horizon is designated as A1 or Ap in the soil series descriptions. The absorption and retention of moisture and nutrients for plant growth are greatly increased by organic matter.

Water management

Many soil properties and site features that affect water management practices have been identified in this soil survey. In table 14 soil and site features that affect use are indicated for each kind of soil. This information is significant in planning, installing, and maintaining water-control structures.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have a low seepage potential, which is determined by permeability and the depth to fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material that is resistant to seepage, erosion, and piping and has favorable stability, shrink-swell potential, shear strength, and compaction characteristics. Large stones and organic matter in a soil downgrade the suitability of a soil for use in embankments, dikes, and levees.

Aquifer-fed excavated ponds are bodies of water made by excavating a pit or dugout into a ground-water aquifer. Excluded are ponds that are fed by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Ratings in table 14 are for ponds that are properly designed, located, and constructed. Soil properties and site features that affect aquifer-fed ponds are depth to a permanent water table, permeability of the aquifer, quality of the water, and ease of excavation.

Drainage of soil is affected by such soil properties as permeability; texture; depth to bedrock, hardpan, or other layers that affect the rate of water movement; depth to the water table; slope; stability of ditchbanks; susceptibility to flooding; salinity and alkalinity; and availability of outlets for drainage.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to intercept runoff. They allow water to soak into the soil or flow slowly to an outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth to bedrock, hardpan, or other unfavorable material; large stones; permeability; ease of establishing vegetation; and resistance to water erosion, soil blowing, soil slipping, and piping.

Grassed waterways are constructed to channel runoff to outlets at a nonerosive velocity. Features that affect the use of soils for waterways are slope, permeability, erodibility, wetness, and suitability for permanent vegetation.

Recreation

The soils of the survey area are rated in table 15 according to limitations that affect their suitability for recreation uses. The ratings are based on such restrictive soil features as flooding, wetness, slope, and texture of the surface layer. Not considered in these ratings, but important in evaluating a site, are location and accessibility of the area, size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites available, and either access to public sewerlines or capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degree, for recreation use by the duration and intensity of flooding and the season when flooding occurs. Onsite assessment of height, duration, intensity, and frequency of flooding is essential in planning recreation facilities.

The degree of the limitation of the soils is expressed as slight, moderate, or severe. *Slight* means that the soil properties are generally favorable and that the limitations are minor and easily overcome. *Moderate* means that the 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 15 can be supplemented by information in other parts of this survey. Especially helpful are interpretations for septic tank absorption fields, given in table 12, and interpretations for dwellings without basements and for local roads and streets, given in table 11.

Camp areas require such site preparation as shaping and leveling for 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 for this use 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 camping sites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for use as 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 will 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 or boulders, is firm after rains, and is not dusty when dry. If shaping is required to obtain a uniform grade, the depth of the soil over bedrock or hardpan should be enough to allow necessary grading.

Paths and trails for walking, horseback riding, bicycling, and other uses should require little or no cutting and filling. The best soils for this use are those that are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once during the annual period of use. They should have moderate slopes and have 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 should have a surface that is free of stones and boulders and have moderate slopes. Suitability of the soil for traps, tees, or greens was not considered in rating the soils. Irrigation is an assumed management practice.

Wildlife habitat

Soils directly affect the kind and amount of vegetation that is available to wildlife as food and cover, and they affect the construction of water impoundments. The kind and abundance of wildlife that populate an area depend largely on the amount and distribution of food, cover, and water. If any one of these elements is missing, is inadequate, or is inaccessible, wildlife either are scarce or do not inhabit the area.

If the soils have the potential, wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by helping the natural establishment of desirable plants.

In table 16, the soils in the survey area are rated according to their potential to support the main kinds of wildlife habitat in the area. This information can be used in planning for parks, wildlife refuges, nature study areas, and other developments for wildlife; selecting areas that are suitable for wildlife; selecting soils that are suitable for creating, improving, or maintaining specific elements of wildlife habitat; and 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 (*1*). A rating of *good* means that the element of wildlife habitat or the kind of habitat is easily created, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected if the soil is used for the designated purpose. A rating of *fair* means that the element of wildlife habitat or kind of habitat can be created, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* means that limitations are severe for the designated element or kind of wildlife habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* means that restrictions for the element of wildlife habitat or kind of wildlife are very severe, and that unsatisfactory results can be expected. Wildlife habitat is impractical or even impossible to create, improve, or maintain on soils having such a rating.

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

Grain and seed crops are seed-producing annuals used by wildlife. The major soil properties that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes that are planted for wildlife food and cover. Major soil properties 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, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds, that provide food and cover for wildlife. Major soil properties 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 foxtail, goldenrod, smartweed, ragweed, and fescue.

Hardwood trees and the associated woody understory provide cover for wildlife and produce nuts or other fruit, buds, catkins, twigs, bark, or foliage that wildlife eat. Major soil properties that affect growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of native plants are oak, poplar, cherry, apple, hawthorn, dogwood, hickory, blackberry, and black walnut. Examples of fruit-producing shrubs that are commercially available and suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Coniferous plants are cone-bearing trees, shrubs, or ground cover plants that furnish habitat or supply food in the form of browse, seeds, or fruitlike cones. Soil properties that have a major effect on the growth of coniferous plants are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, and hemlock.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites, exclusive of submerged or floating aquatics. They produce food or cover for wildlife that use wetland as habitat. Major soil properties affecting wetland plants are texture of the surface layer, wetness, reaction, slope, and surface stoniness. Examples of wetland plants are duckweed, wild millet, willows, saltgrass, and rushes, sedges, and reeds.

Shallow water areas are bodies of water that have an average depth of less than 5 feet and that are useful to wildlife. They can be naturally wet areas, or they can be created by dams or levees or by water-control structures in marshes or streams. Major soil properties affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. The availability of a dependable water supply is important if water areas are to be developed. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The kinds of wildlife habitat are briefly described in the following paragraphs.

Openland habitat 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 kinds of wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail rabbit, and red fox.

Woodland habitat consists of areas of hardwoods or conifers, or a mixture of both, and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

Wetland habitat consists of open, marshy or swampy, shallow water areas where water-tolerant plants grow. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Soil properties

Extensive data about soil properties are summarized on the following pages. The two main sources of these data are the many thousands of soil borings made during the course of the survey and the laboratory analyses of selected soil samples from typical profiles.

In making soil borings during field mapping, soil scientists can identify several important soil properties. They note the seasonal soil moisture condition or the presence of free water and its depth. For each horizon in the profile, they note the thickness and color of the soil material; the texture, or amount of clay, silt, sand, and gravel or other coarse fragments; the structure, or the natural pattern of cracks and pores in the undisturbed soil; and the consistence of the soil material in place under the existing soil moisture conditions. They record the depth of plant roots, determine the pH or reaction of the soil, and identify any free carbonates.

Samples of soil material are analyzed in the laboratory to verify the field estimates of soil properties and to determine all major properties of key soils, especially properties that cannot be estimated accurately by field observation. Laboratory analyses are not conducted for all soil series in the survey area, but laboratory data for many soil series not tested are available from nearby survey areas.

The available field and laboratory data are summarized in tables. The tables give the estimated range of engineering properties, the engineering classifications, and the physical and chemical properties of each major horizon of each soil in the survey area. They also present data about pertinent soil and water features.

Engineering properties

Table 17 gives estimates of engineering properties and classifications for the major horizons of each soil in the survey area.

Most soils have, within the upper 5 or 6 feet, horizons of contrasting properties. Table 17 gives information for each of these contrasting horizons in a typical profile. *Depth* to the upper and lower boundaries of each horizon is indicated. More information about the range in depth and about other properties in each horizon is given for each soil series in the section "Soil series and morphology."

Texture is described in table 17 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 soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains gravel or other particles coarser than sand, an appropriate modifier is added, for example, "gravelly loam." Other texture terms are defined in the Glossary.

The two systems commonly used in classifying soils for engineering use are the Unified Soil Classification System (Unified) (*3*) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO) (*2*).

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, plasticity index, liquid limit, and organic matter content. Soils are grouped into 15 classes—eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes have a dual classification symbol, for example, CL-ML.

The *AASHTO* system classifies soils according to those properties that affect their use in highway construction and maintenance. In this system a mineral soil is classified in one of seven basic groups ranging 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. At the other extreme, in group A-7, are fine-grained soils. Highly organic soils are classified in group A-8 on the basis of visual inspection.

Also in table 17 the percentage, by weight, of rock fragments more than 3 inches in diameter is estimated for each major horizon. These estimates are determined mainly by observing volume percentage in the field and then converting that, by formula, to weight percentage.

Percentage of the soil material less than 3 inches in diameter that passes each of four sieves (U.S. standard) is estimated for each major horizon. The estimates are based on tests of soils that were sampled in the survey area and in nearby areas and on field estimates from many borings made during the survey.

Liquid limit and *plasticity index* indicate the effect of water on the strength and consistence of soil. These indexes are used in both the Unified and AASHTO soil classification systems. They are also used as indicators in making general predictions of soil behavior. Range in liquid limit and plasticity index are estimated on the basis of test data from the survey area or from nearby areas and on observations of the many soil borings made during the survey.

In some surveys, the estimates are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterburg limits extend a marginal amount across classification boundaries (1 or 2 percent), the classification in the marginal zone is omitted.

Physical and chemical properties

Table 18 shows estimated values for several soil characteristics and features that affect behavior of soils in engineering uses. These estimates are given for each major horizon, at the depths indicated, in the typical pedon of each soil. The estimates are based on field observations and on test data for these and similar soils.

Permeability is estimated on the basis of known relationships among the soil characteristics observed in the field—particularly soil structure, porosity, and gradation or texture—that influence the downward movement of water in the soil. The estimates are for vertical water movement when the soil is saturated. Not considered in the estimates is lateral seepage or such transient soil features as plowpans and surface crusts. Permeability of the soil is an important factor to be considered in planning and designing drainage systems, in evaluating the potential of soils for septic tank systems and other waste disposal systems, and in many other aspects of land use and management.

Available water capacity is rated on the basis of soil characteristics that influence the ability of the soil to hold water and make it available to plants. Important characteristics are content of organic matter, soil texture, and soil structure. Shallow-rooted plants are not likely to use the available water from the deeper soil horizons. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design of irrigation systems.

Soil reaction is expressed as a range in pH values. The range in pH of each major horizon is based on many field checks. For many soils, the values have been verified by laboratory analyses. Soil reaction is important in selecting the crops, ornamental plants, or other plants to be grown; in evaluating soil amendments for fertility and stabilization; and in evaluating the corrosivity of soils.

Shrink-swell potential depends mainly on the amount and kind of clay in the soil. Laboratory measurements of the swelling of undisturbed clods were made for many soils. For others the swelling was estimated on the basis of the kind and amount of clay in the soil and on measurements of similar soils. The size of the load and the magnitude of the change in soil moisture content also influence the swelling of soils. Shrinking and swelling of some soils can cause damage to building foundations, basement walls, roads, and other structures unless special designs are used. A high shrink-swell potential indicates that special design and added expense may be required if the planned use of the soil will not tolerate large volume changes.

Risk of corrosion pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to soil moisture, particle-size distribution, total acidity, and electrical conductivity of the soil material. The rate of corrosion of concrete is based mainly on the sulfate content, texture, and acidity of the soil. Protective measures for steel or more resistant concrete help to avoid or minimize damage resulting from the corrosion. Uncoated steel intersecting soil boundaries or soil horizons is more susceptible to corrosion than an installation that is entirely within one kind of soil or within one soil horizon.

Erosion factors are used to predict the erodibility of a soil and its tolerance to erosion in relation to specific kinds of land use and treatment. The soil erodibility factor (K) is a measure of the susceptibility of the soil to erosion by water. Soils having the highest K values are the most erodible. K values range from 0.10 to 0.64. To estimate annual soil loss per acre, the K value of a soil is modified by factors representing plant cover, grade and length of slope, management practices, and climate. The soil-loss tolerance factor (T) is the maximum rate of soil erosion, whether from rainfall or soil blowing, that can occur without reducing crop production or environmental quality. The rate is expressed in tons of soil loss per acre per year.

Wind erodibility groups are made up of soils that have similar properties that affect their resistance to soil blowing if cultivated. The groups are used to predict the susceptibility of soil to blowing and the amount of soil lost as a result of blowing. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are extremely erodible, so vegetation is difficult to establish. They are generally not suitable for crops.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible, but crops can be grown if intensive measures to control soil blowing are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible, but crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible, but crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible, but crops can be grown if measures to control soil blowing are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible, but crops can be grown if measures to control soil blowing are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible, and 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, and crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to soil blowing.

Soil and water features

Table 19 contains information helpful in planning land uses and engineering projects that are likely to be affected by soil and water features.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are placed in one of four groups on the basis of the intake of water after the soils have been wetted and have received 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 chiefly of deep, well drained to excessively drained sands or gravels. 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 that have a layer that impedes the downward movement of water or soils that have 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 clay soils 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 is the temporary covering of soil with water from overflowing streams, with runoff from adjacent slopes, and by tides. Water standing for short periods after rains or after snow melts is not considered flooding, nor is water in swamps and marshes. Flooding is rated in general terms that describe the frequency and duration of flooding and the time of year when flooding is most likely. The ratings are based on evidence in the soil profile of the effects of flooding, namely thin strata of gravel, sand, silt, or, in places, clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive soil horizons that form in soils of the area that are not subject to flooding. The ratings are also based on local information about floodwater levels in the area and the extent of flooding and on information that relates the position of each soil on the landscape to historic floods.

The generalized description of flood hazards is of value in land use planning and provides a valid basis for land use restrictions. The soil data are less specific, however, than those provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table is the highest level of a saturated zone more than 6 inches thick for a continuous period of more than 2 weeks during most years. The depth to a seasonal high water table applies to undrained soils. Estimates are based mainly on the relationship between grayish colors or mottles in the soil and the depth to free water observed in many borings made during the course of the soil survey. Indicated in table 19 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. Only saturated zones above a depth of 5 or 6 feet are indicated.

Information about the seasonal high water table helps in assessing the need for specially designed foundations, the need for specific kinds of drainage systems, and the need for footing drains to insure dry basements. Such information is also needed to decide whether or not construction of basements is feasible and to determine how septic tank absorption fields and other underground installations will function. Also, a seasonal high water table affects ease of excavation.

Depth to bedrock is shown for all soils that are underlain by bedrock at a depth of 5 to 6 feet or less. For many soils, the limited depth to bedrock is a part of the definition of the soil series. The depths shown are based on measurements made in many soil borings and on other observations made during the mapping of the soils. The kind of bedrock and its hardness as related to ease of excavation are also shown. Rippable bedrock can be excavated with a single-tooth ripping attachment on a 200-horsepower tractor, but hard bedrock generally requires blasting.

Potential frost action refers to the likelihood of damage to pavements and other structures by frost heaving and low soil strength after thawing. Frost action results from the movement of soil moisture into the freezing temperature zone in the soil, which causes ice lenses to form. Soil texture, temperature, moisture content, porosity, permeability, and content of organic matter are the most important soil properties that affect frost action. It is assumed that the soil is not covered by insulating vegetation or snow and is not artificially drained. Silty and clayey soils that have a high water table in winter are most susceptible to frost action. Well drained very gravelly or sandy soils are the least susceptible.

Physical and chemical analyses of selected soils

Many of the soils in Lake County were sampled and laboratory data determined by the Soil Characterization Laboratory, Department of Agronomy, Ohio State University, Columbus, Ohio. The physical and chemical data obtained on most samples include particle size distribution, reaction, organic matter content, calcium carbonate equivalent, and extractable cations.

These data were used in the classification and correlation of these soils and in evaluating their behavior under various land uses. From these data, 12 profiles representative of their respective series are described in this survey. These series and their laboratory identification numbers are Colonie (LK-7), Euclid (LK-24), Fitchville (LK-19), Kingsville (LK-6) , Minoa (LK-14), Oshtemo (LK-21), Painesville (LK-26), Pierpont (LK-30), Platea (LK-8), Red Hook (LK-4), Stafford (LK-5), and Tioga Variant (LK-25).

In addition to the Lake County data, laboratory data are also available for many of the same soils from nearby counties in northeastern Ohio. These data and the Lake County data are on file at the Department of Agronomy, Ohio State University, Columbus, Ohio; the Ohio Department of Natural Resources, Division of Lands and Soil, Columbus, Ohio; and the Soil Conservation Service, State Office, Columbus, Ohio. Some of these data have been published in special studies of soils in nearby counties (*8*).

Engineering test data

Several of the soils in Lake County were analyzed for engineering properties by the Soil Physical Studies Laboratory, Department of Agronomy, Ohio State University. Some of the moisture density determinations were made by the Ohio Department of Transportation Soil Testing Laboratory. Data from eight of the series are considered as representative of those series in Lake County. These series and the laboratory identification numbers are Euclid (LK-24), Fitchville (LK-19), Kingsville (LK-6), Minoa (LK-14), Painesville (LK-26), Platea (LK-8), Red Hook (LK-4), and Stafford (LK-5). These sampled profiles are typical of the series discussed in the section "Soil series and morphology".

In addition to the Lake County data, engineering test data are also available for many of the same soils from nearby counties in northeastern Ohio. These data and the Lake County data are on file at the Department of Agronomy, Ohio State University, Columbus, Ohio; The Ohio Department of Natural Resources, Division of Lands and Soil, Columbus, Ohio; and the Soil Conservation Service, State Office, Columbus, Ohio.

Soil series and morphology

In this section, each soil series recognized in the survey area is described in detail. The descriptions are arranged in alphabetic order by series name.

Characteristics of the soil and the material in which it formed are discussed for each series. The soil is then compared to similar soils and to nearby soils of other series. Then a pedon, a small three-dimensional area of soil that is typical of the soil series in the survey area, is described. The detailed descriptions of each soil horizon follow standards in the Soil Survey Manual (*9*). Unless otherwise noted, colors described are for moist soil.

Following the pedon description is the range of important characteristics of the soil series in this survey area. Phases, or map units, of each soil series are described in the section "Soil maps for detailed planning."

Adrian series

The Adrian series consists of deep, very poorly drained, rapidly permeable soils in depressions on the lake plain. These soils formed in organic material that is 16 to 50 inches thick over sandy mineral deposits. Slope is generally less than 2 percent.

Adrian soils are similar to Carlisle soils. Carlisle soils formed in more than 51 inches of organic material.

Typical pedon of Adrian muck, in an area of natural shrubs in Painesville Township, 2.8 miles east of Painesville, 1,000 feet east of Bacon Road, and 150 feet north of State Route 2:

Oa1—0 to 14 inches; black (10YR 2/1), broken face and rubbed, sapric material; less than 1 percent fiber rubbed; moderate medium and coarse granular structure; very friable; many fine roots; slightly acid; clear smooth boundary.

Oa2—14 to 21 inches; black (10YR 2/1), broken face and rubbed, sapric material; less than 1 percent fiber rubbed; moderate fine subangular blocky structure; friable; few fine roots; medium acid; abrupt smooth boundary.

IIC1g—21 to 38 inches; grayish brown (2.5Y 5/2) loamy sand; few coarse distinct yellowish brown (10YR 5/6) mottles; single grained; loose; strongly acid; clear smooth boundary.

IIC2g—38 to 40 inches; grayish brown (2.5Y 5/2) loamy sand; many prominent brown (7.5YR 4/4) mottles; single grained; loose; iron coatings binding some sand grains; medium acid; clear wavy boundary.

IIC3g—40 to 60 inches; gray (N 5/0) sand; single grained; loose; medium acid.

The organic material ranges from 16 to 50 inches in thickness.

The surface tier and the organic part of the subsurface tier, broken face and rubbed, have hue of 10YR, value of 2 or 3, and chroma of 1 or 2. Some pedons contain woody fragments. Reaction ranges from strongly acid to slightly acid. The C horizon has hue of 10YR to 5Y or N, value of 4 to 6, and chroma of 0 to 2.

Allis series

The Allis series consists of moderately deep, poorly drained, slowly permeable soils on the lake plain. These soils formed in 20 to 40 inches of glacial till derived mainly from acid shale. Slope ranges from 0 to 2 percent.

Allis soils are similar to Conneaut soils. Conneaut soils contain less clay in the B horizon and lack shale bedrock above a depth of 40 inches.

Typical pedon of Allis silt loam in a formerly cultivated area in the City of Willoughby, 450 feet north and 150 feet west of the intersection of State Route 91 and U.S. Route 20:

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure; friable; many fine roots; very strongly acid; abrupt smooth boundary.

B1g—6 to 10 inches; gray (10YR 6/1) silt loam; many coarse prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; common fine roots; grayish brown (10YR 5/2) coatings on faces of peds; very strongly acid; abrupt wavy boundary.

B21g—10 to 14 inches; gray (10YR 6/1) heavy silty clay loam; many coarse prominent yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure parting to moderate angular blocky; firm; grayish brown (2.5Y 5/2) coatings on faces of peds; very strongly acid; clear wavy boundary.

B22g—14 to 32 inches; gray (N 6/0) silty clay; many coarse prominent strong brown (7.5YR 5/6) mottles; strong coarse prismatic structure; firm; gray (N 6/0) coatings on faces of peds; 2 percent shale fragments; very strongly acid; gradual wavy boundary.

Cg—32 to 34 inches; gray (N 6/0) silty clay; many coarse prominent reddish brown (2.5YR 4/4) mottles; moderate medium platy structure; firm; 2 percent shale fragments; strongly acid; abrupt smooth boundary.

Cr—34 inches; gray (N 6/0) shale bedrock; many coarse prominent reddish brown (2.5Y 5/4) mottles; strongly acid.

The solum thickness and the depth to bedrock range from 20 to 40 inches. Reaction is very strongly acid or strongly acid throughout. Content of coarse fragments ranges from none to 15 percent in the solum.

The Ap horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 2. The B horizon has hue of 10YR to 5Y or N, value of 5 or 6, and chroma of 0 to 2 with mottles higher in chroma. It is silty clay or silty clay loam.

Carlisle series

The Carlisle series consists of deep, very poorly drained soils in depressions on the lake plain. These soils formed in accumulated organic material that is more than 51 inches thick over medium textured lacustrine sediment. Permeability is moderately rapid in the organic material and moderately slow in the lacustrine sediment. Slope is generally less than 2 percent.

Carlisle soils are similar to Adrian soils. Adrian soils formed in less than 51 inches of organic material over sandy mineral deposits.

Typical pedon of Carlisle muck, in an area of natural shrubs in the City of Mentor, 0.75 mile north of State Route 283, 0.5 mile west of Corduroy Road, 2,500 feet southeast of intersection of Forrest and Woodridge Roads, 125 yards from north edge of marsh, and 25 feet from Becker Trail:

Oa1—0 to 8 inches; black (N 2/0), broken face and rubbed, sapric material; no fiber rubbed; moderate fine granular structure; friable; many roots; neutral; abrupt smooth boundary.

Oa2—8 to 18 inches; black (10YR 2/1) sapric material; no fiber rubbed; weak fine subangular blocky structure; friable; few roots; neutral; abrupt smooth boundary.

Oa3—18 to 36 inches; dark reddish brown (5YR 3/3) broken face, dark reddish brown (5YR 2/2) rubbed, sapric material; about 20 percent fiber, 5 percent rubbed; massive; friable; few roots; about 10 percent wood fragments; neutral; clear smooth boundary.

Oa4—36 to 54 inches; dark reddish brown (5YR 3/3) broken face, dark reddish brown (5YR 2/2) rubbed, sapric material; about 15 percent fiber, 2 percent rubbed; massive; friable; 3 percent wood fragments; neutral; abrupt smooth boundary.

IICg—54 to 72 inches; gray (N 5/0) silt loam; massive; firm; laminated; dense; neutral.

The organic material is more than 51 inches thick. Reaction ranges from medium acid to neutral.

The surface tier has hue of 10YR or N, value of 2, and chroma of 0 to 2. The subsurface tier has hue of 10YR to 5YR, value of 2 or 3, and chroma of 1 to 3. Content of fibers is 0 to 15 percent, rubbed, in the organic material. The bottom tier is similar in color to the subsurface tier. The C horizon is neutral or mildly alkaline.

Colonie series

The Colonie series consists of deep, somewhat excessively drained, rapidly permeable soils on beach ridges. These soils formed in beach ridge deposits or wind-laid deposits that are dominantly fine sand. Slope ranges from 0 to 50 percent.

Colonie soils are commonly adjacent to Elnora soils and are similar to Otisville and Tyner soils. Elnora soils have low-chroma mottles above a depth of 40 inches. Otisville soils contain more than 35 percent gravel and more coarse sand between depths of 10 and 40 inches than Colonie soils. Tyner soils contain more coarse sand and do not have the lamellae that Colonie soils have.

Typical pedon of Colonie loamy fine sand, 2 to 6 percent slopes, in a meadow in Perry Township, about 1,875 feet east of Perry Park Road and 50 feet south of State Route 20:

A1—0 to 3 inches; dark grayish brown (10YR 4/2) loamy fine sand; single grained; loose; many fine roots; neutral; abrupt smooth boundary.

B1—3 to 11 inches; yellowish brown (10YR 5/6) fine sand; very weak medium and coarse subangular blocky structure; very friable; common fine roots; neutral; abrupt wavy boundary.

B21—11 to 20 inches; pale brown (10YR 6/3) fine sand; single grained; loose; neutral; gradual wavy boundary.

B22—20 to 65 inches; pale brown (10YR 6/3) fine sand; single grained; loose; few fine roots; thin (1/8 to 1/2 inch thick) wavy lamellae of dark brown (7.5YR 4/4) loamy sand; neutral; gradual wavy boundary.

C—65 to 80 inches; brown (10YR 4/3) fine sand; single grained; loose; neutral.

The solum ranges from 48 to 70 inches in thickness.

The Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 2 or 3. Unless limed, the Ap horizon ranges from strongly acid to slightly acid. The B horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. It is mainly loamy fine sand or fine sand. Below a depth of 20 to 30 inches, this horizon contains lamellae 1/8 to 1/2 inch thick. Where slopes are more than 6 percent, the pedon has fewer lamellae. The lamellae have hue of 7.5YR or 10YR, value of 4, and chroma of 3 or 4. The B and C horizons range from strongly acid to neutral.

Conneaut series

The Conneaut series consists of deep, poorly drained and somewhat poorly drained, slowly permeable soils on the lake plain. These soils formed in lacustrine sediment over glacial till. Slope ranges from 0 to 4 percent.

Conneaut soils are similar to Allis, Euclid, and Painesville soils. Allis soils have a finer textured B horizon and shale bedrock at a depth of 20 to 40 inches. Euclid soils formed in stream terrace deposits and have stratification in the profile. Conneaut soils have a more silty B horizon than Painesville soils.

Typical pedon of Conneaut silt loam, 0 to 1 percent slopes, in the City of Mentor, 1.25 miles south of the intersection of State Route 2 and Heisley Road, 30 yards south of Hendricks Road, and 50 yards west of Heisley Road:

Ap—0 to 9 inches; dark grayish brown (2.5Y 4/2) silt loam; strong coarse granular structure; firm; many fine roots; medium acid; abrupt smooth boundary.

B21g—9 to 21 inches; gray (10YR 5/1) silty clay loam; many medium prominent yellowish brown (10YR 5/8) and strong brown (N 5/0) mottles; moderate medium prismatic structure parting to strong coarse angular blocky; firm; many fine roots; common continuous gray (10YR 5/1) coatings on faces of peds; very dark brown (10YR 2/2) concretions; strongly acid; gradual wavy boundary.

IIB22g—21 to 27 inches; grayish brown (2.5Y 5/2) silty clay loam; many medium prominent yellowish brown (10YR 5/8) mottles; moderate coarse prismatic structure parting to moderate coarse angular blocky; firm; few fine roots; continuous gray (10YR 5/1) coatings on faces of peds; common fine very dark brown (10YR 2/2) concretions; 2 to 5 percent coarse fragments; slightly acid; gradual wavy boundary.

IIB23—27 to 32 inches; yellowish brown (10YR 5/4) silty clay loam; many medium prominent grayish brown (2.5Y 5/2) mottles; moderate coarse prismatic structure parting to moderate coarse angular blocky; firm; continuous gray (10YR 5/1) coatings on faces of peds; many fine very dark brown (10YR 2/2) concretions; 2 to 5 percent coarse fragments; slightly acid; gradual wavy boundary.

IIB3—32 to 54 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct gray (10YR 5/1) mottles; weak very coarse prismatic structure; firm; continuous gray (10YR 5/1) coatings on vertical faces of peds; common fine very dark brown (10YR 2/2) concretions; 2 to 5 percent coarse fragments; neutral; gradual wavy boundary.

IIC—54 to 60 inches; light olive brown (2.5Y 5/4) silty clay loam; common coarse prominent yellowish brown (10YR 5/8) mottles; moderate thick platy structure; firm; common vertical gray (N 5/0) seams; 2 to 5 percent coarse fragments; mildly alkaline; calcareous.

The solum ranges from 40 to 56 inches in thickness. The lacustrine deposits range from 16 to 36 inches in thickness. Depth to carbonates ranges from 45 to 80 inches.

The Ap horizon has hue of 10YR or 2.5Y, value of 4, and chroma of 1 or 2. Unplowed areas have an A1 horizon, 1 to 4 inches thick, and an A2 horizon, 3 to 6 inches thick. The A2 horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2. The A horizon ranges from very strongly acid to neutral. The B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 to 6. It is silt loam or silty clay loam. It is very strongly acid or strongly acid in the upper part and slightly acid or neutral in the lower part. The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. It is silty clay loam or silt loam. It is neutral to moderately alkaline.

Conotton series

The Conotton series consists of deep, somewhat excessively drained, rapidly permeable soils on outwash terraces. These soils formed in stratified sand and gravel. Slope ranges from 0 to 15 percent.

Conotton soils are similar to Oshtemo, Otisville, and Tyner soils. Oshtemo and Tyner soils contain less gravel in the B horizon. Otisville and Tyner soils have a coarser textured B horizon and do not have an argillic horizon.

Typical pedon of Conotton gravelly loam, 2 to 6 percent slopes, in a formerly cultivated field in Madison Village, 1 1/4 mile southwest of the center of the village of Madison, about 2,000 feet south of State Route 84, and about 3,000 feet east of Dayton Road:

Ap—0 to 10 inches; dark brown (7.5YR 4/2) gravelly loam; moderate medium and fine granular structure; very friable; many fine roots; 20 percent gravel; strongly acid; abrupt smooth boundary.

B1—10 to 17 inches; brown (7.5YR 5/4) gravelly loam; weak fine subangular blocky structure; friable; common fine roots; 20 percent gravel; medium acid; clear wavy boundary.

B21t—17 to 24 inches; brown (7.5YR 4/4) gravelly loam; massive; friable; few fine roots; thin patchy clay films coating gravel; about 35 percent gravel; medium acid; diffuse smooth boundary.

B22t—24 to 42 inches; brown (7.5YR 4/4) very gravelly clay loam; massive; friable; few fine roots; thin patchy clay films coating gravel and some bridging sand grains; 50 percent gravel; slightly acid; clear wavy boundary.

C—42 to 60 inches; brown (10YR 4/3) gravelly fine sand; single grained; loose; 30 percent gravel; mildly alkaline; weakly calcareous.

The solum ranges from 40 to 50 inches in thickness. Gravel content increases with depth from 10 to 20 percent by volume in the Ap horizon to 50 to 70 percent in the lower part of the B horizon and in the C horizon.

The Ap horizon has hue of 10YR or 7.5YR, value of 4, and chroma of 2 or 3. It is loam or gravelly loam. Unless limed, the A horizon ranges from very strongly acid to slightly acid. The B horizon has hue of 7.5YR, value of 4 or 5, and chroma of 3 to 5. It is gravelly or very gravelly sandy loam or loam and has subhorizons of gravelly or very gravelly clay loam. It is medium acid to very strongly acid in the upper part and medium acid to neutral in the lower part.

Darien series

The Darien series consists of deep, somewhat poorly drained, slowly permeable soils on uplands. These soils formed in loamy glacial till. Slope ranges from 0 to 12 percent.

Darien soils are similar to Mahoning, Mitiwanga, and Platea soils. Mahoning soils have a finer textured argillic horizon. Mitiwanga soils have bedrock at a depth of 20 to 40 inches. Platea soils have more silt in the argillic horizon and have a fragipan.

Typical pedon of Darien silt loam, 1 to 4 percent slopes, in a meadow in Leroy Township, 0.7 mile west of Leroy Center and 250 yards south of Leroy Center Road:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam; weak medium granular structure; friable; many fine roots; about 2 percent coarse fragments; slightly acid; abrupt smooth boundary.

B1—7 to 12 inches; yellowish brown (10YR 5/6) silt loam; many medium distinct light brownish gray (2.5Y 6/2) mottles; moderate medium and coarse subangular blocky structure; firm; common fine roots; thin patchy light brownish gray (2.5Y 6/2) coatings on faces of peds; about 2 percent coarse fragments; strongly acid; clear wavy boundary.

B21t—12 to 20 inches; brown (7.5YR 5/4) silty clay loam; many medium distinct grayish brown (10YR 5/2) mottles; moderate fine and medium subangular blocky structure; firm; common fine roots; thin patchy grayish brown (10YR 5/2) clay films on faces of peds; thin patchy light brownish gray (10YR 6/2) silt coatings; 5 percent coarse fragments; strongly acid; clear wavy boundary.

B22t—20 to 28 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct grayish brown (10YR 5/2) mottles; weak coarse prismatic structure parting to moderate medium and coarse subangular blocky; firm; common fine roots; thin patchy grayish brown (10YR 5/2) clay films on faces of peds; thin patchy gray (10YR 6/1) silt coatings on faces of peds; about 5 percent coarse fragments; strongly acid; clear wavy boundary.

B23t—28 to 40 inches; brown (7.5YR 5/4) silty clay loam; many medium distinct light brownish gray (10YR 6/2) mottles; weak coarse subangular blocky structure; firm; few fine roots; thin patchy grayish brown (10YR 5/2) clay films on ped surfaces; about 8 percent coarse fragments; strongly acid; clear wavy boundary.

C—40 to 45 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct light brownish gray (10YR 6/2) mottles; weak thick platy structure; firm; 10 percent shale fragments; slightly acid; clear smooth boundary.

IIR—45 inches; dark grayish brown (10YR 4/2) fractured shale and siltstone bedrock; slightly acid.

The depth to fractured shale and siltstone bedrock ranges from 40 to 60 inches. The solum ranges from 36 to 45 inches in thickness. Content of coarse fragments ranges from 2 to 10 percent by volume in the solum and from 10 to 20 percent in the C horizon.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2. It ranges from strongly acid to neutral. The B horizon has hue of 7.5YR to 2.5Y, value of 4 or 5, and chroma of 2 to 4. Mottles have chroma of 2 or less. Coatings on faces of peds have hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2. The B1 horizon is silty clay loam or silt loam, and the B2 horizon is silty clay loam or clay loam. The B horizon is strongly acid or medium acid. The C horizon is slightly acid to mildly alkaline.

Ellsworth series

The Ellsworth series consists of deep, moderately well drained, slowly permeable or very slowly permeable soils on glacial till plains. These soils formed in glacial till derived mainly from shale. Slope ranges from 2 to 70 percent.

Ellsworth soils are commonly adjacent to Mahoning soils and are similar to Glenford and Pierpont soils. Mahoning soils have dominantly low chroma on the surface of peds in the argillic horizon and have mottles immediately below the Ap horizon. Glenford and Pierpont soils have less clay in the argillic horizon. Glenford soils formed in glaciolacustrine deposits, and Pierpont soils have a fragipan.

Typical pedon of Ellsworth silt loam, 6 to 12 percent slopes, in a meadow in Kirtland Township, 2 miles east of the intersection of State Route 306 and U.S. Route 6, 1,250 feet east of Sperry Road, and 400 feet north of U.S. Route 6:

Ap1—0 to 2 inches; dark grayish brown (10YR 4/2) silt loam; moderate fine granular structure; friable; many fine roots; 2 to 5 percent coarse fragments; slightly acid; abrupt smooth boundary.

Ap2—2 to 8 inches; dark grayish brown (10YR 4/2) silt loam; weak medium subangular blocky structure; friable; many fine roots; 2 to 5 percent coarse fragments; slightly acid; abrupt smooth boundary.

B21t—8 to 15 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; firm; common fine roots; brown (10YR 5/3) coatings on faces of peds; pale brown (10YR 6/3) silt coatings and patchy thin clay films on faces of peds; 2 to 5 percent coarse fragments; strongly acid; clear wavy boundary.

B22t—15 to 30 inches; dark yellowish brown (10YR 4/4) heavy clay loam; common medium distinct light brownish gray (10YR 6/2) and common medium distinct yellowish brown (10YR 5/8) mottles; moderate coarse prismatic structure parting to weak coarse subangular blocky; firm; few fine roots; medium patchy grayish brown (10YR 5/2) clay films on vertical faces of peds; thin patchy brown (10YR 4/3) clay films on horizontal faces of peds; thin patchy pale brown (10YR 6/3) silt coatings on faces of peds; common very dark brown (10YR 2/2) iron and manganese stains in ped interiors; 2 to 5 percent coarse fragments; strongly acid; clear wavy boundary.

B3—30 to 42 inches; dark yellowish brown (10YR 4/4) clay loam; few medium distinct grayish brown (10YR 5/2) mottles; weak coarse prismatic structure parting to weak thick platy; firm; thin patchy grayish brown (10YR 5/2) clay films on vertical ped surfaces; common very dark brown (10YR 2/2) iron and manganese stains in ped interiors; 2 to 5 percent coarse fragments; neutral; clear wavy boundary.

C—42 to 60 inches; brown (10YR 4/3) clay loam; weak thick platy structure; firm; about 10 percent coarse fragments; slight effervescence; mildly alkaline.

The solum ranges from 30 to 46 inches in thickness. Depth to bedrock is more than 60 inches, except in bedrock substratum phases where bedrock is at a depth of 40 to 60 inches. Content of coarse fragments ranges from 2 to 10 percent in the solum.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It ranges from very strongly acid to neutral. The B horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 5. It is silty clay loam, clay loam, or clay. It is very strongly acid to slightly acid in the upper part and slightly acid to mildly alkaline in the lower part. The C horizon is silty clay loam or clay loam. It is neutral to moderately alkaline.

Elnora series

The Elnora series consists of deep, moderately well drained, moderately rapidly or rapidly permeable soils on beach ridges and offshore bars. These soils formed in water- or wind-deposited material. Slope ranges from 1 to 5 percent.

Elnora soils are commonly adjacent to Colonie, Kingsville, and Stafford soils. Colonie soils do not have low-chroma mottles above a depth of 40 inches. Kingsville and Stafford soils have chroma of 3 or less in the matrix of the B horizon above a depth of 20 inches. Kingsville soils also have a dark colored surface layer.

Typical pedon of Elnora loamy fine sand, 1 to 5 percent slopes, in a cultivated field in Madison Township, 0.5 mile north of State Route 20 and 300 yards east of Green Road:

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) loamy fine sand; weak fine granular structure; very friable; many fine roots; strongly acid; abrupt smooth boundary.

B1—5 to 14 inches; strong brown (7.5YR 5/6) loamy fine sand; weak coarse subangular blocky structure; very friable; many fine roots; medium acid; clear smooth boundary.

B21—14 to 24 inches; brownish yellow (10YR 6/6) loamy fine sand; common fine distinct strong brown (7.5YR 5/8) mottles; very weak coarse subangular blocky structure; very friable; common fine roots; medium acid; clear smooth boundary.

B22—24 to 32 inches; yellowish brown (10YR 5/6) loamy fine sand; common coarse distinct light brownish gray (2.5Y 6/2) and few medium distinct strong brown (7.5YR 5/8) mottles; single grained; very friable; medium acid; gradual smooth boundary.

C1g—32 to 50 inches; grayish brown (10YR 5/2) fine sand; single grained; loose; slightly acid; clear smooth boundary.

C2g—50 to 67 inches; dark gray (N 4/0) fine sand; single grained; loose; slightly acid.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It ranges from very strongly acid to slightly acid. The B horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 4 to 6. It has mottles below a depth of 12 to 30 inches. The B horizon is loamy fine sand or fine sand. It ranges from very strongly acid to slightly acid. The C horizon has hue of 10YR, 2.5Y, or N; value of 4 to 5; and chroma of 0 to 2. It is strongly acid to neutral.

Euclid series

The Euclid series consists of deep, somewhat poorly drained, moderately slowly permeable soils on low terraces. These soils formed in stratified stream terrace deposits. Slope ranges from 0 to 2 percent.

Euclid soils are similar to Conneaut, Fitchville, Minoa, and Orrville soils. Conneaut soils contain more coarse fragments and do not have the stratification that Euclid soils have. Fitchville soils have an argillic horizon. Minoa soils have a coarser textured solum. Orrville soils contain more sand and less silt in the B horizon and have an irregular distribution of organic matter with depth.

Typical pedon of Euclid silt loam, 0 to 2 percent slopes, in an area of natural shrubs in Willoughby Village, 3 miles south of Willoughby, 0.7 miles south of Eagle Road, and 500 feet east of Dodd Road:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium and coarse granular structure; friable; many fine roots; very strongly acid; abrupt smooth boundary.

B1—8 to 13 inches; yellowish brown (10YR 5/4) silt loam; many coarse distinct gray (5Y 6/1) and common medium distinct strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; firm; many fine roots; medium continuous gray (5Y 6/1) coatings on faces of peds; few fine dark brown (10YR 4/3) concretions; very strongly acid; clear smooth boundary.

B21—13 to 18 inches; yellowish brown (10YR 5/4) silt loam; many coarse distinct gray (5Y 6/1) and common medium distinct strong brown (7.5YR 5/6) mottles; weak coarse prismatic structure parting to weak coarse subangular blocky; firm; common fine roots; thin continuous gray (5Y 6/1) coatings on faces of peds; few fine dark brown (10YR 4/3) concretions; strongly acid; clear smooth boundary.

B22—18 to 30 inches; dark yellowish brown (10YR 4/4) silt loam; many coarse distinct gray (5Y 5/1) and common medium distinct dark brown (7.5YR 4/4) mottles; weak coarse prismatic structure parting to weak coarse subangular blocky; firm; common fine roots; many fine vesicular voids in peds; thick gray (5Y 5/1) coatings on faces of peds; common medium black (10YR 2/1) stains; few coarse dark brown (10YR 4/3) concretions; strongly acid; gradual smooth boundary.

B3—30 to 40 inches; dark brown (10YR 4/3) silt loam; common coarse distinct gray (5Y 6/1) and few medium distinct strong brown (7.5YR 5/6) mottles; weak coarse prismatic structure; firm; many fine vesicular voids on surfaces of peds; few fine roots; gray (5Y 6/1) coatings on faces of peds; strongly acid; abrupt smooth boundary.

IIC1—40 to 46 inches; gray (10YR 5/1) fine sandy loam; common medium distinct dark yellowish brown (10YR 4/4) mottles; massive; friable; strongly acid; abrupt smooth boundary.

IIIC2—46 to 56 inches; brown (10YR 4/3) silt loam; common fine distinct gray (5Y 5/1) and few fine distinct strong brown (7.5YR 5/6) mottles; massive; firm; few fine vesicular voids; few vertical gray (5Y 5/1) seams; few shale fragments at a depth of 50 inches; strongly acid; abrupt smooth boundary.

IVC3—56 to 60 inches; gray (10YR 5/1) fine sandy loam; single grained; loose; medium acid.

The solum ranges from 35 to 50 inches in thickness. Reaction ranges from very strongly acid to medium acid in the solum and from strongly acid to slightly acid in the C horizon.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. The B horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Silt coatings that have hue of 2.5Y or 5Y, value of 5 or 6, and chroma of 1 or 2 are common on faces of peds. The B horizon is silty clay loam or silt loam. The C horizon is dominantly stratified silt loam and loam but includes thin strata of fine sandy loam.

Fitchville series

The Fitchville series consists of deep, somewhat poorly drained, moderately slowly permeable soils on old lake beds. These soils formed in silty lacustrine deposits. Slope ranges from 1 to 4 percent.

Fitchville soils are commonly adjacent to Glenford soils and are similar to Euclid and Platea soils. Glenford soils do not have low-chroma coatings on surfaces of peds in the argillic horizon. Euclid soils formed in stratified stream terrace deposits and do not have an argillic horizon. Platea soils have a fragipan and formed in glacial till.

Typical pedon of Fitchville silt loam, 1 to 4 percent slopes, in a cultivated field in Concord Township, 1.5 miles south of Painesville, 0.4 mile west of Ravenna Road on State Route 84, and 500 feet south of State Route 84:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

B1—8 to 16 inches; yellowish brown (10YR 5/4) silt loam; many coarse light brownish gray (2.5Y 6/2) and common medium yellowish brown (10YR 5/8) mottles; strong coarse subangular blocky structure; firm; common fine roots; thin very patchy light yellowish brown (10YR 6/4) clay films in depressions and pores; continuous light brownish gray (2.5Y 6/2) coatings on faces of peds; few iron and manganese stains; very strongly acid; clear wavy boundary.

B21tg—16 to 28 inches; yellowish brown (10YR 5/4) silt loam; many coarse distinct light brownish gray (2.5Y 6/2) and common coarse faint light olive brown (2.5Y 5/4) and yellowish brown (10YR 5/8) mottles; weak coarse prismatic structure parting to weak coarse subangular blocky; firm; common fine roots; thin very patchy yellowish brown (10YR 5/6) clay films in pores and in few fine root channels and depressions; grayish brown (2.5Y 6/2) coatings on faces of peds; few iron and manganese stains; very strongly acid; clear smooth boundary.

B22tg—28 to 46 inches; light olive brown (2.5Y 5/4) silt loam; many medium distinct light brownish gray (2.5Y 6/2) mottles; weak coarse prismatic structure parting to weak thick platy; firm; grayish brown (2.5Y 5/2) coatings on ped surfaces; few fine roots; very patchy yellowish brown (10YR 5/6) clay films in pores, depressions, and fine root channels; very strongly acid; gradual smooth boundary.

B3g—46 to 52 inches; light olive brown (2.5Y 5/4) silt loam; common coarse distinct light brownish gray (2.5Y 6/2) and yellowish brown (10YR 5/8) mottles; moderate thick platy structure; firm; thin very patchy yellowish brown (10YR 5/6) clay films mainly along few fine root channels; very strongly acid; clear wavy boundary.

C—52 to 60 inches; light olive brown (2.5Y 5/4) silt loam; few coarse distinct light brownish gray (2.5Y 5/2) and common coarse distinct yellowish brown (10YR 5/8) mottles; massive; firm; occasional thin lenses of silty clay loam; few iron and manganese stains; medium acid.

The solum ranges from 36 to 60 inches in thickness.

The Ap horizon has hue of 10YR or 2.5Y, value of 4, and chroma of 2. Unless limed, it ranges from very strongly acid to medium acid. The B2 horizon has hue of 7.5YR to 2.5Y and value and chroma of 4 to 6. It is silt loam or silty clay loam. It is very strongly acid to medium acid. The C horizon is mainly silt loam, but is stratified or laminated with thin lenses of very fine sand or silty clay loam. It is slightly acid to mildly alkaline.

Glenford series

The Glenford series consists of deep, moderately well drained, moderately slowly permeable soils on terrace remnants adjacent to the uplands. These soils formed in medium textured and moderately coarse textured glaciolacustrine deposits. Slope ranges from 0 to 6 percent.

Glenford soils are commonly adjacent to Fitchville soils and are similar to Ellsworth and Pierpont soils. Fitchville soils have dominantly low chroma on the surface of peds in the argillic horizon. Ellsworth and Pierpont soils formed in glacial till. Ellsworth soils have a finer textured argillic horizon, and Pierpont soils have a fragipan.

Typical pedon of Glenford silt loam, 2 to 6 percent slopes, in a pasture in Concord Township, 1.5 miles south of Painesville, 0.4 mile west of Ravenna Road, and 1,100 feet south of State Route 84:

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam; moderate medium granular structure; friable; many fine roots; medium acid; abrupt smooth boundary.

B&A—8 to 14 inches; yellowish brown (10YR 5/4) silt loam (B2t); common dark brown (10YR 4/3) mottles; moderate medium subangular blocky structure; firm; common fine roots; 10 to 15 percent pale brown (10YR 6/3) coatings (A2) on faces of peds; strongly acid; gradual smooth boundary.

B21t—14 to 27 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct light brownish gray (10YR 6/2) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; faces of peds coated dark brown (10YR 4/3); thin very patchy clay films mainly on faces of peds; very strongly acid; clear smooth boundary.

B22t—27 to 39 inches; light olive brown (2.5Y 5/4) silt loam; many coarse distinct yellowish brown (10YR 5/8) and common medium distinct light brownish gray (10YR 6/2) mottles; weak coarse prismatic structure parting to weak thick platy; firm; vertical faces of peds coated dark brown (10YR 4/3); thin very patchy clay films mainly on vertical faces of peds; very strongly acid; clear smooth boundary.

B3—39 to 53 inches; light olive brown (2.5Y 5/4) silt loam; many coarse distinct yellowish brown (10YR 5/8) and common coarse distinct light brownish gray (10YR 6/2) mottles; weak very coarse prismatic structure parting to weak medium platy; firm; strongly acid; gradual smooth boundary.

C—53 to 60 inches; light olive brown (2.5Y 5/4) silt loam; common coarse distinct yellowish brown (10YR 5/8) mottles; weak medium platy structure; friable; medium acid.

The solum ranges from 36 to 60 inches in thickness.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. It ranges from very strongly acid to neutral. The B horizon has hue of 10YR and 2.5Y, value of 4 or 5, and chroma of 3 to 6. It is silt loam or silty clay loam. It ranges from very strongly acid to medium acid. The C horizon is made up of stratified layers that range from silt loam to fine sandy loam with thin strata of sandy loam. It is medium acid to mildly alkaline.

Gosport series

The Gosport series consists of moderately deep, well drained, slowly permeable soils on side slopes in dissected areas along streams. These soils formed in residuum of thin-bedded shale and siltstone. Slope ranges from 25 to 70 percent.

Gosport soils are similar to Ellsworth and Lordstown soils. Ellsworth soils do not have shale bedrock above a depth of 40 inches. Lordstown soils contain less clay in the B horizon and are underlain by sandstone bedrock rather than by shale.

Typical pedon of Gosport silty clay loam, 25 to 70 percent slopes, in a wooded area in Madison Township, 1 3/4 miles northeast of South Madison and 2,600 feet north of Ross Road at north end of Chapin Road, Boy Scout Camp:

A1—0 to 2 inches; very dark brown (10YR 2/2) silty clay loam; moderate medium granular structure; friable; many fine roots; very strongly acid; clear wavy boundary.

B1—2 to 6 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine and medium subangular blocky structure; friable; common fine roots; very dark grayish brown (10YR 3/2) patchy organic stains on faces of peds; about 2 percent shale fragments; extremely acid; clear smooth boundary.

B21—6 to 15 inches; yellowish brown (10YR 5/4) silty clay loam; few medium faint yellowish brown (10YR 5/6 and 5/8) mottles; moderate medium subangular blocky structure; firm; common fine roots; thin patchy pale brown (10YR 6/3) silt coatings on faces of peds; about 2 percent shale fragments; very strongly acid; clear smooth boundary.

B22—15 to 22 inches; yellowish brown (10YR 5/4) heavy silty clay loam; weak medium subangular blocky structure; firm; common fine roots; thin patchy brown (10YR 5/3) silt coatings on faces of peds; 15 percent shale fragments; very strongly acid; clear wavy boundary.

B3—22 to 27 inches; olive brown (2.5Y 4/4) heavy silty clay loam; common medium distinct gray (5Y 5/1) mottles; weak coarse subangular blocky structure; firm; few fine roots; thin continuous pale olive (5Y 6/3) and olive (5Y 5/3) coatings on faces of peds; 10 percent shale fragments; very strongly acid; gradual wavy boundary.

C—27 to 32 inches; olive brown (2.5Y 4/4) shaly heavy silty clay loam; few medium distinct yellowish brown (10YR 5/6) and common medium distinct gray (5Y 5/1) mottles; massive with platiness inherited from the shale bedrock; firm; 30 percent shale fragments; very strongly acid; abrupt smooth boundary.

Cr—32 inches; thin bedded shale bedrock.

The solum ranges from 20 to 36 inches in thickness. Depth to shale bedrock is 20 to 40 inches. Content of coarse fragments of shale or siltstone ranges from 0 to 25 percent by volume in the solum through the B2 horizon and from 5 to 50 percent in the B3 and C horizons. Where the soil has not been limed, reaction ranges from strongly acid to extremely acid in the solum.

The A1 horizon has hue of 10YR, value of 2 to 4, and chroma of 1 or 2. The B horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 3 or 4. Texture of the fine earth is silty clay loam or silty clay. The C horizon has hue of 2.5Y or 5Y, value of 4 or 5, and chroma of 1 to 4. Texture of the fine earth is silty clay loam or silty clay.

Granby series

The Granby series consists of deep, very poorly drained, rapidly permeable soils on lake plains. These soils formed in sandy glaciofluvial deposits. Slope ranges from 0 to 2 percent.

Granby soils in this county have more coarse sand and gravel in the solum and are more acid in the A horizon and upper part of the B horizon than the defined range for the series. These differences do not alter the usefulness or behavior of the soils.

Granby soils are similar to Kingsville and Swanton soils and are commonly adjacent to these soils. Kingsville and Swanton soils do not have a mollic epipedon. Kingsville soils also contain fewer fines than the Granby soils. Swanton soils are finer textured in the upper part of the B horizon and they have contrasting fine textured and moderately fine textured sediment in the lower part of the soils.

Typical pedon of Granby sandy loam in a cultivated field in Perry Village, about 1,200 feet south of Narrows Road, 1,300 feet southwest of the intersection of Narrows Road and Center Road, and 2,200 feet north of the Penn Central railroad tracks:

Ap—0 to 12 inches; black (10YR 2/1) sandy loam; moderate medium granular structure; friable; 10 percent gravel; many fine roots; strongly acid; abrupt smooth boundary.

B21g—12 to 16 inches; gray (5Y 5/1) gravelly coarse sandy loam; massive; very friable; 20 percent gravel; common fine roots; strongly acid; abrupt smooth boundary.

B22g—16 to 32 inches; gray (5Y 5/1) gravelly loamy coarse sand; single grained; loose; 30 percent gravel; medium acid; clear smooth boundary.

C1g—32 to 40 inches; olive gray (5Y 5/2) sand; single grained; loose; 5 percent gravel; slightly acid; clear smooth boundary.

C2g—40 to 60 inches; olive gray (5Y 5/2) fine sand; single grained; loose; neutral, mildly alkaline at a depth of 48 inches.

The solum ranges from 30 to 40 inches in thickness.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It ranges from 10 to 14 inches in thickness. Unless limed, it is medium acid or strongly acid. The B horizon has hue of 10YR to 5Y or N, value of 4 to 6, and chroma of 0 to 2. It is gravelly loamy coarse sand, loamy sand, or sand with individual subhorizons of gravelly coarse sandy loam or sandy loam in the upper part. The B horizon is medium acid or strongly acid. The C horizon has hue of 10YR to 5Y, value of 5 or 6, and chroma of 1 to 4. It is sand, fine sand, or loamy sand. It ranges from medium acid to mildly alkaline.

Kingsville series

The Kingsville series consists of deep, very poorly drained, rapidly permeable soils on low beach ridges. These soils formed in lake-laid deposits. Slope ranges from 0 to 2 percent.

Kingsville soils are commonly adjacent to Elnora, Granby, Stafford, and Swanton soils. Elnora soils have higher chroma in the matrix between the A1 or Ap horizon and a depth of 20 inches. Granby soils have a mollic epipedon and contain more fines in the solum. Stafford soils do not have a dark colored surface layer. Swanton soils are finer textured in the upper part of the B horizon and have contrasting fine textured and moderately fine textured lacustrine sediment in the lower part of the soils.

Typical pedon of Kingsville fine sand in a cultivated field in Madison Township, 2.6 miles northwest of the village of Madison, 1.8 miles west of State Route 528, 300 yards north of U.S. Route 20, and 100 yards east of Haines Road:

Ap—0 to 8 inches; very dark gray (10YR 3/1) fine sand; moderate fine granular structure; very friable; many fine roots; medium acid; abrupt smooth boundary.

B2g—8 to 30 inches; grayish brown (2.5Y 5/2) fine sand; common medium and coarse distinct yellowish brown (10YR 5/4 and 5/6) mottles; single grained; very friable; common fine roots; medium acid; diffuse wavy boundary.

C1G—30 to 42 inches; grayish brown (2.5Y 5/2) sand; single grained; loose; slightly acid; gradual smooth boundary.

C2g—42 to 60 inches; gray (N 5/0) sand; single grained; loose; slightly acid.

The solum ranges from 24 to 40 inches in thickness. It is typically free of coarse fragments, but they occur in some pedons in unconforming layers 1 to 2 inches thick.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1. Unless limed, it is strongly acid or very strongly acid. The B horizon has hue of 10YR to 5Y or N, value of 4 to 6, and chroma of 0 to 2 with mottles higher in chroma. The B horizon is fine sand, loamy fine sand, or sand. It ranges from very strongly acid to slightly acid. The C horizon is fine sand, sand, or loamy fine sand. It is medium acid or slightly acid.

Lobdell series

The Lobdell series consists of deep, moderately well drained, moderately or moderately rapidly permeable soils on flood plains. These soils formed in recent alluvial material. Slope ranges from 0 to 2 percent.

Lobdell soils are commonly adjacent to Orrville and Tioga soils. Orrville soils have a horizon with dominantly low chroma between the Ap horizon and a depth of 30 inches. Tioga soils do not have low-chroma mottles above a depth of 24 inches.

Typical pedon of Lobdell silt loam in an area of natural shrubs in the City of Willoughby, 1,000 feet north of U.S. Route 20 and 750 feet east of Chagrin River, between Penn Central and Norfolk and Western Railroad tracks:

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam; weak medium and coarse granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

B21—10 to 20 inches; yellowish brown (10YR 5/4) silt loam; weak coarse subangular blocky structure; friable; common fine roots; patchy very dark grayish brown (10YR 3/2) coatings on faces of peds; slightly acid; abrupt wavy boundary.

B22—20 to 36 inches; yellowish brown (10YR 5/4) silt loam; many coarse prominent light brownish gray (2.5Y 6/2) mottles; weak coarse subangular blocky structure; friable; few fine roots; slightly acid; gradual smooth boundary.

C1g—36 to 42 inches; light brownish gray (2.5Y 6/2) silt loam; many coarse prominent yellowish brown (10YR 5/6) mottles; massive; friable; neutral; gradual smooth boundary.

C2g—42 to 96 inches; light brownish gray (2.5Y 6/2) silt loam; many coarse prominent yellowish brown (10YR 5/4) and common fine prominent dark brown (7.5YR 4/4) mottles; massive; friable; neutral; abrupt wavy boundary.

The solum ranges from 24 to 50 inches in thickness.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. It is strongly acid to neutral. In undisturbed areas the A1 horizon is 1 to 5 inches thick. The B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. Thin subhorizons in some pedons have value of 2 or 3 and chroma of 2. The B horizon is loam, silt loam, or silty clay loam. It ranges from strongly acid to neutral. The C horizon has hue of 10YR to 2.5Y, value of 4 to 6, and chroma of 1 to 4. It is stratified and nonstratified loam, silt loam, sandy loam, or loamy sand. The C horizon ranges from medium acid to neutral.

Lordstown series

The Lordstown series consists of moderately deep, well drained, moderately permeable soils on bedrock-controlled landforms on uplands. These soils formed in a mixture of glacial till and material weathered from bedrock. Slope ranges from 2 to 70 percent.

Lordstown soils are similar to Gosport and Ellsworth soils. Ellsworth soils have an argillic horizon and do not have bedrock above a depth of 40 inches. Gosport soils have finer textured horizons and are underlain by shale bedrock.

Typical pedon of Lordstown channery silt loam, 2 to 6 percent slopes, in a wooded area in Concord Township, 6 miles south of Painesville, 30 yards south of Pinecrest Road, and 30 yards southeast of Morley Road:

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) channery silt loam; moderate fine granular structure; friable; many fine roots; 20

percent coarse fragments; very strongly acid; abrupt smooth boundary.

B1—4 to 7 inches; yellowish brown (10YR 5/4) channery silt loam; weak fine subangular blocky structure; friable; many fine roots; 20 percent coarse fragments; very strongly acid; clear wavy boundary.

B21—7 to 13 inches; yellowish brown (10YR 5/4) channery loam; weak fine and medium subangular blocky structure; friable; many fine roots; 25 percent coarse fragments; very strongly acid; clear wavy boundary.

B22—13 to 20 inches; yellowish brown (10YR 5/6) channery loam; weak medium and coarse subangular blocky structure; friable; common fine roots; 30 percent coarse fragments; very strongly acid; clear wavy boundary.

IIC—20 to 24 inches; brown (10YR 5/3) channery fine sandy loam; massive; friable; common fine roots; 20 percent coarse fragments; strongly acid; abrupt smooth boundary.

IIR—24 inches; sandstone bedrock.

Depth to bedrock ranges from 20 to 30 inches. Content of coarse fragments ranges from 15 to 30 percent, by volume, in the solum. Where the soil has not been limed, reaction is very strongly acid or strongly acid in the solum.

The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2. It ranges from 2 to 4 inches in thickness. The B horizon has hue of 10YR, value of 5, and chroma of 4 to 6. Texture of the fine earth is loam, silt loam, or very fine sandy loam.

Mahoning series

The Mahoning series consists of deep, somewhat poorly drained, slowly or very slowly permeable soils on glacial till plains. These soils formed in glacial till derived mainly from shale. Slope ranges from 0 to 6 percent.

Mahoning soils are similar to Darien, Mitiwanga, and Platea soils and are commonly adjacent to these soils and Ellsworth soils. Darien, Mitiwanga, and Platea soils have less clay in the argillic horizon. Platea soils have a fragipan, and Mitiwanga soils have bedrock at a depth of 20 to 40 inches. Ellsworth soils do not have mottles immediately below the Ap horizon or low-chroma coatings on surfaces of peds in the argillic horizon.

Typical pedon of Mahoning silt loam, 2 to 6 percent slopes, in a formerly cultivated field in Kirtland Township, 3.5 miles southeast of Kirtland Village and 100 feet west of the intersection of Kirtland-Chardon Road and Sperry Road:

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure; friable; many fine roots; 2 percent coarse fragments; medium acid; abrupt smooth boundary.

B&A—10 to 12 inches; yellowish brown (10YR 5/4) heavy silt loam (B2t); many medium distinct light brownish gray (2.5Y 6/2) and yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; common fine roots; 10 to 15 percent light brownish gray (2.5Y 6/2) and pale brown (10YR 6/3) coatings (A2) on faces of peds; 2 percent coarse fragments; very strongly acid; abrupt smooth boundary.

B21t—12 to 15 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct light brownish gray (10YR 6/2) and few gray (5Y 6/1) mottles; moderate coarse subangular blocky structure; firm; common fine roots; light brownish gray (2.5Y 6/2) coatings on faces of peds; thin patchy clay films; 2 percent coarse fragments; very strongly acid; clear smooth boundary.

B22t—15 to 22 inches; dark brown (10YR 4/3) silty clay loam; common medium distinct light brownish gray (10YR 6/2) mottles; moderate coarse subangular blocky structure; firm; common fine roots; light brownish gray (2.5Y 6/2) coatings on faces of peds; thin patchy grayish brown (2.5Y 5/2) clay films; 2 percent coarse fragments; very strongly acid; clear smooth boundary.

B23t—22 to 32 inches; dark brown (10YR 4/3) silty clay loam; common medium distinct grayish brown (2.5Y 5/2) and common distinct yellowish brown (10YR 5/8) mottles; moderate coarse prismatic structure parting to weak coarse subangular blocky; firm; few fine roots; faces of peds coated grayish brown (2.5Y 5/2); thin patchy clay films on faces of peds; common very dark brown (10YR 2/2) stains; 2 or 3 percent coarse fragments; strongly acid; gradual wavy boundary.

B3—32 to 41 inches; dark brown (10YR 4/3) silty clay loam; weak coarse prismatic structure; firm; vertical faces of peds coated grayish brown (2.5Y 5/2); very patchy clay films on vertical faces of peds; common very dark brown (10YR 2/2) stains; 3 or 4 percent coarse fragments; slightly acid; gradual wavy boundary.

C1—41 to 45 inches; dark brown (10YR 4/3) silty clay loam; weak thick platy structure; firm; common light brownish gray (2.5Y 6/2) vertical fractures; 3 or 4 percent shale and siltstone fragments; slight effervescence; mildly alkaline; gradual wavy boundary.

C2—45 to 72 inches; brown (10YR 5/3) silty clay loam; massive; firm; 3 or 4 percent shale and siltstone fragments; strong effervescence; moderately alkaline.

The solum ranges from 36 to 44 inches in thickness. Depth to bedrock is more than 60 inches, except in a bedrock substratum phase where bedrock is at a depth of 40 to 60 inches. Content of coarse fragments ranges from 2 to 10 percent throughout.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. Unless limed, it is strongly acid or very strongly acid. The B horizon has hue of 10YR, value of 4 to 6, and chroma of 3 or 4. It is silty clay loam or clay. The B horizon is strongly acid or very strongly acid in the upper part and medium acid to mildly alkaline in the lower part. The C horizon is silty clay loam or clay loam.

Minoa series

The Minoa series consists of deep, somewhat poorly drained, moderately permeable soils on the lake plain. These soils formed in water-sorted sediment. Slope ranges from 0 to 2 percent.

Minoa soils are similar to Euclid, Fitchville, Orrville, and Stafford soils. Euclid, Fitchville, and Orrville soils have a finer textured solum than Minoa soils. Fitchville soils also have an argillic horizon. Orrville soils are subject to flooding and have an irregular decrease in organic matter content with depth. Stafford soils contain more fine sand and less silt in the B horizon.

Typical pedon of Minoa fine sandy loam in a cultivated field in Perry Township, North Perry Village, 2,100 feet south of Lake Erie, 1,800 feet south of Lockwood Road, and 200 feet east of Center Road:

Ap—0 to 12 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak coarse granular structure; friable; many fine roots; small specks of yellowish brown (10YR 5/4) B horizon; slightly acid; abrupt smooth boundary.

B1—12 to 20 inches; yellowish brown (10YR 5/4) loam; common medium distinct light brownish gray (2.5Y 6/2) and common medium distinct yellowish brown (10YR 5/8) mottles; weak medium prismatic structure parting to weak coarse subangular blocky; firm; few fine roots; faces of peds coated pale brown (10YR 6/3); common very dark brown (10YR 2/2) stains; slightly acid; clear wavy boundary.

B21—20 to 30 inches; yellowish brown (10YR 5/4) loam; common medium distinct light brownish gray (2.5Y 6/2) and common medium faint yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure parting to weak coarse subangular blocky; very firm; vertical faces of peds coated light brownish gray (2.5Y 6/2); few very dark brown (10YR 2/2) stains; slightly acid; gradual wavy boundary.

B22—30 to 42 inches; yellowish brown (10YR 5/4) loam; common medium prominent gray (5Y 5/1) mottles; weak coarse prismatic structure parting to weak coarse subangular blocky; firm; vertical faces of peds coated light brownish gray (2.5Y 6/2) and grayish brown (2.5Y 5/2); neutral; gradual wavy boundary.

B3—42 to 52 inches; yellowish brown (10YR 5/4) loam; common medium prominent gray (5Y 5/1) and common medium distinct yellowish brown (10YR 5/8) mottles; weak coarse prismatic structure parting to weak medium platy; firm; vertical faces of peds coated light brownish gray (2.5Y 6/2) and grayish brown (10YR 5/2); common tubular-shaped yellowish brown (10YR 5/8) iron concretions; neutral; gradual wavy boundary.

C—52 to 60 inches; brown (10YR 5/3) loam; common medium distinct gray (5Y 5/1) and common coarse strong brown (7.5YR 5/8) mottles; weak medium platy structure; firm; neutral.

The solum ranges from 36 to 60 inches in thickness.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. It is strongly acid to neutral. The B horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is loam or fine sandy loam. It ranges from strongly acid to neutral. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 4. It is stratified very fine sandy loam, loam, or silt loam in most pedons. It is neutral or mildly alkaline.

Mitiwanga series

The Mitiwanga series consists of moderately deep, somewhat poorly drained, moderately permeable soils on bedrock-controlled landforms on uplands. These soils formed in a mixture of glacial till and material weathered from bedrock. Slope ranges from 0 to 2 percent.

Mitiwanga soils in this county are more acid in the B horizon and have a lower base saturation than the defined range for this series. These differences do not alter the usefulness or behavior of the soils.

Mitiwanga soils are similar to Darien, Mahoning, and Platea soils and are commonly adjacent to these soils. Darien, Mahoning, and Platea soils do not have bedrock above a depth of 40 inches. Mahoning soils have a finer textured argillic horizon than Mitiwanga soils. Platea soils have a fragipan, and they contain more silt and less sand in the argillic horizon.

Typical pedon of Mitiwanga silt loam, 0 to 2 percent slopes, in a wooded area in Concord Township, 5 miles south of Painesville, 0.38 mile east of Morley Road, and 170 yards north of Pinecrest Road:

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) silt loam; moderate fine and medium granular structure; very friable; many fine roots; about 3 percent coarse fragments; very strongly acid; abrupt smooth boundary.

A2—4 to 8 inches; light yellowish brown (10YR 6/4) silt loam; weak medium platy structure; friable; many fine roots; thin very patchy very dark grayish brown (10YR 3/2) coatings on faces of peds; common medium yellowish red (5YR 5/6) stains; about 3 percent coarse fragments; very strongly acid; clear wavy boundary.

B1—8 to 13 inches; light olive brown (2.5Y 5/4) heavy silt loam; common fine distinct light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; friable common fine roots; thin very patchy very dark grayish brown (10YR 3/2) coatings on faces of peds; about 3 percent coarse fragments; very strongly acid; clear wavy boundary.

B21—13 to 17 inches; light olive brown (2.5Y 5/4) clay loam; many medium distinct brownish yellow (10YR 6/6) and common medium distinct light brownish gray (10YR 6/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; faces of peds coated grayish brown (2.5Y 5/2); thin very patchy clay films on faces of peds; about 3 percent coarse fragments; very strongly acid; gradual wavy boundary.

B22t—17 to 22 inches; light olive brown (2.5Y 5/4) clay loam; many medium distinct brownish yellow (10YR 6/6) and common medium distinct light brownish gray (10YR 6/2) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; faces of peds coated grayish brown (2.5Y 5/2); thin continuous clay films on vertical faces of peds and patchy thin clay films on horizontal faces of peds; about 3 percent coarse fragments; very strongly acid; clear wavy boundary.

IIB3t—22 to 28 inches; brown (10YR 5/3) channery loam; many medium prominent strong brown (7.5YR 5/8) and common medium distinct light brownish gray (10YR 6/2) mottles; weak coarse subangular blocky structure; firm; few fine roots; vertical faces of peds coated grayish brown (2.5Y 5/2); thin patchy clay films on vertical faces of peds; 15 percent coarse fragments; very strongly acid; clear wavy boundary.

IIC—28 to 35 inches; strong brown (7.5YR 5/6) channery sandy loam; massive; friable; 25 percent coarse fragments; very strongly acid; abrupt smooth boundary.

IIIR—35 inches; sandstone bedrock.

Depth to sandstone bedrock ranges from 20 to 40 inches. Where the soil has not been limed, reaction is very strongly acid or strongly acid in the solum.

The Ap horizon in cultivated areas has hue of 10YR, value of 4 or 5, and chroma of 2. It is very strongly acid to slightly acid. The B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. It is clay loam, silty clay loam, silt loam, or channery loam. The B horizon is very strongly acid or strongly acid. Some pedons do not have a C horizon. If present, the C horizon is channery sandy loam or channery loam. It is very strongly acid or strongly acid.

Orrville series

The Orrville series consists of deep, somewhat poorly drained, moderately permeable soils on flood plains. These soils formed in recently deposited alluvial material. Slope ranges from 0 to 2 percent.

Orrville soils are similar to Euclid and Minoa soils and are commonly adjacent to Lobdell and Tioga soils. Euclid and Minoa soils have a regular decrease in organic matter content with depth. Euclid soils are also more silty and less frequently flooded than Orrville soils. Minoa soils have a coarser textured solum and are not subject to flooding. Lobdell soils do not have horizons with dominantly low chroma between the Ap horizon and a depth of 24 inches. Tioga soils do not have low chroma in the B horizon above a depth of 24 inches.

Typical pedon of Orrville silt loam in a wooded area in Concord Township, 3 miles south of Painesville, and 0.4 mile north of the intersection of Auburn and Prouty Roads:

A1—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium and coarse granular structure; very friable; many fine roots; common medium distinct very dark gray (10YR 3/1) stains; about 8 percent coarse fragments; medium acid; clear wavy boundary.

B1g—7 to 18 inches; grayish brown (2.5Y 5/2) silt loam; common medium distinct reddish brown (5YR 4/4) mottles; moderate medium and coarse subangular blocky structure; friable; common fine roots; common medium distinct very dark gray (10YR 3/1) stains; about 8 percent coarse fragments; medium acid; clear wavy boundary.

B2—18 to 28 inches; brown (10YR 5/3) gravelly loam; many medium distinct gray (10YR 5/1) mottles; weak coarse subangular blocky structure; friable; few fine roots; 30 percent coarse fragments; medium acid; abrupt wavy boundary.

C1g—28 to 47 inches; gray (5Y 5/1) silt loam; many medium distinct strong brown (7.5YR 5/8) mottles; massive; friable; about 3 percent coarse fragments; slightly acid; abrupt smooth boundary.

C2—47 to 51 inches; brown (10YR 5/3) gravelly loam; common medium distinct grayish brown (2.5Y 5/2) mottles; massive; friable; 20 percent coarse fragments; slightly acid; abrupt smooth boundary.

C3g—51 to 62 inches; gray (5Y 5/1) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; massive; friable; slightly acid.

The solum ranges from 24 to 50 inches in thickness. Reaction is strongly acid to slightly acid.

The A1 or Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2. The B horizon has hue of 2.5Y or 10YR, value of 4 to 6, and chroma of 1 to 4. It is loam, silt loam, or gravelly loam. The C horizon is stratified and nonstratified silt loam, gravelly loam, sandy loam, or loamy sand. It is strongly acid to neutral.

Oshtemo series

The Oshtemo series consists of deep, well drained soils on outwash plains. These soils formed in loamy and sandy glaciofluvial deposits. Permeability is moderately rapid in the upper part of the solum and very rapid in the substratum. Slope ranges from 0 to 6 percent.

Oshtemo soils are similar to Conotton, Otisville, and Tyner soils and are commonly adjacent to Tyner soils. Conotton and Otisville soils contain more gravel. Otisville and Tyner soils have a coarser textured B horizon and do not have an argillic horizon.

Typical pedon of Oshtemo sandy loam, 0 to 2 percent slopes, in a meadow in Waite Hill Village, 2,000 feet west of Smith Road and 250 feet south of Waite Hill Road:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) sandy loam; weak fine granular structure; friable; many fine roots; medium acid; abrupt smooth boundary.

B1—8 to 12 inches; dark brown (10YR 4/3) gravelly sandy loam; weak medium and coarse subangular blocky structure; firm; common dark grayish brown (10YR 4/2) coatings on faces of peds; 20 to 25 percent gravel; medium acid; abrupt smooth boundary.

B2t—12 to 22 inches; dark brown (7.5YR 4/4) gravelly sandy loam; massive; friable; thin patchy clay films bridging sand grains and coating gravel; 20 to 25 percent gravel; strongly acid; clear wavy boundary.

B3—22 to 40 inches; brown (7.5YR 5/4) gravelly loamy sand; massive; very friable; 20 to 25 percent gravel; medium acid; clear wavy boundary.

C—40 to 60 inches; brown (10YR 4/3) gravelly loamy sand; single grained; loose; 15 to 20 percent gravel; medium acid.

The solum ranges from 40 to 50 inches in thickness.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. Unless limed, reaction ranges from strongly acid to slightly acid. The B2 horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. It is gravelly sandy loam or sandy loam. The B2 horizon ranges from strongly acid to slightly acid, and the B3 horizon ranges from strongly acid to neutral. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3. It is gravelly loamy sand or gravelly sand. It ranges from medium acid to neutral.

Otisville series

The Otisville series consists of deep, excessively drained, rapidly permeable soils on postglacial beach ridges. These soils formed in water-sorted sand and gravel. Slope ranges from 1 to 6 percent.

Otisville soils are similar to Conotton, Oshtemo, and Tyner soils and are commonly adjacent to Tyner soils. Conotton and Oshtemo soils are finer textured and have an argillic horizon. Oshtemo and Tyner soils have less gravel in the B horizon.

Typical pedon of Otisville gravelly loamy sand, 1 to 6 percent slopes, in a cultivated field in Perry Township, 0.6 mile east of North Perry, 2,000 feet south of U.S. Route 20, about 1 mile east of the intersection of Middle Ridge and Townline Roads, and 800 feet north of Middle Ridge Road:

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) gravelly loamy sand; weak fine granular structure; very friable; many fine roots; 30 percent gravel; medium acid; abrupt smooth boundary.

B21—6 to 14 inches; brown (7.5YR 5/4) gravelly loamy coarse sand; single grained; loose; common fine roots; 40 percent gravel; strongly acid; clear smooth boundary.

B22—14 to 30 inches; yellowish brown (10YR 5/4) very gravelly loamy coarse sand; single grained; loose; few fine roots; 55 percent gravel; strongly acid; clear smooth boundary.

C—30 to 60 inches; dark brown (10YR 4/3) very gravelly sand; single grained; loose; 55 percent gravel; medium acid.

The solum ranges from 20 to 36 inches in thickness. Content of gravel is more than 35 percent, by volume, between depths of 10 and 40 inches.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. Unless limed, it is strongly acid, or very strongly acid. The B horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4. It is gravelly or very gravelly loamy sand or sand. It is strongly acid or very strongly acid. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3. It ranges from very strongly acid to medium acid.

Painesville series

The Painesville series consists of deep, somewhat poorly drained, slowly or moderately slowly permeable soils on lake plains. These soils formed in glaciofluvial loamy material over medium textured and moderately fine textured glacial till. Slope ranges from 0 to 2 percent.

Painesville soils occur near and are similar to Conneaut, Red Hook, Stafford, and Swanton soils. Conneaut soils are more silty in the upper part of the solum. Red Hook and Stafford soils have less clay in the solum. Swanton soils have less clay in the upper part of the B horizon, and have contrasting fine textured and moderately fine textured sediment in the lower part.

Typical pedon of Painesville fine sandy loam in a cultivated field in Perry Township, 4 miles east of Painesville, 0.3 miles west of Blackmore Road, and 0.5 mile north of U.S. Route 20:

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak coarse granular structure; very friable; many fine roots; medium acid; abrupt smooth boundary.

B1—9 to 15 inches; light yellowish brown (2.5Y 6/4) fine sandy loam; few medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; very friable; many fine roots; medium acid; clear smooth boundary.

B21g—15 to 20 inches; light brownish gray (2.5Y 6/2) fine sandy loam; many coarse prominent yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable; common fine roots; light brownish gray (10YR 6/2) coatings on faces of peds; medium acid; clear wavy boundary.

B22—20 to 30 inches; dark yellowish brown (10YR 4/4) fine sandy loam; common medium distinct strong brown (7.5YR 5/6) mottles; moderate coarse prismatic structure; firm; few fine roots; gray (5Y 5/1) coatings on faces of peds; 2 percent gravel; few lenses of sandy clay loam; slightly acid; abrupt smooth boundary.

IIB3—30 to 36 inches; olive brown (2.5Y 4/4) silt loam; many medium prominent gray (5Y 5/1) mottles; weak coarse prismatic structure; very firm; gray (5Y 5/1) coatings on faces of peds; 5 percent coarse fragments; neutral; gradual wavy boundary.

IIC—36 to 72 inches; olive brown (2.5Y 4/4) silt loam; few medium distinct yellowish brown (10YR 5/6) mottles; weak thick platy structure; very firm; 5 percent coarse fragments; neutral.

The solum ranges from 34 to 42 inches in thickness. It typically extends into the underlying medium textured or moderately fine textured material. The moderately coarse textured material ranges from 18 to 32 inches in thickness. Gravel content is generally less than 5 percent in the upper part of the solum and 2 to 10 percent in the lower part.

The Ap horizon has hue of 10YR or 2.5Y, value of 4, and chroma of 1 or 2. It ranges from neutral to strongly acid. The B2 horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 4. It is fine sandy loam, sandy loam, or loam but includes thin, individual subhorizons of sandy clay loam or loamy sand. The B2 horizon ranges from strongly acid to slightly acid. The C horizon is silt loam or silty clay loam. It is neutral or mildly alkaline.

Pierpont series

The Pierpont series consists of deep, moderately well drained soils. These soils formed in medium textured glacial till. A dense, slowly or very slowly permeable fragipan in the lower part of the subsoil restricts rooting and internal drainage. Slope ranges from 2 to 18 percent.

Pierpont soils are commonly adjacent to Platea soils and are similar to Ellsworth and Glenford soils. Platea soils have low-chroma mottles in the upper 10 inches of the argillic horizon. Ellsworth and Glenford soils do not have a fragipan. Ellsworth soils have a finer textured argillic horizon, and Glenford soils formed in glaciolacustrine deposits.

Typical pedon of Pierpont silt loam, 6 to 12 percent slopes, moderately eroded, in a cultivated area in Perry Township, 4 miles east of Painesville, 1.9 miles east of State Route 84, 50 yards south of River Road, and 100 yards east of Blair Road:

Ap—0 to 8 inches; brown (10YR 5/3) silt loam; moderate medium granular structure; friable; many fine roots; 2 to 5 percent coarse fragments; medium acid; abrupt smooth boundary.

B1—8 to 16 inches; yellowish brown (10YR 5/4) silt loam; few fine faint dark brown (7.5YR 4/4) and few fine distinct light brownish gray (10YR 6/2) mottles; moderate coarse subangular blocky structure; firm; many fine roots; brown (10YR 5/3) coatings on faces of peds; surfaces of peds are silty; 2 to 5 percent coarse fragments; very strongly acid; clear wavy boundary.

B21—16 to 21 inches; dark yellowish brown (10YR 4/4) silty clay loam; common medium distinct grayish brown (10YR 5/2) and few fine faint dark brown (7.5YR 4/4) mottles; weak medium prismatic structure parting to moderate coarse subangular blocky; firm; few fine roots; thin grayish brown (2.5Y 5/2) coatings on faces of peds; 5 percent coarse fragments; very strongly acid; abrupt smooth boundary.

B22—21 to 24 inches; dark yellowish brown (10YR 4/4) silty clay loam; few fine faint dark brown (7.5YR 4/4) mottles; weak coarse prismatic structure parting to moderate coarse subangular blocky; firm; few fine roots; thin grayish brown (2.5Y 5/2) coatings on faces of peds; few fine very dark brown (10YR 2/2) concretions; 5 percent coarse fragments; very strongly acid; abrupt smooth boundary.

Bx1—24 to 31 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak very coarse prismatic structure; very firm; brittle; few fine roots on prism faces; thick grayish brown (10YR 5/2) clay films on faces of peds; yellowish brown (10YR 5/6) rind between the coating and ped interior; thin patchy clay films in voids; common fine very dark brown (10YR 2/2) stains; 5 percent coarse fragments; medium acid; clear wavy boundary.

Bx2—31 to 40 inches; brown (10YR 4/3) silty clay loam; weak very coarse prismatic structure parting to weak thick platy; very firm, brittle; few fine roots on prism faces; dark grayish brown (10YR 4/2) clay films on faces of peds; yellowish brown (10YR 5/6) rind between the coating and ped interior; thin patchy clay films in voids; 5 percent coarse fragments; neutral; abrupt wavy boundary.

C1—40 to 44 inches; brown (10YR 4/3) silty clay loam; weak thick platy structure; firm; vertical fractures have grayish brown (10YR 5/2) coatings; medium patchy gray (10YR 5/1) lime segregations on vertical fractures; 5 percent coarse fragments; mildly alkaline; gradual wavy boundary.

C2—44 to 60 inches; brown (10YR 4/3) silty clay loam; weak thick platy structure; firm; common gray (10YR 5/1) lime segregations; 5 percent coarse fragments; strong effervescence; mildly alkaline.

The solum ranges from 36 to 54 inches in thickness. Depth to the Bx horizon ranges from 18 to 30 inches. Content of coarse fragments ranges from 2 to 5 percent throughout.

The Ap horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or 3. It is very strongly acid to slightly acid. The B2 horizon has hue of 10YR, value of 4 or 5, and chroma of 4. It is silt loam or silty clay loam. Reaction is strongly acid or very strongly acid. The Bx horizon has hue of 10YR, value of 4, and chroma of 3 or 4. It is silty clay loam or clay loam. Reaction of the Bx horizon increases with depth from very strongly acid to medium acid in the upper part to neutral or mildly alkaline at the contact with the C horizon. The C horizon has hue of 10YR, value of 4, and chroma of 3 or 4. It is silt loam, silty clay loam, or clay loam.

Platea series

The Platea series consists of deep, somewhat poorly drained soils on uplands. These soils formed in glacial till. A dense, very slowly permeable fragipan at a depth of 24 to 28 inches restricts rooting. Slope ranges from 0 to 6 percent.

Platea soils are commonly adjacent to Pierpont soils and are similar to Darien and Mahoning soils. Darien and Mahoning soils do not have a fragipan. Darien soils have more sand and less silt in the argillic horizon, and Mahoning soils have a finer textured argillic horizon. Pierpont soils do not have low-chroma mottles in the upper 10 inches of the argillic horizon.

Typical pedon of Platea silt loam, 2 to 6 percent slopes, in a meadow in Madison Township, 1.25 miles southeast of Madison, 200 feet south of Interstate Route 90, and 600 feet west of Bates Road:

Ap—0 to 6 inches; brown (10YR 4/3) silt loam; moderate fine granular structure; friable; many fine roots; very strongly acid; abrupt smooth boundary.

B1—6 to 10 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct grayish brown (2.5Y 5/2) and many fine distinct strong brown (7.4YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; many fine pores; continuous grayish brown (2.5Y 5/2) degradational coatings on faces of peds; very strongly acid; abrupt smooth boundary.

B21—10 to 16 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct light brownish gray (10YR 6/2) and strong brown (7.5YR 5/8) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; grayish brown (2.5Y 5/2) coatings on faces of peds; 1 percent coarse fragments; very strongly acid; clear wavy boundary.

B22—16 to 26 inches; dark yellowish brown (10YR 4/4) silty clay loam; common medium distinct grayish brown (2.5Y 5/2) mottles; weak coarse prismatic structure parting to moderate fine angular blocky; firm; few fine roots; prisms are approximately 8 to 12 inches across and are separated by silty grayish brown (2.5Y 5/2) streaks with 1/4-inch brown (7.5YR 4/4) borders; thin very patchy brown (10YR 4/3) clay films on some faces of peds; common black (10YR 2/1) stains; 2 to 5 percent coarse fragments; very strongly acid; gradual wavy boundary.

Bx—26 to 43 inches; dark yellowish brown (10YR 4/4) silty clay loam; common medium distinct grayish brown (2.5Y 5/2) mottles; weak very coarse prismatic structure parting to weak medium platy; very firm, brittle; very few fine roots; continuous grayish brown (2.5Y 5/2) coatings on faces of prisms; horizontal gray (5Y 5/1) coatings on some faces of peds; thin patchy clay films on vertical faces of peds; many black (10YR 2/1) stains; 2 to 5 percent coarse fragments; slightly acid; clear smooth boundary.

C—43 to 60 inches; brown (10YR 4/3) silty clay loam between depths of 43 to 54 inches and silt loam between depths of 54 to 60 inches; few fine distinct light brownish gray (10YR 6/2) mottles; weak thick platy structure; firm; 2 to 5 percent coarse fragments; slight effervescence; mildly alkaline.

The solum ranges from 34 to 48 inches in thickness.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. Unless limed, it ranges from very strongly acid to medium acid. The B2 horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. It is very strongly acid to medium acid. The Bx horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4 with mottles that have chroma of 1 or 2. The Bx horizon is silty clay loam or clay loam. It ranges from medium acid to neutral.

Red Hook series

The Red Hook series consists of deep, somewhat poorly drained, moderately or moderately slowly permeable soils on postglacial lake beach ridges and offshore bars. These soils formed in outwash deposits over stratified material. Slope ranges from 0 to 2 percent.

Red Hook soils are commonly adjacent to Painesville, Stafford, and Tyner Variant soils. Painesville soils have finer textured B and C horizons. Stafford soils have a coarser textured B horizon that is dominantly fine sand. Tyner Variant soils have a coarser textured B horizon that is less gray.

Typical pedon of Red Hook sandy loam, 0 to 2 percent slopes, in a cultivated field in Madison Township, about 2 miles northwest of Madison, 930 yards east of McMackin Road, and 1,700 feet north of Middle Ridge Road:

Ap—0 to 11 inches; dark grayish brown (10YR 4/2) sandy loam; moderate fine granular structure; very friable; few roots; medium acid; clear wavy boundary.

B21—11 to 16 inches; light olive brown (2.5Y 5/4) sandy loam; common medium distinct light brownish gray (10YR 6/2) and common fine distinct dark brown (7.5YR 4/4) mottles; weak coarse subangular blocky structure; friable; few roots; common fine pores; 2 to 5 percent gravel; light brownish gray (10YR 6/2) coatings on faces of peds; medium acid; clear smooth boundary.

B22g—16 to 25 inches; light brownish gray (2.5Y 6/2) sandy loam; few medium distinct dark brown (7.5YR 4/4) and common medium distinct yellowish brown (10YR 5/6) mottles; massive; friable; common fine pores; slightly acid; clear wavy boundary.

B3g—25 to 40 inches; light brownish gray (2.5Y 6/2) sandy loam; common coarse prominent strong brown (7.5YR 4/4) mottles; massive; friable; few pockets of very friable loamy sand; slightly acid; abrupt irregular boundary.

C1g—40 to 47 inches; grayish brown (2.5Y 5/2) gravelly sandy loam; common coarse distinct yellowish brown (10YR 5/6) and dark red (2.5YR 3/6) mottles; massive; very friable; 20 percent gravel; medium acid; clear wavy boundary.

C2g—47 to 52 inches; gray (10YR 5/1) loamy sand; common coarse prominent dark yellowish brown (10YR 4/4) mottles; single grained; very friable; medium acid; gradual smooth boundary.

IIC3g—52 to 72 inches; gray (5Y 5/1) gravelly fine sand; common coarse distinct yellowish brown (10YR 5/6) mottles; single grained; loose; 45 percent fine gravel; 1/2-inch layer of silt loam at a depth of 68 inches; medium acid.

The solum ranges from 30 to 40 inches in thickness.

The Ap horizon has hue of 10YR to 2.5Y, value of 4, and chroma of 2. Unless limed, it ranges from strongly acid to slightly acid. The B horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 2 to 4. It is sandy loam, loam, or gravelly sandy loam. It is medium acid to neutral. The C horizon has hue of 10YR to 5Y, value of 4 or 5, and chroma of 1 or 2. It ranges from gravelly loam to loamy sand and gravelly sand and from medium acid to neutral.

Stafford series

The Stafford series consists of deep, somewhat poorly drained, moderately rapidly or rapidly permeable soils on lower side slopes of beach ridges and on offshore bars. These soils formed in glaciofluvial sand. Slope ranges from 0 to 2 percent.

Stafford soils in this county have higher reaction in the solum and lower chroma in the B and C horizons than the defined range for the series. These differences do not alter the usefulness or behavior of the soils.

Stafford soils are commonly adjacent to Elnora and Kingsville soils and are similar to Minoa, Painesville, and Red Hook soils. Elnora soils have higher chroma in the matrix between the A1 or Ap horizon and a depth of 20 inches. Kingsville soils have a darker colored surface layer. Minoa, Painesville, and Red Hook soils have a finer textured solum. Red Hook soils also have gravel in the C horizon.

Typical pedon of Stafford loamy fine sand in a cultivated field in Madison Township, 2 3/4 miles northwest of the center of the village of Madison, 630 yards north of U.S. Route 20, and 72 yards east of Green Road:

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) loamy fine sand, weak coarse granular structure; very friable; many fine roots; few fine very dark brown (10YR 2/2) concretions; neutral; abrupt smooth boundary.

B21—9 to 15 inches; pale olive (5Y 6/3) loamy fine sand; many medium prominent yellowish brown (10YR 5/6) mottles; very weak coarse subangular blocky structure; very friable; many fine roots; neutral; abrupt wavy boundary.

B22—15 to 24 inches; gray (5Y 6/1) loamy fine sand; single grained; very friable; few fine roots; neutral; abrupt wavy boundary.

IIB23—24 to 27 inches; gray (5Y 5/1) loamy coarse sand; single grained; very friable; neutral; abrupt wavy boundary.

IIC1—27 to 42 inches; gray (5Y 5/1) fine sand; few coarse prominent yellowish brown (10YR 5/8) mottles around old root channels; single grained; very friable; slightly acid; clear wavy boundary.

IIC2—42 to 52 inches; gray (N 5/0) fine sand; single grained; loose; strongly acid; clear wavy boundary.

IIC3—52 to 60 inches; gray (N 5/0) coarse sand; single grained; loose; strongly acid.

The solum ranges from 25 to 40 inches in thickness. Coarse fragments are typically absent. Depth to horizons that have dominant chroma of 2 or less ranges from 10 to 18 inches.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2. It ranges from strongly acid to neutral. The B horizon, to a depth of 20 inches, has hue of 10YR or 5Y or N, value of 4 or 5, and chroma of 0 to 3. It is loamy fine sand or fine sand with thin individual subhorizons of loamy coarse sand. It ranges from strongly acid to neutral. The C horizon has hue of 5Y or N, value of 5 or 6, and chroma of 0 or 1. It ranges from strongly acid to slightly acid.

Swanton series

The Swanton series consists of deep, poorly drained soils on lacustrine plains. These soils formed in a loamy mantle 18 to 40 inches thick over fine textured or moderately fine textured sediments. Permeability is moderately rapid in the loamy material and slow or very slow in the lacustrine sediment. Slope ranges from 0 to 2 percent.

Swanton soils in this county are less acid and have higher chroma in the lower part of the B horizon than the defined range for the series. These differences do not alter the usefulness or behavior of the soils.

Swanton soils are similar to Conneaut, Granby, Kingsville, and Painesville soils. All of these soils do not have the contrasting fine textured and moderately fine textured sediment that Swanton soils have. Conneaut and Painesville soils also have a lighter colored A horizon. Granby soils have a mollic epipedon.

Typical pedon of Swanton fine sandy loam in a cultivated field in Madison Township, about 2.3 miles northwest of the center of the village of Madison, about 600 yards south of Middle Ridge Road, and 100 yards east of Wood Road:

Ap—0 to 7 inches; black (10YR 2/1) fine sandy loam; moderate medium and fine granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

B21g—7 to 16 inches; gray (5Y 5/1) sandy loam; many medium prominent yellowish brown (10YR 5/6) and many coarse distinct light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; friable; common fine roots; slightly acid; clear smooth boundary.

B22—16 to 22 inches; yellowish brown (10YR 5/4) sandy loam; many coarse prominent light brownish gray (10YR 6/2) mottles; massive; friable; few fine roots; slightly acid; abrupt smooth boundary.

B23—22 to 28 inches; yellowish brown (10YR 5/6) sandy loam; many medium prominent light brownish gray (10YR 6/2) mottles; single grained; loose; slightly acid; abrupt smooth boundary.

B24g—28 to 34 inches; gray (5Y 5/1) sandy loam; common medium prominent yellowish brown (10YR 5/6) mottles; massive; friable; neutral; abrupt smooth boundary.

IICg—34 to 60 inches; gray (5Y 5/1) silty clay; common coarse prominent light olive brown (2.5Y 5/4) mottles; massive; firm; mildly alkaline; calcareous.

The solum ranges from 28 to 36 inches in thickness. The coarse-loamy mantle ranges from 18 to 40 inches in thickness. The solum is usually free of coarse fragments.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1. It ranges from 5 to 8 inches in thickness. It ranges from neutral to strongly acid. The B horizon has hue of 10YR or 5Y, value of 4 to 6, and chroma of 1 to 6. Texture is dominantly sandy loam or fine sandy loam, but includes subhorizons of loamy sand or sandy clay loam in some pedons. It ranges from strongly acid to neutral. The C horizon has hue of 5Y, value of 5, and chroma of 1 or 2. It is silty clay or silty clay loam.

Tioga series

The Tioga series consists of deep, well drained soils on flood plains. These soils formed in recent alluvial material. Permeability is moderate in the solum and moderately rapid or rapid in the substratum. Slope ranges from 0 to 2 percent.

Tioga soils are commonly adjacent to Lobdell and Orrville soils and are similar to Tioga Variant soils. Lobdell and Orrville soils have low chroma in the B horizon above a depth of 30 inches. Tioga Variant soils have a cambic horizon and a lower base status than Tioga soils. They occur on low stream terraces and are not so frequently flooded.

Typical pedon of Tioga loam in a meadow in Willoughby Hills Village, 0.6 mile south of U.S. Route 6 and 30 yards east of State Route 174, Cleveland Metropolitan Park System:

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) loam; weak fine and medium granular structure; friable; many fine roots; 2 percent coarse fragments; medium acid; abrupt smooth boundary.

B21—6 to 10 inches; dark yellowish brown (10YR 4/4) loam; weak fine and medium subangular blocky structure; friable; common fine roots; dark grayish brown (10YR 4/2) coatings on ped faces; 2 percent coarse fragments; medium acid; clear wavy boundary.

B22—10 to 32 inches; dark yellowish brown (10YR 4/4) loam; weak coarse subangular blocky structure; friable; common fine roots; 2 percent coarse fragments; slightly acid; abrupt smooth boundary.

IIC1—32 to 36 inches; brown (10YR 4/3) coarse sand; single grained; loose; 5 percent coarse fragments; slightly acid; abrupt smooth boundary.

IIIC2—36 to 40 inches; brown (10YR 4/3) loam; massive; friable; 2 percent coarse fragments; slightly acid; abrupt smooth boundary.

IVC3—40 to 60 inches; brown (10YR 4/3) gravelly coarse sand; single grained; loose; 25 percent coarse fragments; neutral.

The solum ranges from 18 to 36 inches in thickness.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. Unless limed, it is medium acid or strongly acid. The B horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It ranges from sandy loam to silt loam and from strongly acid to neutral. The C horizon is stratified sandy loam, loam, loamy sand, and gravelly sand. It is slightly acid or neutral.

Tioga Variant

The Tioga Variant consists of deep, well drained, moderately rapidly permeable soils on low stream terraces. These soils formed in stratified alluvial material. Slope ranges from 0 to 2 percent.

Tioga Variant soils are similar to Tioga soils and are commonly adjacent to Euclid soils. Tioga Variant soils are not so frequently flooded and have a lower base status than Tioga soils. Euclid soils have a finer textured solum that regularly decreases in organic matter content with depth and a horizon between the A1 or Ap horizon and a depth of 30 inches with dominant chroma of 2 or less in the matrix or on the faces of peds.

Typical pedon of Tioga Variant silt loam in an area of natural shrubs in Kirtland Township, 3 miles south of Willoughby, 0.7 mile south of Eagle Road, and 1,000 feet east of Dodd Road:

Ap—0 to 12 inches; dark grayish brown (10YR 4/2) silt loam; moderate fine granular structure; friable; very strongly acid; abrupt smooth boundary.

B21—12 to 19 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium and coarse subangular blocky structure; friable; very patchy thin dark grayish brown (10YR 4/2) coatings on ped surfaces; very strongly acid; gradual smooth boundary.

B22—19 to 28 inches; yellowish brown (10YR 5/4) silt loam; weak coarse subangular blocky structure; firm; very strongly acid; abrupt smooth boundary.

B3—28 to 34 inches; yellowish brown (10YR 5/4) loam; common coarse distinct gray (5Y 6/1) mottles; weak coarse subangular blocky structure; friable; very strongly acid; abrupt smooth boundary.

C1—34 to 38 inches; brown (10YR 4/3) fine sandy loam; common medium distinct light brownish gray (2.5Y 6/2) and few medium distinct yellowish brown (10YR 5/8) mottles; massive; friable; very strongly acid; abrupt smooth boundary.

C2—38 to 60 inches; yellowish brown (10YR 5/4) silt loam; many medium distinct gray (5Y 6/1) and few medium distinct strong brown (7.5YR 5/6) mottles; massive; firm; very strongly acid.

The solum ranges from 24 to 40 inches in thickness.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is very strongly acid to slightly acid. The B horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Some pedons have mottles with chroma of 2 or less below a depth of 24 inches. The B horizon is silt loam, loam, or fine sandy loam. It is very strongly acid or strongly acid. The C horizon is silt loam, loam, or fine sandy loam. It is strongly acid or very strongly acid.

Tyner series

The Tyner series consists of deep, well drained, rapidly permeable soils on beach ridges. These soils formed in sandy sediment. Slope ranges from 1 to 12 percent.

Tyner soils are similar to Colonie, Oshtemo, and Tyner Variant soils and are commonly adjacent to Conotton, Oshtemo, Otisville, and Tyner Variant soils. Colonie soils formed in fine or very fine sand and have weakly expressed textural lamellae. Conotton and Oshtemo soils are finer textured and have an argillic horizon. Conotton and Otisville soils contain more than 35 percent gravel in the textural control section. Tyner Variant soils have a cambic horizon and have low-chroma mottles at a depth between 18 and 24 inches.

Typical pedon of Tyner loamy sand, 1 to 6 percent slopes, in a cultivated field in Madison Township, about 2 miles northwest of the village of Madison, 1,250 feet south of the intersection of Green Road and U.S. Route 20, and 2,000 feet west of Burns Road:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) loamy sand; weak fine granular structure; very friable; many fine roots; about 5 percent fine gravel; medium acid; abrupt smooth boundary.

B2—8 to 32 inches; brown (7.5YR 4/4) loamy sand; weak fine and medium subangular blocky structure; very friable; common fine roots; about 5 percent fine gravel; medium acid; clear wavy boundary.

B3—32 to 56 inches; brown (7.5YR 4/4) coarse sand; single grained; loose; few fine roots; about 10 percent fine gravel; medium acid; clear wavy boundary.

C—56 to 66 inches; yellowish brown (10YR 5/4) sand; single grained; loose; about 5 percent fine gravel; medium acid.

The solum ranges from 36 to 60 inches in thickness. Where the soil has not been limed, reaction ranges from strongly acid to slightly acid in the solum. Content of gravel in the solum ranges from 0 to 10 percent.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is typically loamy sand but ranges to sand in the lower part. The C horizon is coarse sand, medium sand, or fine gravelly sand.

Tyner Variant

The Tyner Variant consists of deep, moderately well drained, rapidly permeable soils on low ridges on the lake plain. These soils formed in sandy sediment. Slope ranges from 0 to 2 percent.

Tyner Variant soils are commonly adjacent to Tyner and Red Hook soils. Tyner soils do not have gray mottles in the B horizon. Red Hook soils have dominantly low chroma in part of the B horizon above a depth of 30 inches.

Typical pedon of Tyner Variant sandy loam in a cultivated field in Madison Township, 1 1/2 miles northwest of the village of Madison, 50 feet west of Dayton Road, 100 yards north of Arcola Creek, and 0.3 mile south of Middle Ridge Road:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) sandy loam; weak medium and fine granular structure; friable; many fine roots; 10 percent fine gravel; neutral; abrupt smooth boundary.

B21—8 to 22 inches; yellowish brown (10YR 5/4) sandy loam; many medium faint brown (10YR 5/3) and common medium faint brown (7.5YR 5/4) mottles; weak medium subangular blocky structure; friable; many fine roots; 10 percent fine gravel; medium acid; abrupt wavy boundary.

B22—22 to 32 inches; yellowish brown (10YR 5/4) loamy coarse sand; many medium distinct grayish brown (10YR 5/2) and common medium faint dark yellowish brown (10YR 4/4) mottles; single grained; very friable; many fine roots; 10 percent fine gravel; many coarse very dark grayish brown (10YR 3/2) iron-manganese stains; medium acid; abrupt wavy boundary.

C1—32 to 42 inches; brown (10YR 5/3) loamy sand; many medium faint grayish brown (10YR 5/2) and many medium distinct brown (7.5YR 4/4) mottles; single grained; loose; few fine roots; 10 percent fine gravel; medium acid; abrupt wavy boundary.

C2—42 to 50 inches; brown (10YR 4/3) sand; many medium faint brown (7.5YR 4/4) mottles; single grained; loose; few fine roots; 5 percent fine gravel; slightly acid; clear wavy boundary.

C3—50 to 60 inches; yellowish brown (10YR 5/4) coarse sand; single grained; loose; 5 percent fine gravel; neutral.

The solum ranges from 30 to 45 inches in thickness. Where the soil has not been limed, reaction is strongly acid or medium acid in the solum.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The B horizon has hue of 10YR, value of 4 or 5, and chroma of 4 to 6. Mottles with chroma of 2 or less are between depths of 18 and 24 inches. The B horizon is sandy loam in the upper part and sandy loam, loamy sand, or gravelly loamy sand in the lower part. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is loamy coarse sand, coarse sand, sand, or gravelly sand.

Classification of the soils

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965. Readers interested in further details about the system should refer to "Soil taxonomy" (*12*).

The system of classification has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. In this system the classification is based on the different soil properties that can be observed in the field or those that can be inferred either from other properties that are observable in the field or from the combined data of soil science and other disciplines. The properties selected for the higher categories are the result of soil genesis or of factors that affect soil genesis. In table 20, the soils of the survey area are classified according to the system. Categories of the system are discussed in the following paragraphs.

ORDER. Ten soil orders are recognized as classes in the system. The properties used to differentiate among orders are those that reflect the kind and degree of dominant soil-forming processes that have taken place. Each order is identified by a word ending in *sol*. An example is Alfisol.

SUBORDER. Each order is divided into suborders based primarily on properties that influence soil genesis and are important to plant growth or that are selected to reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aqualfs (*Aqu*, meaning water, 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 expression of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and a prefix that suggests something about the properties of the soil. An example is Ochraqualfs (*Ochr*, meaning light colored surface layer, plus *aqualf*, the suborder of Alfisols that have an aquic moisture regime).

SUBGROUP. Each great group may be divided into three subgroups: the central (typic) concept of the great groups, which is not necessarily the most extensive subgroup; the intergrades, or transitional forms to other orders, suborders, or great groups; and the extragrades, which have some properties that are representative of the great groups 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 *Aeric* identifies the subgroup that is thought to be drier than typical of the great group. An example is Aeric Ochraqualfs.

FAMILY. Families are established within a subgroup on the basis of similar physical and chemical properties that affect management. Among the properties considered in horizons of major biological activity below plow depth are particle-size distribution, mineral content, temperature regime, thickness of the soil penetrable by roots, consistence, moisture equivalent, soil slope, and permanent cracks. A family name consists of the name of a subgroup and a series of adjectives. The adjectives are the class names for the soil properties used as family differentiae. An example is fine-loamy, mixed, mesic Aeric Ochraqualfs.

SERIES. The series consists of soils that formed in a particular kind of material and have horizons that, except for texture of the surface soil or of the underlying substratum, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineral and chemical composition.

Formation of the soils

This section discusses the factors and processes of soil formation and explains their effects on the soils in Lake County.

Factors of soil formation

Unique soils are formed as a result of complex interactions among the principal soil-forming factors. Soil formation and the present characteristics of soil at any place depend on the physical and mineralogical composition of the parent material, relief, the climate under which the soil formed, plant and animal life in and on the soil, and the length of time during which the forces of soil formation have acted.

Climate and plants and animals are active factors in soil formation. The plants and animals and microbial life, influenced by climate, act upon parent material and gradually change it into a natural body having genetically related horizons. The effects of climate and vegetation during soil formation are modified by the parent material and by relief, which influences drainage. The parent material and relief determine the kind of soil profile that forms and in some cases dominate the other factors of soil formation.

Time is required for active soil-forming factors to transform parent material into a soil. Weathering, leaching, translocation of soil particles, formation of structure, and other processes of soil formation require time to differentiate horizons in the parent material.

Parent material

Parent material of mineral soils is the unconsolidated mass of fine earth material that results from the weathering of rocks. Some kinds of parent material are derived from bedrock in place, some have been transported into the county by glaciers, and some have been transported by water (*5*). Parent material largely determines the chemical and mineralogical composition of soils.

In Lake County parent material originated from glacial till, glacial outwash and beach ridges, lacustrine sediment, recent stream alluvium, and locally accumulated organic material. Soils that formed in glacial till are the most extensive; Conneaut, Platea, Darien, and Mahoning soils are examples. Soils that formed in glacial outwash and beach deposits are generally loamy and commonly are underlain by stratified sand and gravel; examples are Tyner, Oshtemo, and Otisville soils. Some soils in the county formed in lacustrine or slack-water deposits of sandy and silty material; examples are Minoa, Fitchville, Conneaut, and Painesville soils. Soils on the flood plain formed in recent alluvium, are commonly medium textured, and have little or no profile development; examples of these are Tioga and Orrville soils. Soils that formed in organic material are included as muck; an example is Adrian soils.

Climate

Lake County has a humid, temperate, continental climate. The soils formed under the influence of this type of climate in a region covered mostly by hardwood forest.

Climate, among its other influences on soil formation, regulates the rate of weathering and decomposition of minerals. Important climatic factors include precipitation and temperature characteristics and the evapotranspiration ratio. These factors are closely related to the plant and animal communities and on a regional basis affect the kinds of soils that form. Over an area the size of Lake County, the climate is fairly uniform and soil differences are more related to other soil-forming factors such as parent material, drainage, and the age of soil material.

Climate also influences the removal of material by leaching. In Lake County's wet climate soluble bases are removed as they are released by decomposition from mineral material, so the soils are mostly acid. Clay and sesquioxides are translocated by water percolating from the surface to lower horizons. Most soils of the county are naturally acid, at least in the upper part, because the bases are continually leached downward. Mahoning and Ellsworth soils show evidence of clay movement from the A horizon to the B horizon.

Conneaut and Swanton soils, because of their relatively low position on the landscape, formed under a wetter microclimate than adjoining soils at higher positions. This results in saturation for extended lengths of time and in gleying, which is caused by the reduction and leaching of iron.

All soils in Lake County are classified as "mesic" at the family category based on temperature (see table 20). The average annual soil temperature at a depth of 20 inches is approximately 2 degrees higher than the average annual air temperature.

More information about climate in Lake County is given in the section "General nature of the county."

Relief

Relief influences soil formation by its effect on water relationships, erosion, local temperature relationships, and plant cover. Surface runoff, ponding, depth to the water table, internal drainage, accumulation and removal of organic matter, and other phenomena are affected either directly or indirectly by surface drainage.

Relief in a humid climate, as in Lake County, can account for the formation of different soils in the same kind of parent material because of the resulting variation in natural drainage conditions. For this reason, among the external features of soils, relief is often most reliable in differentiating soil series. Commonly, a given set of soil characteristics is indirectly related to slope and internal drainage. This is illustrated in comparing the somewhat poorly drained Mahoning soils with the moderately well drained Ellsworth soils, all of which formed in similar Wisconsin glacial till. Because of the difference in drainage, Mahoning soils have dominantly low chroma on the surface of peds in the argillic horizon and have mottles immediately below the Ap horizon, but Ellsworth soils do not.

Rainfall that does not infiltrate the soil runs off and collects on soils in depressions or is removed through the natural surface drainage system. Therefore, from the same amount of rainfall, sloping soils receive less water and depressional soils receive more water than gently sloping soils receive. Because of frequent or periodic movement of water through them, gently sloping soils commonly show the greatest degree of development because they are not saturated yet have a significant amount of water moving through the soil.

Living organisms

All living organisms influence soil formation. These include plants, animals, bacteria, and fungi. The vegetation is generally responsible for the amount of organic matter, color of the surface layer, and the principal amount of available nutrients in the natural soil. Earthworms, cicadas, and other burrowing animals help to keep the soil open and porous. Bacteria and fungi decompose the vegetation, thus releasing nutrients for plants. Although vegetation is a major factor in soil formation, the surface layer has been greatly influenced by human activity. This activity includes clearing trees, plowing the land, adding fertilizers, mixing some of the upper horizons, and moving the soil material from place to place.

The original vegetation in Lake County was primarily deciduous forest. The trees common on the somewhat poorly drained soils, such as Mahoning soils, were white oak, beech, maple, and red oak. The better drained sandy and gravelly soils, such as Conotton soils, supported white oak, black oak, and hickory. Some soils in the county formed in swampy areas under elm, white ash, or red maple; the more extensive swampy areas are now Swanton, Granby, and Adrian soils.

Time

The length of time that parent material has been exposed to soil-forming factors is important. Generally, the longer the time that climate and plant and animal life act on parent material, the more distinct the horizons of the soil profile become. The distinctiveness of the horizons indicates relative maturity of the soils.

The soils of Lake County have formed since the last glaciation, about 10,000 to 15,000 years ago. In the steeper areas, geologic erosion has kept pace with soil formation, so the horizons are thinner and the depth to parent material may only be a few inches. Gosport soils are an example. In the gently sloping areas, however, the profile is thicker and depth to parent material generally is more than 36 inches. An example is Mahoning soils.

Soils that formed on recent flood plain alluvium, such as Tioga and Orrville soils, have no strongly differentiated horizons. The time needed for other soil-forming factors to influence the soil significantly has not elapsed. These soils are the youngest and least developed in the county.

Processes of soil formation

Basic chemical and physical processes such as oxidation, reduction, hydration, hydrolysis, solution, eluviation (leaching), and illuviation (accumulation) and other highly complex processes bring about additions to, losses from, transfers of, and chemical changes within soils. These many processes, influenced by the interrelationships of the soil-forming factors, are responsible for the changing of parent material to a youthful soil and finally to a mature soil, soil that is in dynamic equilibrium with its environment.

Additions to the soils are made by accumulation of organic matter, by sediment depositions, or by accumulation of nutrients and colloidal material from such sources as organic matter, ground water, lime, and fertilizers. Almost all virgin soils, except perhaps recent flood plain soils, had a surface layer of organic accumulation known as an A1 horizon. However, cultivation has mixed this layer with other layers or severe erosion has removed all evidence of this horizon from the profile. Some nutrients move in a cycle from soil to plants and then back to the soil as byproducts of organic matter decomposition. This is true for all soils in the county except where this process is modified by harvesting of crops. Such alluvial soils as Tioga, Lobdell, and Orrville soils periodically receive sediment deposits from floodwater.

Soil losses commonly are caused by erosion, leaching of soluble salts, eluviation of colloids by percolating water, and loss of nutrients because of harvesting of crops. Leaching of carbonates accounts for the most significant soil nutrient losses in Lake County. Carbonates have been removed to a depth of 2 to 4 feet or more in upland soils such as Mahoning and Ellsworth soils. The parent material of these soils contained 5 to 15 percent calcium carbonate equivalent, but these soils are now acid in reaction. Other minerals present in soils often break down through a complicated series of processes and eventually are lost through leaching, but at a slower rate than carbonates.

The decomposition of other minerals often produces free iron oxide that accounts for the fairly bright brownish colors in Tyner and Otisville soils. The periodic or seasonal high water table in Conneaut, Swanton, and other similar soils causes a reduction of iron oxide. This process is primarily responsible for the gray subsoil in these soils.

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Glossary

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim. An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillic horizon. A layer of accumulation of illuvial silicate clay.

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	More than 9

Basal till. Compact glacial till deposited beneath the ice.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

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 frequent flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid. A soil having measurable amounts of calcium carbonate or magnesium carbonate.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coat, clay skin.

Coarse fragments. Mineral or rock particles up to 3 inches (2 millimeters to 7.5 centimeters) in diameter.

Coarse textured (light textured) soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the bases of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures is difficult.

Compressible. 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.

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 (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is 40 or 80 inches (1 or 2 meters).

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. Unstable walls of cuts made by earthmoving equipment. The soil sloughs easily.

Delta. An alluvial deposit, commonly triangular in shape, formed largely beneath water and deposited at the mouth of a river or stream.

Depth to rock. Bedrock at a depth that adversely affects the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

Drainage, surface. Runoff, or surface flow of water, from an area.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by running 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 a bare surface.

Excess fines. Excess silt and clay. 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 (heavy textured) soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 37.5 centimeters) long.

Flooding. The temporary covering of soil with water from overflowing streams, runoff from adjacent slopes, and tides. Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; *November-May*, for example, means that flooding can occur during the period November through May. Water standing for short periods after rainfall or commonly covering swamps and marshes is not considered flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action. Freezing and thawing of soil moisture. Frost action can damage structures and plant roots.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the assorted and unassorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by melt water as it flows from glacial ice.

Glacial till (geology). Unassorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes by water originating mainly from the melting of glacial ice. Many are interbedded or laminated.

Gleyed soil. A soil having one or more neutral gray horizons as a result of waterlogging and lack of oxygen. The term "gleyed" also designates gray horizons and horizons having yellow and gray mottles as a result of intermittent waterlogging.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material from 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Green manure (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table, which is the upper limit of saturation.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

O horizon.—An organic layer, fresh and decaying plant residue, at the surface of a mineral soil.

A horizon.—The mineral horizon, formed or forming at or near the surface, in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon most of which was originally part of a B horizon.

A2 horizon.—A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or a combination of these; (2) by prismatic or blocky structure; (3) by redder or browner colors than those in the A horizon; or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that from which the solum is presumed to have formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Hummocky. Refers to a landscape of hillocks, separated by low sags, having sharply rounded tops and steep sides. Hummocky relief resembles rolling or undulating relief, but the tops of ridges are narrower and the sides are shorter and less even.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered, but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Large stones. Rock fragments 10 inches (25 centimeters) or more across. Large stones adversely affect the specified use.

Leaching. The removal of soluble material from soil or other material by percolating water.

Light textured soil. Sand and loamy sand.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. Inadequate strength for supporting loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Moderately coarse textured (moderately light textured) soil. Sandy loam and fine sandy loam.

Moderately fine textured (moderately heavy textured) soil. Clay loam, sandy clay loam, and silty clay loam.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Types are terminal, lateral, medial, and ground.

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 mixed with mineral soil material. The content of organic matter is more than 20 percent.

Munsell notation. A designation of color by degrees of the three single variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by water that originated mainly from the melting of glacial ice. Glacial outwash is commonly in valleys on landforms known as valley trains, outwash terraces, eskers, kame terraces, kames, outwash fans, or deltas.

Outwash plain. A 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.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly. The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves through the soil. Terms describing permeability are *very slow* (less than 0.06 inch), *slow* (0.06 to 0.20 inch), *moderately slow* (0.2 to 0.6 inch), *moderate* (0.6 to 2.0 inches), *moderately rapid* (2.0 to 6.0 inches), *rapid* (6.0 to 20 inches), and *very rapid* (more than 20 inches).

pH value. (See Reaction, soil). A numerical designation of acidity and alkalinity in soil.

Piping. Moving water forms subsurface tunnels or pipelike cavities in the soil.

Productivity (soil). The capability of a soil for producing a specified plant or sequence of plants under a specified system of management. Productivity is measured in terms of output, or harvest, in relation to input.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulates over disintegrating rock.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth. Shallow root zone. The soil is shallow over a layer that greatly restricts roots. See Root zone.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged in stream channels from a drainage area. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

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. The rapid movement of water through the soil. Seepage adversely affects the specified use.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

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.

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 intake. The slow movement of water into the soil.

Slow refill. The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones. Rock fragments 3 to 10 inches (7.5 to 25 centimeters) in diameter. Small stones adversely affect the specified use.

Soil. A natural, three-dimensional body at the earth's surface that is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows: *very coarse sand* (2.0 millimeters to 1.0 millimeter); *coarse sand* (1.0 to 0.5 millimeter); *medium sand* (0.5 to 0.25 millimeter); *fine sand* (0.25 to 0.10 millimeter); *very fine sand* (0.10 to 0.05 millimeter); *silt* (0.05 to 0.002 millimeter); and *clay* (less than 0.002 millimeter).

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristics of the soil are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stratified. Arranged in strata, or layers. The term refers to geologic material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use or management.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. A stream terrace is frequently called a second bottom, in contrast with a flood plain, and is seldom subject to overflow. A marine terrace, generally wide, was deposited by the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt, silt loam, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer. Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The condition of the soil, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Unstable fill. Risk of caving or sloughing in banks of fill material.

Water table. The upper limit of the soil or underlying rock material that is wholly saturated with water.

Water table, apparent. A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

Water table, artesian. A water table under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

Water table, perched. A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Illustrations

Figure 1.—Residential community on Conneaut silt loam, 0 to 1 percent slopes. Wetness and slow permeability limit design of pavements and foundations.

Figure 2.—House on Conotton gravelly loam, 6 to 15 percent slopes. Erosion is reduced by cover on site.

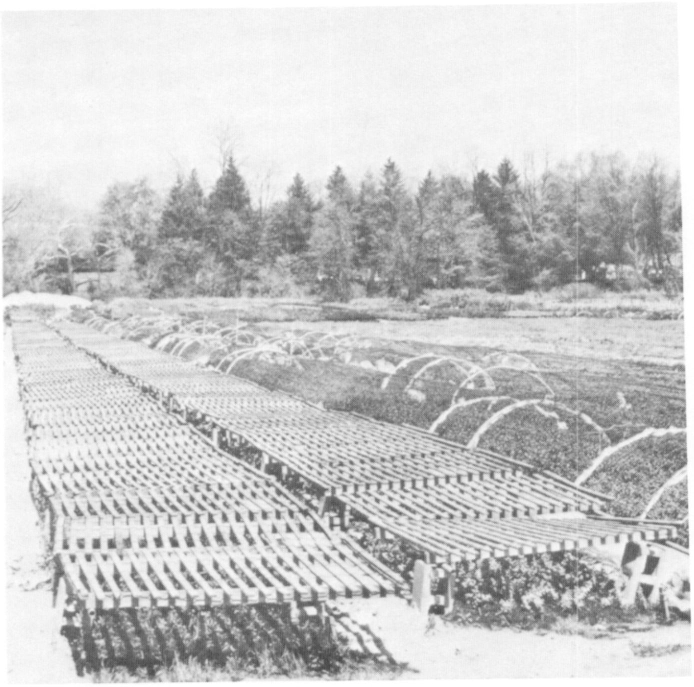

Figure 3.—Nursery on Euclid silt loam, 0 to 2 percent slopes.

Figure 4.—Lordstown channery silt loam, 2 to 6 percent slopes, in woodland. This soil is well suited to trees and has value for scenery and recreation.

Figure 5.—Mahoning silt loam, 2 to 6 percent slopes, is suited to cultivated crops.

Figure 6.—If drained, Minoa fine sandy loam is suited to nursery stock. The surface texture of this soil is good for most nursery needs.

Figure 7.—House on Platea silt loam, 2 to 6 percent slopes. A suitable foundation is needed to overcome the wetness in this soil.

Figure 8.—Red Hook sandy loam, 0 to 2 percent slopes, is well suited to nurseries if adequately drained.