SOIL SURVEY OF

Orleans County, New York

United States Department of Agriculture
Soil Conservation Service
in cooperation with
Cornell University Agricultural Experiment Station

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.

Major fieldwork for this soil survey was completed in the period 1955–73. Soil names and descriptions were approved in 1973. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1973. This survey was made cooperatively by the Soil Conservation Service and the Cornell University Agricultural Experiment Station. It is part of the technical assistance furnished to the Orleans County Soil and Water Conservation District.

Fieldwork was financed partly by funds provided to the Soil and Water Conservation District by the Orleans County Board of Supervisors.

HOW TO USE THIS SOIL SURVEY

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

Locating Soils

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

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

Finding and Using Information

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

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

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

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

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

Community planners and others can read about soil properties that affect the choice of sites for dwellings, industrial buildings, and recreation areas in the sections "Town and Country Planning," and "Recreation."

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

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

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

Cover: Dairy farm on Hilton-Ontario-Cazenovia association. Contour strips are on low drumlin occupied by Hilton soils.

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SOIL SURVEY OF ORLEANS COUNTY, NEW YORK

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UNITED STATES DEPARTMENT OF AGRICULTURE,
SOIL CONSERVATION SERVICE
IN COOPERATION WITH CORNELL UNIVERSITY AGRICULTURAL
EXPERIMENT STATION

ORLEANS COUNTY, in the northwestern part of New York (fig. 1), is bordered on the north by Lake Ontario. The total area is 396 square miles, or 253,440 acres. Albion, in the central part of the county, is the county seat. Important villages are Medina, the largest, to the west of Albion and Holley to the east. There are a number of small hamlets, such as Barre Center.

Most of the soils in the county are well suited to a wide variety of both farm and nonfarm uses. The main exceptions are the muck areas in the southern part of the county, which are used mostly for vegetable production or wetland wildlife preserves.

Improved natural drainage is the main concern of management. Many of the soils need artificial drainage before they can be used for intensive crop production. Muck areas and other very wet areas need drainage for maximum crop response. Erosion is a local concern. The most serious erosion hazard is in areas on lake bluffs along Lake Ontario (fig. 2) and in sloping areas near streams and drainageways.

According to the 1969 Census of Agriculture, 65 percent of the acreage in the county is farmed, of which 78 percent is cropped. Important crops are vegetables, fruit, dairy products, and grain.

Orleans County is near good markets for farm products. The metropolitan areas of Rochester and Buffalo are within 50 miles of Albion, Niagara Falls, Lockport, Batavia, and other cities are nearby.

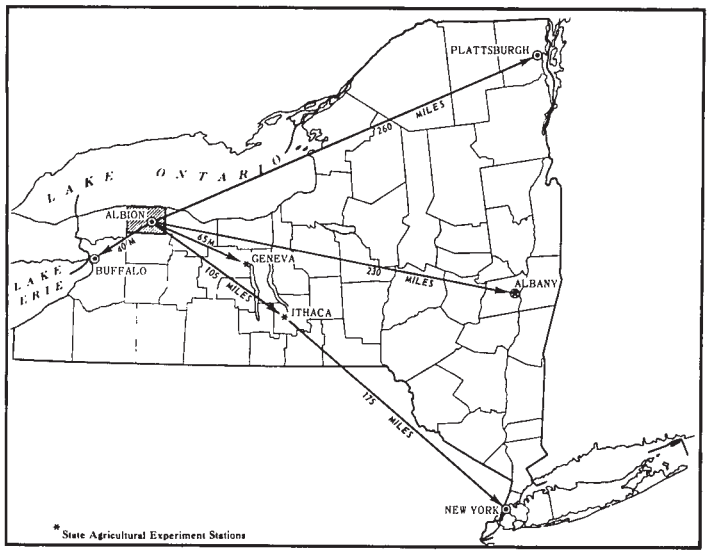

Figure 1.—**Location of Orleans County in New York.**

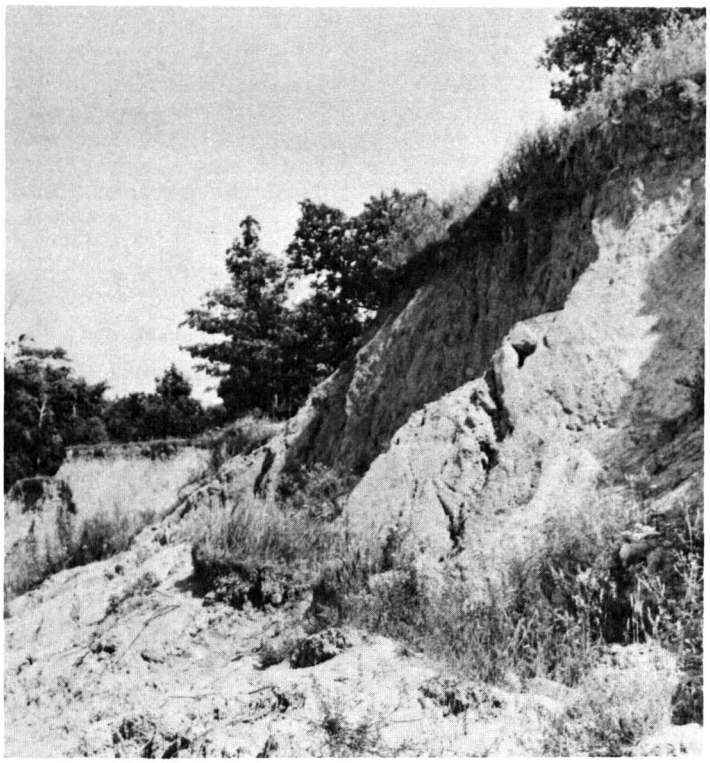

Figure 2.—**Shoreline erosion on lake bluffs along Lake Ontario in Rhinebeck-Madalin association.**

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Orleans County, where they are located, and how they can be used. The soil scientists went into

the county knowing they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes; the size and speed of streams; the kinds of native plants or crops; the kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

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

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

Soils of one series can differ in texture of the surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Appleton silt loam, 0 to 3 percent slopes, is one of two phases within the Appleton series.

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

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

Some mapping units are made up of soils of different series or of different phases within one series. Two such kinds of mapping units, soil complexes and undifferentiated groups, are shown on the soil map of Orleans County.

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 of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. The name of a soil complex ordinarily consists of the names of the dominant soils, joined by a hyphen. Arkport-Collamer complex, 6 to 20 percent slopes, is an example.

An undifferentiated group is made up of two or more soils that could be delineated individually but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not uniform. An area shown on the map may be made up of only one of the dominant soils, or of two or more. If there are two or more dominant series represented in the group, the name of the group ordinarily consists of the names of the dominant soils, joined by "and." Kendaia and Appleton silt loams, rock substratum, 0 to 3 percent slopes, is an example.

Most surveys include areas where the soil material is so rocky, so shallow, so severely eroded, or so variable that it has not been classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Udifluvents, frequently flooded, is an example.

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

Soil scientists observe how soils behave when used as a growing place for native and cultivated plants and as material for structures, foundations for structures, or covering for structures. They relate this behavior to properties of the soils. For example, they observe that filter fields for onsite disposal of sewage fail on a given kind of soil, and they relate this to the slow permeability of the soil or to its high water table. They see that streets, road pavements, and foundations for houses are cracked on a given kind of soil, and they relate this failure to the high shrink-swell potential of the soil material. Thus, they use observations and knowledge of soil properties, together with available research data, to predict limitations of suitability of soils for present and potential uses.

After data have been collected and tested for the key, or benchmark, soils in a survey area, the soil scientists set up trial groups of soils. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. They then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under current methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Orleans County. A soil association is a landscape that has

a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

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

The general soil map and a table "Interpretations for Selected Uses" are in an envelope at the back of this publication.

The soil associations in this survey have been grouped into 12 general kinds of landscapes for broad interpretative purposes. The terms for texture used in the title for several of the associations apply to the texture of the surface layer. For example, in the title of association 1, the term "medium textured" refers to the surface layer. The drainage indicated in the title of several of the broad groups applies to the dominant soils within the association.

The general soil map of Orleans County does not join with those of Monroe, Genesee, and Niagara Counties because those maps were published at a much smaller scale. Also, the concepts and names of some soil series have changed as a result of changes in the classification system since publication.

Each of the broad groups and the 32 soil associations in Orleans County are described on the following pages.

Deep, Dominantly Well Drained and Moderately Well Drained Soils Formed in Glacial Till

The three soil associations in this group, mainly in the southern part of Orleans County, make up about 6.9 percent of the county. The soils formed in glacial till of ground moraines, recessional moraines, and drumlins. Most of this acreage has been cleared. Part of it is used for farming and part for community development.

1. ONTARIO-HILTON ASSOCIATION, GENTLY SLOPING

Deep, well drained and moderately well drained, medium textured soils on till plains

This nearly level to sloping association is on glacial till plains, mainly on drumlins and recessional moraines, in the southern part of the county. Slopes are 0 to 15 percent.

This association makes up about 1.8 percent of the county. It is about 44 percent Ontario soils, 36 percent Hilton soils, and 20 percent soils of minor extent.

Ontario soils are deep, well drained, medium textured soils that formed in calcareous glacial till. They are gently sloping and sloping. They are on the tops and sides of drumlins and recessional moraines. Ontario soils have 3 to 4 feet of moderately permeable soil material over a slowly permeable substratum.

Hilton soils are deep, moderately well drained, medium textured soils that also formed in calcareous glacial till. They are nearly level and gently sloping. They are in areas where precipitation moves off slowly or accumulates for short periods. In spring and during other wet periods, Hilton soils have a temporary high water table perched above the moderately slowly permeable subsoil.

Minor soils in this association are mainly Appleton, Bombay, and Madrid soils. Appleton soils are wetter than the dominant soils. Bombay and Madrid soils are similar to Ontario and Hilton soils, but they have a slightly coarser textured surface layer and subsoil.

This association, although of minor extent, has a medium to high value for farming. Much of the acreage is used for hay and grain crops, and some is used intensively for vegetables. Slope and the hazard of erosion are the main limitations in farming. Slope and the slow permeability of the underlying glacial till limit nonfarm use.

Most of the association is open land. The only forested areas are scattered farm woodlots. On the higher areas, such as drumlins and recessional moraines, this association provides scenic views of the surrounding landscape.

2. HILTON-ONTARIO-CAZENOVIA ASSOCIATION, ROCK SUBSTRATUM, GENTLY SLOPING

Deep, moderately well drained and well drained, medium textured soils on till plains

This association is in morainic areas, mainly near swamps in the southeastern part of the county. Slopes are short and complex and range from 0 to 8 percent. Limestone bedrock is at a depth of 3½ to 6 feet.

This association makes up about 1.6 percent of the county. It is about 54 percent Hilton and Cazenovia soils in a complex, 26 percent Ontario soils, and 20 percent soils of minor extent.

Hilton soils are deep, moderately well drained, and medium textured. They are mainly nearly level in this association. They are similar to the Hilton soils in other associations, but they have a stony surface layer and are 3½ to 6 feet deep over bedrock.

Ontario soils are deep, well drained, and medium textured. They are on the higher, drier parts of the landscape. They contain slightly more stones than the other soils in this association.

Cazenovia soils are deep, well drained and moderately well drained, and medium textured. They are near Hilton soils. They contain slightly fewer stones in the surface layer than either Ontario or Hilton soils.

Minor soils in this association are mainly Churchville and Appleton soils. Churchville soils are wetter and have a finer textured subsoil than Ontario, Hilton, or Cazenovia soils. They are in depressions and other low areas. Appleton soils are similar to Hilton soils, but are somewhat poorly drained. They are in low

areas where water accumulates. Also in this association are very stony Ontario soils and nonstony Hilton and Ontario soils.

Most of this association is used for hay and grain crops. It has good potential for homesites if domestic water and sewerage are available. Stones and slow permeability are the main limitations. The underlying bedrock limits deep excavations. Scenic areas are scarce.

3. BOMBAY-MADRID ASSOCIATION, GENTLY SLOPING

Deep, moderately well drained and well drained, moderately coarse textured soils on till plains

This association is in scattered glacial till areas throughout Orleans County. In the northern part of the county, the association is on ground moraines and drumlins that commonly have been influenced by sandy lake and beach deposits. In the central part, it is on or near bedrock-controlled glacial till that commonly has been modified by sandy lake or beach deposits. In the southern part, it is commonly in glacial till areas that have been modified by water-sorted material. It is adjacent to areas of sand and gravel. Slopes are 0 to 15 percent.

This association makes up about 3.5 percent of the county. It is about 50 percent Bombay soils, 21 percent Madrid soils, and 29 percent soils of minor extent.

Bombay soils are deep, moderately well drained, moderately coarse textured soils that formed in calcareous glacial till. They are nearly level and gently sloping, at mid slope positions on the landscape. In spring and during other wet periods, Bombay soils have a temporary high water table perched above the moderately slowly or slowly permeable substratum.

Madrid soils are also deep and moderately coarse textured, but unlike Bombay soils, they are well drained. They are gently sloping and sloping and are on the higher, drier parts of the landscape.

Minor soils in this association are mainly Galen, Massena, Appleton, Howard, and Arkport soils. Galen and Arkport soils contain more sand than the dominant soils and formed in lake deposits instead of glacial till. Howard soils formed in sand and gravel deposits. Massena soils are wetter than the dominant soils, and Appleton soils are wetter and finer textured.

In the northern part of the county, this association is used mainly for vegetables and fruit. In the central part, it has mixed farming uses. In the southern part, it is used mainly for hay and grain crops.

The seasonal high water table in the Bombay soils and the moderately slowly or slowly permeable substratum in both major soils affect farm and nonfarm use. The wetness of the minor soils and the hazard of erosion are additional limitations.

This association has medium to high value for farming. Much of the acreage is used for hay and grain crops. Some is used for vegetables and fruit.

Most of the association is open land. The only forested areas are scattered farm woodlots. On the higher areas, such as drumlins and recessional moraines, this association provides scenic views of the surrounding landscape.

Deep, Dominantly Moderately Well Drained and Somewhat Poorly Drained Soils Formed in Glacial Till

The three soil associations in this group, scattered throughout Orleans County, make up about 33.9 percent of the county. This is the largest single group. The soils are deep and formed in glacial till of ground moraines, recessional moraines, and drumlins. Most of this acreage has been cleared. Part of it is for farming and part for community development.

4. CAZENOVIA-OVID ASSOCIATION, GENTLY SLOPING

Deep, well drained to somewhat poorly drained, medium textured soils that have a reddish, moderately fine textured subsoil; on till plains

This association is in glacial till areas, mainly in the northern and central parts of the county. In the northern part, the association is generally on glacial till plains that have been modified by silt and clay lake deposits. In the central part, it is influenced by grayish or reddish shale in many areas. Slopes are 0 to 8 percent.

This association makes up about 3.5 percent of the county. It is about 41 percent Cazenovia soils, 23 perment Ovid soils, and 36 percent soils of minor extent.

Cazenovia soils are deep, well drained and moderately well drained, medium textured soils that formed in reddish glacial till derived dominantly from shale and modified by lacustrine sediments. They are nearly level and gently sloping and are on the higher, drier parts of the landscape. Cazenovia soils have a firm, slowly or moderately slowly permeable subsoil and a slowly permeable substratum.

Ovid soils are deep, somewhat poorly drained, medium textured soils that have a reddish, moderately fine textured subsoil. They formed in glacial till dominantly of shale and lacustrine origin. They are mainly nearly level and are in areas below Cazenovia soils where runoff accumulates. The seasonal high water table is generally perched above the slowly permeable substratum.

Minor soils in this association are Hilton, Ontario, Appleton, and Lyons soils. Ontario, Hilton, and Appleton soils are similar to Cazenovia and Ovid soils, but they have a slightly coarser textured subsoil. Lyons soils are also similar, but they are poorly drained or very poorly drained.

In the northern part of the county, this association is used mainly for vegetables and fruit. In the central part, it has mixed farming uses.

The seasonal high water table and the slowly permeable substratum affect farm and nonfarm use. Erosion is a hazard in gently sloping areas. Stones are a limitation in some areas.

This association has excellent potential for hay and grain crops if it is adequately drained. In areas free of stones and other coarse fragments, it has good potential for vegetables.

About 80 percent of the association is open land. The rest is chiefly in scattered farm woodlots and under urban development. Openland wildlife is plentiful. Pheasant and rabbit are the most commonly hunted species. Natural scenic areas are scarce.

5. HILTON-APPLETON ASSOCIATION, GENTLY SLOPING

Deep, moderately well drained and somewhat poorly drained, medium textured soils on till plains

This association is on scattered glacial till plains throughout Orleans County. In the northern part, the association is on ground moraines and drumlins that commonly have been modified by lake and beach deposits. In central part, it is on bedrock-controlled ground moraines and recessional moraines (fig. 3). In the southern part, it is on drumlins, recessional moraines, and ground moraines and in some bedrock-controlled till areas. Slopes are 0 to 8 percent.

This association, the largest of the 32 associations, makes up about 26.3 percent of the county. It is about 44 percent Hilton soils, 32 percent Appleton soils, and 24 percent soils of minor extent.

Hilton soils are deep, moderately well drained, medium textured soils that formed in calcareous glacial till. They are nearly level and gently sloping. They are on the higher, drier parts of the landscape. In spring and during other wet periods, Hilton soils have a temporary seasonal high water table perched above the slowly or moderately slowly permeable substratum.

Appleton soils are deep, nearly level, somewhat poorly drained, and medium textured. They are similar to Hilton soils, but are on the lower, wetter parts of the landscape. Appleton soils have a seasonal high water table generally perched above the moderately slowly permeable subsoil.

Minor soils in this association are mainly Lyons, Sun, Ontario, Bombay, and Massena soils. Lyons and Sun soils are wetter than the dominant soils, and Ontario soils are drier. Bombay and Massena soils are similar, but are slightly coarser textured in the surface layer and subsoil.

In the northern part of the county, this association is used mainly for vegetables and fruit. In the central part, it has mixed farming uses. In the southern part, it is used mainly for hay and grain crops.

The seasonal high water table and the moderately slowly or slowly permeable substratum affect farm and nonfarm use. Drainage is the main limitation because much of this association is nearly level. Most areas in this association can be drained readily by using a combination of tile and open ditches. Stones are a limitation in some areas.

This association has good to excellent potential for hay and grain crops if it is adequately drained. In areas free of stones and other coarse fragments, it has good potential for vegetables.

About 80 percent of the association is open land. The rest is chiefly in scattered farm woodlots and under urban development. Openland wildlife is plentiful. Pheasants and rabbits are the most commonly hunted species. Natural scenic areas are scarce.

6. HILTON-APPLETON-KENDAIA ASSOCIATION, NEARLY LEVEL

Deep, moderately well drained and somewhat poorly drained, medium textured soils that are 3½ to 6 feet thick over bedrock; on till plains

This association is in glacial till areas in the central

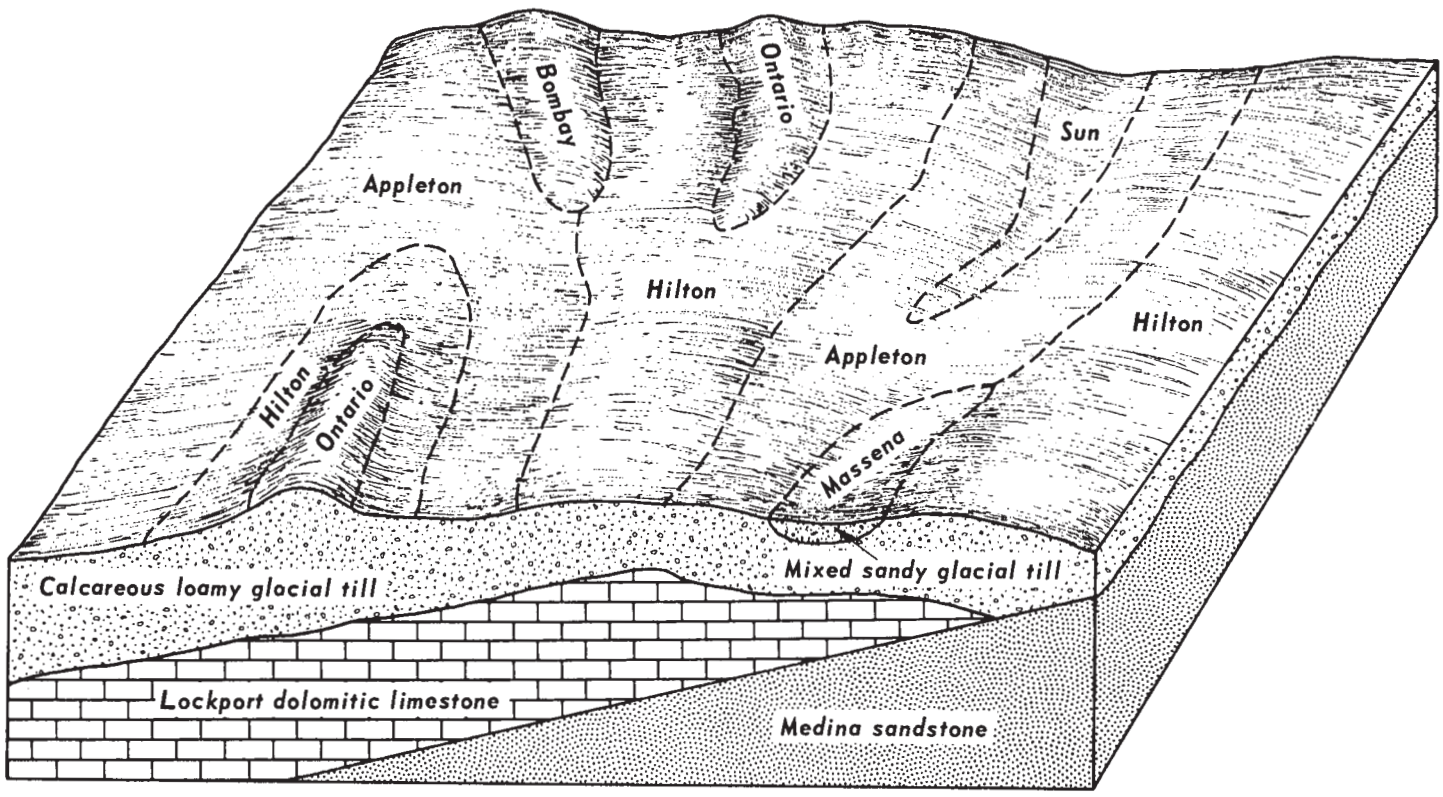

Figure 3.—Typical cross section of Hilton-Appleton association in central part of Orleans County.

and southern parts of Orleans County. The landscape is mainly bedrock-controlled. In the central part of the county, the soils are underlain by sandstone or limestone, and in the southern part, they are underlain by limestone. Slopes are 0 to 8 percent.

This association makes up about 4.1 percent of the county. It is about 53 percent Hilton soils, 12 percent Appleton soils, 8 percent Kendaia soils, and 21 percent soils of minor extent.

Hilton soils are deep, moderately well drained, medium textured soils that formed in calcareous glacial till. They are on the higher, drier parts of the landscape.

Appleton and Kendaia soils are somewhat poorly drained. They are on the flatter, wetter parts of the landscape. They have a seasonal high water table generally perched above the moderately slowly and slowly permeable substratum.

Minor soils in this association are mainly Ontario, Wassaic, and Lyons soils. Ontario soils are similar to Hilton soils, but they are better drained. The Ontario soils in this association are stony. Wassaic soils are also similar to Hilton soils, but they are only 20 to 40 inches deep over bedrock. Lyons soils are similar to Kendaia soils, but are poorly drained or very poorly drained.

Most of this association has been cleared and is used for crops, mainly small grain and hay. Wet areas are generally idle or wooded. Openland wildlife is plentiful. Pheasants and rabbits are the most commonly hunted species. Natural scenic areas are scarce.

Deep, Dominantly Somewhat Poorly Drained to Very Poorly Drained Soils Formed in Glacial Till

The three soil associations in this group, scattered throughout Orleans County, make up about 10.4 percent of the county. Most of these soils have a silty surface layer because they are in low glacial till areas that have been influenced by ponding. Much of the acreage is used for such crops as hay or small grain. A large part is wooded.

7. OVID-CHURCHVILLE ASSOCIATION, NEARLY LEVEL

Deep, somewhat poorly drained, medium textured soils that have a moderately fine and fine textured subsoil; on lake modified till plains

This association is on glacial till plains that have been influenced by silty and clayey lake deposits or by a high content of reworked shale. Slopes are mainly less than 3 percent, but range to 8 percent.

This association, one of the larger associations, makes up about 7.2 percent of the county. It is about 48 percent Ovid soils, 25 percent Churchville soils, and 27 percent soils of minor extent.

Ovid soils are deep, somewhat poorly drained, medium textured soils that have a moderately fine textured subsoil. They are nearly level and gently sloping. In the northern part of the county, they formed mainly in a moderately fine textured mixture of glacial till and lake sediments. In the central part, they formed in reworked glacial till derived from both lake sediments and shale. In the southern part, they formed mainly in glacial till that has a high shale content. They are in fringe areas between glacial till and lacustrine sediments and in areas of glacial till that has a high shale content. They have a seasonal high water table perched above the moderately slowly or slowly permeable subsoil.

Churchville soils are deep, somewhat poorly drained, medium textured soils that have a fine textured or moderately fine textured subsoil. They are nearly level or gently sloping. They formed in moderately fine textured and fine textured lake sediments deposited over glacial till. They have a seasonal high water table perched above the slowly permeable subsoil.

Minor soils in this association are mainly Cazenovia, Hilton, Niagara, Rhinebeck, Barre, Appleton, and Collamer soils. Cazenovia soils are similar to Ovid soils, but they are better drained. Hilton soils are better drained and have a coarser textured subsoil than Ovid or Churchville soils. Niagara and Rhinebeck soils are similar to Churchville soils, but they formed in deeper lake sediments. Barre soils are wetter than Churchville soils. Appleton soils have a coarser textured subsoil than Ovid or Churchville soils and formed in deeper, coarser textured glacial till deposits.

Most of the association is open land. It is used for most crops grown in the county. Natural drainage and permeability are the main limitations for farm and community use.

This association has good potential for most cultivated crops if it is adequately drained. It has fair to good potential for homesites if sewerage and domestic water facilities are available. Scenic areas are scarce.

8. LYONS-APPLETON ASSOCIATION, NEARLY LEVEL

Deep, very poorly drained to somewhat poorly drained, medium textured soils on till plains

This association is in scattered glacial till areas throughout the county, mainly in nearly level and depressional areas where water accumulates. It is often subject to surface deposition during ponding and to the accumulation of soil material eroded from soils at a higher elevation. Slopes are mainly less than 3 percent, but range to 8 percent.

This association makes up about 1.7 percent of the county. It is about 44 percent Lyons soils, 26 percent Appleton soils, and 30 percent soils of minor extent.

Lyons soils are deep, poorly drained and very poorly drained, medium textured soils that formed in calcareous glacial till. They are nearly level and are on lower, wetter parts of the landscape. Lyons soils have a moderately slowly permeable subsoil 1½ to 3 feet deep over a slowly permeable substratum. They have a prolonged seasonal high water table at or near the surface. Many areas are ponded during some part of the year.

Appleton soils are deep, somewhat poorly drained, medium textured soils that formed in calcareous glacial till. They are on slightly drier parts of the landscape. They have a seasonal high water table generally perched above the moderately slowly permeable subsoil.

Minor soils in this association are mainly Hilton, Sun, Canandaigua, and Palms soils. Hilton soils are

drier than the dominant soils. Sun soils are similar to Lyons soils, but they are slightly coarser textured. Canandaigua soils have thicker silt deposits. Palms soils are 16 inches or more of organic material.

This association has limited use. A seasonal high water table and ponding are the main limitations for farm and community use. This association has good potential for hay and some grain crops if it is adequately drained and it is productive of certain vegetables. Otherwise, it is limited to hay, pasture, or woods. It provides desirable areas for wetland wildlife. Natural scenic areas are scarce.

9. SUN-MASSENA ASSOCIATION, NEARLY LEVEL

Deep, very poorly drained to somewhat poorly drained, medium textured and moderately coarse textured soils on till plains

This nearly level association is on glacial till plains in low depressions where surface water accumulates. Most areas are near gently sloping soils that formed in glacial till. Slopes are generally less than 3 percent.

This association makes up about 1.5 percent of the county. It is about 41 percent Sun soils, 29 percent Massena soils, and 30 percent soils of minor extent.

Sun soils are deep, poorly drained and very poorly drained, medium textured soils that formed in calcareous glacial till. During wet periods, they are subject to ponding and have a water table at or near the surface. Sun soils have a moderately slowly to slowly permeable subsoil and substratum.

Massena soils are deep, somewhat poorly drained, moderately coarse textured soils that formed in calcareous glacial till. They have a moderately permeable subsoil and a moderately slowly or slowly permeable substratum.

Minor soils in this association are mainly Bombay, Appleton, Lamson, and Elnora soils. Bombay soils are similar to Sun and Massena soils, but they are better drained. Appleton soils are similar to Massena soils, but they have a finer textured subsoil. Lamson soils are coarser textured.

This association is generally too wet for intensive farm use. It can be used for cultivated crops if it is properly drained. Suitable outlets for drainage are generally lacking on individual farms. The prolonged wetness of the major soils and the moderately slow or slow permeability of the substratum are the main limitations for farm and community use. This association has potential for ponds, marshes, and habitat for wetland wildlife. Scenic areas are scarce.

Moderately Deep and Shallow, Dominantly Well Drained to Somewhat Poorly Drained Soils Formed in Thin Glacial Till Over Bedrock

The three soil associations in this group occupy bedrock-controlled glacial till areas, mainly in an east-to-west direction, parallel to bedrock formations. They make up about 8.2 percent of the county. Much of this acreage is idle or reverting to woods. The main farm use is for hay and grain crops.

10. WASSAIC-NEWSTEAD-FARMINGTON ASSOCIATION, NEARLY LEVEL

Moderately deep and shallow, well drained to poorly drained, medium textured soils on bedrock-controlled till plains

This association is in glacial till areas on or near the limestone escarpment (fig. 4). The landscape is bedrock controlled. Slopes are 0 to 15 percent.

This association makes up only about 1.4 percent of the county. It is about 51 percent Wassaic soils, 14 percent Newstead soils, 8 percent Farmington soils, and 27 percent soils of minor extent.

Wassaic soils are moderately deep, well drained and moderately well drained, medium textured soils that formed in 20 to 40 inches of glacial till over bedrock. They are nearly level or gently sloping. They are on the higher, drier parts of the landscape with Farmington soils.

Newstead soils are moderately deep, somewhat poorly drained to poorly drained, medium textured soils that also formed in 20 to 40 inches of glacial till over bedrock. They are on the lower, wetter parts of the landscape where runoff accumulates. The seasonal high water table is generally perched above the bedrock.

Farmington soils are well drained, medium textured soils that are 10 to 20 inches deep over limestone or sandstone bedrock. They are nearly level to sloping.

Minor soils in this association are mainly Hilton, Ontario, and Lyons soils. Hilton and Ontario soils are similar to Wassaic soils, but they are more than 40 inches deep over bedrock. Lyons soils are similar to Newstead soils, but they are generally wetter and are deeper over bedrock.

This association has limited use for farming and community development. Depth to bedrock and natural drainage are the main limitations. Installing artificial drainage and other underground construction is expensive. This association has potential for homesites if adequate drainage, sewerage, and domestic water supplies are available. On or near the escarpment, it provides scenic views of the surrounding landscape.

11. LOCKPORT-OVID ASSOCIATION, NEARLY LEVEL

Moderately deep and deep, somewhat poorly drained, medium textured soils on shale bedrock-controlled till plains

This association is in broad, flat areas, mainly in the northern part of the county (fig. 5). It overlies shale bedrock. Slopes are commonly less than 3 percent.

This association makes up about 6.1 percent of the county. It is about 64 percent Lockport soils, 12 percent Ovid soils, and 24 percent soils of minor extent.

Lockport soils are nearly level, somewhat poorly drained, medium textured soils that have a fine textured or moderately fine textured subsoil. They are 20 to 36 inches deep over red shale bedrock. They occur as broad, flat areas. They have a seasonal high water table perched above a slowly permeable subsoil.

Ovid soils are somewhat poorly drained, medium textured soils that have a moderately fine textured subsoil. In most areas they are 3½ to 6 feet deep over red shale bedrock. They are nearly level to gently sloping. They are generally in fringe areas around

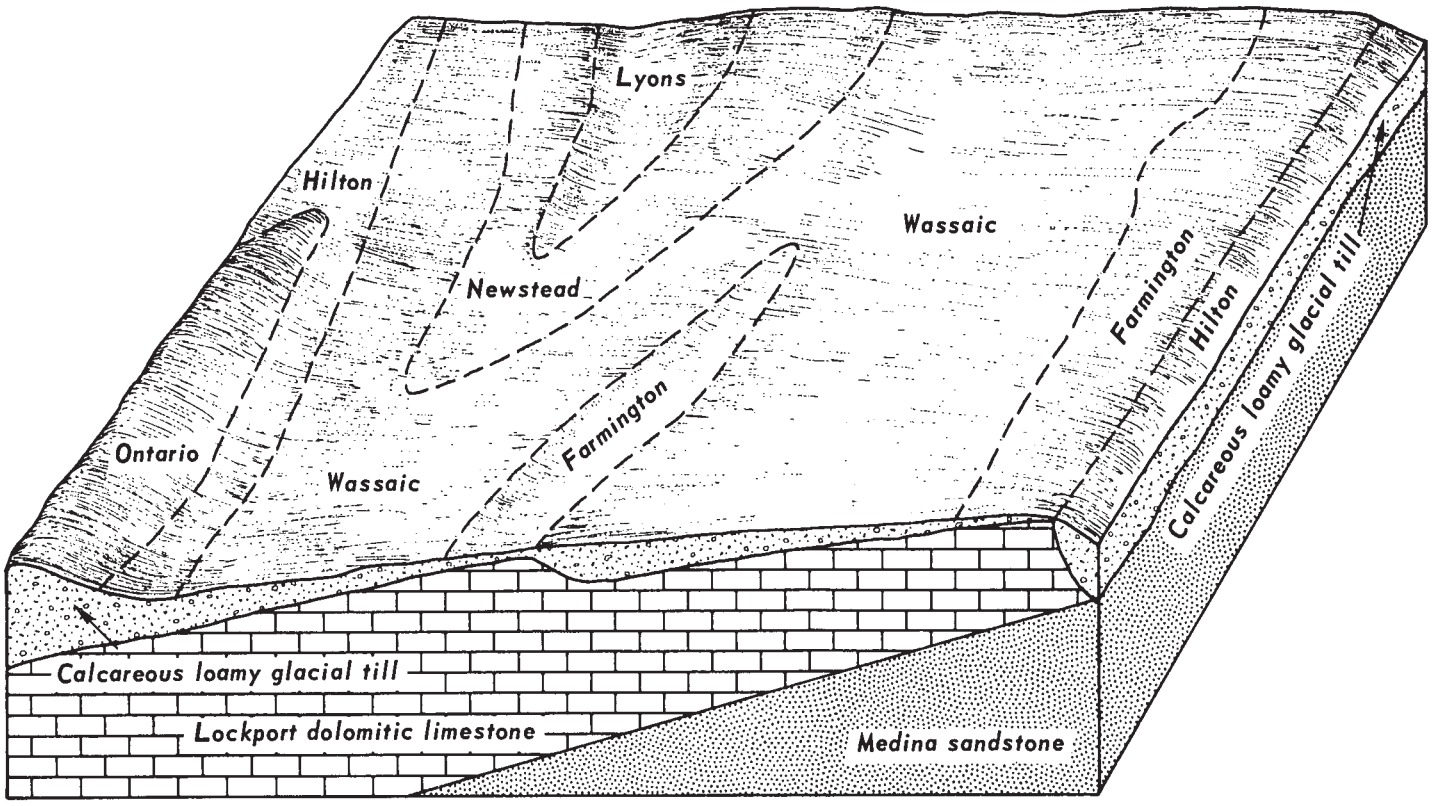

Figure 4.—Typical cross section of Wassaic-Newstead-Farmington association in west-central Orleans County.

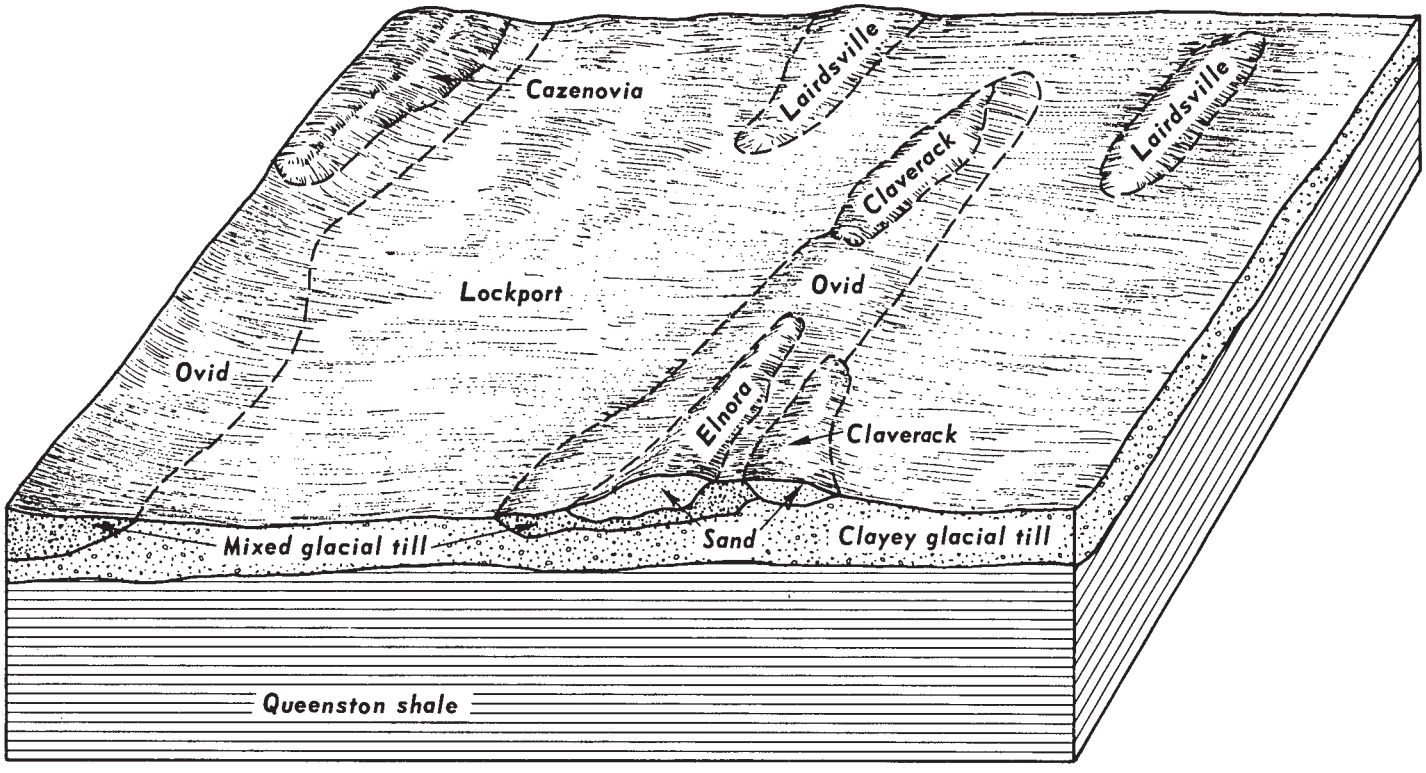

Figure 5.—Typical cross section of Lockport-Ovid association.

broader, larger areas of Lockport soils. Ovid soils have a seasonal high water table, like that in Lockport soils, perched above the slowly permeable subsoil.

Minor soils in this association are mainly Lairdsville, Cazenovia, Elnora, and Claverack soils. Lairdsville soils are similar to Lockport soils, but are better drained. Cazenovia soils are similar to Ovid soils, but are better drained. Elnora soils are deep soils that formed in sandy beach deposits. They occur as sandy knolls in this association. Claverack soils are similar to Elnora soils, but they are moderately deep over fine textured or moderately fine textured soil material.

This association has limited farm and community use. Much of it is idle or is reverting to woods. Natural drainage, slow permeability, and depth over shale bedrock are the main limitations. Some areas are used for recreation.

12. BROCKPORT ASSOCIATION, GENTLY SLOPING

Moderately deep, somewhat poorly drained, moderately fine textured soils on shale bedrock-controlled till plains

This association is in nearly level to sloping areas, mainly in the central part of the county. It overlies shale bedrock. Slopes are 0 to 12 percent.

This association, one of the smallest, makes up only about 0.7 percent of the county. It is about 81 percent Brockport soils and 19 percent soils of minor extent.

Brockport soils are moderately deep, somewhat poorly drained, moderately fine textured soils that formed mainly in the underlying grayish shale. They are nearly level to sloping. The seasonal high water table is perched above the slowly permeable subsoil.

Minor in this association are mainly Cazenovia and Ovid soils; some poorly drained and very poorly drained Lyons soils; Udifluvents, frequently flooded; and Shale outcrop, steep. Cazenovia and Ovid soils are 3½ to 6 feet deep over shale bedrock. They are somewhat similar to Brockport soils, but they are deeper and formed in moderately fine textured, reddish reworked glacial till over gray shale. In places where slopes are 6 percent or greater there is a minor soil that is similar to Brockport soils but better drained.

This association has limited farm and community use. Most of it is used for hay and grain crops. Natural drainage, slow permeability, and depth over shale bedrock are the main limitations. Because this association is mostly gently sloping, surface drainage is needed. The potential is fair for farming and is fair to good for homesites if domestic water and sewerage are available. The association provides recreation sites and some scenic areas.

Deep, Dominantly Well Drained and Moderately Well Drained Soils Formed in Sandy Deltaic and Glaciolacustrine Sediments

The three soil associations in this group, on sandy glacial deposits of deltaic, beach, and lacustrine sediments, make up about 3.9 percent of the county. Most of this acreage has been cleared and is used for farming. The nearly level and gently sloping areas are used intensively for vegetable or fruit crops.

13. ARKPORT-COLLAMER ASSOCIATION, ROLLING

Deep, well drained and moderately well drained, medium textured soils on dissected lacustrine sediments

This association is in rolling areas that are dominantly very erosive sand and silt lake plain deposits. Slopes are convex and tip in many directions. They are 6 to 20 percent.

This association makes up about 0.9 percent of the county. It is about 44 percent Arkport soils, 29 percent Collamer soils, and 27 percent soils of minor extent.

Arkport soils are deep, well drained, medium textured soils that have reddish bands in the sandy subsoil. Collamer soils are deep, moderately well drained, and medium textured. They have a finer textured subsoil than Arkport soils and have a temporary seasonal high water table in spring and during other wet periods. Both Arkport and Collamer soils are sloping or rolling.

Minor soils in this association are mainly Galen and Teel soils and Udifluents, frequently flooded. Galen soils are similar to Arkport soils, but they are moderately well drained. Teel soils are moderately well drained and somewhat poorly drained soils on flood plains.

Most of this association is idle, pastured, or wooded. Some of the least sloping areas are cultivated. This association is seriously limited for farm and community use. The erosion hazard and the slope are the main limitations. This association has good potential for recreation sites and potential for large estate-type homes. Scenic overlook sites are plentiful.

14. ARKPORT-GALEN ASSOCIATION, GENTLY SLOPING

Deep, well drained and moderately well drained, medium textured soils that have a medium textured to coarse textured subsoil; on deltaic and glaciolacustrine sediments

This association is in sandy areas on lake plains where the deposit of soil material is dominantly very fine sand. Slopes are 0 to 12 percent.

This association makes up about 1.3 percent of the county. It is about 51 percent Arkport soils, 31 percent Galen soils, and 18 percent soils of minor extent.

Arkport soils are deep, well drained, medium textured soils that have reddish bands in the sandy subsoil. They are nearly level to sloping. They formed in deltaic sandy deposits. Galen soils are deep, moderately well drained, and medium textured. They are nearly level to gently sloping. They are similar to Arkport soils, but they have a temporary seasonal water table in spring and during other wet periods.

Minor soils in this association are mainly Alton, Collamer, Colonie, Lamson, Canandaigua, Elnora, Minoa, and Teel soils. Minoa and Lamson soils are similar to the dominant soils, but are wetter. Colonie and Elnora soils are also similar, but are coarser textured. Collamer soils are similar, but have a finer textured subsoil. Alton soils are gravelly. Canandaigua soils have a finer textured subsoil and are wetter. Teel soils are on flood plains. There are also gravel pits in this association.

Most of this association is cleared and used intensively for farming. Fruit crops that require good drainage grow well. Vegetables are well suited, but erosion control is needed in sloping areas. The association has good potential for homesites. The seasonal high water table in Galen soils and the erosion hazard are the main limitations. There are scenic areas in this association, especially in the more sloping parts.

15. ELNORA-COLONIE ASSOCIATION, GENTLY SLOPING

Deep, moderately well drained and well drained, coarse textured soils on sandy lake or beach deposits

This association is on nearly level to sloping deltas, glacial beaches, and sandbars that formed in old glacial lakes. Slopes are 0 to 12 percent.

This association makes up about 1.7 percent of the county. It is about 59 percent Elnora soils, 16 percent Colonie soils, and 25 percent soils of minor extent.

Elnora soils are deep, moderately well drained, and coarse textured. They are nearly level and gently sloping. They have a temporary seasonal water table in spring and during other wet periods. Colonie soils are deep, well drained, and coarse textured. They are nearly level to sloping. They formed in water-laid deposits of fine sand.

Minor soils in this association are mainly Junius, Galen, Minoa, Claverack, and Cosad soils. Junius soils are similar to the dominant soils, but they are somewhat poorly drained. Galen soils are similar to Elnora soils, but they are finer textured. Minoa soils are finer textured and somewhat poorly drained. Claverack soils are similar to Elnora soils, but they are underlain by silt and clay at a depth of 20 to 36 inches. Cosad soils are somewhat poorly drained and formed in deposits of sand over clay.

Most of this association has been cleared and is used for farming. Because most of the soils are coarse textured, they are not so well suited to crops as medium textured soils. This association has potential for homesites. Lawns need to be adequately fertilized. Scenic areas are scarce.

Deep, Dominantly Moderately Well Drained and Somewhat Poorly Drained Soils Formed in Sandy Deltaic and Glaciolacustrine Sediments

The three soil associations in this group, on sandy glacial deposits of deltaic, beach, and lacustrine sediments, make up 6.8 percent of the county. Except in the Elnora-Junius association, most of the acreage in this group has been cleared and is used for farming. Much of the Elnora-Junius association is idle.

16. GALEN-MINOA ASSOCIATION, NEARLY LEVEL

Deep, moderately well drained and somewhat poorly drained, medium textured soils that have a medium textured to coarse textured subsoil; on delta or lake sediments

This association is in slightly concave, sandy areas that are dominantly very fine sand. Surface water accumulates in the lowest areas. Slopes are 0 to 6 percent.

This association makes up about 3.7 percent of the county. It is about 53 percent Galen soils, 20 percent Minoa soils, and 27 percent soils of minor extent.

Galen soils are deep, moderately well drained, and medium textured. They are nearly level to gently sloping. They have a temporary seasonal high water table in spring and during other wet periods. Minoa soils are deep, somewhat poorly drained, and medium textured. They are nearly level. They are in lower areas where some runoff accumulates. They have a seasonal high water table for longer periods than Galen soils.

Minor soils in this association are mainly Collamer, Niagara, Canandaigua, Claverack, Cosad, Arkport, and Elnora soils. Collamer, Niagara, and Canandaigua soils have a finer textured subsoil than the dominant soils. Claverack and Cosad soils have a coarser textured surface layer, but a finer textured substratum. Arkport soils are similar to Galen soils, but are better drained. Elnora soils are also similar to Galen soils, but are coarser textured. The minor soils are well drained to very poorly drained.

Most of this association is cleared and used for farming. Vegetables and fruit are commonly grown in the large area south of Lyndonville. Seasonal wetness and the erosion hazard are the main limitations for farm and community use. Areas of the very wet minor soils are potential pond sites. Scenic areas are scarce.

17. ELNORA-JUNIUS ASSOCIATION, NEARLY LEVEL

Deep, moderately well drained and somewhat poorly drained, coarse textured soils on sandy lake plains

This association is on nearly level and gently sloping deltas, beaches, and sandbars that formed in old glacial lakes. Slopes are 0 to 6 percent.

This association makes up 2.0 percent of the county. It is about 41 percent Elnora soils, 21 percent Junius soils, and 38 percent soils of minor extent.

Elnora soils are deep, moderately well drained, and coarse textured. They are nearly level to gently sloping. They have a temporary seasonal water table in spring and during other wet periods. Junius soils are deep, somewhat poorly drained, and coarse textured. They are nearly level. They have a seasonal high water table for longer periods than Elnora soils. They are in low areas where water accumulates and runoff is slow.

Minor soils in this association are mainly Minoa, Fredon, Cosad, Lamson, Phelps, and Massena soils. Minoa soils are similar to Junius soils, but they are finer textured. Fredon and Phelps soils are deep and gravelly. Cosad soils are underlain by fine textured or moderately fine textured soil material at a depth of 18 to 36 inches. Lamson soils are poorly drained and very poorly drained. The minor soils are moderately well drained to very poorly drained.

Much of this association is idle or in hay or grain crops. Natural drainage and the coarse texture are the main limitations for farm and community use. Suitable outlets for drainage are generally lacking. This association has potential for farming, especially for vegetable crops that are suited to sandy soils. Adequate drainage and frequent, adequate additions of lime and fertilizer are needed. Scenic areas are scarce.

18. COSAD-CLAVERACK ASSOCIATION, NEARLY LEVEL

Deep, somewhat poorly drained and moderately well drained, coarse textured soils that are 18 to 36 inches thick over clay and silt; on thin sand bars or beach deposits

This association is on nearly level and gently sloping lake plains, mainly in the northern part of the county. It is commonly associated with fine textured lake sediments. Slopes are 0 to 6 percent.

This association makes up about 1.1 percent of the county. It is about 42 percent Cosad soils, 32 percent Claverack soils, and 26 percent soils of minor extent.

Cosad soils are deep, somewhat poorly drained, coarse textured soils that are underlain by silt and clay at a depth of 18 to 36 inches. These soils are nearly level and are on the wetter parts of the landscape. A seasonal high water table is generally perched over the underlying silt and clay.

Claverack soils are deep, moderately well drained, coarse textured soils that are underlain by silt and clay at a depth of 20 to 36 inches. They are nearly level to gently sloping and are on knolls or the higher, drier parts of the landscape. A temporary seasonal high water table is generally perched over the underlying silt and clay.

Minor soils in this association are mainly Elnora, Galen, Lamson, Rhinebeck, and Madalin soils. Elnora soils are similar to Claverack soils, but are more than 40 inches deep over the finer textured material. Galen soils have a finer textured surface layer and subsoil, but do not have silt and clay within a depth of 40 inches. Lamson soils are poorly drained and very poorly drained. Rhinebeck and Madalin soils lack the sandy surface layer that is characteristic of Cosad and Claverack soils.

Most areas of this association are cleared and used for farming. Seasonal wetness, coarse texture in the upper part, and slow or very slow permeability in the substratum are the main limitations for farm and community use. The dominant soils can be drained readily by tile if a suitable outlet is available. If adequately drained and managed, they can be productive, especially for vegetables and fruit. There are good sites for dugout ponds in this association. Natural scenic areas are scarce.

Deep, Dominantly Poorly Drained and Very Poorly Drained Soils Formed in Sandy Deltaic and Glaciolacustrine Sediments

The one association in this group, one of the smallest of the associations, makes up only about 0.6 percent of the county. Most of the acreage is in woods, pasture, or hay.

19. LAMSON-CHEEKTOWAGA ASSOCIATION, NEARLY LEVEL

Deep, poorly drained and very poorly drained, medium textured and moderately coarse textured soils on variable lake sediments

This association is in swampy areas, mainly in the southern part of the county. It is nearly level and is subject to ponding. Slopes are less than 2 percent.

This association, one of the smallest, makes up only about 0.6 percent of the county. It is about 45 percent Lamson soils, 26 percent Cheektowaga soils, and 29 percent soils of minor extent.

Lamson soils are deep, poorly drained and very poorly drained, medium textured soils that formed in lake deposits, dominantly of fine and very fine sand. They are in nearly level areas where water ponds or is removed very slowly, and they receive runoff from surrounding areas. The water table is at or near the surface most of the year unless the soil is artificially drained.

Cheektowaga soils are deep, poorly drained and very poorly drained, moderately coarse textured soils that are over fine textured or moderately fine textured lake sediments at a depth of 20 to 36 inches. They are nearly level. The water table is at or near the surface most of the year unless the soil is drained.

Minor soils in this association are mainly Minoa, Canandaigua, Cosad, Elnora, Junius, Lakemont, and Palms soils. Minoa soils are similar to Lamson soils, but they are better drained. Canandaigua soils formed in deep, silty deposits. Cosad soils are similar to Cheektowaga soils, but they are better drained. Lakemont soils lack the thick, sandy surface layer that is characteristic of Cheektowaga soils. Palms soils have at least 16 inches of organic material in the surface layer.

Most of this association is in woods, pasture, or hay. Prolonged wetness, variable permeability, and ponding are the main limitations for farm and community use. Adequate drainage is needed for cultivated crops. This association has good potential for pond and marsh development. Scenic areas are scarce.

Deep, Dominantly Somewhat Poorly Drained and Moderately Well Drained Soils Formed in Silty or Clayey Glaciolacustrine Sediments

The three soil associations in this group, scattered throughout Orleans County, make up 9.2 percent of the county. They are in areas that were occupied by glacial lakes during the glaciation period. Most of the acreage is cleared and used for farming.

20. COLLAMER-NIAGARA ASSOCIATION, GENTLY SLOPING

Deep, moderately well drained and somewhat poorly drained, medium textured soils that have a medium textured to moderately fine textured subsoil; on lake plains

This association is on nearly level to sloping silty lake plains (fig. 6). The largest areas are along the shore of Lake Ontario in the northern part of the county. Slopes are 0 to 12 percent.

This association, the second largest, makes up about 7.5 percent of the county. It is about 50 percent Collamer soils, 24 percent Niagara soils, and 26 percent soils of minor extent.

Collamer soils are deep, moderately well drained, and medium textured. They are nearly level to sloping. They have a temporary seasonal high water table generally perched above the slowly or moderately slowly permeable substratum. Niagara soils are deep, some-

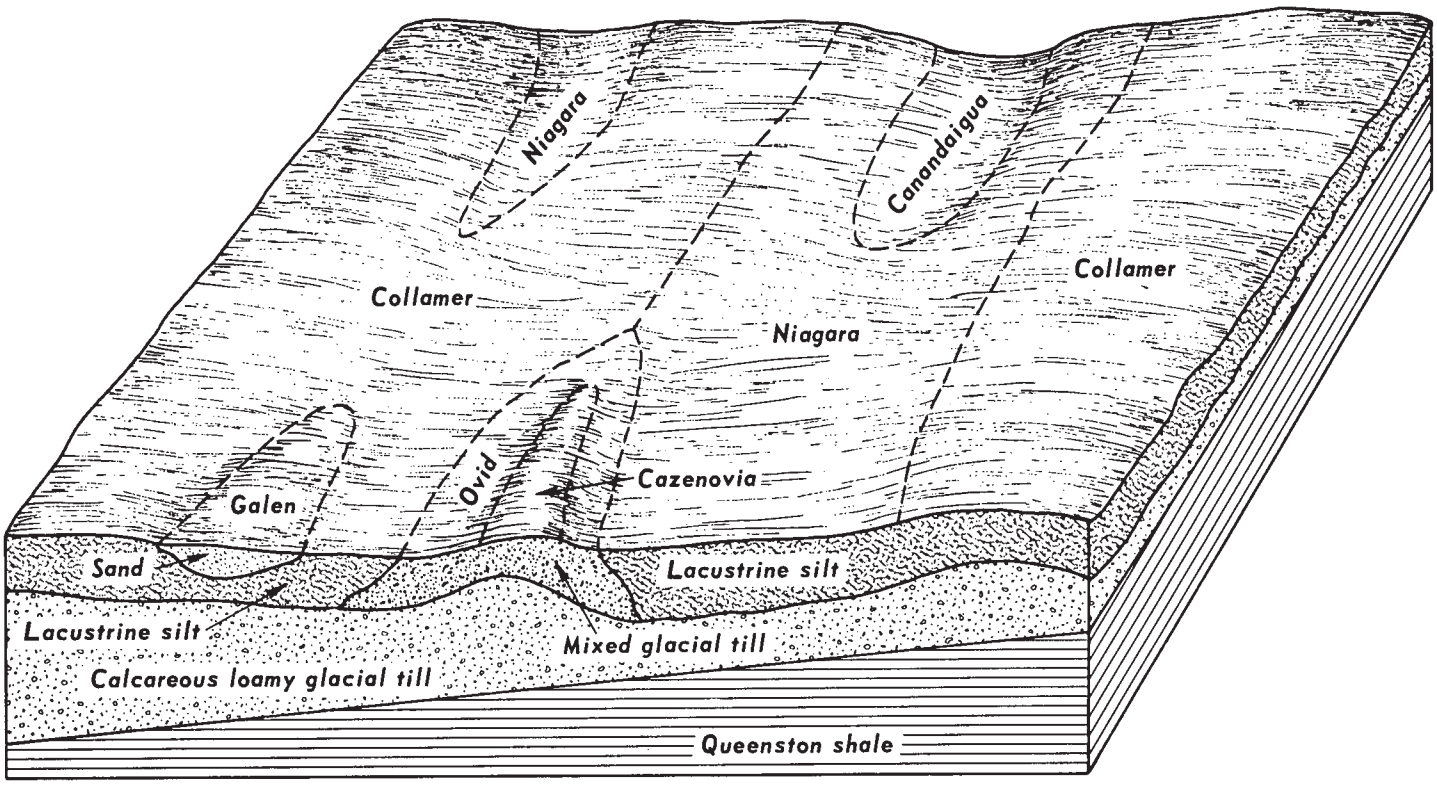

Figure 6.—**Typical cross section of Collamer-Niagara association near Lake Ontario.**

what poorly drained, and medium textured. They are nearly level to gently sloping. They are similar to Collamer soils, but they have a seasonal high water table for longer periods.

Minor soils in this association are many and varied. They are mainly Schoharie, Rhinebeck, Madalin, Cazenovia, Ovid, Galen, and Canandaigua soils. Schoharie, Rhinebeck, and Madalin soils have a finer textured subsoil than the dominant soils. Madalin soils are poorly drained and very poorly drained. Cazenovia and Ovid soils contain coarse fragments and are over glacial till. Galen soils have a coarser textured subsoil and are dominantly sand instead of silt. Canandaigua soils are also similar to Collamer and Niagara soils, but they are poorly drained to very poorly drained.

Most of this association is cleared and used for fruit and vegetable crops. Seasonal wetness, moderately slow or slow permeability, and the erosion hazard are the main limitations for farm and community use. If adequately drained and protected from erosion, this association is well suited to fruit and vegetable crops. Areas near streams and Lake Ontario provide good scenic view.

21. ODESSA-CHURCHVILLE ASSOCIATION, NEARLY LEVEL

Deep, somewhat poorly drained, medium textured soils that have a fine textured or moderately fine textured subsoil; on lake plains

This association is on nearly level to gently sloping, clayey lake plains near areas of loamy glacial till. Slopes are 0 to 6 percent.

This association makes up about 1.1 percent of the county. It is about 57 percent Odessa soils, 23 percent Churchville soils, and 20 percent soils of minor extent.

Odessa soils are deep, somewhat poorly drained, medium textured soils that have a reddish, fine textured or moderately fine textured subsoil. They are nearly level to gently sloping. Odessa soils formed in glacial lake deposits, dominantly of silt and clay. They have a seasonal high water table generally perched above the slowly or very slowly permeable substratum. Churchville soils are similar to Odessa soils, but they are underlain by glacial till at a depth of 20 to 36 inches.

Minor soils in this association are mainly Cayuga, Barre, Niagara, Canandaigua, Ovid, Rhinebeck, and Lakemont soils. Cayuga and Barre soils are underlain by glacial till. Cayuga soils are better drained than the dominant soils. Barre soils are poorly drained to very poorly drained. Niagara and Canandaigua soils are somewhat poorly drained to very poorly drained and are silty. Ovid soils are somewhat poorly drained, medium textured, reddish soils that have a moderately fine textured subsoil. Rhinebeck soils are browner, but are otherwise similar to Odessa soils. Lakemont soils are wetter, but are otherwise similar to Odessa soils.

Most of this association is cleared and used for hay and grain crops. The seasonal high water table and the slow permeability are the main limitations for farm and community use. This association has potential for pond and marsh development. Scenic areas are scarce.

22. RHINEBECK-CLAVERACK ASSOCIATION, GENTLY SLOPING

Deep, somewhat poorly drained and moderately well drained, medium textured to coarse textured soils that have a fine textured to coarse textured subsoil; on lake plains

This association is on nearly level and gently sloping lake plains, mainly in the northern part of the county. Slopes are 0 to 6 percent.

This association, one of the smallest, makes up about 0.6 percent of the county. It is about 43 percent Rhinebeck soils, 26 percent Claverack soils, and 31 percent soils of minor extent.

Rhinebeck soils are deep, somewhat poorly drained, medium textured, brownish and grayish soils that have a fine textured or moderately fine textured subsoil. They are nearly level to gently sloping. They formed in lake deposits, dominantly of silt and clay. They have a seasonal high water table generally perched above the slowly permeable subsoil and substratum.

Claverack soils are deep, moderately well drained, coarse textured soils that are 20 to 36 inches deep over fine textured or moderately fine textured lake sediments. They are nearly level to gently sloping. In spring and during other wet periods, they have a temporary seasonal high water table perched above the substratum.

Minor soils in this association are mainly Elnora, Collamer, Niagara, Ovid, Odessa, Cosad, and Madalin soils. Elnora soils are similar to Claverack soils, but do not have a clayey substratum. Collamer and Niagara soils are moderately well drained to somewhat poorly drained and are silty. Ovid soils are somewhat poorly drained and formed in glacial till. Odessa soils are similar to Rhinebeck soils, but they are reddish. Cosad soils are similar to Claverack soils, but they are wetter. Madalin soils are similar to Rhinebeck soils, but they are poorly drained to very poorly drained.

Most of this association is cleared and cultivated. Seasonal wetness and slow permeability in the substratum are the main limitations for farm and community use. Areas of this association near streams provide scenic overlooks.

Deep, Dominantly Somewhat Poorly Drained to Very Poorly Drained Soils Formed in Silty or Clayey Lacustrine Sediments

The four soil associations in this group, mainly in the southern part of Orleans County, make up about 10.6 percent of the county. They are in areas that were occupied by glacial lakes during the glaciation period. Most of the acreage is idle or wooded or is used for hay or small grain. A small part has been drained and is used intensively for crops.

23. CANANDAIGUA-NIAGARA ASSOCIATION, NEARLY LEVEL

Deep, very poorly drained to somewhat poorly drained, medium textured soils that have a medium textured to moderately fine textured subsoil; on lake plains

This association is in silty lake plain areas that are mainly nearly level and susceptible to ponding. Areas are scattered throughout the county, but the largest areas are in the southern part. Slopes range from 0 to 6 percent.

This association makes up about 4.5 percent of the county. It is about 41 percent Canandaigua soils, 32 percent Niagara soils, and 27 percent soils of minor extent.

Canandaigua soils are deep, poorly drained to very poorly drained, medium textured soils that formed in glacial lake deposits, dominantly of silt. They are nearly level and are in depressions where water accumulates or is removed very slowly. A prolonged seasonal high water table is at or near the surface. Niagara soils are somewhat poorly drained. They are similar to Canandaigua soils, but the seasonal high water table is perched above the moderately slowly or slowly permeable substratum. They occur at a slightly higher elevation than the wetter Canandaigua soils.

Minor soils in this association are many and varied. They are mainly Collamer, Elnora, Galen, Minoa, Lamson, Claverack, Appleton, Ovid, Palms, and Wayland soils. Collamer soils are similar to Niagara soils, but they are better drained. Elnora and Galen soils are sandy and are better drained than either Canandaigua or Niagara soils. Minoa and Lamson soils contain more sand and less silt. Claverack soils are better drained and coarser textured. Appleton and Ovid soils are somewhat poorly drained and formed in glacial till. Palms soils have 16 to 50 inches of organic material over mineral soil. Wayland soils are poorly drained to very poorly drained soils on flood plains.

Most of this association is idle or wooded or is used for hay and grain crops. Prolonged wetness is the main limitation for farm and community use. If adequately drained, this association has some potential for vegetables. It provides excellent sites for marsh development. Natural scenic areas are scarce.

24. ODESSA-LAKEMONT ASSOCIATION, NEARLY LEVEL

Deep, somewhat poorly drained to very poorly drained, medium textured and moderately fine textured soils that have a fine textured and moderately fine textured subsoil; on lake plains

This association is on clayey lake plains that are mainly level and susceptible to ponding. These areas are mainly in the southern part of the county. Slopes are 0 to 6 percent.

This association makes up 1.7 percent of the county. It is about 52 percent Odessa soils, 28 percent Lakemont soils, and 20 percent soils of minor extent.

Odessa soils are deep, somewhat poorly drained, medium textured, reddish soils that have a moderately fine textured and fine textured subsoil. They are nearly level to gently sloping. Odessa soils formed in glacial lake deposits, dominantly of silt and clay. They have a seasonal high water table generally perched above the slowly permeable subsoil and slowly or very slowly permeable substratum.

Lakemont soils are deep, poorly drained to very poorly drained, moderately fine textured to medium textured soils that have a fine textured or moderately fine textured subsoil. They are nearly level. They are similar to Odessa soils, but they have a prolonged seasonal high water table at or near the surface. Lakemont soils are subject to ponding.

Minor soils in this association are mainly Niagara, Canandaigua, Cazenovia, Ovid, Claverack, Cosad, and Cheektowaga soils. Niagara and Canandaigua soils are somewhat poorly drained to very poorly drained silty soils formed in lacustrine deposits. Cazenovia and Ovid soils are moderately well drained to somewhat poorly drained, reddish soils formed in glacial till. Claverack, Cosad, and Cheektowaga soils are moderately well drained to very poorly drained sandy soils over fine textured lake sediments.

Most of this association is cleared and used for hay and grain crops. The seasonal high water table, the slow permeability, and the susceptibility to ponding are the main limitations for farm and community use. Even if drained, this association has serious limitations. Many areas are favorable sites for pond and marsh development. Scenic areas are scarce.

25. RHINEBECK-MADALIN ASSOCIATION, NEARLY LEVEL

Deep, somewhat poorly drained to very poorly drained, medium textured soils that have a brownish, fine textured to moderately fine textured subsoil; on lake plains

This association is on clayey lake plains that are generally nearly level. It is mainly in the northern part of the county. Slopes are 0 to 6 percent.

This association makes up about 2.2 percent of the county. It is about 65 percent Rhinebeck soils, 14 percent Madalin soils, and 21 percent soils of minor extent.

Rhinebeck soils are deep, somewhat poorly drained, medium textured, brownish and grayish soils that have a fine textured or moderately fine textured subsoil. They are nearly level to gently sloping. They formed in lake deposits, dominantly of silt and clay. They have a seasonal high water table generally perched above the slowly permeable subsoil.

Madalin soils are deep, poorly drained to very poorly drained, medium textured soils that have a fine textured or moderately fine textured subsoil. They are nearly level. They are similar to Rhinebeck soils, but they have a prolonged seasonal high water table at or near the surface. Most areas of Madalin soils are subject to ponding.

Minor soils in this association are mainly Collamer, Niagara, Ovid, Cosad, Churchville, and Barre soils. Collamer and Niagara soils are moderately well drained to somewhat poorly drained and silty. Ovid soils are reddish soils formed in glacial till that have a moderately fine textured subsoil. Cosad soils have 18 to 36 inches of sandy material over silt and clay. Churchville and Barre soils are similar to Rhinebeck and Madalin soils, but they are underlain by glacial till.

This association is mostly cleared and used for hay and grain crops. Some areas are idle or are reverting to woods. The seasonal high water table, the slow permeability, and ponding are the main limitations for farm and community use. This association provides favorable sites for pond or marsh development. Natural scenic areas are scarce except in areas that border streams and Lake Ontario.

26. LAKEMONT-MADALIN-BARRE ASSOCIATION, NEARLY LEVEL

Deep, poorly drained and very poorly drained, moderately fine textured and medium textured soils that have a fine textured or moderately fine textured subsoil; on swampy lake plains

This association is on the lowlands, on clayey lake plains where water accumulates from surrounding higher elevations. Some areas are adjacent to swamps and bogs of organic soils. Slopes are less than 2 percent.

This association makes up about 2.2 percent of the county. It is about 30 percent Lakemont soils, 19 percent Madalin soils, 13 percent Barre soils, and 38 percent soils of minor extent.

Lakemont soils are deep, poorly drained to very poorly drained, moderately fine textured to medium textured soils that have a reddish, fine textured or moderately fine textured subsoil. They are nearly level. They have a seasonal high water table at or near the surface. Most areas are susceptible to ponding. Madalin soils are similar to Lakemont soils, but they have a grayish or olive subsoil. Barre soils are also similar to Lakemont soils, but they are underlain by glacial till at a depth of 20 to 36 inches.

Minor soils in this association are mainly Churchville, Fonda, Odessa, Lyons, Claverack, and Hilton soils. Churchville soils are somewhat poorly drained and formed in lacustrine silt and clay over glacial till. Fonda soils are very poorly drained and have very little profile development. Odessa soils are somewhat poorly drained and formed in clayey lacustrine deposits. Lyons soils are poorly drained to very poorly drained and formed in glacial till. Claverack soils are moderately well drained sandy soils that are underlain by fine textured or moderately fine textured lake sediments. Hilton soils are moderately well drained and medium textured and formed in glacial till. Claverack and Hilton soils are on knolls or in the higher, better drained areas.

Much of this association is idle or wooded. Poor and very poor drainage, slow permeability, and ponding are serious limitations for farm and community use. This association provides good sites for pond and marsh development. Scenic areas are scarce.

Deep, Somewhat Excessively Drained to Moderately Well Drained Soils Formed in Dominantly Gravelly and Sandy Glacial Outwash

The three soil associations in this group, scattered throughout the county, make up about 3.5 percent of the county. They formed in gravelly water-laid deposits. Except in hilly and wet areas, most of the acreage in this group is used for farming and community development. There are many gravel pits.

27. HOWARD ASSOCIATION, ROLLING

Deep, well drained to somewhat excessively drained, medium textured to moderately coarse textured soils on kames and eskers

This association is in rolling, gravelly kettle and kame areas, generally near swamps and bogs (fig. 7). Slopes are 8 to 25 percent.

This association makes up about 0.8 percent of the

Figure 7.—**View of Howard association, rolling, showing kettle and kame topography.**

county. It is about 68 percent Howard soils and 32 percent soils of minor extent.

Howard soils are deep, well drained to somewhat excessively drained, medium textured to moderately coarse textured soils that formed in water-laid deposits of sand and gravel.

Minor soils in this association are mainly Madrid, Bombay, Colonie, Arkport, Galen, and Elnora soils. Madrid and Bombay soils are in areas where the sand and gravel deposit is capped by reworked glacial till. Colonie, Arkport, Galen, and Elnora are sandy soils in gravelly areas. This association also has some gravel pits and some poorly drained or very poorly drained soils.

Most of this association is in hay, pasture, and woods. The small areas of less sloping minor soils have high potential for farming. The association has potential for recreation, especially for trails and nature areas, and is an excellent source of sand and gravel. It also has some potential for fruit crops that require good drainage. Slope and the erosion hazard are the main limitations for farm and community use. Because of the rolling or hilly nature, this association provides some of the best scenic areas in the county.

28. HOWARD-BOMBAY ASSOCIATION, GENTLY SLOPING

Deep, somewhat excessively drained to moderately well drained, medium textured and moderately coarse textured soils on outwash plains and till plains

This association is in fringe areas between gently sloping outwash plains and glacial till plains, mainly in the southern part of the county. Slopes are 3 to 8 percent.

This association, one of the smallest, makes up about 0.6 percent of the county. It is about 46 percent Howard soils, 19 percent Bombay soils, and 35 percent soils of minor extent.

Howard soils are deep, well drained to somewhat excessively drained, medium textured to moderately coarse textured soils that formed in water-laid deposits of sand and gravel. They are gently sloping. The Bombay soils in this association are deep, moderately well drained, moderately coarse textured soils that formed in glacial till deposits reworked to some extent by glacial water. They are gently sloping. In spring and during other wet periods, a temporary seasonal high water table is generally perched above the moderately slowly to slowly permeable substratum.

Minor soils in this association are mainly Madrid, Arkport, Phelps, and Hilton soils. Madrid soils are similar to Bombay soils, but they are better drained. Arkport soils are deep, well drained, medium textured, and sandy. Phelps soils are similar to Howard soils,

but they are moderately well drained and have less gravel in the subsoil. Phelps soils have a temporary high water table in spring and during other wet periods. Hilton soils are similar to Bombay soils in drainage and parent material, but they have a finer textured surface layer and subsoil.

Most of this association is cleared and used for farming. Seasonal wetness and the slow permeability of the Bombay soils are the main limitations. This association has good potential for farm and community use. It is a potential source of sand and gravel. Scenic areas are limited.

29. ALTON-PHELPS ASSOCIATION, GENTLY SLOPING

Deep, somewhat excessively drained to moderately well drained, moderately coarse textured soils on beach and outwash deposits

This association is in gravelly areas, mainly on nearly level and gently sloping glacial beach, bar, or outwash deposits. The largest areas are on or near the Iroquois Beach Ridge, on which U.S. Highway 104 is built. Slopes are 0 to 8 percent.

This association makes up about 2.1 percent of the county. It is about 48 percent Alton soils, 23 percent Phelps soils, and 29 percent soils of minor extent.

Alton soils are deep, well drained to somewhat excessively drained, moderately coarse textured soils that formed mainly in water-laid deposits of sand and gravel. Phelps soils are deep, moderately well drained, moderately coarse textured soils that formed in water-laid beach and outwash deposits. They are nearly level. They have a temporary high water table in spring and during other wet periods.

Minor soils in this association are mainly Wampsville, Fredon, Colonie, and Elnora soils. Wampsville soils are similar to Alton soils, but they are finer textured. Fredon soils are similar to Phelps soils, but they are wetter. Colonie soils are deep, well drained and sandy. Elnora soils are similar to Colonie soils, but they are moderately well drained. The minor soils are somewhat excessively drained to poorly drained.

Most of this association is cleared and used for farming. Some of the area along Ridge Road is used for highways and buildings. There are many homesites and small fruit farms within this association. Gravel pits are common. The moderately coarse texture, the droughtiness, and the seasonal high water table are the main limitations for farm and community use. This association has potential for fruit and vegetable crops, homesites, gravel pits, and recreational development. There are many Indian relics and historical sites.

Deep, Dominantly Moderately Well Drained to Very Poorly Drained Soils Formed in Recent Alluvial Deposits on Flood Plains

The one soil association in this group makes up about 1.2 percent of the county. It is in areas along the largest streams in the county and is subject to flooding. The dominant soils are moderately well drained to very poorly drained. Most of the acreage is idle, pastured, or wooded.

30. TEEL-WAYLAND ASSOCIATION, NEARLY LEVEL

Deep, moderately well drained to very poorly drained, medium textured soils on flood plains

This association is on nearly level flood plains scattered throughout the county. Slopes are less than 3 percent.

This association makes up about 1.2 percent of the county. It is about 54 percent Teel soils, 12 percent Wayland soils, and 34 percent soils of minor extent.

Teel soils are deep, moderately well drained to somewhat poorly drained, medium textured soils that formed in alluvial deposits on flood plains. They are nearly level and have a seasonal high water table. They are susceptible to flooding during extended wet periods. Wayland soils are deep, nearly level, poorly drained to very poorly drained, and medium textured. The water table is at or near the surface most of the year. Wayland soils are frequently flooded.

Minor soils are many and varied. Cazenovia, Lairdsville, and Lockport soils, which are deep or moderately deep over reddish shale bedrock, formed in deposits of glacial till and lacustrine and outwash material near flood plains. Also in this association is a considerable acreage of Udifluvents, frequently flooded.

Most of this association is idle, wooded, or pastured. A small part is cropped. The high water table and the flood hazard are limitations for farming and community use. The potential is good for recreation and small gardens. The soils are naturally fertile. There are many scenic areas, especially views of streams.

Deep, Very Poorly Drained Soils Formed in Organic Deposits and Fluvaquents and Humaquepts, Ponded

The two soil associations in this group occupy the wettest parts of the landscape, mainly swamps and bogs. They make up about 4.8 percent of the county. They are very poorly drained or ponded. Drained areas are intensively cropped. Other areas are wooded, idle, or used as wildlife marshes.

31. PALMS-CARLISLE ASSOCIATION, LEVEL

Deep, very poorly drained organic soils in swamps and bogs

This association is in swamps and bogs where water from surrounding areas accumulates. Major areas are in the southern part of the county.

This association makes up about 4.2 percent of the county. It is about 60 percent Palms soils, about 13 percent Carlisle soils, and 27 percent soils of minor extent.

Palms soils are nearly level organic soils that have from 16 to 51 inches of organic soil material over mineral soil material. They have a high water table at or near the surface and are frequently ponded. Carlisle soils are similar, but they have 51 inches or more of organic material over mineral soil material.

Minor soils in this association are mainly Edwards, Martisco, Canandaigua, Lyons, and Lamson soils. Edwards and Martisco soils are organic soils underlain by marl. Canandaigua soils are poorly drained or very poorly drained and silty. Lyons soils are poorly drained

or very poorly drained soils formed in glacial till. Lamson soils are poorly drained or very poorly drained and sandy.

Cleared and drained areas of this association are used mainly for vegetables. Undrained or partly drained areas are wooded or idle. The prolonged high water table, the high organic matter content, and the frequent ponding are limitations for most community uses. Scenic areas are scarce.

32. FLUVAQUENTS AND HUMAQUEPTS, PONDED, LEVEL

Deep, very poorly drained soils in marshy areas

This association is in wet, periodically flooded areas where the vegetation is mainly grasses, cattails, rushes, and other water-tolerant plants. Most of this association is in the Iroquois National Wildlife Refuge in the southwestern part of Orleans County.

This association, one of the smallest, makes up about 0.6 percent of the county. It is about 85 percent Fluvaquents and Humaquepts, ponded, and 15 percent soils of minor extent.

Minor soils in this association are mainly Lakemont, Madalin, Lamson, Appleton, and Elnora soils. Lakemont, Madalin, and Lamson soils are poorly drained to very poorly drained and formed in lacustrine deposits. Appleton soils are somewhat poorly drained and formed in glacial till. Elnora soils are moderately well drained, coarse textured, and sandy. Elnora and Appleton soils are at the higher elevations.

This association is well suited to wetland wildlife, and most areas are used for this purpose. In the wildlife refuge, the water table is regulated to maintain the desired plant cover. Some areas support water-tolerant trees. Ponding is the main limitation affecting town and country planning.

Descriptions of the Soils

This section describes the soil series and mapping units in Orleans County. Each soil series is described in detail, and then, briefly, each mapping unit in that series. Unless it is specifically mentioned otherwise, it is to be assumed that what is stated about the soil series holds true for the mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

An important part of the description of each soil series is the soil profile; that is, the sequence of layers from the surface layer downward to rock or other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second is much more detailed and is for those who need to make thorough and precise studies of soils. Color terms are for moist soil unless otherwise stated. The profile described in the series is representative for mapping units in that series. If the profile of a given mapping unit differs from the one described for the series, the differences are stated in describing the mapping unit, or they are differences that are apparent in the name of the mapping unit. The description of each mapping unit contains suggestions on how the soil can be managed.

As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. Udifluvents, frequently flooded, for example, does not belong to a soil series but, nevertheless, is listed in alphabetic order along with the soil series.

Preceding the name of each mapping unit is a symbol that identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit is the capability unit and woodland suitability group in which the mapping unit has been placed. The page for the description of each mapping unit can be learned by referring to the "Guide to Mapping Units" at the back of this survey.

The acreage and proportionate extent of each mapping unit are shown in table 1. Many terms used in describing soils can be found in the Glossary, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual. (*8*)[1]

[1] Italic numbers in parentheses refer to Literature Cited, p. 136.

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

Soil	Acres	Percent	Soil	Acres	Percent
Alton gravelly sandy loam, 3 to 8 percent slopes	2,965	1.2	Brockport silty clay loam, 6 to 12 percent slopes	167	0.1
Appleton silt loam, 0 to 3 percent slopes	21,087	8.3	Canandaigua soils	6,348	2.5
Appleton silt loam, 3 to 8 percent slopes	892	.4	Carlisle muck	1,922	.8
Arkport very fine sandy loam, 0 to 6 percent slopes	2,886	1.1	Cayuga silt loam, 2 to 6 percent slopes	396	.2
Arkport very fine sandy loam, 6 to 12 percent slopes	886	.3	Cazenovia silt loam, 0 to 3 percent slopes	363	.1
Arkport-Collamer complex, 6 to 20 percent slopes	1,131	.5	Cazenovia silt loam, 3 to 8 percent slopes	3,425	1.4
Barre silt loam	1,740	.7	Cazenovia gravelly silt loam, shale substratum, 0 to 3 percent slopes	841	.3
Bombay fine sandy loam, 0 to 3 percent slopes	2,557	1.0	Cazenovia gravelly silt loam, shale substratum, 3 to 8 percent slopes	2,010	.8
Bombay fine sandy loam, 3 to 8 percent slopes	4,603	1.8	Cheektowaga fine sandy loam	781	.3
Brockport silty clay loam, 0 to 2 percent slopes	595	.2	Churchville silt loam, 0 to 2 percent slopes	5,790	2.3
Brockport silty clay loam, 2 to 6 percent slopes	1,048	.4	Churchville silt loam, 2 to 6 percent slopes	1,290	.5
			Claverack loamy fine sand, 0 to 6 percent slopes	2,552	1.0
			Collamer silt loam, 0 to 2 percent slopes	1,078	.4
			Collamer silt loam, 2 to 6 percent slopes	10,824	4.3

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

Soil	Acres	Percent	Soil	Acres	Percent
Collamer silt loam, 6 to 12 percent slopes, severely eroded	615	0.2	slopes	751	0.3
Colonie loamy fine sand, 0 to 6 percent slopes	935	.4	Martisco muck	118	(1)
Colonie loamy fine sand, 6 to 12 percent slopes	193	.1	Massena fine sandy loam	2,566	1.0
Cosad loamy fine sand	2,013	.8	Minoa very fine sandy loam	2,283	.9
Edwards muck	613	.2	Newstead silt loam	686	.3
Elnora loamy fine sand, 0 to 6 percent slopes	6,621	2.6	Niagara silt loam, 0 to 2 percent slopes	9,438	3.7
Farmington silt loam, 0 to 8 percent slopes	344	.1	Niagara silt loam, 2 to 6 percent slopes	1,092	.4
Farmington silt loam, 8 to 15 percent slopes	125	(1)	Odessa silt loam, 0 to 2 percent slopes	5,304	2.1
Fluvaquents and Humaquepts, ponded	1,420	.6	Odessa silt loam, 2 to 6 percent slopes	210	.1
Fonda mucky silt loam	980	.4	Ontario loam, 3 to 8 percent slopes	2,903	1.1
Fredon loam	708	.3	Ontario loam, 8 to 15 percent slopes	679	.3
Galen very fine sandy loam, 0 to 2 percent slopes	2,603	1.0	Ontario stony loam, 3 to 8 percent slopes	1,149	.5
Galen very fine sandy loam, 2 to 6 percent slopes	4,610	1.8	Ontario very stony loam, 3 to 15 percent slopes	351	.1
Hamlin silt loam	230	.1	Ontario loam, rock substratum, 0 to 8 percent slopes	471	.2
Hilton loam, 0 to 3 percent slopes	8,202	3.2	Ovid silt loam, 0 to 3 percent slopes	9,524	3.8
Hilton loam, 3 to 8 percent slopes	27,859	11.0	Ovid silt loam, 3 to 8 percent slopes	3,473	1.4
Hilton loam, rock substratum, 0 to 3 percent slopes	4,201	1.7	Ovid silt loam, shale substratum, 0 to 4 percent slopes	3,851	1.5
Hilton loam, rock substratum, 3 to 8 percent slopes	1,991	0.8	Palms muck	6,520	2.6
Hilton-Cazenovia stony silt loams, 0 to 8 percent slopes	2,155	.9	Phelps gravelly fine sandy loam	1,788	.7
Howard gravelly loam, 3 to 8 percent slopes	1,323	.5	Rhinebeck silt loam, 0 to 2 percent slopes	4,168	1.6
Howard soils, 8 to 25 percent slopes	1,417	.6	Rhinebeck silt loam, 2 to 6 percent slopes	2,369	.9
Junius loamy fine sand	1,446	.6	Schoharie silt loam, 2 to 6 percent slopes	592	.2
Kendaia and Appleton silt loams, rock substratum, 0 to 3 percent slopes	3,987	1.6	Shale outcrop, steep	216	.1
Lairdsville silt loam, 0 to 6 percent slopes	615	.2	Sun silt loam	1,943	.8
Lakemont silty clay loam	2,920	1.2	Teel silt loam	2,534	1.0
Lakemont silt loam, shale substratum	906	.4	Udifluvents, frequently flooded	1,604	.6
Lamson soils	1,317	.5	Wampsville gravelly loam, 3 to 8 percent slopes	619	.2
Lockport silty clay loam	10,633	4.2	Wassaic silt loam, 0 to 3 percent slopes	1,531	.6
Lyons silt loam	4,119	1.6	Wassaic silt loam, 3 to 8 percent slopes	865	.3
Lyons silt loam, rock substratum	1,145	.5	Wayland silt loam	1,610	.6
Madalin silt loam	2,891	1.1	Cut and fill land	918	.4
Madrid fine sandy loam, 3 to 8 percent slopes	1,975	.8	Gravel pits	364	.1
Madrid fine sandy loam, 8 to 15 percent			Made land	113	(1)
			Quarries	157	.1
			Water areas less than 40 acres	1,411	.6
			Total	253,440	100.0

[1] Less than 0.05 percent.

Alton Series

The Alton series consists of deep, gently sloping, well drained to somewhat excessively drained soils on glacial terraces, beaches, and associated bars. These soils formed in sandy and gravelly glacial outwash or glacial lake beach deposits derived from sandstone and shale.

In a representative profile the surface layer is dark brown to brown gravelly sandy loam 10 inches thick. The upper 9 inches of the subsoil is very friable, reddish brown very gravelly sandy loam. The lower 19 inches is loose, reddish brown very gravelly sandy loam. The upper part of the substratum is loose, brown cobbly sand, and the lower part is loose, dark brown to brown sand.

Permeability is rapid in the subsoil and substratum. Available water capacity is low to moderate. The capacity of these soils to supply nitrogen, phosphorus, and potassium is low. Surface gravel and moderately coarse texture are the main limitations in farming and in town and country planning.

Representative profile of Alton gravelly sandy loam, 3 to 8 percent slopes, in an idle area 400 feet south of U.S. 104 and 50 feet west of Kenyonville Road, in the town of Gaines:

Ap—0 to 10 inches, dark brown (7.5YR 4/2) gravelly sandy loam; weak, fine, granular structure; very friable; many roots; 20 percent gravel; neutral; abrupt, wavy boundary.

B21—10 to 19 inches, reddish brown (5YR 4/4) very gravelly sandy loam; weak, fine, granular structure; very friable; common roots; 35 percent gravel; medium acid; clear, smooth boundary.

B22—19 to 38 inches, reddish brown (5YR 4/4) very gravelly sandy loam; single grain; loose; few roots; 55 percent gravel; neutral; clear, smooth boundary.

C1—38 to 50 inches, brown (7.5YR 4/4) cobbly sand; single grain; loose; 40 percent pebbles and cobbles of which 20 percent are greater than 3 inches in diameter; neutral; abrupt, smooth boundary.

IIC2—50 to 60 inches, dark brown to brown (10YR 4/3 and 10YR 5/3) medium sand; single grain; loose; neutral.

Thickness of the solum ranges from 30 to 40 inches. The average content of gravel and cobblestones between 10 and 40 inches is greater than 35 percent. Reaction ranges from medium acid to neutral in the solum and from neutral to moderately alkaline in the C horizon.

The Ap horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 or 3.

The B horizon has hue of 10YR to 5YR, value of 3 to 5, and chroma of 3 or 4. It ranges from gravelly to very gravelly sandy loam.

The C horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 2 to 4. It is stratified sand and gravel.

Alton soils are commonly near or are similar to Phelps, Colonie, Elnora, Madrid, and Bombay soils. They formed in material similar to that of the moderately well drained Phelps soils. They are finer textured and contain more gravel than Colonie soils. They are better drained and finer textured and contain more gravel than Elnora soils. They lack the Bt horizon that is characteristic of Madrid and Bombay soils and contain more gravel than those soils.

AlB—Alton gravelly sandy loam, 3 to 8 percent slopes. This gently sloping soil is on terraces, glacial beaches, and associated bars. Areas are irregular in shape.

Included with this soil in mapping are areas where slope is greater than 8 percent or less than 3 percent. Also included are areas where the surface layer is gravelly loam, loamy fine sand, and gravelly loamy sand and areas of Colonie, Elnora, and Howard soils.

Runoff is very slow, and the hazard of erosion is slight. The major limitation is droughtiness as a result of the moderately coarse texture and the gravel content. In places, gravel in the surface layer interferes with the tillage of some crops and the establishment of lawns.

This soil is readily leached and therefore requires timely applications of lime and fertilizer. It is used mainly for fruit and vegetables and as rural homesites. It has potential for commercial and recreational development. There are a few large gravel pits. Capability unit IIIs–1; woodland suitability group 3o1.

Appleton Series

The Appleton series consists of deep, nearly level to gently sloping, somewhat poorly drained soils on till plains. These soils formed in glacial till derived from sandstone, limestone, and shale.

In a representative profile the surface layer is very dark grayish brown silt loam 8 inches thick. The subsurface layer is 6 inches of light brownish gray loam that is faintly mottled. The subsoil is firm, mottled brown heavy loam 8 inches thick. The substratum is calcareous, firm brown loam.

A seasonal high water table is generally perched above the moderately slowly or slowly permeable substratum. The subsoil is moderately permeable. Available water capacity is moderate to high. The capacity of these soils to supply nitrogen and phosphorus is medium, and the capacity to supply potassium is high. The seasonal high water table and the moderately slow permeability in the substratum are the main limitations in farming and in town and country planning.

Representative profile of Appleton silt loam, 0 to 3 percent slopes, in an idle area one-half mile north of Oak Orchard Road, 200 feet west of Angevine Road, in the town of Barre:

Ap—0 to 8 inches, very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) when dry; moderate, fine, granular structure; friable; many roots; 5 percent coarse fragments; neutral; abrupt, smooth boundary.

A2—8 to 14 inches, light brownish gray (10YR 6/2) loam; few, fine, faint, yellowish brown (10YR 5/4) and grayish brown (10YR 5/2) mottles; weak, medium, subangular blocky structure; friable; common roots and pores; A2 material interfingers into the upper 3 inches of the Bt horizon; 5 percent coarse fragments; neutral; clear, wavy boundary.

B2t—14 to 22 inches, brown (7.5YR 4/4) heavy loam; common, medium, distinct, yellowish brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; firm; common roots; common fine pores; 5 percent coarse fragments; brown (7.5YR 5/2) ped surfaces; thin patchy clay films on ped faces, thicker clay linings in pores; neutral; clear, wavy boundary.

C—22 to 65 inches, brown (7.5YR 5/2) loam; common, medium, distinct, yellowish brown (10YR 5/6) mottles; weak, medium, platy structure; firm; few roots to a depth of 30 inches; 15 percent coarse fragments; moderately alkaline; calcareous.

Thickness of the solum ranges from 20 to 30 inches, and depth to carbonates ranges from 18 to 30 inches. Depth to bedrock is greater than 40 inches. The content of coarse fragments ranges from 5 to 20 percent in the solum and from 10 to 30 percent in the C horizon.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2. The A2 horizon has hue of 7.5YR to 2.5Y, value of 5 or 6, and chroma of 2. It ranges from fine sandy clay loam to silt loam.

The B horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 3 or 4. Low and high chroma mottles are common to many. The texture ranges from loam to sandy clay loam. Thin patchy clay films are on 10 to 30 percent of the ped faces. Reaction ranges from slightly acid to mildly alkaline.

The C horizon has hue of 5YR to 2.5Y, value of 4 or 5, and chroma of 2 to 4. It ranges from fine sandy loam to silt loam.

Appleton soils are commonly near or are similar to Hilton, Massena, Ovid, and Lyons soils. They formed in material similar to that of the moderately well drained Hilton soils. They are similar to Massena and Ovid soils, but they have a finer textured B horizon than Massena soils and a coarser textured Bt horizon than Ovid soils. They are better drained than Lyons soils.

AnA—Appleton silt loam, 0 to 3 percent slopes. This nearly level soil has the profile described as representative of the series. It is in areas of glacial till. Areas are generally oblong in shape and oriented northeast to southwest. They range from less than 5 to more than 100 acres in size.

Included with this soil in mapping are small areas of better drained Hilton soils on slight rises or knolls and wetter Sun and Lyons soils in low spots and along drainageways. Also included are areas of Bombay and Massena soils, areas totaling about 20 percent of the mapping unit where the surface layer is loam, some areas where the soil has a thick silt cap, and some where layers of gravel are in the subsoil or substratum. Most sand spots, gravel areas, and clay spots are indicated by spot symbols on the soil map.

Runoff is slow, and the hazard of erosion is slight. The seasonal high water table and the moderately slow to slow permeability in the substratum are the main limitations. In some areas stones or pebbles in the surface layer interfere with tillage. This soil can be easily drained if suitable outlets are available. If adequately drained, it is suited to most crops grown in the county. Capability unit IIIw–1; woodland suitability group 3w1.

AnB—Appleton silt loam, 3 to 8 percent slopes. This gently sloping soil has a profile similar to the one

described as representative of the series, but it has fewer mottles and a thinner surface layer. The soil is in areas of glacial till. Areas are generally oblong in shape and range from less than 5 to about 25 acres in size.

Included with this soil in mapping are small areas of better drained Hilton soils in higher, drier spots and wetter Sun and Lyons soils in low spots or along drainageways. Also included are small areas of Bombay or Massena soils, areas totaling about 20 percent of the mapping unit where the surface layer is loam, some areas where the soil has a thick silt cap, and other areas where layers of gravel are in the subsoil or substratum. Most sand spots, gravel areas, and clay spots are indicated by spot symbols on the soil map.

Runoff is medium, and the hazard of erosion is moderate. The seasonal high water table, the moderately slow or slow permeability in the substratum, and the moderate hazard of erosion are the main limitations. In some areas stones or pebbles in the surface layer interfere with tillage.

This soil responds well to artificial drainage if suitable outlets are available. If adequately drained, it is suited to most crops grown in the county. Undrained, it is best suited to plants that tolerate wetness. If it is used intensively, stripcropping, contour planting, and diversions are needed to control runoff and reduce the risk of erosion. Capability unit IIIw–3; woodland suitability group 3w1.

Arkport Series

The Arkport series consists of deep, nearly level to hilly, well drained soils on deltaic glacial lake deposits. These soils formed in water-laid deposits of very fine sand and fine sand.

In a representative profile the surface layer is dark brown very fine sandy loam 9 inches thick. The upper 6 inches of the subsoil is friable, brown, very fine sandy loam. The lower 13 inches is brown, loamy very fine sand that has a few 1/16-inch bands of reddish brown very fine sandy loam. The next layer is 30 inches of light reddish brown very fine sand and loamy fine sand that has bands of reddish brown very fine sandy loam 1/16 inch to 4 inches thick. Below this is 34 inches of pinkish gray loamy fine sand that has bands of reddish brown fine sandy loam and very fine sandy loam. The substratum is loose, pinkish-gray fine sand.

Permeability is moderately rapid in the subsoil and substratum. Available water capacity is moderate to high. The capacity of these soils to supply nitrogen is medium, and the capacity to supply phosphorus and potassium is low. The erosion hazard in sloping areas is the main limitation in farming and in town and country planning.

Representative profile of Arkport very fine sandy loam, 0 to 6 percent slopes, in a cultivated area one-fourth mile south of intersection of Rich's Corners Road and N.Y. 31, 610 feet north and 90 feet west of southwest corner of small cemetery on west side of Rich's Corners Road, in the town of Albion:

Ap—0 to 9 inches, dark brown (7.5YR 4/2) very fine sandy loam; weak, very fine, granular structure; very friable; few medium and common fine roots; 1 percent very fine pebbles; medium acid, abrupt, smooth boundary.

B21—9 to 15 inches, brown (7.5YR 5/4) very fine sandy loam; weak, fine, granular structure; friable; common medium roots; many fine pores; medium acid; gradual, wavy boundary.

B22—15 to 28 inches, brown (7.5YR 5/4) loamy very fine sand in an intricate pattern with brown (7.5YR 5/2), clean very fine sand and a few reddish brown (5YR 4/3) very fine sandy loam lamellae 1/16 inch thick and 3 to 6 inches long; massive; very friable; common fine and medium roots; strongly acid; abrupt, wavy boundary.

A21&B23t—28 to 45 inches, light reddish brown (5YR 6/3) very fine sand A material, massive, very friable; reddish brown (5YR 5/4) very fine sandy loam Bt material as lamellae 1/16 inch to 4 inches thick that total 6 inches in thickness; massive; firm; few medium roots; strongly acid; abrupt, wavy boundary.

A22&B24t—45 to 58 inches, light reddish brown (5YR 6/3) loamy fine sand intricately patterned by reddish brown (5YR 4/4), wavy, branching, crudely horizontal lamellae 1/16 to 1/2 inch thick that total 1 1/2 inches in thickness; massive; very friable and firm; lamellae are slightly plastic; few roots; strongly acid; abrupt, wavy boundary.

A23&B25t—58 to 92 inches, pinkish gray (5YR 6/2) loamy fine sand patterned by dark reddish brown (5YR 3/4) fine sandy loam, thin, wavy, branching lamellae that total 1 inch in thickness and by reddish brown (5YR 4/4) very fine sandy loam, thick lamellae that total 4 inches in thickness; massive; very friable; few roots in upper part; medium acid; clear, wavy boundary.

C—92 to 106 inches, pinkish gray (5YR 6/2) fine sand; single grain; loose; slightly acid.

Thickness of the solum ranges from 40 to 96 inches. Depth to lamellae that contain clay films or clay bridges between sand grains ranges from 20 to 30 inches. Reaction ranges from strongly acid to neutral.

The Ap horizon has hue of 7.5YR to 10YR, value of 4 or 5, and chroma of 2 or 3.

The B21 and B22 horizons have hue of 10YR or 7.5YR, value of 5, and chroma of 4 to 6. Texture ranges from very fine sandy loam to loamy fine sand. The lamellae in the A2&B2t horizon have hue of 5YR to 10YR, value of 3 to 5, and chroma of 3 or 4. Texture ranges from fine sandy loam to light silt loam. Each lamella is 1/16 to 5 inches thick; total thickness ranges from 6 to 15 inches. The A2 part of the A2&B2t horizon has hue of 5YR to 10YR, value of 5 or 6, and chroma of 3 or 4. Texture ranges from fine sand to loamy very fine sand.

The C horizon has hue of 5YR or 7.5YR, value of 4 to 6, and chroma of 2 to 4. Texture ranges from fine sand to very fine sandy loam. Reaction ranges from slightly acid to moderately alkaline.

Arkport soils are commonly near or are similar to Galen, Colonie, and Collamer soils. They formed in material similar to that of the moderately well drained Galen soils. They are similar to Colonie soils, but are finer textured and contain thicker lamellae. They have a coarser textured B horizon and are better drained than Collamer soils.

ArB—Arkport very fine sandy loam, 0 to 6 percent slopes. This nearly level to gently sloping soil has the profile described as representative of the series. It is on deltaic sandy deposits of former glacial lakes. Areas are irregularly shaped and range from less than 5 to more than 100 acres in size.

Included with this soil in mapping are small areas of wetter, moderately well drained Galen soils and coarser textured, well drained Colonie soils; some areas where the Arkport soil contains gravel or layers of gravel; and small areas of Alton and Howard soils. Also included are areas where the Arkport soil is

underlain by soil material high in silt at a depth of less than 40 inches. These areas may have spots of Collamer soils. In some areas this soil has a surface layer of fine sandy loam or loamy fine sand, and in some areas it has gravel in the surface layer. Gravelly spots are indicated by spot symbols on the soil map.

Runoff is slow, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is also a concern. The high content of fine sand and very fine sand and the erosion hazard are the main limitations.

Because the soil is readily leached, frequent applications of lime and fertilizer are needed to maintain productivity. This soil is used mainly for vegetables and fruit. Because drainage is good, it is well suited to specialty crops, such as cherries and peaches. Contour planting and cover crops reduce the hazard of erosion on the longer slopes. Capability unit IIe–3; woodland suitability group 2o1.

ArC—Arkport very fine sandy loam, 6 to 12 percent slopes. This sloping soil has a profile similar to the one described as representative of the series, but the surface layer is slightly thinner. The soil is on deltaic sandy deposits of former glacial lakes. Areas are mostly small and irregularly shaped.

Included with this soil in mapping are areas of gently sloping Arkport soils and small areas of moderately well drained Galen soils and coarser textured, well drained Colonie soils. In some areas this soil contains gravel or layers of gravel, and these areas include Alton or Howard soils. Also included are a few areas where this soil is underlain by soil material high in silt at a depth of less than 40 inches; and areas where the surface layer is fine sandy loam and loamy fine sand. Spots where the surface layer is gravelly are indicated by spot symbols on the soil map.

Runoff is medium to rapid, and the hazard of erosion is severe. The hazard of soil blowing is also a concern. The high content of fine sand and very fine sand and the hazard of erosion are the main limitations.

Because this soil is readily leached, frequent applications of lime and fertilizer are needed to maintain productivity. Maintaining the level of organic matter is a constant concern. The soil is used mainly for fruit and vegetables. Because it has good drainage and no gravel or stones, it is suited to many specialty crops. If protected from erosion, it is well suited to cherries and peaches. Contour tillage, cover crops, and diversions help to control runoff and protect the soil from erosion. Capability unit IIIe–2; woodland suitability group 2o1.

AsD—Arkport-Collamer complex, 6 to 20 percent slopes. This mapping unit is about 60 percent Arkport soil and about 25 percent Collamer soil. The surface layer ranges from fine sandy loam to silt loam. Areas are irregularly shaped and commonly more than 20 acres in size. This unit has been dissected, and the hilly slopes tip in many directions.

Included with this unit in mapping are areas of the moderately well drained Galen soils, the well drained, coarser textured Colonie soils, and the wetter, somewhat poorly drained Minoa soils, all of which are similar to the soils in this unit. Also included are areas of Udifluvents, frequently flooded; areas where slope is less than 6 or greater than 20 percent, and eroded areas where the surface layer is silty clay loam.

Runoff is medium to rapid, and the hazard of erosion is moderate to severe. Slope and the hazard of erosion are the main limitations. In some places drainageways and wet spots are problems. Permeability is variable, and the soils are unstable.

Most of the acreage is idle or is in permanent hay. The unit has potential for woodland, hilly park areas and estate type homes, and specialized fruit. Without erosion control, drainage of wet spots, and land shaping, it is limited for cultivated crops. Capability unit IVe–1; woodland suitability group 2r1.

Barre Series

The Barre series consists of deep, nearly level, poorly drained soils in depressional areas in lake plains bordering glacial till plains. These soils formed in silt and clay lacustrine deposits that are underlain by glacial till at a depth of 20 to 36 inches.

In a representative profile the surface layer is very dark gray silt loam 8 inches thick. The upper 4 inches of the subsoil is firm, gray, distinctly mottled silty clay. The substratum is firm, reddish brown gravelly loam that has a few distinct mottles.

The water table is near the surface for long periods. Permeability is slow to very slow in the subsoil and moderately slow to slow in the substratum. Available water capacity is high. The capacity of these soils to supply nitrogen and potassium is high, but nitrogen is released slowly in spring. The capacity to supply phosphorus is medium. Wetness, ponding, and slow permeability are the main limitations in farming and in town and country planning.

Representative profile of Barre silt loam, in hay, three-fifths of a mile north of Oak Orchard Road, 200 feet west of Angevine Road, in the town of Barre:

Ap—0 to 8 inches, very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) when dry; moderate, medium and coarse, granular structure; friable; many fine roots; neutral; abrupt, smooth boundary.

B21tg—8 to 12 inches, gray (10YR 5/1) silty clay; common, medium, distinct, yellowish brown (10YR 5/6) mottles; moderate, medium, angular blocky structure; firm; common roots; common pores; grayish brown (10YR 5/2) ped surfaces; thin patchy clay films on ped faces; thick clay linings in pores; neutral; clear, wavy boundary.

B22tg—12 to 25 inches, weak red (2.5YR 5/2) silty clay; common, medium and coarse, distinct, strong brown (7.5YR 5/6) and common, medium, prominent, greenish gray (5GY 6/1) mottles; moderate, coarse, prismatic structure that parts to moderate, medium, angular blocky; firm; common roots; common pores; thick clay linings in pores; neutral; clear, smooth boundary.

IIC—25 to 50 inches, reddish brown (5YR 5/3) gravelly loam; common, medium and coarse, distinct, strong brown (7.5YR 5/6) and few, medium, distinct, light gray (N7/0) mottles; massive; firm; few roots in top 10 inches; 15 percent coarse fragments; calcareous; moderately alkaline.

Thickness of the solum and depth to the contrasting IIC horizon range from 20 to 36 inches. Depth to bedrock is greater than 40 inches. Depth to carbonates ranges from 18 to 36 inches. The content of coarse fragments ranges from none to 5 percent in the solum and from 8 to 20 percent in the IIC horizon.

The Ap horizon has hue of 10YR, value of 2 or 3 when moist and 5 when dry, and chroma of 1 or 2.

The Btg horizon has hue of 10YR to 2.5YR, value of 4 or 5, and chroma of 1 to 3. Mottles range from few to many and from faint to prominent. The texture ranges from heavy silty clay loam to clay. Thin patchy to continuous clay films are on 10 to 30 percent of the ped faces. Reaction mainly ranges from slightly acid to mildly alkaline, but the lower 5 to 6 inches of the Btg horizon is moderately alkaline in places.

The IIC horizon has hue of 2.5YR to 5Y, value of 4 or 5, and chroma of 3 or 4. The texture ranges from loam to silt loam. Reaction is mildly alkaline or moderately alkaline.

Barre soils are commonly near or are similar to Cayuga, Churchville, Ovid, and Fonda soils. They formed in material similar to that of the moderately well drained to well drained Cayuga soils and the somewhat poorly drained Churchville soils. They are wetter and have a finer textured Bt horizon than Ovid soils. They lack the mucky A horizon that is characteristic of Fonda soils.

Ba—Barre silt loam. This nearly level soil is in concave basins of glacial lakes adjacent to areas of glacial till. Areas are irregularly shaped and range from about 5 to 50 acres in size.

Included with this soil in mapping are areas of Churchville, Ovid, and Appleton soils in slightly higher and drier areas and Lakemont, Madalin, and Fonda soils where the lacustrine cap is thinner than 20 inches, some areas of soils that have a thin mucky surface layer, some areas where the surface layer is silty clay loam, and a few areas of stony glacial till.

Runoff is very slow, and some areas are ponded. The hazard of erosion is slight. Prolonged wetness, ponding, and slow permeability are the main limitations.

This soil crusts or forms hard clods if cultivated when wet. Most areas are in woods or permanent hay or are idle. If adequately drained and well managed, this soil is suited to cultivated crops, such as small grain, corn, and some kinds of vegetables. Where outlets are available, surface drainage by open ditches or land shaping, or a combination of both, is generally more effective than tile drainage because of the slowly or very slowly permeable subsoil. Capability unit IVw–1; woodland suitability group 5w1.

Bombay Series

The Bombay series consists of deep, nearly level to gently sloping, moderately well drained soils on glacial till plains. These soils formed in glacial till derived from sandstone and limestone.

In a representative profile the surface layer is dark grayish brown fine sandy loam 8 inches thick. The subsurface layer is 2 inches of brown fine sandy loam. The subsoil is 22 inches thick. In sequence downward, it is 4 inches of brown to dark brown, friable fine sandy loam; 7 inches of mottled brown to dark brown, firm fine sandy loam; 6 inches of mottled yellowish brown, firm fine sandy loam; and 5 inches of mottled reddish brown, firm loam. The substratum is reddish brown, firm loam.

A temporary high water table is perched above the substratum in spring and during other wet periods. Permeability is moderate in the subsoil and moderately slow in the substratum. Available water capacity is moderate. The capacity of these soils to supply nitrogen is medium, and the capacity to supply phosphorus and potassium is low to medium. Seasonal wetness and moderately slow permeability in the substratum are the main limitations in farming and in town and country planning.

Representative profile of Bombay fine sandy loam, 3 to 8 percent slopes, in a cultivated area 50 feet west of Kenyonville Road, three-eighths of a mile north of Eagle Harbor-Knowlesville Road, 300 feet north of cemetery, in the town of Gaines:

Ap—0 to 8 inches, dark grayish brown (10YR 4/2) fine sandy loam; moderate, medium to fine, granular structure; friable; many roots; many fine pores; less than 5 percent coarse fragments; slightly acid; abrupt, smooth boundary.

A2—8 to 10 inches, brown (7.5YR 5/4) fine sandy loam; moderate, medium, granular structure; friable; many roots; many fine pores; less than 5 percent coarse fragments; slightly acid; clear, wavy boundary.

B&A—10 to 14 inches, brown to dark brown (7.5YR 4/4) fine sandy loam; weak, fine, subangular blocky structure parting to weak, thin, platy; friable; common roots; common fine pores with clay linings; light gray (10YR 7/2) ped coats 1 to 2 millimeters thick; 10 percent coarse fragments; neutral; gradual, smooth boundary.

B21t—14 to 21 inches, brown to dark brown (7.5YR 4/4) fine sandy loam; common, medium, distinct, strong brown (7.5YR 5/6) mottles; weak, fine, subangular blocky structure parting to weak, thin, platy; firm; common roots; common fine pores with clay linings; clay films on 15 percent of ped faces; few clay linings in pores; 10 percent coarse fragments; neutral; clear, wavy boundary.

B22t—21 to 27 inches, yellowish brown (10YR 5/4) fine sandy loam; common, medium, distinct, brownish yellow (10YR 6/6) mottles; weak, fine, subangular blocky structure parting to weak, thin, platy; firm; few pores; few patchy clay films on ped faces; 5 percent coarse fragments; neutral; abrupt, wavy boundary.

B3—27 to 32 inches, reddish brown (5YR 4/3) loam; few, medium, prominent, brownish yellow (10YR 6/6) mottles; weak, fine, subangular blocky structure parting to weak, thin, platy; firm; 15 percent coarse fragments; neutral; smooth boundary.

C—32 to 50 inches, reddish brown (5YR 4/3) loam; moderate, medium, platy structure; firm; 15 percent coarse fragments; calcareous; moderately alkaline.

Thickness of the solum and depth to carbonates range from 30 to 40 inches. The content of coarse fragments ranges from 10 to 20 percent in the solum and from 10 to 25 percent in the C horizon. Reaction ranges from medium acid to neutral in the solum and from neutral to moderately alkaline in the C horizon.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2. The A2 horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 or 4. It ranges from fine sandy loam to loam.

The B&A horizon has interfingering A2 material surrounding peds as coatings 1 to 2 millimeters thick in hue of 10YR, value of 6 or 7, and chroma of 2 or 3. The B horizon has hue of 5YR to 10YR, value of 4 or 5, and chroma of 3 or 4. It is loam or fine sandy loam. The Bt horizon has clay films that coat 10 to 30 percent of the ped surfaces.

The C horizon has the same color and texture ranges as the B horizon.

Bombay soils are commonly near or are similar to Madrid, Massena, Hilton, and Appleton soils. They formed in material similar to that of the well drained Madrid soils and somewhat poorly drained Massena soils. Bombay soils are similar to Hilton soils, but have a coarser textured B horizon. They have a coarser textured B horizon and are better drained than Appleton soils.

BoA—Bombay fine sandy loam, 0 to 3 percent slopes.

This nearly level soil has a profile similar to the one described as representative of the series, but the subsurface layer is slightly thicker. The soil is on glacial till plains. Areas are oblong and range from less than 5 to about 50 acres in size.

Included with this soil in mapping are areas of gently sloping Bombay or Madrid soils on knolls and Massena or Appleton soils in drainageways or depressions. Near Fancher are a few areas where the soil is 30 to 40 inches deep over silt and clay, and in Carlton, a few areas where the soil is moderately deep over sand and gravel. In the vicinity of West Shelby are a few areas of soils that have a fragipan.

Runoff is slow, and the hazard of erosion is slight. Seasonal wetness and moderately slow permeability are the main limitations. In most areas this soil responds well to random tile drainage and to lime and fertilization. It is suited to most crops grown in the county, including cherries. Artificial drainage, however, is needed for crops that require good drainage. Capability unit IIw–1; woodland suitability group 2o1.

BoB—Bombay fine sandy loam, 3 to 8 percent slopes. This gently sloping soil has the profile described as representative of the series. It is on till plains in many parts of the county. Areas are oblong and range from less than 5 to about 50 acres in size.

Included with this soil in mapping are nearly level Bombay or Massena soils in drainageways or depressions and gently sloping Madrid soils in higher, drier areas. Near Fancher are a few areas where the soil is moderately deep over reddish silt and clay lacustrine deposits, and north of West Barre, areas where the soil is moderately deep over silt and fine sand. Near West Shelby are areas of soils that have a fragipan.

Runoff is medium, and the hazard of erosion is moderate. The seasonal high water table, the moderate hazard of erosion, and the moderately slow permeability are the main limitations. In most areas this soil responds well to tile drainage and to lime and fertilization. It is suited to most crops grown in the county, including cherries. Artificial drainage, however, is needed for crops that require good drainage. Contour planting, stripcropping, and diversions help to control runoff and reduce the risk of erosion. Capability unit IIe–2; woodland suitability group 2o1.

Brockport Series

The Brockport series consists of moderately deep, nearly level to sloping, somewhat poorly drained soils on bedrock-controlled till plains. These soils formed in 20 to 40 inches of glacial till derived from shale.

In a representative profile the surface layer is dark grayish brown silty clay loam 5 inches thick. The subsurface layer is 4 inches of mottled gray silty clay loam. The upper 9 inches of the subsoil is mottled olive brown clay. The lower 9 inches is mottled grayish brown clay. Olive gray, calcareous shale bedrock, which is easily cut or broken, is at a depth of 27 inches.

A seasonal high water table is generally perched above the bedrock. Permeability is very slow. Available water capacity is moderate. The capacity of these soils to supply nitrogen, phosphorus, and potassium is medium. The depth to shale bedrock, the seasonal wetness, the very slow permeability, and the high clay content are the main limitations in farming and in town and country planning.

Representative profile of Brockport silty clay loam, 2 to 6 percent slopes, in an idle area, two-tenths of a mile north of Lynch Road on east roadbank of Hindsburg Road, in the town of Murray:

Ap—0 to 5 inches, dark grayish brown (2.5Y 4/2) silty clay loam; moderate, fine, subangular blocky structure; friable; many fine roots; neutral; abrupt, wavy boundary.

A2g—5 to 9 inches, gray (5Y 6/1) silty clay loam; common, fine, prominent, brown (7.5YR 5/4) and strong brown (7.5YR 5/8) mottles; moderate, fine, blocky structure; firm; sticky, plastic; many fine roots; neutral; clear, wavy boundary.

B2gt—9 to 18 inches, olive brown (2.5Y 4/4) clay; many, fine and medium, distinct, strong brown (7.5YR 5/6) and yellowish red (5YR 5/6) mottles; strong, medium, blocky structure within strong coarse prisms; firm; very sticky, very plastic; common roots; common, very fine pores with clay linings; distinct dark gray (5Y 4/1) clay coats on all faces of peds in lower 7 inches; gray (5Y 5/1) silt coats on vertical faces of peds in upper 2 inches; few fine shale fragments; mildly alkaline; clear, wavy boundary.

B3g—18 to 27 inches, grayish brown (2.5Y 5/2) clay; common, medium, distinct, olive yellow (2.5Y 6/6) and light olive brown (2.5Y 5/6) mottles; moderate, medium, blocky structure grading to medium platy below 24 inches; very firm; very plastic; few roots; dark gray (5Y 4/1) coats and patches of light brownish gray (10YR 6/2) carbonates on ped faces; common, soft, fine and medium shale fragments; matrix calcareous; mildly alkaline; clear, wavy boundary.

R—27 to 36 inches, shale; olive (5Y 5/3) interiors and gray (N 5/0) exteriors; commonly broken and displaced in the upper part; calcareous; moderately alkaline; easily cut or broken.

Solum thickness ranges from 21 to 36 inches and generally corresponds to the depth to shale bedrock. The content of coarse fragments ranges from none to 20 percent. Most coarse fragments are in the Ap horizon or just above the shale bedrock. Reaction ranges from slightly acid to moderately alkaline in the solum.

The Ap horizon has hue of 10YR to 2.5Y, value of 3 or 4, and chroma of 2. The A2 horizon has hue of 5Y to 10YR, value of 5 or 6, and chroma of 1 or 2. It ranges from silt loam to silty clay loam.

The B2gt horizon has hue of 5Y to 10YR, value of 4 or 5, and chroma of 3 or 4. Low chroma mottles of 2 or less range from none to 35 percent. Faces of peds have chroma of 1 or 2. Interfingering of A2g material in the upper part of the Bt horizons ranges from 2 to 4 inches. Texture ranges from clay to silty clay. The B3 horizon is neutral or has hue of 2.5Y or 10YR, value of 5, and chroma of 0 to 2. It is clay or silty clay.

The C horizon has platy structure and generally contains more shale fragments than the B horizon. The underlying bedrock is generally Rochester Shale, but in some areas it is limestone or sandstone.

Brockport soils are commonly near or are similar to Lockport, Rhinebeck, and Madalin soils. They are similar to Lockport soils in texture and depth, but are brown or olive, whereas Lockport soils are reddish. They are similar in drainage, texture, and color to Rhinebeck soils, but are moderately deep over shale. They are similar to Madalin soils in texture and color, but they are better drained and are moderately deep over shale.

BrA—Brockport silty clay loam, 0 to 2 percent slopes. This nearly level soil has a profile similar to the one described as representative of the series, but the surface layer is thicker. The soil is on bedrock-controlled

till plains. Areas are roughly rectangular or circular in shape and range from 5 to more than 100 acres in size.

Included with this soil in mapping are areas of deep Rhinebeck and Madalin soils and some areas where the upper part of the Brockport soil has been reworked by glacial action. Within the reworked areas are spots of the reddish Cazenovia soils. Also included are some areas where this soil has a silt loam surface layer. Wet spots, stones, and rock outcrop are indicated by spot symbols on the soil map.

Runoff is slow, and the hazard of erosion is slight. Seasonal wetness, depth of shale rock, clay content, and very slow permeability are the main limitations.

This soil is used mainly for hay, small grain, and pasture. Some of the acreage is idle, and some is in trees. Cultivated crops can be grown if adequate surface drainage is provided and tilth is maintained. Cover crops and green manure crops along with proper fertilization help to maintain tilth and productivity. Capability unit IIIw–2; woodland suitability group 3w1.

BrB—Brockport silty clay loam, 2 to 6 percent slopes. This gently sloping soil has the profile described as representative of the series. It is on bedrock-controlled till plains. Areas are roughly rectangular or circular in shape and range from 5 to 100 acres in size.

Included with this soil in mapping are areas where the surface layer is silt loam, areas of soils that are shallower or deeper than the Brockport soil, and some areas where the upper part of the Brockport soil has been reworked by glacial action. Within these reworked areas are spots of Cazenovia soils. Wet spots, stones, and rock outcrop are indicated by spot symbols on the soil map.

Runoff is medium, and the hazard of erosion is moderate. Seasonal wetness, depth to shale rock, clay content, and slow permeability are the main limitations.

This soil is used for hay, small grain, and pasture. Some of the acreage is idle, and some is in trees. Cultivated crops can be grown if adequate drainage is provided. Because of the high clay content, this soil clods if tilled when wet. On long slopes, protection from erosion is needed. Contour rows, stripcrops, and diversions help to control runoff and reduce the hazard of erosion. Cover crops and green manure crops along with proper fertilization help to maintain tilth and productivity. Capability unit IIIw–3; woodland suitability group 3w1.

BrC—Brockport silty clay loam, 6 to 12 percent slopes. This sloping soil is on bedrock-controlled till plains. Areas are irregular or oblong in shape and small in size.

Included with this soil in mapping are areas where the surface layer is silt loam and loam and some areas where the upper part of the Brockport soil has been reworked by glacial action. In the reworked areas are spots of Cazenovia soils. Wet spots and stones are indicated by spot symbols on the soil map.

Runoff is rapid, and the hazard of erosion is moderate to severe. Seasonal wetness, depth to shale rock, clay content, very slow permeability, and the hazard of erosion are the main limitations.

This soil is used mainly for hay, pasture, and trees. If it is cultivated, protection is needed from erosion. If tilled when wet, this soil puddles or clods because of the high clay content. Contour rows or contour stripcrops and diversions help to control runoff and reduce the hazard of erosion. Cover crops, green manure crops, and proper fertilization help to maintain tilth. Capability unit IIIe–3; woodland suitability group 3w1.

Canandaigua Series

The Canandaigua series consists of deep, nearly level, poorly drained and very poorly drained soils in depressions on lake plains. These soils formed in lacustrine deposits of silt, very fine sand, and clay.

In a representative profile the surface layer is very dark gray silt loam 8 inches thick. The subsoil is about 22 inches thick. The upper 4 inches is mottled, light brownish gray, friable silt loam; the next 7 inches is mottled, gray, friable silt loam; and the lower 11 inches is mottled, light brownish gray, friable silt loam. The substratum is mottled light gray and light brown, stratified, friable silt loam and very fine sandy loam in nearly equal proportions.

The water table is near the surface for long periods. Permeability is moderately slow. Available water capacity is high. The capacity of these soils to supply nitrogen is high, but nitrogen is released slowly in spring when the soil is wet. The capacity to supply phosphorus and potassium is medium. Prolonged wetness and ponding are the main limitations in farming and in town and country planning.

Representative profile of Canandaigua silt loam in a cultivated area of Canandaigua soils, 300 feet east of Gaines Basin Road and 450 feet south of Allen Road intersection, in the town of Albion:

Ap—0 to 8 inches, very dark gray (10YR 3/1) silt loam; moderate, fine and very fine, subangular blocky structure; friable; many fine roots; neutral; abrupt, smooth boundary.

B21g—8 to 12 inches, light brownish gray (10YR 6/2) silt loam; many, medium, distinct, yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; weak, very coarse, prismatic structure parting to weak, fine, subangular blocky; friable; many roots; neutral; clear, irregular boundary.

B22g—12 to 19 inches, gray (10YR 6/1) silt loam; many, medium, faint, light gray (10YR 7/2) and distinct, strong brown (7.5YR 5/6) mottles; moderate, fine and medium, blocky structure within strong, very coarse prisms that have gray (10YR 5/1) faces; friable; few roots; thin organic coatings on parts of prism faces; neutral; clear, wavy boundary.

B3g—19 to 30 inches, light brownish gray (10YR 6/2) silt loam; many, medium, distinct, light brown (7.5YR 6/4) and strong brown (7.5YR 5/6) mottles; moderate, medium and thick plates parting to weak, fine, subangular blocky structure; friable; light gray (10YR 6/1) ped faces; calcareous; mildly alkaline; gradual, irregular boundary.

C—30 to 50 inches, light gray (10YR 6/1) and light brown (7.5YR 6/4) thinly stratified silt loam and very fine sandy loam; common, medium, distinct, strong brown (7.5YR 5/8), and pinkish gray (7.5YR 6/2) mottles; massive; friable; calcareous; moderately alkaline.

Thickness of the solum ranges from 20 to 36 inches. Depth to bedrock is greater than 6 feet. The content of coarse fragments ranges from 0 to 2 percent. Reaction ranges from slightly acid to mildly alkaline.

The Ap horizon has hue of 10YR or N, value of 2 or 3, and chroma of 0 or 1.

The B horizon has hue of 10YR to 5YR, value of 5 to 7, and chroma of 1 or 2. Mottles range from few to many and are faint to prominent. The texture ranges from silt loam to silty clay loam.

The C horizon has hue of 10YR to 5YR, value of 5 or 6, and chroma of 1 to 4. It ranges from fine sandy loam to silty clay loam, or it can be varved layers of silt, fine sand, and clay.

Canandaigua soils are commonly near or are similar to Collamer, Niagara, Lamson, and Rhinebeck soils. They formed in material similar to that of the moderately well drained Collamer soils and the somewhat poorly drained Niagara soils. They have a finer textured B horizon than Lamson soils. They are wetter and have a coarser textured B horizon than Rhinebeck soils.

Ca—Canandaigua soils. These nearly level soils are in basins that receive surface runoff. Areas are irregularly shaped and range from less than 5 to more than 100 acres in size. The surface layer is silt loam, mucky silt loam, and very fine sandy loam. Silt loam is the dominant texture.

Included with these soils in mapping are higher, drier areas of Niagara soils, areas of finer textured Lakemont or Madalin soils, and areas of coarser textured Lamson soils. Also included are areas of Lyons or Sun soils near glacial till areas and some areas where the Canandaigua soils have sand or gravel layers in the subsoil or substratum.

Runoff is very slow, and the hazard of erosion is slight. Prolonged wetness and ponding are the main limitations.

In most areas these soils are in woods or pasture or are idle. They are suited to cultivated crops if adequately drained and protected from ponding. They respond well to tile drainage if suitable outlets are available. Large areas of these soils are suited to wetland wildlife. Some areas are good sites for ponds. Capability unit IIIw–5; woodland suitability group 4w1.

Carlisle Series

The Carlisle series consists of deep, nearly level, very poorly drained muck soils in swamps and bogs. These soils formed in woody organic deposits more than 51 inches thick.

In a representative profile muck extends to a depth of 67 inches where it is underlain by mineral material. The upper 11 inches is black and well decomposed, the next 19 inches is very dark brown and firm, and the lower 37 inches is dark reddish brown and friable. The substratum is gray silt.

The water table is near the surface for long periods. Available water capacity is high. The capacity of these soils to supply nitrogen is high. The capacity to supply phosphorus and potassium is low to medium. Prolonged wetness and ponding are the main limitations in farming and in town and country planning.

Representative profile of Carlisle muck in a cultivated area 40 feet north of New Guinea Road, 275 feet east of Transit Road, in the town of Elba:

Oa1—0 to 11 inches, black (N 2/0) sapric material on broken face and rubbed and pressed; about 2 percent fibers unrubbed, none rubbed; moderate, fine, granular structure; friable, nonplastic; few roots; no mineral content; no wood particles; slightly acid; abrupt, smooth boundary.

Oa2—11 to 30 inches, very dark brown (10YR 2/2) sapric material, dark reddish brown (5YR 3/3) pressed, black (10YR 2/1) rubbed; 5 percent fibers unrubbed, none rubbed; massive; firm, nonplastic; no roots; 5 percent mineral; brittle; nonporous; slightly acid; abrupt, smooth boundary.

Oa3—30 to 67 inches, dark reddish brown (5YR 2/2) sapric material on broken face and pressed, black (5YR 2/1) rubbed; about 50 percent fibers unrubbed, less than 10 percent fibers rubbed; massive; friable, nonplastic; no roots; nonporous; less than 1 percent small pieces of wood; neutral; abrupt, smooth boundary.

IIC—67 to 73 inches, gray (N 5/0) silt; massive; slightly sticky; calcareous; moderately alkaline.

Thickness of the organic deposit ranges from 51 inches to about 96 inches. Reaction ranges from slightly acid to neutral. The content of coarse fragments consisting of pieces of wood ranges from none to 5 percent in the subsurface tier and from none to 10 percent in the lower tier.

The surface tier is generally black, in hue of N to 5YR, value of 2, and chroma of 0 or 1. The subsurface and lower tier has hue of 5YR to 10 YR, value of 2 or 3, and chroma of 0 to 3. The underlying mineral material ranges from fine sandy loam to silty clay loam.

Carlisle soils are commonly near or are similar to Palms and Edwards soils. They formed in deeper deposits of organic material than Palms or Edwards soils.

Cb—Carlisle muck. This nearly level organic soil is in swamps and bogs where water is at or near the surface most of the year. It occurs mainly as one large contiguous area near the Barre-Clarendon townline in southeastern Orleans County.

Included with this soil in mapping are organic soils, such as Palms and Edwards soils, that are less than 50 inches thick.

Runoff is very slow. There is no hazard of erosion unless the soil is drained and cultivated. When artificially drained and especially when the water table is lowered, this soil is subject to blowing. Prolonged wetness and ponding are the main limitations.

Soil blowing is best controlled by regulating the water table and by using windbreaks, such as snow fences and stands of shrubs and trees. Unless drained, this soil has limited use. Most of the acreage in Orleans County, however, has been drained and is used for vegetables, commonly onions. Other crops are potatoes, carrots, spinach, and lettuce. This soil has potential as wetland wildlife sites and water storage areas. Capability unit IIIw–6; woodland suitability group 5w1.

Cayuga Series

The Cayuga series consists of deep, gently sloping, moderately well drained to well drained soils on lake deposits in till plains. These soils formed in lacustrine silt and clay underlain by glacial till.

In a representative profile the surface layer is dark grayish brown silt loam 8 inches thick. The subsurface layer is 4 inches of mottled brown silt loam. The subsoil is 13 inches of reddish brown, firm silty clay. The substratum is firm, glacial till. The upper 7 inches is mottled brown loam, the next 17 inches is brown gravelly fine sandy loam, and the lower 11 inches is brown gravelly loam.

A seasonal high water table is perched above the

slowly permeable substratum for brief periods in spring, especially in the lesser sloping areas. Available water capacity is high. The capacity to supply nitrogen and phosphorus is medium, and the capacity to supply potassium is high. Slight seasonal wetness, slow permeability, and the moderate hazard of erosion are the main limitations in farming and in town and country planning.

Representative profile of Cayuga silt loam, 2 to 6 percent slopes, in a cultivated area, 500 feet west of Drake Island Road and 50 feet north of Gillete Road, in the town of Barre:

Ap—0 to 8 inches, dark grayish brown (10YR 4/2) silt loam; weak, fine, subangular blocky structure; friable; many fine roots; 2 percent coarse fragments; medium acid; abrupt, smooth boundary.

A2—8 to 12 inches, brown (10YR 5/3) silt loam; common, medium, distinct, strong brown (7.5YR 5/6) mottles; weak, medium, subangular blocky structure; friable; common fine roots; common fine pores; 2 percent coarse fragments; medium acid; clear, wavy boundary.

B2t—12 to 25 inches, reddish brown (5YR 4/4) silty clay; moderate, medium, blocky structure; firm; few fine roots; common fine pores; continuous, thin, reddish brown (5YR 4/3) clay films on ped faces with thicker linings in pores; grayish brown (10YR 5/2) silty ped coats 1 millimeter thick in upper 3 to 4 inches; 2 percent coarse fragments; slightly acid; clear, smooth boundary.

IIC1—25 to 32 inches, brown (7.5YR 5/4) loam; few, fine, faint, strong brown (7.5YR 5/6) mottles; weak, thick, platy structure; firm; few fine roots; few fine pores; 10 percent coarse fragments; neutral; clear, wavy boundary.

IIC2—32 to 49 inches, brown (10YR 5/3) gravelly fine sandy loam; massive; firm; few fine pores; 20 percent coarse fragments; calcareous; moderately alkaline; abrupt, smooth boundary.

IIC3—49 to 60 inches, brown (10YR 5/3) gravelly loam; weak, medium, platy structure; firm; 20 percent coarse fragments; calcareous; moderately alkaline.

Thickness of the solum ranges from 20 to 36 inches. Depth to carbonates ranges from 20 to 40 inches. Reaction ranges from medium acid to neutral. The content of coarse fragments ranges from 10 to 50 percent in the C horizon.

The Ap horizon has hue of 7.5YR to 2.5Y, value of 3 or 4, and chroma of 2 to 4. The A2 horizon has hue of 10YR, value of 4 to 6, and chroma of 2 or 3.

The Bt horizon has hue of 5YR to 10YR, value of 4 or 5, and chroma of 3 or 4. It ranges from heavy silty clay loam to silty clay.

The C horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 3 or 4. It ranges from fine sandy loam to silt loam.

Cayuga soils formed in the same kind of parent material and are in the same drainage sequence as the somewhat poorly drained Churchville soils and the poorly drained Barre soils. They are better drained and are on thinner clay deposits than Odessa or Rhinebeck soils.

CcB—Cayuga silt loam, 2 to 6 percent slopes. This gently sloping soil is on glacial till deposits that have a lacustrine cap 20 to 36 inches thick. Areas are oblong and generally less than 25 acres in size.

Included with this soil in mapping are areas of other Cayuga soils where slope is less than 2 percent or more than 6 percent. Also included are areas of Churchville, Odessa, and Rhinebeck soils in depressions and along drainageways, areas of Ontario or Hilton soils on knolls, areas where the clay cap is thinner than 20 inches, and south of Clarendon, areas of similar soils that are moderately deep over shale or limestone.

Runoff is medium, and the hazard of erosion is moderate. Slow permeability and the moderate hazard of erosion are the main limitations. This soil is well suited to most crops grown in the county. Cover crops and green manure crops along with contour planting and contour stripcropping help to reduce runoff and erosion. Capability unit IIe–5; woodland suitability group 2o1.

Cazenovia Series

The Cazenovia series consists of deep, nearly level to gently sloping, moderately well drained to well drained soils on till plains. These soils formed in glacial till derived from limestone and shale and commonly modified by clayey lake sediment.

In a representative profile the surface layer is dark brown to brown silt loam 7 inches thick. The upper 6 inches of the subsoil is brown, friable silt loam. The lower 14 inches is mottled reddish brown, firm clay loam. The substratum is brown, firm heavy loam.

A seasonal high water table is perched above the moderately slowly permeable subsoil for brief periods in spring, especially in lesser sloping areas. The substratum is slowly permeable. Available water capacity is moderate to high. The capacity of these soils to supply nitrogen and phosphorus is medium, and the capacity to supply potassium is high. Slight seasonal wetness, slow permeability, and the erosion hazard in sloping areas are the main limitations in farming and in town and country planning.

Representative profile of Cazenovia silt loam, 3 to 8 percent slopes, in an idle area, three-fifths of a mile south of N.Y. 31A and 25 feet east of Bennetts Corners Road, in the town of Clarendon:

Ap—0 to 7 inches, dark brown to brown (7.5YR 4/2) silt loam; moderate, medium, granular structure; friable; many roots; 14 percent coarse fragments; neutral; clear, smooth boundary.

B21—7 to 13 inches, brown (7.5YR 5/4) silt loam; weak, medium, subangular blocky structure; friable; common roots; many fine pores; 10 percent coarse fragments; neutral; clear, wavy boundary.

B22t—13 to 27 inches, reddish brown (5YR 4/4) clay loam; few, fine, faint, yellowish red (5YR 5/6) mottles; moderate, coarse, subangular blocky structure; firm; few roots; common fine pores with clay linings; brown (7.5YR 5/4) ped coats; patchy, thin clay films on about 30 percent of ped faces in lower part; pinkish gray (5YR 6/2) ped coatings 1 to 3 millimeters thick in upper 3 to 4 inches; 15 percent coarse fragments; neutral; gradual, wavy boundary.

C1—27 to 43 inches, brown (7.5YR 5/4) heavy loam; massive; firm; few roots; few fine pores; 15 percent coarse fragments; some clay or weathered shale fragments; neutral; clear, wavy boundary.

C2—43 to 62 inches, brown (7.5YR 5/2) heavy loam; massive; firm; 15 percent coarse fragments 2 millimeters to 8 inches in diameter; some clay and weathered shale fragments.

Thickness of the solum ranges from 20 to 40 inches. Depth to carbonates ranges from 20 to 45 inches. Depth to bedrock is greater than 40 inches. The content of coarse fragments ranges from 5 to 25 percent in the solum and from 10 to 30 percent in the C horizon. Reaction ranges from neutral to medium acid in the solum and from neutral to moderately alkaline in the C horizon.

The Ap horizon has hue of 10YR to 5YR, value of 3 to 5, and chroma of 2 or 3.

The B horizon has hue of 7.5YR or 5YR, value of 3 to 5, and chroma of 3 or 4. It ranges from clay loam to silty clay loam. In the Bt horizon, clay films are on 10 to 50 percent of the ped faces.

The C horizon has hue of 7.5YR to 2.5YR, value of 3 to 5, and chroma of 2 to 4.

Cazenovia soils formed in similar deposits and are in the same drainage sequence as the somewhat poorly drained Ovid soils. They are commonly near Hilton and Cayuga soils. They have a finer textured B horizon than Hilton soils and a coarser textured B horizon than Cayuga soils.

CeA—Cazenovia silt loam, 0 to 3 percent slopes. This nearly level soil has a profile similar to the one described as representative of the series, but the surface layer is slightly thicker and mottles are slightly higher in the profile. It is in areas of glacial till. Areas are mostly oblong and generally less than 20 acres in size.

Included with this soil in mapping are areas of Ovid or Appleton soils in depressions and areas of Cazenovia soils where slope is greater than 3 percent. Also included are areas of Hilton or Bombay soils and areas where the surface layer is loam or fine sandy loam. Wet spots, gravel areas, and stony spots are indicated by spot symbols on the soil map.

Runoff is slow, and the hazard of erosion is slight. Slight seasonal wetness and slow permeability are the main limitations. In places, surface gravel or stones make tillage difficult. This soil is suited to most crops commonly grown in the county. Artificial drainage, however, is needed for crops that require good drainage. Capability unit IIw–1; woodland suitability group 2o1.

CeB—Cazenovia silt loam, 3 to 8 percent slopes. This gently sloping soil has the profile described as representative of the series. It is in areas of glacial till. Areas are oblong or irregular in shape and range from less than 5 acres to more than 100 acres in size.

Included with this soil in mapping are areas of Cazenovia soils where slope is greater than 8 percent or less than 3 percent. Also included are areas where the surface layer is loam or fine sandy loam; areas of Ovid or Appleton soils in depressions or along drainageways; and northwest of Medina, an area where the soil is underlain by silty glacial till that is less than 5 percent coarse fragments. Most areas where the surface is gravelly or stony are indicated by spot symbols on the soil map.

Runoff is medium, and the hazard of erosion is moderate. Slight seasonal wetness, the slow permeability, and the erosion hazard are the main limitations. In places, surface gravel or stones make tillage difficult.

Improved drainage is needed for crops that require good drainage. This soil is suited to most crops commonly grown in the county. Because of the coarse fragments and the moderately fine textured subsoil, it is not used so frequently for vegetables as other soils. It is well suited to general farm crops. Capability unit IIe–2; woodland suitability group 2o1.

CfA—Cazenovia gravelly silt loam, shale substratum, 0 to 3 percent slopes. This nearly level soil has a profile similar to the one described as representative of the series, but it has more coarse fragments in the surface layer and is 3 to 6 feet deep over shale bedrock. It is in areas of till plains. Areas are oblong or irregular in shape and range from 5 to 50 acres in size.

Included with this soil in mapping are areas where the surface layer is loam, silt loam, or gravelly loam and areas of Ovid or Appleton soils in depressions. Also included are areas of gently sloping Cazenovia, Ontario, and Madrid soils on knolls and a few areas of a similar soil that is less than 3 feet deep over shale bedrock. Wet spots, sand spots, and stony areas are indicated by spot symbols on the soil map.

Runoff is slow, and the hazard of erosion is slight. Slight seasonal wetness, slow permeability, and the gravelly surface layer are the main limitations. In places, large surface stones and shallowness over shale bedrock are limitations. Much of the acreage is idle or is not intensively used. Capability unit IIw–1; woodland suitability group 2o1.

CfB—Cazenovia gravelly silt loam, shale substratum, 3 to 8 percent slopes. This gently sloping soil has a profile similar to the one described as representative of the series, but it has more gravel in the surface layer and is 3 to 6 feet deep over shale bedrock. It is in areas of glacial till. Areas are oblong or irregular in shape and range from less than 5 to more than 50 acres in size.

Included with this soil in mapping are areas where the surface layer is loam, silt loam, or gravelly loam; areas of Ontario or Madrid soils on knolls; and areas of Ovid or Appleton soils in depressions or along drainageways. Also included are areas where this soil is less than 3 feet deep over shale bedrock, an area northeast of Lyndonville where it is underlain by clay, and an area southwest of Medina where it is underlain by gray shale. Wet spots, sand spots, and stony areas are indicated by spot symbols on the soil map.

Runoff is medium, and the hazard of erosion is moderate. Slight seasonal wetness, slow permeability, the gravelly surface layer, and the erosion hazard are the main limitations. In places, large surface stones and shallowness over shale bedrock are limitations. Much of the acreage is idle or is not intensively used, but part of it is cultivated. Contour planting, contour stripcropping, and diversions help to control runoff and erosion. Capability unit IIe–2; woodland suitability group 2o1.

Cheektowaga Series

The Cheektowaga series consists of deep, nearly level, poorly drained and very poorly drained soils in depressional areas in lake plains. These soils formed in sandy deltaic deposits underlain by lacustrine silt and clay at a depth of 20 to 36 inches.

In a representative profile the surface layer is very dark gray fine sandy loam 9 inches thick. The subsurface layer is 6 inches of mottled gray loamy fine sand. The upper 3 inches of the subsoil is mottled grayish brown, very friable loamy fine sand. The lower 6 inches is mottled dark grayish brown, loose loamy fine sand. The upper part of the substratum is mottled yellowish brown, firm silty clay loam. The lower part is mottled reddish brown, firm silty clay.

The water table is near the surface for long periods. Permeability is rapid in the subsoil and very slow in the substratum. Available water capacity is moderate to high. The capacity of these soils to supply nitrogen

is high, and the capacity to supply phosphorus and potassium is low. Prolonged wetness, the moderately coarse texture, and ponding are the main limitations in farming and in town and country planning.

Representative profile of Cheektowaga fine sandy loam in an idle area, one-half mile south of Smith Road and Millville East Shelby Road, 1,000 feet west of Millville East Shelby Road, in the town of Shelby:

Ap—0 to 9 inches, very dark gray (10YR 3/1) fine sandy loam, gray (10YR 5/1) when dry; moderate, fine, granular structure; very friable; many roots; many fine pores; neutral; abrupt, smooth boundary.

A2g—9 to 15 inches, gray (10YR 5/1) loamy fine sand; few, fine, distinct, yellowish brown (10YR 5/6) mottles; weak, very fine, granular structure; very friable; few roots; common pores; slightly acid; clear, smooth boundary.

B21g—15 to 18 inches, grayish brown (10YR 5/2) loamy fine sand; common, distinct, yellowish brown (10YR 5/6) mottles; massive; very friable; few roots; common pores; band of dark brown (10YR 3/3) loamy fine sand one-half inch thick at the bottom of horizon; slightly acid; clear, smooth boundary.

B22g—18 to 24 inches, dark grayish brown (10YR 4/2) loamy fine sand; common, medium, distinct, strong brown (7.5YR 5/6) and common, medium, distinct, light gray (10YR 7/1) mottles; single grain; loose; common pores; band of brown to dark brown (7.5YR 4/4) heavy fine sandy loam ½ to 1 inch thick; slightly acid; abrupt, wavy boundary.

IIC1—24 to 34 inches, yellowish brown (10YR 5/4) varved silty clay loam; many, medium, faint, strong brown (7.5YR 5/4) mottles; massive; firm, plastic; streaks of gray (10YR 6/1); calcareous; moderately alkaline; clear, wavy boundary.

IIC2—34 to 50 inches, reddish brown (2.5YR 4/4) varved silty clay; common, medium, distinct, yellowish brown (10YR 5/6) and strong brown (7.5YR 5/4) mottles; massive; firm; calcareous; moderately alkaline.

Depth to the underlying clayey material ranges from 20 to 36 inches. The content of coarse fragments ranges from none to few. Depth to bedrock is greater than 4 feet. Reaction ranges from medium acid to neutral in the solum and from neutral to moderately alkaline in the C horizon.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The A2g horizon has hue of 10YR, value of 5 or 6, and chroma of 1 or 2 and few to common mottles of high chroma. It is loamy fine sand or fine sand.

The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 1 or 2. It ranges from fine and medium sand to loamy fine sand. Mottling ranges from few to many and from low to high chroma.

The IIC horizon has hue of 2.5YR to 10YR, value of 4 to 6, and chroma of 2 to 6. It ranges from heavy silty clay loam to silty clay.

Cheektowaga soils are commonly near or are similar to Cosad, Odessa, Lakemont, and Junius soils. They formed in similar deposits and are in the same drainage sequence as the somewhat poorly drained Cosad soils. They have a coarser textured solum than Lakemont soils. They are wetter and have a coarser textured solum than Odessa soils. They are wetter than Junius soils and lack the deep, sandy deposit that is characteristic of those soils.

Cg—Cheektowaga fine sandy loam. This nearly level soil is in low places on lake plains where runoff accumulates. Areas are oblong or irregular in shape and range from about 5 to 50 acres in size.

Included with this soil in mapping are areas where the surface layer is loam and loamy fine sand and small areas of Cosad, Minoa, Lamson, Lakemont, and Madalin soils. Also included are a few areas where the soil is underlain by glacial till instead of lake sediment.

Runoff is very slow, and the hazard of erosion is slight. Prolonged wetness and ponding are the main limitations. Very slow permeability in the substratum is an additional limitation.

This soil is difficult to artificially drain, but it can be adequately drained if suitable outlets are available. It is not intensively used. If adequately drained and fertilized, it is suited to many crops, especially vegetables. Capability unit IIIw–5; woodland suitability group 5w1.

Churchville Series

The Churchville series consists of deep, nearly level and gently sloping, somewhat poorly drained soils on thin lake deposits on till plains. These soils formed in lacustrine silt and clay underlain by glacial till.

In a representative profile the surface layer is dark grayish brown silt loam 9 inches thick. The subsoil is 13 inches of mottled reddish brown, firm silty clay. The upper part of the substratum is mottled reddish brown, very firm silty clay loam. The lower part is mottled reddish brown, firm loam.

A seasonal high water table is generally perched above the slowly permeable subsoil. The substratum is also slowly permeable. Available water capacity is moderate. The capacity of these soils to supply nitrogen and phosphorus is medium. The capacity to supply potassium is medium to high. The seasonal high water table and the slow permeability are the main limitations in farming and in town and country planning.

Representative profile of Churchville silt loam, 2 to 6 percent slopes, in hay, 150 yards south of N.Y. 31 (Telegraph Road), 50 feet west of Taylor Hill Road, in the town of Ridgeway:

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

B21t—9 to 15 inches, reddish brown (5YR 4/3) silty clay; common, medium, distinct, strong brown (7.5YR 5/6) mottles; moderate, coarse prisms parting to moderate, medium, subangular blocky structure; firm; common roots; common pores; coatings of reddish gray (5YR 5/2) silty material 1 to 2 millimeters thick on peds in upper part; thin, dark reddish gray (5YR 4/2) clay films on 50 percent of peds; less than 2 percent coarse fragments; neutral; clear, smooth boundary.

B22t—15 to 22 inches, reddish brown (5YR 4/3) silty clay; common, fine, faint, yellowish red (5YR 4/6) and reddish gray (5YR 5/2) mottles; moderate, coarse prisms parting to moderate, medium, blocky structure; firm; common roots; common pores with clay linings; dark reddish gray (5YR 4/2) coats and thin continuous clay films on peds; less than 2 percent coarse fragments; neutral; clear, smooth boundary.

C1—22 to 29 inches, reddish brown (5YR 4/3) silty clay loam; many, medium, distinct, yellowish red (5YR 4/6) mottles; moderate, medium, platy structure; very firm; few roots; less than 5 percent coarse fragments; calcareous; moderately alkaline; abrupt, wavy boundary.

IIC2—29 to 52 inches, reddish brown (5YR 5/3) loam; common, medium, faint, yellowish red (5YR 5/6) mottles; massive; firm; 15 percent coarse fragments; calcareous; moderately alkaline.

Thickness of the solum ranges from 20 to 36 inches. Depth to carbonates ranges from 18 to 36 inches. The content of coarse fragments ranges from none to less than 2 percent. Reaction ranges from slightly acid in the upper part of the

solum to mildly alkaline in the lower part.

The Ap horizon has hue of 10YR to 2.5YR, value of 3 to 5, and chroma of 2 or 3.

The B horizon has hue of 10YR to 2.5YR, value of 4 or 5, and chroma of 2 to 4. Texture ranges from silty clay loam to clay. Thin patchy to continuous clay films are on both vertical and horizontal ped faces.

The C1 horizon is similar to the B horizon in color and texture. It is discontinuous, has platy structure, and is calcareous.

The IIC horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4. The texture is loam or silt loam. The content of coarse fragments ranges from 10 to 35 percent.

Churchville soils are commonly near or are similar to Cayuga, Barre, Odessa, and Rhinebeck soils. They formed in similar deposits and are in the same drainage sequence as the well drained to moderately well drained Cayuga soils and the poorly drained Barre soils. They formed in thinner clayey deposits than Odessa and Rhinebeck soils.

ChA—Churchville silt loam, 0 to 2 percent slopes. This nearly level soil has a profile similar to the one described as representative of the series, but it has more mottles nearer the surface. It is in glacial lake areas that are near areas of glacial till. Areas are irregularly shaped and range from less than 5 to more than 50 acres in size.

Included with this soil in mapping are areas where the surface layer is silty clay loam and small areas of wetter Barre, Lakemont, and Madalin soils in depressions and drainageways. Also included are small areas of better drained Cayuga, Schoharie, and Cazenovia soils on knolls and a few areas where stones are on the surface and in the profile.

Runoff is slow, and the hazard of erosion is slight. The seasonal high water table and the slow permeability are the main limitations.

If surface drainage is adequate, this soil is well suited to hay and grain crops. If artificially drained, it is suited to grapes, apples, and pears. It is not so well suited to cherries, peaches, and many vegetables even under artificial drainage, because of the fine textured subsoil. Surface drainage, such as land shaping, is generally more effective than tile systems because of the slowly permeable subsoil. Capability unit IIIw–2; woodland suitability group 3w1.

ChB—Churchville silt loam, 2 to 6 percent slopes. This gently sloping soil has the profile described as representative of the series. It is in glacial lake areas that are near areas of glacial till. Areas are irregularly shaped and range from less than 5 to more than 50 acres in size.

Included with this soil in mapping are areas where the surface layer is silty clay loam. Also included are small areas of Barre, Lakemont, and Madalin soils mostly in depressions or along drainageways and some areas where stones are in the surface layer.

Runoff is medium, and the hazard of erosion is moderate. The seasonal high water table, the slow permeability, and the moderate hazard of erosion are the main limitations.

If surface drainage is adequate, this soil is well suited to hay and grain crops. If artificially drained, it is suited to grapes, apples, and pears. It is not so well suited to cherries, peaches, and many vegetables even under artificial drainage, because of the fine textured subsoil. Surface drainage, such as diversions and graded rows, are generally more effective than tile because of the slowly permeable subsoil. Capability unit IIIw–3; woodland suitability group 3w1.

Claverack Series

The Claverack series consists of deep, nearly level to gently sloping, moderately well drained soils on deltas and beaches associated with glacial lake plains. These soils formed in sandy sediment underlain by lacustrine silt and clay.

In a representative profile the surface layer is dark grayish brown loamy fine sand 9 inches thick. The subsoil is about 18 inches thick. The upper 8 inches is mottled strong brown, very friable loamy fine sand; the next 6 inches is mottled yellowish brown very friable loamy fine sand; and the lower 4 inches is dark yellowish brown and pale brown, very friable loamy fine sand. The substratum is mottled reddish brown, firm silty clay.

A temporary high water table is perched above the slowly or very slowly permeable substratum in spring and during other wet periods. Available water capacity is low to moderate. The capacity to supply nitrogen, phosphorus, and potassium is low. The seasonal high water table and the coarse texture are the main limitations in town and in country planning.

Representative profile of Claverack loamy fine sand, 0 to 6 percent slopes, in a cultivated area 50 feet north of Ashwood Road, 1,000 yards west of Harris Road, in the town of Carlton:

Ap—0 to 9 inches, dark grayish brown (10YR 4/2) loamy fine sand; very weak, fine and medium, granular structure; very friable; many roots; medium acid; abrupt, wavy boundary.

B21—9 to 17 inches, strong brown (7.5YR 5/6) loamy fine sand; weak, fine and very fine, granular structure or single grain; few reddish brown (5YR 5/4) mottles and light gray (10YR 7/2) clean sand grains; very friable; common roots; slightly acid; clear, smooth boundary.

B22—17 to 23 inches, yellowish brown (10YR 5/6) loamy fine sand; common, medium, reddish brown (5YR 5/4) mottles and common, light gray (10YR 7/2) areas of clear sand grains; single grain to weak, very fine, subangular blocky structure; very friable; slightly acid; clear, wavy boundary.

B23—23 to 27 inches, dark yellowish brown (10YR 4/4) and pale brown (10YR 6/3) loamy fine sand; common light gray (10YR 7/2) areas of clean sand grains; very weak, thin, platy structure parting to single grain; very friable; slightly acid; abrupt wavy boundary.

IIC—27 to 50 inches, reddish brown (5YR 4/4) silty clay; common, distinct, yellowish brown (10YR 5/6) mottles; massive; firm, sticky; thin stratified silt films between thick layers of silty clay; calcareous; moderately alkaline.

Depth to the underlying fine textured material ranges from 20 to 36 inches. Reaction ranges from medium acid to neutral in the solum and from neutral to moderately alkaline in the IIC horizon.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3.

The B horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It ranges from loamy fine sand to fine sand. In places it has thin, discontinuous layers or pockets of silt or very fine sand, and in places iron modules or elliptical-shaped bodies that have light colored centers and reddish colored outer rims.

The IIC horizon has hue of 2.5YR to 5Y, value of 3 to 5, and chroma of 2 to 4. It ranges from heavy silty clay loam to clay.

Claverack soils are commonly near or are similar to Cosad, Cheektowaga, Colonie, and Elnora soils. They formed in similar deposits and are in the same drainage sequence as the somewhat poorly drained Cosad soils and the poorly drained to very poorly drained Cheektowaga soils. They are similar to well drained Colonie soils and moderately well drained Elnora soils, but they are underlain by silt and clay.

ClB—Claverack loamy fine sand, 0 to 6 percent slopes. This nearly level to gently sloping soil is on glacial lake plains of sandy deposits underlain by silt and clay. Areas are irregular or oblong in shape and are generally less than 20 acres in size.

Included with this soil in mapping are many areas where the surface layer is fine sandy loam and areas of somewhat poorly drained Cosad, Rhinebeck, or Odessa soils in depressions or along drainageways. Also included are areas of Elnora or Galen soils where the sandy deposit is more than 36 inches thick and a few areas, especially southwest of Lyndonville, where the soils are underlain by glacial till instead of fine textured lake sediment. Near Ridge Road and other beach areas are areas where pebbles are on the surface or are mixed in the profile.

Runoff is slow, and the hazard of water erosion is slight. Soil blowing is a hazard in cultivated areas. The seasonal high water table, the slow or very slow permeability in the underlying silt and clay, and the coarse texture are the main limitations.

This soil is suited to most crops grown in the county. It is especially well suited to vegetable crops and to strawberries in irrigated areas. Tile drainage is needed in wet spots. Frequent applications of lime and fertilizer are needed. Maintaining the level of organic matter is essential. Cover crops and windbreak plantings reduce soil blowing. Capability unit IIw–2; woodland suitability group 3s1.

Collamer Series

The Collamer series consists of deep, nearly level to rolling, moderately well drained soils on lake plains. These soils formed in glacial lake deposits of mainly silt and very fine sand and some clay.

In a representative profile the surface layer is dark grayish brown silt loam 8 inches thick. The subsurface layer is 2 inches of brown, friable silt loam. The upper 12 inches of the subsoil is mottled brown, firm, heavy silt loam. The lower 6 inches is brown, firm silt loam. The substratum is mottled brown, calcareous silt loam.

A temporary high water table is perched above the slowly or moderately slowly permeable substratum in spring and during other wet periods. Available water capacity is high. The capacity of these soils to supply nitrogen, phosphorus, and potassium is medium. The seasonal high water table and the erosion hazard are the main limitations in farming and in town and country planning.

Representative profile of Collamer silt loam, 2 to 6 percent slopes, in a cultivated area 25 feet east of Culvert Road and four-fifths of a mile north of Portage Road, in the town of Ridgeway:

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

A2—8 to 10 inches, brown (10YR 5/3) silt loam; weak, fine, subangular blocky structure; friable; many roots and pores; neutral; clear, wavy boundary.

B21t—10 to 14 inches, brown (7.5YR 5/4) heavy silt loam; few, fine, distinct, reddish yellow (7.5YR 6/6) mottles; moderate, medium, subangular blocky structure; firm; common roots; many fine pores with clay linings; thin, pale brown (10YR 6/3) silty films 1 to 2 millimeters thick surround some peds; a few patchy clay films on some peds; neutral; gradual, wavy boundary.

B22t—14 to 22 inches, brown (7.5YR 5/4) heavy silt loam; common, fine, distinct, yellowish brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; firm; common roots; common fine pores with clay linings; patchy clay films on ped faces; neutral; clear, wavy boundary.

B3—22 to 28 inches, brown (7.5YR 5/4) silt loam; many fine and medium, faint, brown (10YR 5/3) and yellowish brown (10YR 5/4) mottles; weak, medium, subangular blocky structure; firm; few roots and pores; a few, patchy clay films on ped faces; mildly alkaline; gradual, smooth boundary.

C—28 to 50 inches, brown (7.5YR 5/4) silt loam; many, fine and medium, faint, grayish brown (10YR 5/2) and yellowish brown (10YR 5/4) mottles; weak, medium, platy structure; firm; calcareous; moderately alkaline.

Thickness of the solum ranges from 22 to 40 inches. Depth to carbonates is 20 to 48 inches. The content of coarse fragments ranges from essentially none up to 2 percent.

The Ap horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 or 3.

The A2 horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2 to 4. It ranges from fine sandy loam to silt loam.

The B horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 3 or 4. Mottles are few or common and faint to distinct. Chroma ranges from 3 to 6. The texture ranges from silt loam to silty clay loam. Reaction ranges from slightly acid to neutral, but it increases in the lower few inches to mildly alkaline.

The C horizon has hue of 2.5Y to 5YR, value of 4 or 5, and chroma of 2 to 4. It ranges from very fine sandy loam to silty clay loam.

Collamer soils are commonly near or are similar to Niagara, Canandaigua, Galen, and Schoharie soils. They formed in similar deposits and are in the same drainage sequence as the somewhat poorly drained Niagara soils and the poorly drained and very poorly drained Canandaigua soils. They have a finer textured B horizon than Galen soils and a coarser textured B horizon than Schoharie soils.

CmA—Collamer silt loam, 0 to 2 percent slopes. This nearly level soil has a profile similar to the one described as representative of the series, but the subsoil contains slightly more mottles. The soil is in glacial lake deposits that have a high percentage of silt. Areas are roughly rectangular or irregular in shape and range from less than 5 to about 50 acres in size.

Included with this soil in mapping are areas of soils similar to the Collamer soil but have a surface layer of fine sandy loam. Also included are small areas of somewhat poorly drained Niagara or Rhinebeck soils in low spots or along drainageways; areas of a soil on knolls that is similar to the Collamer soil but is well drained; some areas of well drained Arkport soils and moderately well drained Galen soils; and a few areas of soils that are less than 40 inches deep over glacial till. Areas where sand, gravel, or stones are in the surface layer generally are indicated by spot symbols on the soil map.

Runoff is slow, and the hazard of erosion is slight. The slight seasonal wetness is the main limitation.

This soil is well suited to most crops grown in the county. It is especially well suited to fruit and vegetables. It should not be cultivated when wet because particle size is uniform and a plowpan is likely to form. Capability unit IIw–1; woodland suitability group 2o1.

CmB—Collamer silt loam, 2 to 6 percent slopes. This gently sloping soil has the profile described as representative of the series. It is on glacial lake deposits that have a high percentage of silt. Areas are irregular in shape and range from less than 5 to about 50 acres in size.

Included with this soil in mapping are areas of a similar but well drained soil. Also included are areas where the surface layer is fine sandy loam or very fine sandy loam and areas of Niagara and Canandaigua soils in depressions and along drainageways. Northeast of Kendall is an area where the soil has more clay in the substratum, and north of Waterport is an area where the soil has a sandy substratum and has gravel in the profile.

Runoff is medium, and the hazard of erosion is moderate. A slight seasonal wetness and the hazard of erosion are the main limitations.

This soil is suited to most crops grown in the county. It is especially suited to most vegetables and to fruit. Because it is highly erodible, cover crops, contouring, and diversions are needed. This soil should not be cultivated when wet because particle size is uniform and a plowpan is likely to form. Random drainage is needed to eliminate the wet spots. Capability unit IIe–4; woodland suitability group 2o1.

CmC3—Collamer silt loam, 6 to 12 percent slopes, severely eroded. This sloping or rolling soil has a profile similar to the one described as representative of the series, but the subsoil has fewer mottles and most of the original surface layer and part of the subsoil have been lost through erosion. The soil is in glacial lake deposits that have a high percentage of silt. Areas are irregularly shaped or occur as narrow strips along drainageways. They range from less than 5 to about 25 acres in size.

Included with this soil in mapping are areas of a similar but better drained soil, areas where the surface layer is silty clay loam or fine or very fine sandy loam, and areas where the slope is less than 6 percent or more than 12 percent. Also included are small areas where the subsoil is fine textured and small areas of well drained Arkport soils and moderately well drained Galen soils.

Runoff is medium to rapid, and the hazard of erosion is severe. The slight seasonal wetness and the erosion hazard are the main limitations. If erosion is controlled, this soil can be used for most crops grown in the county. Cover crops, contour planting, contour stripcropping, and diversions reduce the hazard of erosion. This soil is suited to fruit, especially apples. Capability unit IVe–1; woodland suitability group 2r1.

Colonie Series

The Colonie series consists of deep, nearly level to rolling, well drained soils on beaches and sand bars or deltaic positions associated with glacial lake deposits. These soils formed in water-laid or wind-deposited fine or very fine sand.

In a representative profile the surface layer is dark grayish brown loamy fine sand 8 inches thick. The subsoil is about 55 inches thick. The upper 8 inches is yellowish brown, very friable loamy fine sand; the next 12 inches is yellowish brown, loose fine sand; and the lower 35 inches is brown, loose fine sand that contains several thin dark brown bands (fig. 8). The substratum is mottled brown fine sand.

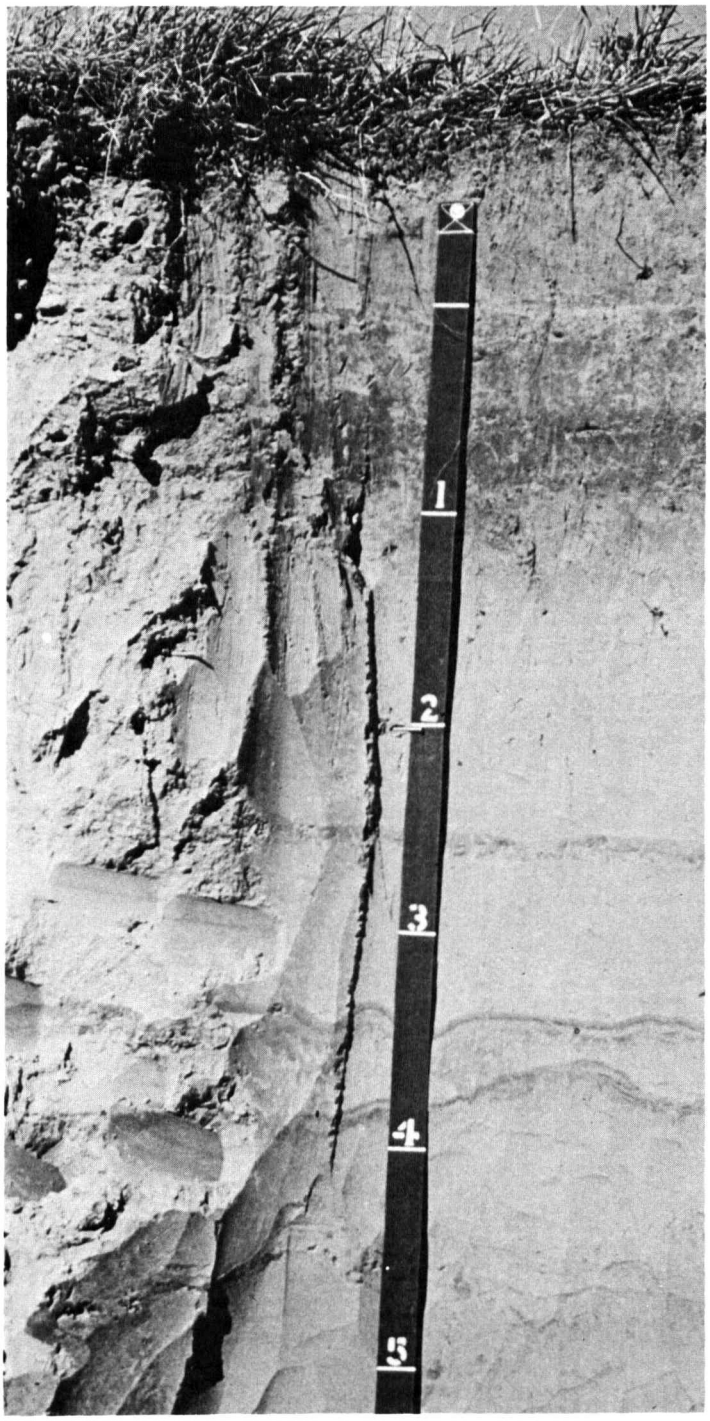

Figure 8.—**Profile of Colonie loamy fine sand showing dark bands.**

Permeability is rapid in the subsoil and substratum. Available water capacity is low. The capacity of these soils to supply nitrogen, phosphorus, and potassium is low. The coarse texture and the hazard of soil blowing are the main limitations in farming and in town and country planning.

Representative profile of Colonie loamy fine sand, 0 to 6 percent slopes, in a cultivated area 500 feet north of the junction of U.S. 104 and Eagle Harbor Road, 275 feet east of the center of Eagle Harbor Road, in the town of Gaines:

Ap—0 to 8 inches, dark grayish brown (10YR 4/2) loamy fine sand; weak, fine and very fine, granular structure; very friable; many roots; slightly acid when limed; abrupt, smooth boundary.

B21—8 to 16 inches, yellowish brown (10YR 5/4) loamy fine sand; very weak, very fine, granular structure; very friable; many roots; medium acid; gradual, wavy boundary.

B22—16 to 28 inches, yellowish brown (10YR 5/4) fine sand; single grain; loose; few roots; strongly acid; abrupt, wavy boundary.

B23—28 to 44 inches, brown (10YR 5/3) fine sand; single grain; loose; few roots; three wavy lamellae ¼ to ½ inch thick, dark brown to brown (7.5YR 4/4) fine sand, massive and slightly firm; strongly acid; abrupt, wavy boundary.

B24—44 to 63 inches, brown (7.5YR 5/2) fine sand; single grain; loose; two wavy lamellae ¼ to ½ inch thick and five wavy thin branching lamellae 1/32 inch thick, dark brown (7.5YR 4/4) to brown (7.5YR 5/4) fine sand, massive and friable; medium acid; gradual, wavy boundary.

C—63 to 80 inches, brown (7.5YR 5/2) fine sand; few, medium, distinct, strong brown (7.5YR 5/6) mottles; single grain; loose; medium acid.

Thickness of the solum ranges from 48 to 70 inches. Reaction ranges from strongly acid to neutral in the solum and from medium to neutral in the C horizon.

The Ap horizon has hue of 10 YR or 7.5YR, value of 4 or 5, and chroma of 2 or 3.

The B horizon, to a depth of 36 inches or more, has hue of 10YR or 7.5YR, value of 5, and chroma of 3 to 6. Below a depth of 36 inches, including the C horizon, hue is 7.5YR or 10YR, value is 5 or 6, and chroma is 2 to 4. The B horizon is loamy fine sand or fine sand. At least 80 percent is sand coarser than very fine. The C horizon is loamy fine sand to medium sand.

Colonie soils are commonly near or are similar to Elnora, Junius, Arkport, and Claverack soils. They formed in similar deposits and are in the same drainage sequence as the moderately well drained Elnora soils and somewhat poorly drained Junius soils. They are coarser textured than Arkport soils and lack the thicker lamellae typical of those soils. Colonie soils are similar in texture to Claverack soils, but they are better drained and do not have the clayey C horizon typical of those soils.

CoB—Colonie loamy fine sand, 0 to 6 percent slopes. This nearly level to gently sloping soil has the profile described as representative of the series. It is on sandy beach and sandbar deposits associated with glacial lakes. Areas are oblong or occur as narrow strips and range from less than 5 to about 25 acres in size.

Included with this soil in mapping are areas where the surface layer is fine sandy loam or fine sand. Also included are small areas of moderately well drained Elnora soils and somewhat poorly drained Junius soils in depressions or along drainageways. Near Ridge Road are areas of Alton soils, some areas of Arkport soils, and a few spots where gravel is on the surface.

Runoff is slow, and the hazard of erosion is slight. Soil blowing is a hazard in cultivated and other unprotected areas. The coarse texture and the low natural fertility are the main limitations.

Because of its good drainage and rapid permeability, this soil is used for early vegetables and for cherries and peaches. Frequent liming and fertilizing and maintaining the level of organic matter are important management needs. This soil responds well to irrigation. Snow fences, windbreak plantings, or cover crops control soil blowing and stabilize the soil to protect new plantings. Capability unit IIIs–1; woodland suitability group 4s1.

CoC—Colonie loamy fine sand, 6 to 12 percent slopes. This sloping or rolling soil has a profile similar to the one described as representative of the series, but the surface layer is thinner and lighter colored. The soil is on sandy beach or sandbar deposits associated with glacial lakes. Areas are oblong or occur as narrow strips and range from less than 5 to about 25 acres in size.

Included with this soil in mapping are areas where the surface layer is fine sandy loam or fine sand. Also included are small areas of moderately well drained Elnora soils in depressions, areas of Alton or Howard soils near beaches or areas of outwash, some areas of Arkport soils, and a few spots where gravel is on the surface and in the soil.

Runoff is generally slow, and the hazard of water erosion is moderate. Soil blowing is a hazard where the soil is unprotected. The coarse texture, the low natural fertility, and the hazard of soil blowing are the main limitations.

Frequent liming and fertilizing and maintaining the level of organic matter are important management needs. Because this soil has good drainage and rapid permeability, it is suited to early market vegetables or to stone fruits, such as cherries and peaches. Cover crops, contour rows, diversions, and windbreaks are needed to control water erosion and soil blowing. Capability unit IVs–1; woodland suitability group 4s1.

Cosad Series

The Cosad series consists of deep, nearly level, somewhat poorly drained soils on glacial lake plains. These soils formed in sandy deltaic or lacustrine deposits that are underlain by lacustrine silt and clay.

In a representative profile the surface layer is very dark grayish brown loamy fine sand 8 inches thick. The upper 7 inches of the subsoil is mottled pale brown, very friable loamy fine sand. The lower 9 inches is mottled brown, very friable loamy fine sand. The substratum is mottled brown, firm layers of silty clay loam and silty clay.

A seasonal high water table is generally perched above the slowly permeable substratum. Permeability is rapid in the subsoil. Available water capacity is moderate. The capacity of these soils to supply nitrogen, phosphorus, and potassium is low. The seasonal high water table, the coarse texture in the surface layer and subsoil, and the slow permeability in the substratum are the main limitations in farming and in town and country planning.

Representative profile of Cosad loamy fine sand in a cultivated area 30 feet south of Waterport-Carlton

Road, 20 feet west of Park Avenue, 1 mile east of the village of Waterport, in the town of Carlton:

Ap—0 to 8 inches, very dark grayish brown (10YR 3/2) loamy fine sand; weak, fine, granular structure; very friable; many roots; neutral; abrupt, smooth boundary.

B21—8 to 15 inches, pale brown (10YR 6/3) loamy fine sand; few, medium distinct, strong brown (7.5YR 5/6) and common, medium, faint, brown (7.5YR 5/2) mottles; weak, fine, subangular blocky structure; very friable; few roots and pores; neutral, clear, wavy boundary.

B22—15 to 24 inches, brown (7.5YR 5/4) loamy fine sand; common, medium, distinct, strong brown (7.5YR 5/6) and common, large, faint, brown (7.5YR 5/2) mottles; weak, medium, subangular blocky structure; very friable; discontinuous layer of reddish brown (5YR 5/3) very fine sandy loam, 0 to 6 inches thick, friable; very few pores; neutral; abrupt, smooth boundary.

IIC—24 to 51 inches, brown (7.5YR 5/2 and 7.5YR 5/4) stratified layers of silty clay loam and silty clay; common, coarse, distinct, strong brown (7.5YR 5/6) and fine, medium, distinct, greenish gray (5GY 6/1) mottles; weak, thick, platy structure to massive; firm; calcareous; moderately alkaline.

Thickness of solum and depth to the underlying fine textured material ranges from 18 to 36 inches. Reaction ranges from medium acid to neutral in the solum and from neutral to moderately alkaline in the contrasting C horizon. The content of coarse fragments ranges from essentially none to 5 percent.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2.

The B horizon has hue of 10YR to 5YR, value of 4 to 6, and chroma of 2 to 4. It is loamy fine sand or fine sand.

The IIC horizon has hue of 2.5YR to 5GY, value of 3 to 5, and chroma of 1 to 4. It ranges from heavy silty clay loam to clay.

Cosad soils are commonly near or are similar to Claverack, Cheektowaga, Junius, and Minoa soils. They formed in similar deposits and are in the same drainage sequence as the moderately well drained Claverack soils and the poorly drained to very poorly drained Cheektowaga soils. Unlike Junius and Minoa soils, Cosad soils are underlain by clayey lake sediment.

Cs—Cosad loamy fine sand. This nearly level soil is in glacial lake areas where sandy soil material was deposited over silt and clay lake sediment. Areas are irregular in shape and range from less than 5 to about 50 acres in size.

Included with this soil in mapping are areas where the surface layer is fine sandy loam or fine sand. Also included are areas of moderately well drained Claverack and Elnora soils on knolls; small areas of Cheektowaga, Lakemont, and Madalin soils in depressions; and some small areas where this Cosad soil is over glacial till instead of fine textured lake sediment. In a few spots are soils that have gravel in the surface layer and in the subsoil.

Runoff is slow, and the hazard of erosion is slight. The seasonal high water table, the coarse texture of the surface layer and subsoil, and the slowly permeable substratum are the main limitations.

Unless artificially drained, this soil is used mainly for hay, pasture, or woods. If adequately drained and frequently fertilized and limed, it is suited to most crops grown in the county. If the soil is artificially drained and is irrigated during dry periods, it is suited to vegetables. Capability unit IIIw–4; woodland suitability group 4w1.

Edwards Series

The Edwards series consists of deep, nearly level, very poorly drained organic soils in swamps or bogs. These soils formed in organic material underlain by marl at a depth of 16 to 40 inches.

In a representative profile the surface layer is dark brown, well decomposed muck 12 inches thick. The next layer is 10 inches of black, well decomposed muck. The next 18 inches is light gray marl that has yellowish brown streaks and many snail shells. Below this is dark greenish gray to gray clay that is massive, sticky, and calcareous.

The water table is near the surface for long periods. Permeability is moderately rapid in the organic part and variable in the marl. Available water capacity is high. The capacity of these soils to supply phosphorus and potassium is low to medium. The capacity to supply nitrogen is high, but unless the soil is artificially drained, the nitrogen is slowly released. The prolonged high water table, ponding, and the underlying marl are the main limitations in farming and in town and country planning.

Representative profile of Edwards muck in a cultivated area 1 mile south of Lee Road (N.Y. 31A), 100 yards east of Hindsburg Road, in the town of Clarendon:

Oa1—0 to 12 inches, dark brown (7.5YR, 3/2) broken face, black (N 2/0) pressed and rubbed sapric material; about 2 percent fibers unrubbed, none rubbed; massive to moderate, medium, subangular blocky; friable; slightly compacted; few roots; less than 2 percent wood particles; neutral; abrupt, smooth boundary.

Oa2—12 to 22 inches, black (5YR 2/1) broken face sapric material; less than 10 percent fibers rubbed; weak, coarse, subangular blocky structure; friable; many roots; 5 percent wood particles; neutral; abrupt, smooth boundary.

IILca—22 to 40 inches, light gray (10YR 7/1) marl; light yellowish brown (10YR 6/4) and yellowish brown (10YR 5/8) streaks; massive; friable; few roots; many snail shells; calcareous; moderately alkaline; abrupt, smooth boundary.

IIIC—40 to 52 inches, dark greenish gray (5GY 4/1) to gray (N 5/0) clay; grades with depth to reddish brown (5YR 4/3); massive; sticky and plastic; calcareous; moderately alkaline.

Thickness of the sapric material ranges from 16 to 40 inches. Reaction ranges from neutral to mildly alkaline. Some profiles have free carbonates in the form of snail shells. The content of coarse fragments consisting of pieces of wood that resist rubbing range from essentially none to 10 percent. The sapric part has hue of N to 5YR, value of 2 or 3, and chroma of 0 to 2. The underlying limnic material is coprogenous earth and marl. It has hue of 10YR to N, value of 5 to 8, and chroma of 1.

These soils are outside the range defined for the series because the mineral layer is more than 12 inches thick and the upper boundary is within the control section, but below the IILca layer. This difference, however, does not alter use and management.

Edwards soils are commonly near or are similar to Palms, Carlisle, and Martisco soils. They formed in organic deposits similar to those of Palms and Carlisle soils. They lack the thick organic deposit that is characteristic of Carlisle soils. They are underlain by marl deposits at depths ranging from 16 to 51 inches, whereas Palms soils are underlain by mineral material at similar depths. They are like the Martisco soils, but the organic deposit is thicker than 16 inches.

Ed—Edwards muck. This nearly level muck soil is

underlain by marl at depths of 16 to 40 inches. It is in swamps and bogs. Areas are oblong or irregular in shape and are fairly large.

Included with this soil in mapping are Palms soils in areas where there is no marl layer and Martisco soils in areas where the organic layer is less than 16 inches thick.

Runoff is very slow. The hazard of erosion is slight, except where the soil is artificially drained and exposed to soil blowing. Most roots are confined to the upper 6 inches unless the soil is drained. If the soil is artificially drained, roots can penetrate to the marl or to the water table, whichever is deeper. The prolonged high water table, ponding, the underlying marl, and the hazard of soil blowing in artificially drained areas are the main limitations.

Unless drained, this soil is limited to water-tolerant plants and to use as wetland wildlife habitat. If adequately drained and fertilized, it is suited to many vegetable crops. Windbreak plantings, snow fences, and cover crops reduce soil blowing. Capability unit IVw–3; woodland suitability group 5w1.

Elnora Series

The Elnora series consists of deep, nearly level and gently sloping, moderately well drained soils in areas that were formerly deltas or beaches in old glacial lakes. These soils formed in water-laid or wind-deposited fine sand containing little or no gravel (fig. 9).

In a representative profile the surface layer is brown loamy fine sand 10 inches thick. The upper 12 inches of the subsoil is mottled strong brown, very friable loamy fine sand. The lower 17 inches is brown, loose fine sand. The upper part of the substratum is dark grayish brown, loose fine and medium sand and the lower part is dark gray, loose medium and coarse sand.

The water table is high in spring and during other wet periods. Permeability is rapid in the subsoil and substratum. Available water capacity is low to moderate. The capacity of these soils to supply nitrogen, phosphorus, and potassium is low. The seasonal high water table, the hazard of soil blowing, and the coarse texture are the main limitations in farming and in town and country planning.

Representative profile of Elnora loamy fine sand, 0 to 6 percent slopes, in an idle area 200 yards north of N.Y. 18 (Roosevelt Highway), one-half mile west of Norway Road, in the town of Kendall:

Ap—0 to 10 inches, brown (10YR 4/3) loamy fine sand; weak, very fine, granular structure; very friable; many roots; medium acid; abrupt, smooth boundary.

B2—10 to 22 inches, strong brown (7.5YR 5/6) loamy fine sand; few, fine, faint, yellowish red (5YR 5/6) mottles; very weak, fine, granular structure; very friable; common roots; medium acid; clear, smooth boundary.

B31—22 to 27 inches, brown (10YR 5/3) fine sand; few, medium, distinct, yellowish red (5YR 5/6) mottles; single grain; loose; few roots; medium acid; clear, wavy boundary.

B32—27 to 39 inches, brown (10YR 5/3) fine sand; common, medium, distinct, reddish brown (5YR 4/4) and red (2.5YR 4/6) and few, fine, faint, light brownish gray (10YR 6/2) mottles; common, coarse, distinct, very dark grayish brown (10YR 3/2) organic stains; single grain; medium acid; clear, wavy boundary.

C1—39 to 45 inches, dark grayish brown (10YR 4/2) fine and medium sand; single grain; loose; slightly acid; clear, wavy boundary.

C2—45 to 52 inches, dark gray (10YR 4/1) stratified medium and coarse sand; single grain; loose; neutral.

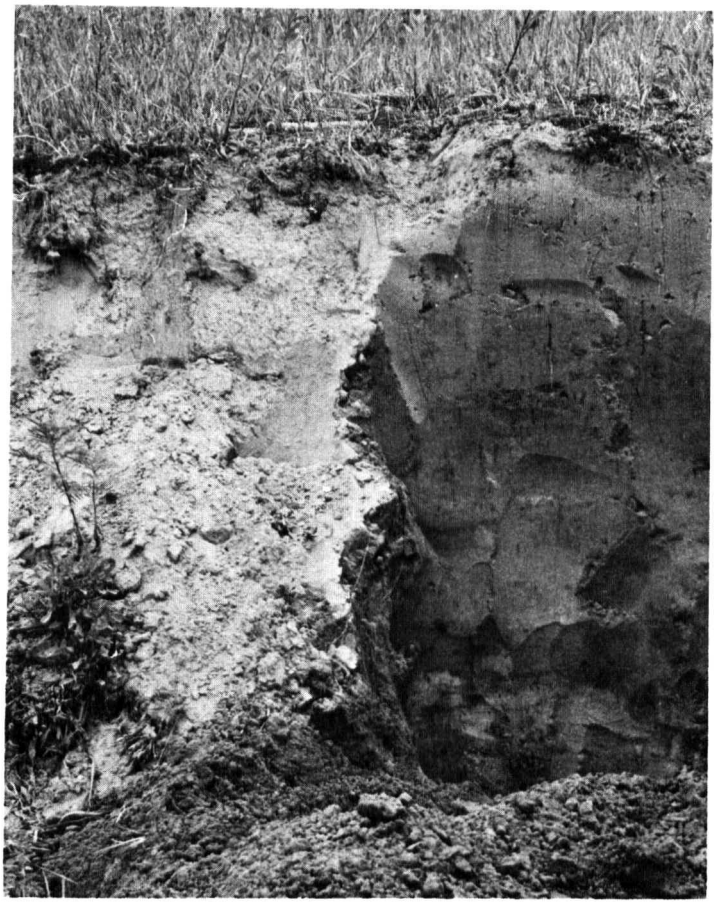

Figure 9.—**Profile of Elnora loamy fine sand. Elnora soils formed in lake-laid deposits of fine sand and little or no gravel.**

Reaction ranges from strongly acid to neutral and becomes less acid with increasing depth. It is neutral at a depth of 3 to 6 feet. Depth to distinct mottling ranges from 15 to 30 inches. Depth to mottles of 2 chroma ranges from 20 to 36 inches. The texture is typically loamy fine sand or fine sand throughout.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The B horizon has hue of 7.5YR or 10YR, value of 5, and chroma of 3 to 6. The C horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 1 to 3.

Elnora soils are commonly near or are similar to Colonie, Junius, Claverack, and Galen soils. They formed in similar deposits and are in the same drainage sequence as the well drained Colonie soils and somewhat poorly drained Junius soils. Elnora soils do not have the clayey C horizon that is characteristic of Claverack soils. They are coarser textured than Galen soils.

ElB—Elnora loamy fine sand, 0 to 6 percent slopes. This nearly level to gently sloping soil is on beaches, sandbars, and deltaic deposits in old glacial lakes. Areas are oblong or irregular in shape and range from less than 5 to more than 50 acres in size.

Included with this soil in mapping are areas where the surface layer is fine sandy loam or fine sand, areas where the surface layer and subsoil contain gravel, and some areas near Ridge Road where the soil is less than 40 inches deep over clay or red shale. Also included are spots of Colonie, Galen, Claverack, Junius, and Minoa soils.

Runoff is slow. The hazard of erosion is slight, but unprotected areas are subject to soil blowing. The seasonal high water table, the coarse texture, and the hazard of soil blowing are the main limitations.

Random tile drainage of wet spots improves productivity. Frequent liming and fertilizing and maintaining the level of organic matter are management needs. This soil responds well to irrigation during dry periods. Because it is easy to cultivate, it is well suited to vegetables and to small fruit. Windbreak plantings, snow fences, and cover crops reduce the hazard of soil blowing. Capability unit IIw–2; woodland suitability group 4s1.

Farmington Series

The Farmington series consists of shallow, nearly level to sloping, well drained soils on bedrock-controlled till plains. These soils formed in 10 to 20 inches of glacial till that overlies limestone or sandstone bedrock (fig. 10).

In a representative profile the surface layer is very dark grayish brown silt loam 7 inches thick. The subsoil is 6 inches of dark brown, friable silt loam. The substratum is 1 inch of brown, flaggy silt loam. Limestone bedrock is at a depth of 14 inches.

Permeability is moderate. Available water capacity is low. The capacity of these soils to supply nitrogen and phosphorus is medium, and the capacity to supply potassium is high. Shallowness over bedrock is the main limitation in farming and in town and country planning.

Representative profile of Farmington silt loam, 0 to 8 percent slopes, in a cultivated area 100 feet east of Fancher Road, one-half mile south of N.Y. 31, in the town of Murray:

Ap—0 to 7 inches, very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) when rubbed; moderate, fine to medium, granular structure; friable; many roots; many fine pores; 5 percent coarse fragments; neutral; abrupt, smooth boundary.

B—7 to 13 inches, dark brown (7.5YR 4/4) silt loam; moderate, fine, subangular blocky structure; fri-

Figure 10.—Road cut in Farmington silt loam showing limestone bedrock at a depth of 10 to 20 inches.

able; many roots; many fine pores; about 12 percent coarse fragments; neutral; clear, smooth boundary.

C—13 to 14 inches, brown (7.5YR 5/4) flaggy silt loam; weak, medium, subangular blocky structure; friable; few roots; few fine pores; about 20 percent coarse fragments; mildly alkaline; clear, broken boundary.

IIR—14 inches, limestone bedrock; vertical joints filled with material from C horizon; roots extend into joints.

Depth to limestone or sandstone bedrock ranges from 10 to 20 inches. Reaction ranges from medium acid to mildly alkaline. The content of coarse fragments ranges from 5 to 25 percent.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2. The B horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. It is silt loam or loam.

Farmington soils are commonly near or are similar to Ontario, Hilton, Wassaic, and Cazenovia soils. Unlike those soils, they lack a Bt horizon and are less than 20 inches deep over bedrock.

FaB—Farmington silt loam, 0 to 8 percent slopes. This nearly level and gently sloping soil has the profile described as representative of the series. It is on glacial till deposits 10 to 20 inches deep over limestone or sandstone rock. Areas are generally narrow strips that follow the bedding plane of the underlying rock and are mostly less than 50 acres in size.

Included with this soil in mapping are areas of soils that are similar to the Farmington soil but are less than 10 inches or more than 20 inches deep over rock and areas of similar but wetter soils in depressions or in spots where the underlying rock is not fractured. Also included are some small areas where rock crops out or the surface layer is very stony and some areas where the surface layer is loam.

Runoff is slow to medium, and the hazard of erosion is slight to moderate. Shallowness over bedrock, the limited root zone and droughtiness, and the stones or rock outcrops are the main limitations. This soil is not suited to most crops. In areas where the underlying rock is fractured, it is suited to vegetables. It has potential for recreational use, such as nature trails. It also provides rocks and minerals for collectors. Capability unit IIIs–2; woodland suitability group 5d1.

FaC—Farmington silt loam, 8 to 15 percent slopes. This sloping soil is on glacial deposits 10 to 20 inches deep over limestone or sandstone rock. Areas are generally narrow strips that follow the bedding plane of the underlying rock and are mostly less than 25 acres in size.

Included with this soil in mapping are areas of soils that are similar to the Farmington soil but are less than 10 inches or more than 20 inches deep over rock. Also included are small areas where the slope is less than 8 percent or more than 15 percent, a few wet spots that occur as springs or seep areas, some areas where rock crops out or the surface layer is very stony, and some areas of moderately deep Wassaic or deep Ontario soils. In some areas the surface layer is loam.

Runoff is medium, and the hazard of erosion is moderate. Shallowness over bedrock and droughtiness, the stones or rock outcrop, and the slope are the main limitations. This soil is poorly suited to most crops. It is better suited to hay and pasture in areas where the underlying rock is fractured than in areas where the rock is massive. It has potential for recreational use, such as nature trails. It also provides rocks and minerals for collectors. Capability unit IVe–2; woodland suitability group 5d1.

Fluvaquents and Humaquepts, Ponded

FH—Fluvaquents and Humaquepts, ponded. This unit consists of wet, periodically flooded areas where the vegetation is mainly grasses, cattails, rushes, and other water-tolerant species. The largest acreage is in the Iroquois National Wildlife Refuge in the southwestern part of Orleans County. In the wildlife refuge the water table is regulated to maintain desirable species of plants. The underlying geologic deposit is dominantly silt, but contains varying amounts of sand and clay. Some marsh areas are underlain by glacial till. Some areas have small knolls of well drained or moderately well drained geologic deposits.

This unit is well suited to wetland wildlife, and most areas are used for this purpose. Some areas support water-tolerant trees. Shallow ponding is the main limitation. Capability unit VIIIw–1; woodland suitability group not assigned.

Fonda Series

The Fonda series consists of deep, nearly level, very poorly drained soils in depressions on lake plains. These soils formed in lacustrine silt and clay.

In a representative profile the surface layer is black mucky silt loam 9 inches thick. The subsoil is about 25 inches thick. The upper 7 inches is mottled gray, very plastic silty clay; the next 8 inches is mottled pinkish gray, very plastic silty clay; and the lower 10 inches is light brownish gray, very plastic silty clay. The substratum is light brownish gray, plastic silty clay loam and layers of silt, clay, and very fine sandy loam.

The water table is near the surface for long periods. Permeability is slow in the subsoil and substratum. Available water capacity is high. The capacity of these soils to supply nitrogen is high, but in spring wetness prevents the release of nitrogen. The capacity to supply phosphorus is medium and potassium high. The prolonged high water table, ponding, and the slow permeability are the main limitations in farming and in town and country planning.

Representative profile of Fonda mucky silt loam in an idle area 1,600 feet south of Delano-Steele Road, east side of N.Y. 98, near ditch, in the town of Barre:

Ap—0 to 9 inches, black (10YR 2/1) mucky silt loam; strong, fine to medium, granular structure; friable; many roots; neutral; abrupt, smooth boundary.

B21g—9 to 16 inches, gray (5Y 6/1) silty clay; common, medium, prominent, strong brown (7.5YR 5/8) mottles; weak, coarse, angular blocky structure; firm, very plastic; few roots; few pores; neutral; clear, wavy boundary.

B22g—16 to 24 inches, pinkish gray (7.5YR 6/2) silty clay; common, medium, prominent, yellowish brown (10YR 5/6) mottles; weak, medium to coarse, subangular blocky structure; firm; very plastic; few pores; neutral; clear, wavy boundary.

B23g—24 to 34 inches, light brownish gray (10YR 6/2) silty clay; moderate, medium to coarse, distinct, brownish yellow (10YR 6/8) mottles; weak, fine to medium, subangular blocky structure; firm;

very plastic; few pores; moderately alkaline; clear, smooth boundary.

Cg—34 to 50 inches, light brownish gray (10YR 6/2) silty clay loam, and layers of silt, clay, and very fine sandy loam; weak, thick, platy structure; firm; plastic; calcareous; moderately alkaline.

Thickness of the solum and depth to carbonates range from 28 to 36 inches.

The Ap horizon has hue of 10YR, value of 2, and chroma of 1 or 2.

The B horizon has hue of 5Y to N, value of 4 to 6, and chroma of 0 to 2. Texture ranges from silty clay loam to clay. Reaction ranges from slightly acid to moderately alkaline. High chroma mottles range from few to many.

The C horizon has hue of 2.5Y to 2.5YR, value of 4 to 6, and chroma of 1 or 2. It ranges from silty clay loam to clay.

Fonda soils are commonly near or are similar to Lakemont, Madalin, Odessa, and Palms soils. They formed in deposits similar to those of Lakemont and Madalin soils, but do not have a Bt horizon. They are wetter than Odessa soils and also differ in not having a Bt horizon. They lack the thick organic surface layer that is characteristic of Palms soils.

Fo—Fonda mucky silt loam. This nearly level soil is in depressional areas that were formerly occupied by glacial lakes. Areas are oblong or occur as narrow strips associated with shallow organic soils. They range from less than 10 acres to more than 100 acres in size.

Included with this soil in mapping are a few areas of Canandaigua soils, which are similar to the Fonda soil but have a coarser textured subsoil; and areas of Lakemont and Madalin soils where there has been some clay movement in the subsoil and more soil development. Also included are spots of Palm soils in some areas where the organic surface layer is thicker and spots of Lyons or Barre soils in a few areas where the soil is underlain by glacial till.

Runoff is very slow, and the hazard of erosion is slight. The prolonged high water table, ponding, and the slow permeability are the main limitations. Unless artificially drained, this soil is limited to water-tolerant trees and short-season cultivated crops or to hay and pasture. If adequately drained, it is suited to corn, small grain, and some vegetables. If tilled when wet, it becomes hard or cloddy and puddles. Ditches or land shaping, or a combination of both, provides the best surface drainage. Capability unit IVw–1; woodland suitability group 5w1.

Fredon Series

The Fredon series consists of deep, nearly level, somewhat poorly drained to poorly drained soils on outwash terraces and beach deposits of sand and gravel. These soils formed in glacial outwash derived from limestone, sandstone, and shale.

In a representative profile the surface layer is very dark grayish brown loam 10 inches thick. The upper 10 inches of the subsoil is mottled light brownish gray, firm gravelly loam. The lower 10 inches is brown, friable very gravelly loamy sand. The upper part of the substratum is mottled brown and grayish brown, loose, fine and medium sand, and the lower part is reddish brown and dark reddish gray, loose sand and gravel.

The water table is near the surface for long periods. Permeability is moderately rapid in the subsoil and rapid in the substratum. Available water capacity is moderate. The capacity of these soils to supply nitrogen is high, and the capacity to supply phosphorus and potassium is low to medium. The seasonal high water table is the main limitation in farming and in town and country planning.

Representative profile of Fredon loam in an idle area 1,900 feet north of Kenyonville on Harris Road, 120 feet west of Harris Road, in the town of Carlton:

Ap—0 to 10 inches, very dark grayish brown (10YR 3/2) loam, gray (10YR 6/1) when dry; weak, fine and medium, granular structure; friable; many roots; 7 percent gravel; neutral; abrupt, smooth boundary.

B2g—10 to 20 inches, light brownish gray (10YR 6/2) gravelly loam; many, medium, distinct, brownish yellow (10YR 6/6) and few, coarse, distinct, brown (7.5YR 4/4) mottles; weak, coarse, subangular blocky structure; firm; common roots; common, fine pores; 23 percent gravel; neutral; some weathered shale fragments that impart a finer texture locally; clear, wavy boundary.

IIB3—20 to 30 inches, brown (10YR 4/3 and 7.5YR 5/2) very gravelly loamy sand; massive; friable; few roots; some voids or pores around pebbles; 46 percent gravel; neutral; abrupt, smooth boundary.

IIC1—30 to 34 inches, brown to dark brown (7.5YR 4/2) and grayish brown (10YR 5/2) fine and medium sand; common, medium, distinct, yellowish brown (10YR 5/6) mottles; single grain; loose; neutral; abrupt, smooth boundary.

IIC2—34 to 50 inches, reddish brown (5YR 4/3) and dark reddish gray (5YR 4/2) stratified sand and gravel; single grain; loose, nonsticky; common voids or pore space around gravel; 45 percent gravel; calcareous; moderately alkaline.

Solum thickness ranges from 23 to 35 inches. The content of gravel ranges from 5 to 25 percent in the upper part of the solum and from 35 to 60 percent in the lower part and in the C horizon. Reaction ranges from neutral to medium acid in the solum and from neutral to moderately alkaline in the IIC horizon.

The Ap horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2. The B horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 or 3. The C horizon has hue of 10YR to 5YR, value of 4 to 6, and chroma of 2 or 3.

Fredon soils are commonly near or are similar to Phelps, Alton, Minoa, and Junius soils. They formed in similar deposits and are in the same drainage sequence as the moderately well drained Phelps soils and well drained to somewhat excessively drained Alton soils. They contain more gravel than Minoa and Junius soils.

Fr—Fredon loam. This nearly level soil is on glacial outwash or beach deposits of sand and gravel. Areas are irregular in shape or occur as narrow strips. They range from about 5 to 25 acres in size.

Included with this soil in mapping are areas where the surface layer is gravelly loam or gravelly sandy loam and small areas of Phelps soils, which are similar to the Fredon soil but are moderately well drained. Also included are areas where the soil is less than 40 inches deep over silty, loamy, or clayey soil material instead of gravel; and areas of the poorly drained or very poorly drained Lamson and Wayland soils.

Runoff is slow, and the hazard of erosion is slight. A seasonal high water table is the main limitation. In places, gravel in the surface layer limits the cultivation of some crops and makes tillage difficult.

This soil responds well to tile drainage, but because of its low position in the landscape a suitable outlet is

generally difficult to locate. Unless artificially drained, this soil is limited mainly to hay and short-season crops. If adequately drained, it is suited to most crops grown in the county. Capability unit IIIw–1; woodland suitability group 3w1.

Galen Series

The Galen series consists of deep, nearly level to gently sloping, moderately well drained soils on deltas that formed within glacial lakes in lake plains. These soils formed in water-deposited fine sand, very fine sand, and some silt.

In a representative profile the surface layer is dark grayish brown, very fine sandy loam 9 inches thick. The upper 11 inches of the subsoil is strong brown loamy very fine sand. The lower 27 inches is mottled brown loamy fine sand that has thin bands of fine sandy loam. The substratum is dark reddish gray fine sand.

A temporary high water table occurs in spring and during other wet periods. Permeability is moderately rapid in the subsoil and substratum. Available water capacity is low to moderate. The capacity of these soils to supply nitrogen is medium, and the capacity to supply phosphorus and potassium is low to medium. The seasonal high water table, the high percentage of fine and very fine sand, and the hazard of erosion are the main limitations in farming and in town and country planning.

Representative profile of Galen very fine sandy loam, 0 to 2 percent slopes, 1½ miles north of U.S. 104 and 30 feet east of N.Y. 63, in the town of Ridgeway:

Ap—0 to 9 inches, dark grayish brown (10YR 4/2) very fine sandy loam; weak, fine and medium, granular structure; very friable; many roots; slightly acid; abrupt, smooth boundary.

B11—9 to 20 inches, strong brown (7.5YR 5/6) loamy fine sand; weak, fine, granular structure; very friable; common roots; slightly acid; clear, wavy boundary.

A'21&B'21t—20 to 32 inches, brown (7.5YR 5/4) loamy fine sand; common, medium, faint, strong brown (7.5YR 5/6) mottles; massive; friable; few roots; few fine pores; six reddish brown (5YR 4/3) lamellae less than ½ inch thick; lamellae are discontinuous, have a fine sandy loam texture, are firm, and have clay bridging between sand grains; medium acid; clear, smooth boundary.

A'22&B'22t—32 to 47 inches, brown (7.5YR 5/4) loamy fine sand; common, medium, faint, brown (7.5YR 5/2) and common, medium, faint, strong brown mottles; massive; friable; few roots in upper 6 inches; few fine pores; many thin reddish brown (5YR 4/3) lamellae stratified with A'22 material; difficult to separate lamellae from A'22 material; lamellae have fine sandy loam texture, are firm, massive, and have clay bridging between sand grains; medium acid; clear, smooth boundary.

C—47 to 55 inches, dark reddish gray (5YR 4/2) fine sand; single grain; wet, nonsticky; neutral.

Solum thickness ranges from 40 to 60 inches. Reaction ranges from medium acid to neutral in the solum and from neutral to mildly alkaline in the C horizon. The soil is generally calcareous in the lower part.

The Ap horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2 or 3.

The A'2 and B'2 horizons have lamellae aggregations 6 to 15 inches thick within the more sandy and lighter colored material. The lamellae have hue of 10YR to 5YR, value of 3 or 4, and chroma of 3 or 4. The texture ranges from fine sandy loam to loam that is 15 to 25 percent sand coarser than very fine sand and 60 to 80 percent very fine sand and silt. The sand particles are coated and bridged with clay. The lamellae are slightly sticky to sticky when wet. The interlamellae parts have hue of 10YR to 5YR, value of 4 to 6, and chroma of 2 to 4. The texture of the interlamellae ranges from fine sand to loamy very fine sand. In some parts, mottling in the B'2 horizon has higher chroma than that in the matrix.

The C horizon has hue of 5YR to 10YR, value of 4 or 5, and chroma of 2 or 3.

Galen soils are commonly near or are similar to Arkport, Minoa, Lamson, and Niagara soils. They formed in similar deposits and are in the same drainage sequence as the well drained Arkport soils, somewhat poorly drained Minoa soils, and poorly drained and very poorly drained Lamson soils. They are better drained and have a coarser textured B horizon than Niagara soils.

GaA—Galen very fine sandy loam, 0 to 2 percent slopes. This level to nearly level soil has the profile described as representative of the series. It is on sandy deltaic deposits that are dominantly fine and very fine sand. Areas are irregular in shape and range from less than 5 to more than 100 acres in size.

Included with this soil in mapping are areas where the surface layer is fine sandy loam or loamy fine sand, small areas of a soil that is similar to the Galen soil but is more silty, spots of a similar soil that has a well developed fragipan, and in an area southwest of Albion a similar soil that is less than 40 inches deep over glacial till. Also included are areas of Arkport or Colonie soils on knolls and Minoa soils in depressions or along drainageways and small areas of Elnora soils.

Runoff is slow. The hazard of erosion is slight, but large unprotected areas are subject to soil blowing. The seasonal high water table, the high content of fine and very fine sand, and the hazard of soil blowing are the main limitations.

Artificial drainage of wet spots, frequent fertilization, and maintenance of organic-matter content are important management needs. This soil responds well to tile drainage. Productivity is improved if crops are irrigated during dry periods. Large cultivated areas should be protected from soil blowing. This soil is easy to cultivate and is well suited to vegetables and fruit. Snow fences, windbreak plantings, and cover crops reduce the hazard of soil blowing. Capability unit IIw–2; woodland suitability group 2o1.

GaB—Galen very fine sandy loam, 2 to 6 percent slopes. This gently sloping or undulating soil has a profile similar to the one described as representative of the series, but the surface layer is thinner and the soil contains fewer mottles. It is on sandy deltaic deposits that are dominantly fine and very fine sand. Areas are oblong or irregular in shape and range from less than 5 to about 50 acres in size.

Included with this soil in mapping are areas where the surface layer is fine sandy loam or loamy fine sand and areas where the slope is less than 2 percent or more than 6 percent. Also included are small areas of a similar but more silty soil and a similar soil that has a well developed fragipan, a few areas of soils that are similar to the Galen soil but are less than 40 inches deep over silty or loamy soil material, areas of Arkport or Colonie soils on knolls and Minoa soils in depressions or along drainageways, and areas of Elnora soils.

Runoff is medium, and the hazard of erosion is

moderate. The seasonal high water table, the high content of fine and very fine sand, and the moderate hazard of erosion are the main limitations.

Artificial drainage of wet spots, frequent fertilization, and maintenance of organic-matter content are important management needs. This soil responds well to tile drainage, and productivity is improved if crops are irrigated during dry periods. Because there are no stones or gravel, this soil is easy to cultivate and is well suited to many vegetables. It is subject to soil blowing if cultivated and not protected. Cover crops, contour rows, diversions, and windbreaks reduce soil loss. Capability unit IIw–2; woodland suitability group 2o1.

Hamlin Series

The Hamlin series consists of deep, nearly level, well drained soils on flood plains. These soils formed in recent alluvial deposits mainly of silt and very fine sand.

In a representative profile the surface layer is dark grayish brown silt loam 10 inches thick. The upper 8 inches of the subsoil is dark brown friable silt loam. The substratum is layers of reddish brown, friable very fine sandy loam and silt loam.

Permeability is moderate in the subsoil and substratum. Available water capacity is high. The capacity of these soils to supply nitrogen, phosphorus, and potassium is medium. Flooding and erosion caused by flooding are the main limitations in farming and in town and country planning.

Representative profile of Hamlin silt loam in a pasture, on a creek bank east side of Yates-Carlton Town Line Road approximately one-fifth mile south of N.Y. 18, in the town of Carlton:

Ap—0 to 10 inches, dark grayish brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable; many roots; neutral; clear, wavy boundary.

B21—10 to 18 inches, dark brown (10YR 4/3) silt loam; weak, fine, subangular blocky structure; friable; many roots; many fine pores; neutral; clear, smooth boundary.

B22—18 to 37 inches, reddish brown (5YR 4/3) silt loam; weak, medium, subangular blocky structure; friable; common roots; many fine pores; a few worm channels; neutral; clear, wavy boundary.

C—37 to 64 inches, reddish brown (5YR 4/4) very fine sandy loam interstratified with silt loam; massive; friable; few roots; common pores; a few pebbles; neutral.

Solum thickness ranges from 24 to 40 inches. Depth to carbonates or strongly contrasting material is more than 40 inches. There are few, if any, coarse fragments within the solum.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 1 or 2.

The B horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 2 to 4. Mottles occur below a depth of 24 inches in some pedons. Texture ranges from fine sandy loam to silt loam. Reaction ranges from slightly acid to neutral.

The C horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 2 to 4. Texture ranges from silt loam to fine sandy loam or to stratified fine sand and silt. Reaction ranges from neutral to mildly alkaline.

Hamlin soils are commonly near or are similar to Teel and Wayland soils and Udifluvents, frequently flooded. They formed in similar deposits and are in the same drainage sequence as the moderately well drained to somewhat poorly drained Wayland soils. Hamlin soils are finer textured than Udifluvents, frequently flooded.

Ha—Hamlin silt loam. This nearly level soil is in silty alluvial deposits on flood plains. Areas generally occur as narrow strips parallel to the stream. They range from less than 5 acres to about 25 acres in size.

Included with this soil in mapping are small areas of the moderately well drained to somewhat poorly drained Teel soils and areas of soils that are similar to the Hamlin soil but are less than 40 inches deep over contrasting material, such as gravel, clay, or shale rock.

Runoff is slow. The hazard of erosion is slight except for streambank erosion and cross-channel erosion during periods of high water. Flooding, wetness after flooding, and dissection of the flooded area are the main limitations. This soil is naturally fertile and is one of the most productive in the county. Most areas are pastured or wooded. Capability unit IIw–3; woodland suitability group 2o2.

Hilton Series

The Hilton series consists of deep, nearly level to gently sloping, moderately well drained soils on till plains. These soils formed in glacial till derived from sandstone and limestone.

In a representative profile the surface layer is dark grayish brown loam 8 inches thick. The upper 6 inches of the subsoil is brown, friable loam. The lower 16 inches is mottled reddish brown, firm heavy loam. The upper part of the substratum is mottled brown, firm loam, and the lower part is mottled brown, firm gravelly loam.

A temporary high water table is perched above the slowly permeable substratum in spring and during other wet periods. The subsoil is moderately permeable. Available water capacity is high. The capacity of these soils to supply nitrogen, phosphorus, and potassium is medium. The seasonal high water table and the slow permeability in the substratum are the main limitations in farming and in town and country planning.

Representative profile of Hilton loam, 0 to 3 percent slopes, in a hayfield four-fifths of a mile east of N.Y. 98 and 300 feet south of Delano-Steele Road, in the town of Barre:

Ap—0 to 8 inches, dark grayish brown (10YR 4/2) loam; weak, fine and medium, granular structure; very friable; many roots; 5 percent coarse fragments; a few fragments larger than 3 inches; slightly acid; abrupt, smooth boundary.

B21—8 to 14 inches, brown (7.5YR 5/4) loam; weak, medium, granular structure; friable; common roots; common fine pores; 5 percent coarse fragments, 1 percent larger than 3 inches; slightly acid; clear, wavy boundary.

B22t—14 to 30 inches, reddish brown (5YR 4/4) heavy loam; common, medium, faint, reddish brown (5YR 5/4) mottles; moderate, medium, blocky structure; firm; few roots; common fine pores with clay linings; thin, nearly continuous, reddish brown (5YR 4/3) clay films on ped faces in lower part; thin gray (10YR 6/1) clean sand grains 1 to 3 millimeters thick on peds in upper 4 inches; 10 percent coarse fragments, 4 percent greater than 3 inches; neutral; clear, smooth boundary.

C1—30 to 36 inches, brown (7.5YR 5/4) loam; common,

medium, faint, brown (7.5YR 5/2) and common, medium, faint, strong brown (7.5YR 5/6) mottles; massive; firm; few roots; few fine pores; 10 percent coarse fragments, 3 percent greater than 3 inches; neutral; clear, broken boundary.

C2—36 to 72 inches, brown (7.5YR 5/4) gravelly loam; common, medium, faint, brown (7.5YR 5/2) and common, medium, faint, strong brown (7.5YR 5/6) mottles; massive; firm; 20 percent coarse fragments, 5 percent greater than 3 inches; calcareous; moderately alkaline.

Thickness of the solum and depth to carbonates range from 24 to 40 inches. Depth to bedrock is more than 40 inches. The content of coarse fragments ranges from 5 to 15 percent in the A horizon and from 5 to 30 percent in the B horizon. Reaction ranges from slightly acid to neutral in the solum.

The Ap horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2.

The B21 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4. It ranges from sandy loam to silt loam.

B21 material interfingers along ped faces and extends 2 to 4 inches into the B22t horizon. The B22t horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 3 or 4. Texture ranges from fine sandy loam to silt loam. Thin patchy clay films are on 10 to 30 percent of the ped faces.

The C horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 2 to 4. The content of coarse fragments ranges from 10 to 30 percent.

Hilton soils are commonly near or are similar to Ontario, Appleton, Lyons, and Bombay soils. They formed in similar deposits and are in the same drainage sequence as the well drained Ontario soils, the somewhat poorly drained Appleton soils, and the poorly drained and very poorly drained Lyons soils. They have a finer textured B horizon than Bombay soils.

HbA—Hilton loam, 0 to 3 percent slopes. This nearly level soil has the profile described as representative of the series. It is on drumlins and on ground or recessional morainic deposits of glacial till. Areas are generally oblong and range from about 5 to 50 acres in size.

Included with this soil in mapping are areas where the surface layer is silt loam, fine sandy loam, or gravelly loam. Also included are areas of Appleton soils in depressions and along drainageways; areas of Ontario and Madrid soils on knolls or in higher, better drained areas; and a few areas of soils that are similar to the Hilton soil but have more silt and a thinner subsoil.

Runoff is slow, and the erosion hazard is slight. A seasonal high water table and the slow permeability of the underlying glacial till are the main limitations. In places, surface stones or gravel is an additional limitation. This soil is suited to most crops grown in the county. Tile drainage increases the choice of crops, especially those that require good drainage. This soil responds well to irrigation during dry periods. Capability unit IIw–1; woodland suitability group 2o1.

HbB—Hilton loam, 3 to 8 percent slopes. This gently sloping or undulating soil has a profile similar to the one described as representative of the series, but the subsoil is thinner. It is on drumlins and on ground or recessional morainic deposits of glacial till. Areas are generally oblong and range from about 5 to 100 acres in size.

Included with this soil in mapping are areas where the surface layer is silt loam, fine sandy loam, or gravelly loam; areas of Appleton soils in depressions and along drainageways; and areas of Ontario or Madrid soils on knolls or in higher, drier areas. Also included in a few areas are soils that are similar to the Hilton soil but have more silt and a thinner combined surface layer and subsoil. Clay spots, sand spots, gravel, and stony spots are indicated by spot symbols on the soil map.

Runoff is medium, and the hazard of erosion is moderate. A seasonal high water table, the moderate hazard of erosion, and the slow permeability in the underlying glacial till are the main limitations. In places, surface stones or gravel is a concern.

Random drainage of wet spots increases the choice of crops and provides for more uniform tillage. Contour rows, contour stripcrops, and diversions reduce runoff and soil loss. This soil is used for nearly all purposes, including dwarf apple orchards. Capability unit IIe–2; woodland suitability group 2o1.

HcA—Hilton loam, rock substratum, 0 to 3 percent slopes. This nearly level soil has a profile similar to the one described as representative of the series, but it has more mottles and is underlain by bedrock at a depth of 40 inches to 72 inches. It is on glacial till deposits near areas of bedrock. Areas are irregular or roughly rectangular in shape and range from about 5 to 100 acres in size.

Included with this soil in mapping are areas where the surface layer is silt loam, fine sandy loam, or stony loam; areas of Appleton or Ovid soils in depressions or along drainageways; and areas of Ontario or Madrid soils on knolls or in other higher, drier areas. Also included are areas of Wassaic soils where the depth to bedrock is less than 40 inches and some areas of a soil that is similar to the Hilton soil but has a higher silt content and a thinner combined surface layer and subsoil. Rock outcrop or boulders are included in some areas.

Runoff is slow, and the hazard of erosion is slight. A seasonal high water table and shallowness over bedrock are the main limitations. In places, surface stones or rock outcrop is an additional limitation. Consequently, tile drainage is costly and not always feasible. Capability unit IIw–1; woodland suitability group 2o1.

HcB—Hilton loam, rock substratum, 3 to 8 percent slopes. This gently sloping soil has a profile similar to the one described as representative of the series, but bedrock is at a depth of 40 inches to 72 inches. It is on glacial till deposits near areas of bedrock. Areas are generally oblong or roughly rectangular in shape and less than 50 acres in size.

Included with this soil in mapping are areas where the surface layer is silt loam, fine sandy loam, or stony loam; areas of Appleton or Ovid soils in depressions or along drainageways; and areas of Ontario or Madrid soils on knolls or in other higher, drier areas. Also included are areas of Wassaic soils where the depth to bedrock is less than 40 inches, some areas where there are large stones or rock outcrop, and a few small areas where the slope is less than 3 percent or more than 8 percent.

Runoff is medium, and the hazard of erosion is moderate. A seasonal high water table, the moderate hazard of erosion, and the shallowness over bedrock are the main limitations. In places, large surface stones

or rock outcrop is a concern. Consequently, tile drainage is costly and not always feasible. Capability unit IIe–2; woodland suitability group 2o1.

HnB—Hilton-Cazenovia stony silt loams, 0 to 8 percent slopes. This mapping unit is mainly near swamps or bogs. It is approximately 55 percent Hilton soil and 35 percent Cazenovia soil. Areas are irregular in shape and are generally 50 to 100 acres in size. These soils have profiles similar to those described as representative of the respective series, but the surface layer has more stones.

Included with this unit in mapping are areas where the surface layer is loam or is nonstony or very stony and a few areas where rock crops out. Also included are areas of Hilton and Cazenovia soils that are less than 6 feet deep over bedrock and areas of soil that is similar to the Hilton soil but has a higher silt content and a thinner solum.

Runoff is slow to medium, and the hazard of erosion is slight. Surface stones and slight seasonal wetness are the main limitations. Drainage of wet spots is difficult because of the many stones or boulders. The soils form clods or a crusty surface if cultivated when wet.

This mapping unit is used mainly for hay, pasture, and grain crops. If surface stones are removed, it is suited to most crops grown in the county. Capability unit IIs–2; woodland suitability group 2o1.

Howard Series

The Howard series consists of deep, gently sloping to hilly, well drained to somewhat excessively drained soils on outwash terraces, glacial beaches, kettles, and kames. These soils formed in glacial outwash derived mainly from sandstone, limestone, and shale.

In a representative profile the surface layer is very dark grayish brown gravelly loam 7 inches thick. The subsoil is about 41 inches thick. The upper 5 inches is brown to dark brown, friable gravelly loam; the next 12 inches is reddish brown, friable gravelly loam; and the lower 24 inches is dark reddish brown, friable very gravelly loam. The substratum is reddish brown, loose sand and gravel.

Permeability is moderately rapid in the subsoil and rapid in the substratum. Available water capacity is moderate. The capacity of these soils to supply nitrogen, phosphorus, and potassium is medium to low. Slope, the erosion hazard, and gravel in the surface layer are the main limitations in farming and in town and country planning.

Representative profile of Howard gravelly loam, 3 to 8 percent slopes, in a gravel pit 150 feet south of Pask Road, six-tenths of a mile west of Pine Hill Road, in the town of Barre:

Ap—0 to 7 inches, very dark grayish brown (10YR 3/2) gravelly loam, light brownish gray (10YR 6/2) dry; weak, medium to fine, granular structure; very friable; many roots; many fine and medium pores; 20 percent coarse fragments; neutral; clear, smooth boundary.

B21—7 to 12 inches, brown to dark brown (7.5YR 4/4) gravelly loam; weak, medium and fine, subangular blocky structure; friable; many roots; many fine and medium pores; 20 percent coarse fragments; neutral; clear, wavy boundary.

B22t—12 to 24 inches, reddish brown (5YR 4/4) gravelly loam; weak, medium and fine, subangular blocky structure; friable; common roots; many fine and medium pores; 25 percent gravel; light brownish gray (10YR 6/2) clean sand 1 to 2 millimeters thick coats ped surfaces in the upper part; patchy, dark reddish gray (5YR 4/2) and reddish brown (5YR 4/3) clay films on some gravel and in pores; slightly acid; gradual, irregular boundary.

B23t—24 to 48 inches, dark reddish brown (5YR 3/4) very gravelly loam, reddish brown (5YR 4/4) rubbed; moderate to weak, medium, and coarse, subangular blocky structure; friable; common roots; common fine pores; thin, patchy, brown to dark brown (7.5YR 4/2) clay films on 25 percent of gravel or ped faces; thicker clay films in pores; 35 percent gravel; slightly acid in upper part and neutral in lower part; gradual, wavy boundary.

C—48 to 60 inches, reddish brown (5YR 4/4) stratified sand and gravel; single grain; loose; few roots in upper part; 40 percent gravel; calcareous; mildly alkaline.

Thickness of the solum and depth to carbonates range from 40 to 60 inches. Reaction ranges from medium acid to neutral in the solum and mildly alkaline to moderately alkaline in the C horizon.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2. The texture is fine sandy loam, sandy loam, or loam. Gravel content ranges from 5 to 30 percent.

The B21 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4. The texture ranges from fine sandy loam to loam. The gravel content ranges from 10 to 30 percent.

The Bt horizon has hue of 10YR to 5YR, value of 3 to 5, and chroma of 3 or 4. Sandy coats on peds in the upper part are 1 to 4 millimeters thick. The texture ranges from sandy loam to loam. The average gravel content ranges from 25 to 40 percent.

The C horizon has hue of 5YR to 10YR, value of 4 or 5, and chroma of 2 to 4. The texture is stratified sand and gravel. The average gravel content is between 35 and 45 percent.

These soils contain slightly fewer coarse fragments than is defined as the range for the series, but this difference does not alter their use or management.

Howard soils formed in similar deposits and are in the same drainage sequence as the moderately well drained Phelps soils and somewhat poorly drained Fredon soils. Unlike Arkport soils, they contain gravel throughout the profile. They have a finer textured B horizon than Alton soils.

HoB—Howard gravelly loam, 3 to 8 percent slopes. This gently sloping or undulating soil has the profile described as representative of the series. It is on outwash terraces, glacial beaches, kettles, and kames. Areas are generally oblong and range from 5 to about 50 acres in size.

Included with this soil in mapping are small areas of Howard soils where the slope is less than 3 percent or more than 8 percent and areas where the surface layer is gravelly or nongravelly fine sandy loam. Also included are areas of Madrid soils where the glacial till is underlain by gravel and areas of Colonie or Arkport soils, especially on kettles and kames.

Runoff is slow to medium, and the hazard of erosion is moderate. The erosion hazard and gravel in the surface layer are the main limitations. The water intake rate is high, but the soil erodes during high intensity rains, especially on long slopes.

This soil is subject to leaching and requires frequent applications of lime and fertilizer. Irrigation is needed during dry periods for some crops. Early season crops are well suited. Contour rows, stripcrops, and diversions help to control runoff and reduce

soil loss. Cover crops and green manure crops help to maintain tilth and the level of organic matter. Capability unit IIs–1; woodland suitability group 2o1.

HpC—Howard soils, 8 to 25 percent slopes. This rolling and hilly mapping unit is on kettles and kames. The surface layer ranges from gravelly sandy loam to gravelly loam. Areas are irregular in shape and are generally more than 25 acres in size.

Included in this unit in mapping are areas where the slope is greater than 25 percent or less than 8 percent, areas of soils that formed in glacial till and are moderately deep over gravel, many areas of Madrid soils, and many areas of sandy Arkport and Colonie soils, especially on lower side slopes. Also included are areas of Alton soils and many areas of a soil similar to Howard soils but less gravelly. Wet spots, drainageways, sand spots, clay spots, and stony spots are indicated by spot symbols on the soil map.

Runoff is medium, and the hazard of erosion is moderate. Complex slopes and the hazard of erosion are the main limitations. Steep areas, wet spots, and in places excessive gravel in the surface layer are also limitations.

This unit is used mostly for general crops, including hay. Many areas are idle or wooded and have potential as recreation sites. The soils are a good source of sand and gravel. A good plant cover is needed as protection against erosion. Capability unit IVe–3; woodland suitability group 2r2.

Junius Series

The Junius series consists of deep, nearly level, somewhat poorly drained soils on lake plains, glacial beaches, or sand bars of former glacial lakes. These soils formed in water-sorted, sandy deposits derived mainly from quartz and feldspar.

In a representative profile the surface layer is very dark gray loamy fine sand 8 inches thick. The upper 8 inches of the subsoil is mottled brown, very friable loamy fine sand. The lower 11 inches is mottled grayish brown, friable loamy fine sand. The substratum is gray, loose, fine and medium sand.

These soils have a seasonal high water table. Permeability is rapid in the subsoil and substratum. Available water capacity is low. The capacity of these soils to supply nitrogen, phosphorus, and potassium is low. The seasonal high water table and the coarse texture are the main limitations in farming and in town and country planning.

Representative profile of Junius loamy fine sand in a cultivated area two-fifths of a mile north of U.S. 104 and 320 feet west of Murdock Road, in the town of Ridgeway:

Ap—0 to 8 inches, very dark gray (10YR 3/1) loamy fine sand, gray (10YR 6/1) dry; moderate, medium, granular structure; very friable; many roots; slightly acid; abrupt, smooth boundary.

B21—8 to 16 inches, brown (10YR 5/3) loamy fine sand; common, fine and medium, faint, light brownish gray (10YR 6/2) and yellowish brown (10YR 5/4) mottles; massive and weak, fine, granular structure; very friable; common roots; slightly acid; gradual, smooth boundary.

B22—16 to 27 inches, grayish brown (10YR 5/2) loamy fine sand; many, medium and coarse, faint, yellowish brown mottles; massive and weak, fine, granular structure; friable; few roots; a few dark red (2.5YR 3/6) concretions; neutral; abrupt, smooth boundary.

C—27 to 50 inches, gray (10YR 5/1) fine and medium sand; single grain; loose; 5 percent fine gravel; neutral in upper part and mildly alkaline in lower part.

Thickness of the solum ranges from 25 to 35 inches. The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 1 or 2.

The B horizon has hue of 2.5YR to 7.5YR, value of 4 or 5, and chroma of 2 to 4. The texture ranges from loamy fine sand to fine sand. Reaction ranges from slightly acid to neutral. The content of coarse fragments ranges from none to less than 5 percent.

The C horizon has hue of 5Y to 7.5YR, value of 5 or 6, and chroma of 1 or 2. Reaction ranges from neutral to mildly alkaline. The content of coarse fragments ranges from 0 to 5 percent.

Junius soils are commonly near or are similar to Colonie, Elnora, Cosad, and Minoa soils. They formed in similar deposits and are in the same drainage sequence as the well drained to excessively drained Colonie soils and moderately well drained Elnora soils. Junius soils are similar to Cosad soils in the B horizon, but they lack the clayey C horizon that is characteristic of Cosad soils. They are coarser textured than Minoa soils.

Ju—Junius loamy fine sand. This nearly level soil is on sandy glacial lake or beach deposits. Areas are irregular in shape and generally less than 25 acres in size.

Included with this soil in mapping are areas where the surface layer is fine sandy loam or fine sand, areas of Elnora soils on knolls, areas of Cosad or Cheektowaga soils where the sand deposit is moderately deep over clay, some areas of the poorly drained to very poorly drained Lamson soils, and areas of Minoa soils that are similar to the Junius soil but are finer textured. Also included near Jeddo is an area where the soil is moderately deep over glacial till, and north of U.S. Route 104 and east of Ridgeway is an area where the soil is moderately deep over red shale.

Runoff is slow, and the hazard of erosion is slight. The prolonged high water table and the coarse texture are the main limitations. Artificial drainage is often difficult because suitable outlets are lacking.

Much of the acreage is idle or wooded or is reverting to woodland. If adequately drained and fertilized, the soil is well suited to vegetable crops. Irrigation is sometimes needed during dry periods if shallow-rooted crops are grown. Capability unit IIIw–4; woodland suitability group 4w1.

Kendaia Series

The Kendaia series consists of nearly level, somewhat poorly drained soils on till plains. These soils formed in glacial till derived mainly from limestone. They are underlain by limestone bedrock at a depth of 3½ to 6 feet.

In a representative profile the surface layer is very dark grayish brown silt loam 9 inches thick. The subsoil is about 13 inches thick. The upper 4 inches is mottled pale brown, firm heavy silt loam; the next 5 inches is mottled brown, firm heavy silt loam; and the lower 4 inches is mottled brown, firm silt loam. The upper 7 inches of the substratum is mottled pinkish gray, firm silt loam. The lower 21 inches is mottled

brown, firm loam. Limestone bedrock is at a depth of 50 inches.

A seasonal high water table is generally perched above the slowly permeable substratum. The subsoil is moderately permeable. Available water capacity is moderate to high. The capacity of these soils to supply nitrogen, phosphorus, and potassium is medium. The seasonal high water table, the slow permeability, and the shallowness over bedrock are the main limitations in farming and in town and country planning.

Representative profile of Kendaia silt loam in an area of Kendaia and Appleton silt loams, rock substratum, 0 to 3 percent slopes, in a cultivated area, 300 feet west of Culver Road and 1,700 feet south of N.Y. 31A, in the town of Barre:

Ap—0 to 9 inches, very dark grayish brown (10YR 3/2) silt loam; light brownish gray (10YR 6/2) dry; moderate, medium, granular structure; friable; many roots; neutral; 5 percent coarse fragments; abrupt, smooth boundary.

B21—9 to 13 inches, pale brown (10YR 6/3) silt loam; common, medium, distinct, yellowish brown (10YR 5/6) and brown (7.5YR 5/4) mottles; moderate, medium, subangular blocky structure; firm; common roots and pores; grayish brown (10YR 5/2) silty films on ped surfaces; 5 percent coarse fragments; neutral; clear, wavy boundary.

B22—13 to 18 inches, brown (10YR 5/3) heavy silt loam; common, medium, distinct, yellowish brown and few, fine, faint, light brownish gray (10YR 6/2) mottles; moderate, medium, subangular blocky structure; firm; common roots and pores; grayish brown (10YR 5/2) ped faces; 5 percent coarse fragments; neutral; clear, wavy boundary.

B3—18 to 22 inches, brown (10YR 5/3) silt loam; common, medium, distinct, yellowish brown (10YR 5/6) mottles; weak, medium and coarse, subangular blocky structure; firm; few roots; common pores; 5 percent coarse fragments; mildly alkaline; clear, wavy boundary.

C1—22 to 29 inches, pinkish gray (7.5YR 6/2) silt loam; many, medium, distinct, strong brown (7.5YR 5/6) mottles; weak, medium, platy structure; firm; 10 percent coarse fragments; calcareous; moderately alkaline; clear, smooth boundary.

C2—29 to 50 inches, brown (10YR 5/3) loam; many, medium, distinct, strong brown (7.5YR 5/6) and common, medium, faint, light brownish gray (10YR 6/2) mottles; massive weak and medium, platy structure; firm; 15 percent coarse fragments; calcareous; moderately alkaline; abrupt, smooth boundary.

IIR—50 inches, dolomitic limestone bedrock.

Thickness of the solum and depth to carbonates range from 18 to 30 inches. Reaction in the solum is neutral or slightly acid in the upper part and neutral to mildly alkaline in the lower part. Depth to bedrock ranges from 40 to 72 inches. The content of coarse fragments ranges from 5 to 15 percent in the solum and from 5 to 25 percent in the C horizon. These fragments are mostly angular or flaggy limestone.

The Ap horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2.

The matrix color of the B horizon is hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 or 4. Mottles are common or many and are generally distinct. Ped faces in the B horizon have hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2. The texture is dominantly silt loam, but it ranges to loam.

The C horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 2 or 3. It ranges from silt loam to fine sandy loam.

Kendaia soils are commonly near or are similar to Lyons, Newstead, Hilton, and Wassaic soils. They formed in material similar to that of the poorly drained or very poorly drained Lyons soils. They are similar to Newstead soils, but are more than 40 inches deep over bedrock. They lack the Bt horizon that is characteristic of Hilton and Wassaic soils and are wetter than those soils.

KaA—Kendaia and Appleton silt loams, rock substratum, 0 to 3 percent slopes. This nearly level mapping unit is closely associated with limestone escarpment, and most of it is within a mile or two of the escarpment area. Some areas are Kendaia soil, some are Appleton soil, and some are both soils. Areas range from about 5 to 50 acres in size. These soils have profiles similar to those described as representative of the respective series, but are only 3½ to 6 feet deep over hard rock.

Included with this unit in mapping are areas of Wassaic and Newstead soils, both of which are similar to the soils in this unit but are less than 40 inches deep over rock, and areas of the nearly level, better drained Hilton loam, rock substratum. Also included are smaller areas of finer textured Ovid and Churchville soils. In some areas only a thick silt cap overlies the till and bedrock.

Runoff is slow, and the hazard of erosion is slight. The wetness and the shallowness over bedrock are the main limitations. Artificial drainage is needed, but is often expensive to install because of the shallowness over bedrock and the lack of a suitable outlet. Large stones occur on the surface in some areas and are common in the subsoil and substratum. This unit is more difficult to drain and to manage than other mapping units of Appleton soils. Capability unit IIIw–1; woodland suitability group 3w1.

Lairdsville Series

The Lairdsville series consists of moderately deep, nearly level to gently sloping, moderately well drained to well drained soils that are underlain by red shale bedrock at depths of 20 to 40 inches. These soils are on bedrock-controlled till plains. They formed mainly in clayey glacial till, but in places in lake-laid deposits.

In a representative profile the surface layer is dark reddish brown, silt loam 9 inches thick. The upper 6 inches of the subsoil is dark reddish brown, firm silty clay. The lower 18 inches is mottled, dark reddish brown, very firm silty clay. The substratum is 3 inches of dark reddish brown, firm silty clay. Red shale bedrock is at a depth of 36 inches.

A seasonal high water table is perched above the very slowly permeable subsoil for brief periods in spring, especially in lesser sloping areas. The substratum also is very slowly permeable. Available water capacity is moderate. The capacity of these soils to supply nitrogen and phosphorus is medium, and the capacity to supply potassium is high. Slight seasonal wetness, the erosion hazard, very slow permeability, and the moderate depth to shale bedrock are the main limitations in farming and in town and country planning.

Representative profile of Lairdsville silt loam, 0 to 6 percent slopes, in a cultivated area 150 feet west of the junction of Slade and Horan Roads, 10 feet south of Slade Road, in the town of Ridgeway:

Ap—0 to 9 inches, dark reddish brown (5YR 3/2) silt loam; strong, medium to fine, subangular blocky structure; friable; many roots; 5 percent coarse fragments; neutral; abrupt, smooth boundary.

IIB21—9 to 15 inches, dark reddish brown (2.5YR 3/4) silty clay; strong, medium, subangular blocky and blocky structure; firm; common pores; common roots; thin, light reddish brown (5YR 6/3) silt coats less than 1 millimeter thick on ped faces; 5 percent coarse fragments; neutral; clear, wavy boundary.

IIB22t—15 to 33 inches, dark reddish brown (2.5YR 3/4) silty clay; few, faint, yellowish red (5YR 5/6) mottles; strong, medium to coarse, blocky structure; very firm; common pores with clay linings; few roots; thick clay films on most ped faces; 2 percent coarse fragments; neutral, becoming mildly alkaline in lower part; clear, wavy boundary.

IIC—33 to 36 inches, dark reddish brown (5YR 3/4) silty clay; weak, medium, platy structure; firm; common, irregularly shaped, olive gray (5Y 5/2) shale remnants occur as discontinuous lenses; calcareous; moderately alkaline; gradual, broken boundary.

IIR—36 to 50 inches, dusky red (2.5YR 3/2) shale bedrock; readily cut with a spade; calcareous; moderately alkaline.

Solum thickness ranges from 27 to 37 inches and commonly corresponds with the depth to red shale bedrock. The content of coarse fragments ranges from 2 to 15 percent in the solum and in the C horizon.

The Ap horizon has hue of 5YR to 10YR, value of 3 or 4, and chroma of 2.

The IIB horizon has hue of 2.5YR or 5YR, value of 3 or 4, and chroma of 3 or 4. Texture ranges from heavy silty clay loam to clay. Clay films are continuous or nearly so on ped faces in the lower part of the IIBt horizon. The IIBt horizon has high chroma mottles in some profiles.

The IIC horizon has hue of 5YR to 10YR, value of 3 or 4, and chroma of 3 or 4. It has the same texture range as the IIB horizon. Structure ranges from weak medium to thick platy.

The IIR horizon is red shale bedrock that is neutral to moderately alkaline in reaction.

Lairdsville soils are commonly near or are similar to Lockport, Cazenovia, Ovid, and Claverack soils. They formed in similar material and are in the same drainage sequence as the somewhat poorly drained Lockport soils. They have a finer textured Bt horizon and are shallower over bedrock than Cazenovia soils. They are better drained, have a finer textured Bt horizon and are shallower over bedrock than Ovid soils. Lairdsville soils are finer textured in the A and B horizons than Claverack soils.

LaB—Lairdsville silt loam, 0 to 6 percent slopes. This nearly level to gently sloping soil is 20 to 40 inches deep over weathered red shale bedrock. Areas are roughly rectangular or irregular in shape and range from about 5 to 50 acres in size.

Included with this soil in mapping are areas where the surface layer is loam or silty clay loam. Also included are small areas of more sloping soils, areas of Lockport soils in depressions or along drainageways, and areas of Cazenovia or Hilton soils where the glacial till is deeper. Sand spots or areas where the surface layer is stony are indicated by spot symbols on the soil map.

Runoff is medium, and the hazard of erosion is moderate. Slight seasonal wetness, the erosion hazard, the very slow permeability, and the moderate depth to shale bedrock are the main limitations. In places, surface stones are also a limitation.

This soil crusts or forms hard clods if tilled when wet. Contour rows, stripcrops, and diversions help to control runoff and reduce soil loss. This soil is used mainly for general farm crops, but some areas are idle or in trees. Additions of organic matter help to maintain soil structure in the surface layer. Capability unit IIe–5; woodland suitability group 3o1.

Lakemont Series

The Lakemont series consists of deep, nearly level, poorly drained to very poorly drained soils in depressions in lake plains. These soils formed in silt and clay glacial lake deposits.

In a representative profile the surface layer is very dark gray silty clay loam 8 inches thick. The subsurface layer is 4 inches of mottled light gray silty clay loam. The subsoil is firm silty clay about 18 inches thick. The upper 4 inches is mottled dark reddish gray, and the lower 14 inches is mottled reddish brown. The substratum is mottled reddish brown, firm, varved silty clay and clay.

The water table is near the surface for long periods. Permeability is slow in the subsoil and substratum. Available water capacity is moderate to high. The capacity of these soils to supply nitrogen is high, but wetness in spring prevents the release of nitrogen. The capacity to supply phosphorus is medium and potassium high. Prolonged wetness, ponding, the very slow permeability, and the high percentage of silt and clay are the main limitations in farming and in town and country planning.

Representative profile of Lakemont silty clay loam in an idle area one-half mile south of East Shelby-West Barre Road, 25 feet east of Shelby-Barre Town Line Road, in the town of Barre:

Ap—0 to 8 inches, very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; moderate, medium, granular structure; friable; many roots; neutral; abrupt, smooth boundary.

A2g—8 to 12 inches, light gray (N 6/0) silty clay loam; common, medium, distinct, brownish yellow (10YR 6/6) mottles; moderate, medium, subangular blocky structure; firm; plastic and sticky; common roots and pores; neutral; clear, smooth boundary.

B21tg—12 to 16 inches, dark reddish gray (5YR 4/2) silty clay; common, medium, distinct, strong brown (7.5YR 5/6) mottles; reddish gray (5YR 5/2) ped faces; moderate, coarse, prismatic structure parting to moderate, medium, blocky; firm; plastic and sticky; few roots and common pores; thin continuous clay films on ped faces; neutral; gradual, wavy boundary.

B22t—16 to 24 inches, reddish brown (2.5YR 4/4) silty clay; common, medium, distinct, strong brown (7.5YR 5/6) and few, faint, distinct, light gray (10YR 6/1) mottles; strong, coarse, prismatic structure parting to moderate, medium, blocky; firm; sticky and plastic; thick continuous reddish gray (5YR 5/2) clay films on ped faces; neutral; clear, wavy boundary.

B3—24 to 30 inches, reddish brown (5YR 4/3) silty clay; common, medium, distinct, yellowish red (5YR 5/6), reddish gray (5YR 5/2), and pinkish gray (5YR 6/2) mottles; moderate, medium, blocky structure; firm; sticky and plastic; calcareous; mildly alkaline; clear, wavy boundary.

C—30 to 60 inches, reddish brown (5YR 4/3) varved silty clay and clay; common, medium, distinct, pinkish gray (5YR 6/2) mottles; massive; firm; calcareous; moderately alkaline.

Solum thickness ranges from 24 to 36 inches. Reaction ranges from slightly acid to mildly alkaline.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It ranges from silt loam to silty clay loam. The A2g horizon has hue of N to 5YR, value of 6 or 7, and chroma of 0 to 2. It ranges from silt loam to silty clay.

The Bt horizon has hue of 5YR or 2.5YR, value of 3 to 5, and chroma of 2 to 4. Ped surfaces have chroma of 2 or less. The B3 horizon above a depth of 30 inches is dominantly reddish brown (2.5YR 4/4) to dark reddish brown (5YR 3/4). Mottles in the B horizon have higher and lower chroma than the matrix. The texture ranges from heavy silty clay loam to clay. Clay films range from thin to thick. The films are thicker on vertical prism faces than on horizontal faces, but are nearly continuous on ped surfaces.

The C horizon may be variegated in color, but is dominantly in hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 2 to 4. It ranges from varved or bedded silt and clay to thick massive silty clay.

Lakemont soils are commonly near or are similar to Schoharie, Odessa, Fonda, and Madalin soils. They formed in similar material and are in the same drainage sequence as the moderately well drained to well drained Schoharie soils and somewhat poorly drained Odessa soils. Lakemont soils have a more clearly expressed Bt horizon than Fonda soils. They are redder than Madalin soils.

Lk—Lakemont silty clay loam. This nearly level soil has the profile described as representative of the series. It is in glacial lake deposits of silt and clay. Areas are roughly circular or rectangular in shape and range from 5 to more than 100 acres in size. Most areas are fairly large.

Included with this soil in mapping are areas where the surface layer is silt loam and silty clay, areas of somewhat poorly drained Odessa soils, and some areas of Fonda soils, which are similar to the Lakemont soil but lack clay films. Also included are Canandaigua soils in some areas and Lyons or Barre soils in areas where the lake sediment is moderately deep over glacial till. In a few areas are Madalin and Rhinebeck soils that are similar to the Lakemont soil but are browner. Sand spots or stony areas are indicated by spot symbols on the soil map.

Runoff is very slow, and the hazard of erosion is slight. Prolonged wetness, ponding, the very slow permeability, and the high content of silt and clay are the main limitations.

Unless drained, this soil is better suited to hay, pasture, trees, or wetland wildlife habitat than to other uses. If it is adequately drained and managed, cultivated crops can be grown. Maintaining desirable structure in the surface layer is a constant management need even in drained areas. If the soil is tilled when wet, hard clods or a crusty surface form and make planting and plant growth difficult. Drainage is generally difficult. Surface drainage is the most effective. Capability unit IVw–1; woodland suitability group 5w1.

Lm—Lakemont silt loam, shale substratum. This nearly level soil has a profile similar to the one described as representative of the series, but the surface layer is medium textured and shale bedrock is at a depth of 3½ to 6 feet. The soil is in silt and clay glacial lake deposits that overlie red shale bedrock. Areas are generally oblong and range from about 5 to 100 acres in size.

Included with this soil in mapping are areas where the surface layer is loam or silty clay loam. Also included are areas of somewhat poorly drained Lockport soils and areas of a soil that is similar to the Lakemont soil but is less than 3½ feet deep over shale bedrock.

Runoff is very slow, and the hazard of erosion is slight. Prolonged wetness, ponding, the very slow permeability, the high content of silt and clay, and the depth to the underlying shale bedrock are limitations.

Unless drained, this soil is best suited to hay, pasture, trees, or wetland wildlife habitat. If it is adequately drained and managed, cultivated crops can be grown. Maintaining desirable structure in the surface layer is a constant management need. If the soil is cultivated when wet, hard clods, or a crusty surface form and make planting and plant growth difficult. Returning crop residue, adding manure, and plowing under green manure crops improve tilth. Drainage is difficult. Surface drainage is the most effective. Capability unit IVw–1; woodland suitability group 5w1.

Lamson Series

The Lamson series consists of deep, nearly level, poorly drained and very poorly drained soils in depressions in glacial lake plains and deltas. These soils formed in water-sorted sediment having particle sizes centered near the fine sand and silt limit.

In a representative profile the surface layer is very dark gray very fine sandy loam 9 inches thick. The subsurface layer is 12 inches of mottled light brownish gray loamy very fine sand. The subsoil is 11 inches of mottled brown, very friable fine sandy loam. The upper part of the substratum is mottled grayish brown, friable fine sandy loam, and the lower part is dark grayish brown, very friable fine sand and silt.

The water table is near the surface for long periods. Permeability is moderately rapid in the subsoil and substratum. Available water capacity is moderate to high. The capacity of these soils to supply nitrogen is high, and the capacity to supply phosphorus and potassium is low. The prolonged high water table and ponding are the main limitations in farming and in town and country planning.

Representative profile of Lamson very fine sandy loam in an area of Lamson soils, in a pasture three-fourths of a mile east of Niagara Orleans County Line Road (N.Y. 269), 50 feet south of Millers Road, in the town of Yates:

Ap—0 to 9 inches, very dark gray (10YR 3/1) very fine sandy loam, gray to light gray (N 6/0) dry; weak, fine, granular structure; very friable; many roots; slightly acid; abrupt, smooth boundary.

A2g—9 to 21 inches, light brownish gray (2.5Y 6/2) loamy very fine sand; common, medium, distinct, yellowish brown (10YR 5/6) and few, fine, faint, light olive brown (2.5Y 5/6) mottles; single grain; loose; common roots; slightly acid; clear, wavy boundary.

B2—21 to 32 inches, brown (10YR 5/3) fine sandy loam; common, medium, distinct, yellowish brown (10YR 5/6) and few, fine, faint, light gray (10YR 7/1) mottles; weak, fine, granular structure; very friable; neutral; clear, wavy boundary.

C1—32 to 36 inches, grayish brown (10YR 5/2) fine sandy loam; common, medium, distinct, strong brown (7.5YR 5/6) mottles; massive; very friable; calcareous; mildly alkaline; gradual, wavy boundary.

C2—36 to 50 inches, dark grayish brown (10YR 4/2) layers of fine sand and silt; massive; very friable; calcareous; moderately alkaline.

Solum thickness and depth to carbonates range from 30 to 40 inches. Depth to bedrock is greater than 4 feet. The content of coarse fragments ranges from essentially none to 2 percent. The texture ranges from very fine sandy loam to loamy very fine sand and mucky equivalents.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The A2g horizon has hue of N to 2.5Y, value of 5 or 6, and chroma of 0 to 2.

The B horizon has hue of 7.5YR to 2.5YR, value of 5 or 6, and chroma of 2 to 4. Reaction ranges from slightly acid to neutral.

The C horizon has hue of 10YR, value of 4 or 5, and chroma of 1 or 2. The texture ranges from loamy fine sand to silt loam and a few layers of fine sand and silt. Reaction ranges from neutral to moderately alkaline.

Lamson soils are commonly near or are similar to Arkport, Galen, Minoa, and Canandaigua soils. They formed in similar material and are in the same drainage sequence as the well drained Arkport soils, moderately well drained Galen soils, and somewhat poorly drained Minoa soils. They have a coarser textured B horizon than Canandaigua soils.

Ln—Lamson soils. These nearly level soils are on glacial lake or delta deposits of sand and silt. Areas are irregular or oblong in shape and range from about 5 to 100 acres in size.

Included with these soils in mapping are areas where the surface layer ranges from loamy very fine sand to mucky silt loam and areas of a soil that is similar to Lamson soils but has layers of gravel. Also included are areas of Minoa soils on knolls or in higher, drier areas and Sun soils in areas underlain by glacial till. Cosad or Cheektowaga soils are in areas where the sandy deposit is underlain by fine sediment, and Canandaigua soils are in areas where the deposit contains more silt and less sand.

Runoff is very slow, and the hazard of erosion is slight. A prolonged high water table and ponding are the main limitations.

These soils can be tile drained if a suitable outlet is available. Unless drained, they are limited to hay, pasture, trees, or wetland wildlife habitat. If adequately drained and managed, they are suited to vegetables and other field crops. Because of the large content of fine sand and silt, a trafficpan forms if the soils are worked when wet. Capability unit IIIw–5; woodland suitability group 4w1.

Lockport Series

The Lockport series consists of moderately deep, nearly level, somewhat poorly drained soils on bedrock-controlled till plains. These soils are 20 to 36 inches deep over red shale bedrock. They formed mainly in glacial till derived from the underlying shale. Some formed in silt and clay lake deposits.

In a representative profile the surface layer is very dark grayish brown silty clay loam 8 inches thick. The subsurface layer is 3 inches of leached, mottled pale brown silty clay loam. The subsoil is 13 inches of mottled reddish brown and dark reddish brown, very firm silty clay. Partly weathered, dark reddish brown shale bedrock is at a depth of 24 inches.

A seasonal high water table is generally perched above the very slowly permeable subsoil. Available water capacity is moderate. The capacity of these soils to supply nitrogen and phosphorus is medium, and the capacity to supply potassium is high. The seasonal high water table, the very slow permeability, and the moderate depth over shale bedrock are the main limitations in farming and in town and country planning.

Representative profile of Lockport silty clay loam in an idle area, west side of Norway Road, 1.3 miles north of U.S. 104 (Ridge Road), in the town of Murray:

Ap—0 to 8 inches, very dark grayish brown (10YR 3/2) silty clay loam; moderate, fine and very fine, subangular blocky structure; firm; many fine roots; medium acid; abrupt, smooth boundary.

A2—8 to 11 inches, pale brown (10YR 6/3) silty clay loam; many, fine, prominent, strong brown (7.5YR 5/6) mottles; weak, medium, platy structure parting to weak, very fine, subangular blocky; firm; common fine roots; common fine and medium pores; medium acid; abrupt, broken boundary.

B21t—11 to 15 inches, reddish brown (5YR 4/3) silty clay; many, medium, prominent, strong brown (7.5YR 5/6) mottles; strong, medium, prismatic structure parting to strong, fine, angular blocky; very firm; few fine roots; common fine pores; dark reddish gray (5YR 4/2) ped faces; slightly acid; clear, wavy boundary.

B22t—15 to 24 inches, dark reddish brown (2.5YR 3/4) silty clay; common, fine, prominent, yellowish red (5YR 4/6) mottles; strong, medium, prismatic structure parting to moderate, medium, angular blocky; very firm; few, fine roots; common fine pores; weak red (2.5YR 5/2) ped faces; slightly acid; abrupt, smooth boundary.

R—24 inches, partially weathered dark reddish brown (2.5YR 2/4) shale which is weakly effervescent on fresh breaks.

Thickness of the solum ranges from 18 to 30 inches. Depth to bedrock ranges from 20 to 36 inches. Coarse fragments range from very few to a content of 15 percent. Reaction ranges from medium acid to mildly alkaline.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3.

The A2 horizon has hue of 5YR to 10YR, value of 5 or 6, and chroma of 2 or 3. It is silt loam or silty clay loam.

The B2t horizon has hue of 10YR to 5YR, value of 3 to 5, and chroma of 3 to 6. It is silty clay loam, silty clay, clay loam, or clay.

The C horizon is silty clay or clay and is similar in color to the B horizon.

Lockport soils are commonly near or are similar to Lairdsville, Ovid, Cazenovia, and Brockport soils. They formed in material similar to that of the moderately well drained to well drained Lairdsville soils. They have a finer textured Bt horizon and are shallower over shale than Ovid soils. They are wetter and have a finer textured Bt horizon than Cazenovia soils. Lockport soils are redder than Brockport soils.

Lo—Lockport silty clay loam. This nearly level soil is on bedrock-controlled till plains and is only 20 to 40 inches deep over red shale. Areas are irregular in shape and generally large.

Included with this soil in mapping are areas where the surface layer is loam, clay loam, and silt loam; areas of gently sloping Lockport soils; and areas of the better drained Lairdsville or Cazenovia soils on knolls and of the wetter Lakemont or Lyons soils in depressions. Also included are a few areas where granite stones are in the surface layer; areas where moderately deep glacial till deposits and moderately deep sandy deposits overlie red shale; and areas of Ovid and Cazenovia shale substratum soils. Some small included areas are indicated by spot symbols on the soil map.

Runoff is slow, and the hazard of erosion is slight. A seasonal high water table, the very slow permeability, and the moderate depth over shale rock are the main limitations. In places, surface stones are a limitation.

Artificial drainage is generally difficult because of the underlying shale and the lack of suitable outlets. Because of the fine textured subsoil and the very slow permeability, surface drainage is generally more effective than subsurface drainage. Unless drained, this soil is best suited to hay, pasture, trees, or wildlife habitat. If adequately drained, it is suited to grain, some vegetables, and fruit. Capability unit IIIw–2; woodland suitability group 3w1.

Lyons Series

The Lyons series consists of deep, nearly level, poorly drained and very poorly drained soils in depressions in till plains. These soils formed in glacial till derived from limestone, sandstone, and shale.

In a representative profile the surface layer is very dark gray silt loam 9 inches thick. The subsoil is about 27 inches thick. The upper 2 inches is mottled light brownish gray silt loam; the next 7 inches is mottled grayish brown, firm silt loam; and the lower 18 inches is mottled grayish brown, firm gravelly loam. The substratum is light brownish gray, firm gravelly loam.

The water table is near the surface for long periods. Permeability is moderately slow in the subsoil and slow in the substratum. Available water capacity is high. The capacity of these soils to supply nitrogen is high, but wetness in spring prevents release. The supply of phosphorus and potassium is medium. The prolonged high water table, ponding, and slow permeability are the main limitations in farming and in town and country planning.

Representative profile of Lyons silt loam in a cultivated area two-tenths of a mile east of junction of Lee Street (N.Y. 31A) and Shelby-Barre Town Line Road, in the town of Barre:

Ap—0 to 9 inches, very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) crushed and dry; weak, fine and medium, granular structure; very friable; many fine roots; few coarse fragments; neutral; abrupt, smooth boundary.

B21g—9 to 11 inches, light brownish gray (10YR 6/2) silt loam; many, medium, prominent mottles of strong brown (7.5YR 5/6) and dark yellowish brown (10YR 4/4); weak, medium, subangular blocky structure; friable; common fine roots; 5 percent coarse fragments; slightly acid; clear, wavy boundary.

B22g—11 to 18 inches, grayish brown (10YR 5/2) silt loam; many, medium, distinct mottles of pale brown (10YR 6/3), strong brown (7.5YR 5/8), and gray (5Y 6/1); moderate, coarse, prismatic structure parting to weak and moderate, medium, blocky; firm; grayish brown (2.5Y 5/2) ped faces; few roots, decreasing with depth; 10 percent coarse fragments; neutral; gradual, wavy boundary.

IIB3g—18 to 36 inches, grayish brown (10YR 5/2) gravelly loam; common, medium, distinct, yellowish brown (10YR 5/6) and gray (5Y 6/1) mottles; high chroma mottles decreasing with depth; weak, medium and coarse, blocky structure; firm; 20 percent coarse fragments; calcareous; mildly alkaline; diffuse boundary.

IIC—36 to 50 inches, light brownish gray (10YR 6/2) gravelly loam; moderate, thick, platy structure; firm; 25 percent coarse fragments; calcareous; moderately alkaline.

Solum thickness ranges from 26 to 36 inches. Depth to carbonates ranges from 12 to 36 inches. Depth to bedrock is greater than 40 inches. Dominant chroma is 2 or less throughout the soil. The content of coarse fragments ranges from 5 to 25 percent.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2.

The B horizon has hue of 10YR to 5YR, value of 4 to 6, and chroma of 1 or 2. It ranges from heavy loam to light silty clay loam. Reaction ranges from slightly acid to mildly alkaline in the solum.

The IIC horizon has hue of 10YR to 5YR, value of 4 to 6, and chroma of 2. It ranges from heavy sandy loam to silt loam. The content of coarse fragments ranges from 10 to 30 percent. The IIC horizon is mildly alkaline to moderately alkaline.

Lyons soils are commonly near or are similar to Ontario, Hilton, Appleton, and Sun soils. They formed in similar material and are in the same drainage sequence as the well drained Ontario soils, moderately well drained Hilton soils, and somewhat poorly drained Appleton soils. They have a finer textured B horizon than Sun soils.

Ly—Lyons silt loam. This nearly level soil has the prifile described as representative of the Lyons series. It is on medium textured glacial till deposits in concave areas. Areas are irregular in shape and range from about 5 to more than 100 acres in size.

Included with this soil in mapping are areas where the surface layer ranges from fine sandy loam to mucky silt loam. Also included are areas of Appleton and Ovid soils on knolls or in higher, drier areas and Canandaigua soils in areas where lake sediment caps the glacial till. In many areas are Sun soils, and in some areas is Lyons silt loam, rock substratum. Small areas where the surface layer is stony are indicated by spot symbols on the soil map.

Runoff is very slow, and the hazard of erosion is slight. A prolonged high water table, ponding, and slow permeability are the main limitations. In places, stones in the surface layer are a limitation.

Locating a suitable outlet for artificial drainage is difficult. Unless drained, this soil is limited mainly to hay, pasture, woods, and wetland wildlife habitat. If adequately drained, it is suited to cultivated crops. Capability unit IVw–2; woodland suitability group 4w1.

Lz—Lyons silt loam, rock substratum. This nearly level soil has a profile similar to the one described as representative of the series, but rock is at a depth of 3½ to 6 feet. The soil is on medium textured glacial till deposits in concave areas. Areas are irregular in shape or occur as narrow strips bordering a swamp or bog.

Included with this soil in mapping are areas where the surface layer ranges from fine sandy loam to mucky silt loam, areas of somewhat poorly drained Kendaia, Appleton, Newstead, and Ovid soils, and small areas of Canandaigua or Sun soils. Also commonly included are areas of a soil that is similar to Lyons soil but is less than 3½ feet deep over rock and some areas of Lyons soils that are deeper than 6 feet. Small areas where the surface layer is stony are indicated by spot symbols on the soil map.

Runoff is very slow, and the hazard of erosion is slight. A prolonged high water table, ponding, and shallowness over bedrock are limitations. In places, stones in the surface layer are a limitation.

Locating a suitable outlet for artificial drainage is difficult. The shallowness over bedrock increases the cost of artificial drainage. Unless drained, this soil is limited to hay, pasture, trees, and wetland wildlife habitat. If adequately drained, it is suited to cultivated crops. Capability unit IVw–2; woodland suitability group 4w1.

Madalin Series

The Madalin series consists of deep, nearly level, poorly drained and very poorly drained soils in depressions in lake plains. These soils formed in lacustrine deposits of clay and silt.

In a representative profile the surface layer is very dark gray silt loam 8 inches thick. The subsoil is 25 inches thick. The upper 8 inches is mottled dark grayish brown, firm silty clay loam; the next 9 inches is mottled brown, firm silty clay; and the lower 8 inches is mottled dark grayish brown silty clay. The substratum is mottled grayish brown silt and clay.

The water table is near the surface for long periods. Permeability is slow in the subsoil and slow to very slow in the substratum. Available water capacity is moderate to high. The capacity of these soils to supply nitrogen and potassium is high, and the capacity to supply phosphorus is medium. The prolonged high water table, ponding, and slow to very slow permeability are the main limitations in farming and in town and country planning.

Representative profile of Madalin silt loam in an idle area 100 yards south of Ashwood Road, 25 feet east of the Yates-Carlton Town Line Road, in the town of Carlton:

Ap—0 to 8 inches, very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate, medium, granular structure; friable; many roots; slightly acid; abrupt, smooth boundary.

B21tg—8 to 16 inches, dark grayish brown (10YR 4/2) silty clay loam; common, medium, distinct, yellowish brown (10YR 5/6) and brown (7.5YR 5/4) mottles; moderate, medium, subangular blocky structure; firm; grayish brown (10YR 5/2) ped coats; thin, continuous clay films on ped faces and lining pores; common fine roots; common pores; neutral; clear, wavy boundary.

B22tg—16 to 25 inches, brown (7.5YR 5/2) silty clay; many, medium, distinct, yellowish brown (10YR 5/6) and few, fine, faint, light gray (10YR 7/1) mottles; light gray (10YR 6/1) ped coats; weak, coarse prisms parting to strong, medium, subangular blocky structure; firm; common pores; thin, continuous clay films on ped faces and lining all pores; neutral; clear, wavy boundary.

B3tg—25 to 33 inches, dark grayish brown (10YR 4/2) silty clay; many, medium, distinct, yellowish brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; firm; common fine pores; light brownish gray (10YR 6/2) ped coats; thin patchy clay films on ped faces and in pores; calcareous; mildly alkaline; gradual, wavy boundary.

C—33 to 52 inches, grayish brown (2.5Y 5/2) layers of silt and clay; common, medium, distinct, yellowish brown (10YR 5/6) and light gray (N 6/0) mottles; moderate, medium, platy structure; firm; calcareous; moderately alkaline.

Thickness of the solum and depth to carbonates range from 24 to 36 inches. The content of coarse fragments ranges from essentially none to 2 percent. Depth to bedrock is greater than 4 feet.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2.

The B horizon has hue of 5Y to 7.5YR, value of 4 to 6, and chroma of 1 or 2. It ranges from silty clay loam to clay. Reaction ranges from slightly acid to mildly alkaline in the lower part.

The C horizon has hue of 10YR to 5YR, value of 5 or 6, and chroma of 1 or 2. It ranges from silty clay loam to clay that is stratified with sand, silt, or clay.

Madalin soils are commonly near or are similar to Rhinebeck, Fonda, Churchville, and Lakemont soils. They formed in material similar to that of the somewhat poorly drained Rhinebeck soils. They have a well expressed Bt horizon, which is lacking in Fonda soils. Madalin soils are wetter and lack the loamy C horizon that is characteristic of Churchville soils. They are browner than Lakemont soils.

Ma—Madalin silt loam. This nearly level soil is on glacial lake deposits of silt and clay. Areas are oblong or irregular in shape and are generally between 10 and 50 acres in size.

Included with this soil in mapping are areas where the surface layer is silty clay loam. In uncultivated areas the surface layer is commonly mucky. Also included are areas of better drained Rhinebeck soils, areas of Barre soils that are moderately deep over glacial till, and a few areas of Fonda soils. Sand spots and areas where coarse fragments are in the surface layer are indicated by spot symbols on the soil map.

Runoff is very slow, and the hazard of erosion is slight. The prolonged wetness, ponding, and slow to very slow permeability are limitations.

Artificial drainage is difficult because of the lack of suitable outlets. Surface drainage is the most effective. Unless artificially drained, this soil is used mostly for hay, pasture, or trees. If drained, it is suited to cultivated crops. Good management is needed to maintain desirable structure in the surface layer. Adding organic matter by returning crop residue, plowing down green manure, and spreading manure are important management needs. Capability unit IVw–1; woodland suitability group 5w1.

Madrid Series

The Madrid series consists of deep, gently sloping to rolling, well drained soils on till plains. These soils formed in glacial till derived mainly from sandstone and limestone.

In a representative profile the surface layer is dark grayish brown, fine sandy loam 9 inches thick. The upper 16 inches of the subsoil is brown, friable fine sandy loam. The lower 15 inches is reddish brown, friable loam. The upper part of the substratum is brown to dark brown and pinkish gray, friable fine sandy loam. The lower part of the substratum is brown, friable fine sandy loam.

Permeability is moderate in the subsoil and moderately slow in the substratum. Available water capacity is moderate to high. The capacity of these soils to supply nitrogen, phosphorus, and potassium is medium. Slope and the erosion hazard are the main limitations in farming and in town and country planning.

Representative profile of Madrid fine sandy loam, 3 to 8 percent slopes, in a cultivated area 25 feet north of East Shelby-West Barre Road, 750 yards east of Crane Road, in the town of Shelby:

Ap—0 to 9 inches, dark grayish brown (10YR 4/2) fine sandy loam; moderate, medium, granular structure; friable; common roots; 5 percent gravel and cobblestones; slightly acid; abrupt, smooth boundary.

B21—9 to 16 inches, brown (7.5YR 5/4) fine sandy loam; moderate, medium, subangular blocky structure; friable; common roots; common fine pores; 5 percent gravel and cobblestones; medium acid; clear, wavy boundary.

B22—16 to 25 inches, brown (7.5YR 5/4) fine sandy loam; weak, coarse, subangular blocky structure parting to moderate, fine, subangular blocky; friable; common roots; common fine pores; 5 percent coarse fragments; medium acid; clear, wavy boundary.

B23t—25 to 40 inches, reddish brown (5YR 4/3) loam; moderate, medium, subangular blocky structure; friable; few roots; common pores with clay linings; yellowish brown (10YR 5/4), light gray (10YR 7/2) dry, clean sand 1 to 3 millimeters thick surrounds peds in upper part and some thin, patchy, reddish brown (5YR 4/3) clay films on ped surfaces in lower part; 5 percent coarse fragments; medium acid; clear, wavy boundary.

C1—40 to 66 inches, brown to dark brown (7.5YR 4/4) and stratified pinkish gray (7.5YR 7/2) fine sandy loam; weak, thick, platy structure; friable; few roots and pores; 5 percent coarse fragments; slightly acid; abrupt, wavy boundary.

C2—66 to 78 inches, brown (7.5YR 5/4) fine sandy loam; massive; friable; 5 percent coarse fragments; calcareous; moderately alkaline.

Solum thickness ranges from 36 to 50 inches. Depth to carbonates ranges from 36 to 72 inches. Depth to bedrock is greater than 4 feet. Reaction ranges from medium acid to neutral. The content of coarse fragments ranges from 2 to 20 percent.

The Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 2.

The B horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 3 or 4. It is fine sandy loam or loam. Clean sand grains 1 to 3 millimeters thick and thin patchy clay films coat most ped faces in the Bt horizon.

The C horizon has hue of 2.5Y to 7.5YR, value of 4 or 5, and chroma of 2 to 4. It is fine sandy loam or loam.

Madrid soils are commonly near or are similiar to Bombay, Massena, Sun, and Ontario soils. They formed in similar material and are in the same drainage sequence as the moderately well drained Bombay soils, somewhat poorly drained Massena soils, and poorly drained to very poorly drained Sun soils. They have a coarser textured Bt horizon than Ontario soils.

MdB—Madrid fine sandy loam, 3 to 8 percent slopes. This gently sloping soil has the profile described as representative of the series. It is on glacial till deposits. Areas are oblong or irregular in shape and range from less than 5 to more than 50 acres in size.

Included with this soil in mapping are areas where the surface layer is loam or silt loam and areas of Bombay and Hilton soils in depressions or along drainageways. Also included are some areas where the soils are similar to the Madrid soil but are moderately deep over stratified sand and gravel (fig. 11); some areas of deep sandy Arkport or Colonie soils; common areas of Ontario soils; and a few areas of Howard or Alton soils. Areas where the surface layer is gravelly or stony are indicated by spot symbols on the soil map.

Runoff is medium, and the hazard of erosion is moderate. The erosion hazard is the main limitation. The stony or gravelly surface layer is also a limitation.

Most areas are used for cultivated crops, rural residences, and other intensive uses. The soil is especially well suited to crops that need good drainage. Contour rows, stripcrops, and diversions help to control runoff and reduce soil loss. Capability unit IIe–1; woodland suitability group 2o1.

Figure 11.—**Road cut in Madrid soils showing underlying stratified sand and gravel.**

MdC—Madrid fine sandy loam, 8 to 15 percent slopes. This sloping or rolling soil is on glacial till deposits mainly in southeastern Orleans County. Areas are crescent or irregular in shape and are generally less than 25 acres in size.

Included with this soil in mapping are areas where the surface layer is loam or silt loam, areas where slope is less than 8 percent or more than 15 percent; and areas of Bombay and Hilton soils in depressions or along drainageways. Also included are some areas where the soils are similar to the Madrid soil but are moderately deep over stratified sand and gravel; a few areas of deep sandy soils, such as the Arkport and Colonie soils; common areas of Ontario soils; and a few areas of Howard or Alton soils. Areas where the surface layer is gravelly or stony are indicated by spot symbols on the soil map.

Runoff is medium to rapid, and the hazard of erosion is moderate. Slope and the erosion hazard are the main limitations. The coarse texture and droughtiness are also limitations. Contour rows, stripcrops, and diversions are needed for erosion control in cultivated areas. If erosion is controlled, the soil is suited to crops

commonly grown in the county. It is used mainly for hay. Capability unit IIIe–1; woodland suitability group 2o1.

Martisco Series

The Martisco series consists of level, very poorly drained muck soils that are less than 16 inches thick over marl. These soils are in swamps and bogs of lacustrine deposits, on outwash and till plains, and in backwater areas on flood plains. They formed in thin organic deposits over marl.

In a representative profile the surface layer is black muck 10 inches thick. The next 18 inches is friable, white marl that contains many soft snail shells. Below this is 5 inches of firm, impervious, very dark gray organic material underlain by dark gray silt.

A high water table is near the surface for long periods. Permeability is moderate to moderately rapid in the organic layer and slow in the marl. The prolonged high water table, the ponding, the high content of organic matter, and the underlying marl are the main limitations in farming and in town and country planning.

Representative profile of Martisco muck in an idle area 500 feet south of Lynch Road and 500 feet east of N.Y. 31, in the town of Murray:

Oa—0 to 10 inches of muck, black (10YR 2/1) on broken face, very dark brown (10YR 2/2) rubbed; less than 5 percent fiber before and after rubbing; moderate, coarse, granular structure; very friable; few snail shells; moderately alkaline; abrupt, smooth boundary.

IILca—10 to 28 inches, white (10YR 8/1) marl, crushes to light gray (10YR 6/1); common, brownish yellow (10YR 6/6) stains near root channels; thick platy structure; friable; nonsticky; few black (10YR 2/1) organic coats between plates; common roots; many soft snail shells; calcareous; moderately alkaline; abrupt, smooth boundary.

IIILco—28 to 33 inches, very dark gray (10YR 3/1) coprogenous earth; weak, thin, platy structure; firm, nonsticky; many soft snail shells; calcareous; moderately alkaline; abrupt, smooth boundary.

IVC—33 to 60 inches, dark gray (10YR 4/1) silt; massive; slightly sticky; many very fine pores; mildly alkaline.

Thickness of the organic surface layer ranges from 8 to 16 inches. Thickness of the underlying marl ranges from 15 to 25 inches. In many places the coprogenous earth layer is lacking. The underlying mineral soil above a depth of 40 inches ranges from silt to light silty clay loam.

Martisco soils are commonly near or similar to Edwards and Palms soils. They formed in deposit similar to that of Edwards soils, but the organic deposit is thinner. Unlike Palm soils, Martisco soils have less than 16 inches of organic material and are underlain by marl instead of mineral soil.

Me—Martisco muck. This level soil is in swamps and bogs where the organic layer is less than 16 inches thick over marl. Included in mapping are areas of Edwards and Palms soils.

Runoff is very slow or ponded, and the hazard of erosion is slight. Most roots are confined to the upper 10 inches. A prolonged high water table, ponding, a high content of organic matter, and shallowness over marl are limitations. Unless drained, this soil is best suited to trees or wetland wildlife habitat. Even if it is adequately drained, shallowness is a serious limitation. Capability unit Vw–2; woodland suitability group 5w1.

Massena Series

The Massena series consists of deep, nearly level, somewhat poorly drained soils on till plains. These soils formed in glacial till derived mainly from siliceous rocks and limestone.

In a representative profile the surface layer is very dark grayish brown fine sandy loam 8 inches thick. The upper 4 inches of the subsoil is mottled light brownish gray, very friable fine sandy loam. The lower 12 inches is mottled brown, firm loam. The substratum is mottled brown, firm, gravelly fine sandy loam.

A seasonal high water table is generally perched above the moderately slowly to slowly permeable substratum. The subsoil is moderately permeable. Available water capacity is moderate. The capacity of these soils to supply nitrogen, phosphorus, and potassium is medium. The seasonal high water table and the moderately slow to slow permeability in the substratum are the main limitations in farming and in town and country planning.

Representative profile of Massena fine sandy loam in a cultivated area three-fifths of a mile north of U.S. 104 and 500 yards west of Murdock Road in a drainage ditch, in the town of Ridgeway:

Ap—0 to 8 inches, very dark grayish brown (10YR 3/2) fine sandy loam, light brownish gray (10YR 6/2) dry; weak, fine, granular structure; very friable; many roots and pores; 5 percent coarse fragments; slightly acid; abrupt, smooth boundary.

B21g—8 to 12 inches, light brownish gray (10YR 6/2) fine sandy loam; many, coarse, faint, yellowish brown (10YR 5/4 and 10YR 5/6) mottles; weak, fine, granular structure; very friable; common roots; common medium pores; 5 percent coarse fragments; slightly acid; clear, wavy boundary.

B22—12 to 24 inches, brown (7.5YR 5/4) loam; many, coarse, faint, strong brown (7.5YR 5/6) mottles; weak, medium, subangular blocky structure; firm; common roots; few fine pores; 10 percent coarse fragments; slightly acid; clear, wavy boundary.

C—24 to 50 inches, brown (7.5YR 5/2) gravelly fine sandy loam; few, medium, faint, brown (7.5YR 5/4) mottles; weak, thick, platy structure; firm; few roots; few fine pores; 20 percent coarse fragments; calcareous; moderately alkaline.

Thickness of the solum ranges from 18 to 30 inches. Depth to carbonates ranges from 20 to 40 inches. Depth to bedrock is greater than 4 feet. The content of coarse fragments ranges from 5 to 20 percent. Reaction ranges from slightly acid to neutral.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 1 or 2.

The B horizon has hue of 10YR to 5YR, value of 4 to 6, and chroma of 2 to 4. It ranges from fine sandy loam to loam.

The C horizon has hue of 10YR to 5YR, value of 5 or 6, and chroma of 2 or 3. It ranges from fine sandy loam to loam and is 15 to 30 percent coarse fragments. Reaction ranges from neutral to moderately alkaline.

Massena soils are commonly near or are similar to Madrid, Bombay, Sun, and Appleton soils. They formed in similar material and are in the same drainage sequence as the well drained Madrid soils, moderately well drained Bombay soils, and poorly drained to very poorly drained Sun soils. Massena soils have a coarser textured B horizon than Appleton soils.

Mn—Massena fine sandy loam. This nearly level soil

is in low lying areas on till plains. Areas are irregularly shaped and range from 5 to 75 acres in size.

Included with this soil in mapping are areas where the surface layer is loam or loamy fine sand; higher areas of Bombay soils; wetter areas of Sun soils; a few areas of Appleton and Hilton soils and the deep, sandy Minoa, Galen, or Elnora soils; and areas of a soil that is similar to the Massena soil but has clay films in the subsoil. Areas where the surface layer has gravel, sand, clay, or stones are indicated by spot symbols on the soil map.

Runoff is slow, and the hazard of erosion is slight. A seasonal high water table and the moderately slowly to slowly permeable substratum are the main limitations. In places, stones or gravel in the surface layer interfere with cultivation. This soil responds well to tile drainage if a suitable outlet is available. Unless artificially drained, its use is limited to short-season crops, hay, and trees. If adequately drained, it is suited to most crops grown in the county. Capability unit IIIw–1; woodland suitability group 3w1.

Minoa Series

The Minoa series consists of deep, somewhat poorly drained soils. These soils formed in water-deposited sediment, dominantly very fine sand.

In a representative profile the surface layer is dark grayish brown very fine sandy loam 8 inches thick. The subsoil is 18 inches of mottled brown, friable loamy very fine sand. The upper 14 inches of the substratum is mottled grayish brown, very friable loamy very fine sand. The next 5 inches of the substratum is gray, very friable fine sand and very fine sand. Below this is brown, firm silty clay loam.

These soils have a seasonal high water table. The subsoil and upper part of the substratum are moderately permeable and the lower part of the substratum is moderately rapidly permeable. Available water capacity is moderate to high. The capacity of these soils to supply nitrogen and phosphorus is medium, and the capacity to supply potassium is low. The seasonal high water table is the main limitation in farming and in town and country planning.

Representative profile of Minoa very fine sandy loam in a cultivated area 1¼ miles north of Mill Road and three-fifths of a mile east of Niagara-Orleans County Line Road (N.Y. 269), in the town of Yates:

Ap—0 to 8 inches, dark grayish brown (10YR 4/2) very fine sandy loam; weak, fine and very fine, granular structure; very friable; many roots; medium acid; abrupt, smooth boundary.

B21—8 to 14 inches, brown (10YR 5/3) loamy very fine sand; common, medium, faint, grayish brown (10YR 5/2) and common, medium, distinct, strong brown (7.5YR 5/6) mottles; weak, medium, granular structure; friable; common roots; common fine pores; medium acid; clear, wavy boundary.

B22—14 to 26 inches, brown (10YR 5/3) loamy very fine sand; common, medium, faint, grayish brown (10YR 5/2) mottles; weak, medium, subangular blocky structure; friable; few roots; few fine pores; common, coarse, distinct, reddish brown (5YR 4/4) pockets of very fine sandy loam that are massive and firm; slightly acid; clear, wavy boundary.

C1—26 to 40 inches, grayish brown (10YR 5/2) loamy very fine sand; few, coarse, distinct, strong brown (7.5YR 5/6) mottles; single grain; very friable; few roots; neutral; gradual, smooth boundary.

C2—40 to 45 inches, gray (10YR 5/1) fine and very fine sand; single grain; very friable; 5 percent fine pebbles; calcareous; moderately alkaline; abrupt, smooth boundary.

IIC3—45 to 50 inches, brown (7.5YR 5/2) silty clay loam; weak, medium, platy structure; firm; calcareous; moderately alkaline.

Solum thickness ranges from 26 to 32 inches. The content of coarse fragments ranges from 0 to 5 percent. Depth to contrasting textures is greater than 40 inches.

The Ap horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2.

The B horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 2 to 4. It ranges from silt loam to loamy very fine sand. Reaction ranges from medium acid to neutral.

The C horizon has hue of 10YR to 5YR, value of 4 to 6, and chroma of 1 to 4. The texture ranges from silt loam to fine sand. The content of coarse fragments ranges from 0 to 10 percent. Reaction ranges from slightly acid to neutral above a depth of 40 inches and from slightly acid to moderately alkaline below that depth.

Minoa soils are commonly near or similar to Arkport, Galen, Lamson, and Junius soils. They formed in similar material and are in the same drainage sequence as the well drained Arkport soils, the moderately well drained Galen soils, and the poorly drained to very poorly drained Lamson soils. Minoa soils are finer textured than Junius soils.

Mo—Minoa very fine sandy loam. This nearly level soil is on deltas of former glacial lakes. The sediment is dominantly very fine sand. Areas are irregularly shaped mostly between 5 and 50 acres in size.

Included with this soil in mapping are areas where the surface layer is fine sandy loam or loamy fine sand, small areas of well drained Arkport soils and moderately well drained Galen soils, and common areas of Lamson or Canandaigua soils in depressions and along drainageways. Also included are some areas of Niagara soils, which have a finer textured subsoil; common areas of a soil that is similar to the Minoa soil but is moderately deep over silt and clay; and small areas of Cosad soils.

Runoff is slow, and the hazard of erosion is slight. A seasonal high water table and the high content of fine and very fine sand are the main limitations.

This soil responds well to tile drainage if a suitable outlet is available. Unless artificially drained, it is limited to short-season crops, hay, pasture, and trees. If adequately drained and managed, it is suited to most crops. It is free of stones, has good tilth, and is easy to work. Additions of organic matter are needed. Capability unit IIIw–1; woodland suitability group 3w1.

Newstead Series

The Newstead series consists of nearly level, somewhat poorly drained to poorly drained soils that are 20 to 40 inches deep over bedrock. These soils are on bedrock-controlled till plains. They formed in glacial till derived mainly from limestone and some sandstone and shale.

In a representative profile the surface layer is very dark gray silt loam 9 inches thick. The upper 5 inches of the subsoil is mottled dark yellowish brown, friable silt loam. The lower 10 inches is mottled brown, friable, flaggy silt loam. The substratum is 2 inches of

mottled grayish brown, friable, flaggy sandy loam. Limestone bedrock is at a depth of 26 inches.

A seasonal high water table is perched above the bedrock. The subsoil is moderately permeable. Available water capacity is low to moderate. The capacity of these soils to supply nitrogen and potassium is medium, and the capacity to supply phosphorus is low. The seasonal high water table and the shallowness over bedrock are the main limitations in farming and in town and country planning.

Representative profile of Newstead silt loam in an idle area 50 feet north of Martin Road, 500 yards east of the junction of Martin and Sanderson Roads, in the town of Shelby:

Ap—0 to 9 inches, very dark gray (10YR 3/1) silt loam; very dark grayish brown (10YR 3/2) rubbed, light brownish gray (10YR 6/2) when dry; moderate, medium, granular structure; friable; many roots; 2 percent coarse fragments; neutral; abrupt, smooth boundary.

B21—9 to 14 inches, dark yellowish brown (10YR 4/4) silt loam; common, medium, distinct, yellowish brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; friable; common roots; few coarse pores; brown to dark brown (10YR 4/3) silty ped coats; 5 percent coarse fragments; neutral; clear, smooth boundary.

B22—14 to 24 inches, brown (10YR 4/3) flaggy silt loam; common, medium, distinct, yellowish brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; friable; common roots; common fine pores; dark grayish brown (10YR 4/2) silty ped coats; 20 percent coarse fragments; neutral; abrupt, smooth boundary.

IIC—24 to 26 inches, grayish brown (10YR 5/2) flaggy sandy loam; few, medium, distinct, yellowish brown (10YR 5/6) mottles; massive; friable; few roots; 20 percent coarse fragments; calcareous; abrupt, smooth boundary.

IIIR—26 inches, dark gray (10YR 4/1) limestone bedrock.

Solum thickness ranges from 18 to 30 inches, and depth to bedrock ranges from 20 to 40 inches. Depth to carbonates ranges from 18 to 36 inches. Texture ranges from sandy loam to silt loam. Reaction ranges from slightly acid to neutral. The content of coarse fragments, mainly flat, angular fragments of limestone, ranges from 2 to 25 percent.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The B horizon has hue of 2.5Y to 7.5YR, value of 4 or 5, and chroma of 2 to 4. The C horizon has hue of 2.5Y to 7.5YR, value of 4 or 5, and chroma of 2 or 3.

Newstead soils are commonly near or are similar to Wassaic, Kendaia, Lyons, and Appleton soils. They formed in material similar to that of the well drained to moderately well drained Wassaic soils. They are like Kendaia soils, but they are moderately deep over bedrock. They are better drained and are shallower to rock than Lyons soils. They lack the depth and the Bt horizon, both of which are characteristic of Appleton soils.

Ne—Newstead silt loam. This nearly level soil is on glacial till deposits 20 to 40 inches deep over bedrock. Areas are roughly rectangular or irregular in shape and range from 5 to 50 acres in size.

Included with this soil in mapping are areas where the surface layer is loam and areas of well drained Wassaic soils. Also included are some areas of Lyons silt loam, rock substratum, and soils that are similar to the Newstead soil but less than 20 inches over bedrock. Areas where the surface layer is stony or where rock crops out are indicated by spot symbols on the soil map.

Runoff is slow, and the hazard of erosion is slight. A seasonal high water table and the shallowness over bedrock are the main limitations. This soil is difficult and expensive to drain because of the underlying rock. Most areas are used for hay, pasture, and trees. Capability unit IIIw–7; woodland suitability group 3w1.

Niagara Series

The Niagara series consists of deep, nearly level to gently sloping, somewhat poorly drained soils on glacial lake plains. These soils formed in silty lacustrine sediment.

In a representative profile the surface layer is dark grayish brown silt loam 8 inches thick. The subsurface layer is 5 inches of mottled brown, friable silt loam. The subsoil is 11 inches of mottled brown to dark brown, firm, heavy silt loam. The substratum is mottled brown, firm silt loam.

These soils have a seasonal high water table. Permeability is moderately slow in the subsoil and moderately slow to slow in the substratum. Available water capacity is high. The capacity of these soils to supply nitrogen, phosphorus, and potassium is medium. The seasonal high water table, the erosion hazard in sloping areas, and the high content of silt are the main limitations in farming and in town and country planning.

Representative profile of Niagara silt loam, 0 to 2 percent slopes, in a cultivated area 800 feet east of Culvert Road, 600 yards south of Porter Road, in the town of Ridgeway:

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

A2—8 to 13 inches, brown (10YR 5/3) silt loam; common, medium, distinct, yellowish brown (10YR 5/6) and few, medium, faint, grayish brown (10YR 5/2) mottles; weak, medium, subangular blocky structure; friable; common roots; many pores; grayish brown (10YR 5/2) ped faces; 2 percent coarse fragments; neutral; clear, smooth boundary.

B2t—13 to 24 inches, brown to dark brown (10YR 4/3) heavy silt loam; common, medium, distinct, yellowish brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; firm; few roots; common pores; grayish brown (10YR 5/2) ped faces; thin patchy clay films on approximately 30 percent of ped surfaces, thicker in pores; neutral; gradual, smooth boundary.

C—24 to 50 inches, brown (7.5YR 5/2) silt loam; few, fine, distinct, yellowish red (5YR 5/6) and light olive brown (2.5Y 5/4) and common, medium, distinct, yellowish brown (10YR 5/6) mottles; moderate, medium, platy structure; firm; few roots; 2 percent coarse fragments; calcareous; moderately alkaline.

Thickness of the solum ranges from 20 to 30 inches. Depth to carbonates ranges from 20 to 40 inches. Depth to bedrock is greater than 4 feet. The content of coarse fragments is essentially none to less than 3 percent.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2. The A2 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4. The A2 horizon ranges from very fine sandy loam to silt loam.

The B2t horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 3 or 4. Ped faces are 2 chroma or less and have common or many, distinct or prominent interior mottles. The B2t horizon ranges from silt loam to silty clay loam. Thin patchy clay films are on 10 to 30 percent of ped faces. Reaction ranges from slightly acid to neutral.

The C horizon has hue of 10YR to 5YR, value of 4 or 5,

and chroma of 2. It ranges from fine sandy loam to silt loam or is stratified layers of silt, fine sand, and clay.

Niagara soils are commonly near or are similar to Collamer, Canandaigua, Odessa, and Rhinebeck soils. They formed in similar material and are in the same drainage sequence as the moderately well drained Collamer soils and poorly drained and very poorly drained Canandaigua soils. Niagara soils have a coarser textured Bt horizon than Odessa and Rhinebeck soils.

NgA—Niagara silt loam, 0 to 2 percent slopes. This nearly level soil has the profile described as representative of the series. It is on silty glacial lake deposits. Areas are irregular in shape and range from about 5 to more than 100 acres in size.

Included with this soil in mapping are areas where the surface layer is very fine sandy loam or fine sandy loam, areas of Collamer or Galen soils on knolls or on higher, better drained spots, and areas of Canandaigua soils on wetter spots. Also included are some areas of a soil that is similar to the Niagara soil but is moderately deep over glacial till and a few areas of a coarse silty soil that lacks clay films. Small areas where gravel, stones, sand, or clay is in the surface layer are indicated by spot symbols on the soil map.

Runoff is slow, and the hazard of erosion is slight. A seasonal high water table and the high content of silt are the main limitations.

This soil can be artificially drained if a suitable outlet is available. Unless artificially drained, it is limited to short-season crops, hay, pasture, and trees. If adequately drained and well managed, it is suited to most crops generally grown in the area. Regular additions of organic matter are needed to maintain desirable structure. Capability unit IIIw–1; woodland suitability group 3w1.

NgB—Niagara silt loam, 2 to 6 percent slopes. This gently sloping or undulating soil has a profile similar to the one described as representative of the series, but the subsoil is slightly thinner. The soil is on silty glacial lake deposits. Areas are roughly rectangular or irregular in shape and generally less than 50 acres in size.

Included with this soil in mapping are areas where the surface layer is fine sandy loam or very fine sandy loam. Also included are areas of moderately well drained Collamer or Galen soils, nearly level and sloping Niagara soils, and poorly drained Canandaigua soils in depressions or along drainageways. In a few areas is a soil that is similar to the Niagara soil but is moderately deep over glacial till, and in some areas is a coarse silty soil that lacks clay films. Small areas where gravel, stones, sand, or clay is in the surface layer are indicated by spot symbols on the soil map.

Runoff is medium, and the hazard of erosion is moderate. A seasonal high water table, the hazard of erosion, and the high silt content are the main limitations.

This soil can be tile drained. Cover crops, green manure crops, and close-grown crops at regular intervals in a cropping system reduce the hazard of erosion. If adequately drained and managed, this soil is suited to most crops grown in the area. Capability unit IIIw–3; woodland suitability group 3w1.

Odessa Series

The Odessa series consists of deep, nearly level to gently sloping, somewhat poorly drained soils on glacial lake plains. These soils formed in reddish colored silt and clay lacustrine sediment.

In a representative profile the surface layer is very dark grayish brown silt loam 8 inches thick. The upper 9 inches of the subsoil is mottled brown, firm silty clay loam. The lower 24 inches is mottled reddish brown, firm silty clay. The substratum is mottled dark reddish gray and brown to dark brown, stratified silt and clay.

A seasonal high water table is generally perched above the slowly permeable subsoil. The substratum is slowly to very slowly permeable. Available water capacity is moderate to high. The capacity of these soils to supply nitrogen is high, but release is slow in spring when the soil is wet. The capacity to supply phosphorus is medium and potassium high. The seasonal high water table, the slow to very slow permeability, and the high content of silt and clay are the main limitations in farming and in town and country planning.

Representative profile of Odessa silt loam, 0 to 2 percent slopes, in an idle area one-half mile south of East Shelby-West Barre Road, 50 feet east of Shelby-Barre Town Line Road, in the town of Barre:

Ap—0 to 8 inches, very dark grayish brown (10YR 3/2) silt loam; gray to light brownish gray (10YR 6/2) when dry; weak, medium, granular structure; friable; many roots; slightly acid; abrupt, smooth boundary.

B21t—8 to 17 inches, brown to dark brown (7.5YR 4/4) silty clay loam; common, medium, distinct, strong brown (7.5YR 5/6) mottles; weak, coarse prisms parting to moderate, medium, angular blocky structure; firm; common roots; common fine pores with clay linings; pinkish gray (7.5YR 6/2) silty films on peds in upper part; thin; dark brown to brown (7.5YR 4/2) clay films on ped surfaces in lower part; slightly acid; clear, wavy boundary.

B22t—17 to 29 inches, reddish brown (5YR 4/3) silty clay; common, fine, distinct, yellowish red (5YR 4/8) and few, fine, faint, brown (7.5YR 5/2) and pinkish gray (7.5YR 6/2) mottles; moderate, coarse prisms parting to moderate, medium, angular blocky structure; firm; few roots; common fine pores with clay linings; dark brown to brown (7.5YR 4/2), thin, continuous clay films on ped surfaces; neutral; clear, wavy boundary.

B3—29 to 41 inches, reddish brown (5YR 5/4) silty clay; common, medium, distinct, yellowish brown (10YR 5/6) mottles; weak, medium, angular blocky structure; firm; calcareous; mildly alkaline; clear, smooth boundary.

C—41 to 50 inches, dark reddish gray (5YR 4/2) and brown to dark brown (7.5YR 4/2) stratified silt and clay; common, medium, distinct, yellowish brown (10YR 5/6) mottles; moderate, medium, platy structure; firm; calcareous; moderately alkaline.

Thickness of the solum ranges from 20 to 45 inches. Depth to carbonates ranges from 17 to 40 inches. Depth to bedrock is more than 4 feet. The content of coarse fragments ranges from 0 to 5 percent.

The Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 2.

The B horizon has hue of 7.5YR to 2.5YR, value of 4 or 5, and chroma of 2 to 4. High chroma mottles range from common to many in ped interiors. Ped surfaces are dominantly 2 chroma or less. The texture ranges from silty clay loam to silty clay. Clay films are on 10 to 40 percent of

both vertical and horizontal ped faces. Reaction ranges from slightly acid to mildly alkaline in the lower part.

The C horizon has hue of 2.5YR to 7.5YR, value of 4 or 5, and chroma of 2 to 4. It is silty clay loam, silty clay, or varved silt, clay, and very fine sand.

Odessa soils are commonly near or are similar to Schoharie, Lakemont, Rhinebeck, and Madalin soils. They formed in similar material and are in the same drainage sequence as the moderately well drained to well drained Schoharie soils and poorly drained to very poorly drained Lakemont soils. Odessa soils are redder in the lower part of the B horizon than Rhinebeck and Madalin soils.

OdA—Odessa silt loam, 0 to 2 percent slopes. This nearly level soil has the profile described as representative of the series. It is on glacial lake deposits that are dominantly silt and clay. Areas are narrow and finger shaped or irregularly shaped and range from about 5 to more than 100 acres in size.

Included with this soil in mapping are areas where the surface layer is silty clay loam. Also included are areas of Schoharie or Cayuga soils on knolls and on small, better drained spots and areas of Lakemont or Fonda soils in depressions and along drainageways. In a few areas are Rhinebeck soils, which are browner in the lower part of the subsoil, and in some areas are Churchville soils, which are similar to the Odessa soil but are moderately deep over glacial till. Small areas where gravel, stones, or sand is in the surface layer are indicated by spot symbols on the soil map.

Runoff is slow, and the hazard of erosion is slight. A seasonal high water table, the slow to very slow permeability, and the high silt and clay content are the main limitations.

This soil responds well to surface drainage. Tile generally is less effective. The soil crusts or forms hard clods if cultivated when wet. Unless artificially drained, it is best suited to short-season crops, hay, pasture, and trees. If adequately drained, it can be used for most crops commonly grown in the area. Additions of organic matter are needed to maintain soil tilth. Capability unit IIIw–2; woodland suitability group 3w1.

OdB—Odessa silt loam, 2 to 6 percent slopes. This gently sloping or undulating soil has a profile similar to the one described as representative of the series, but the subsoil is slightly thinner. It is on glacial lake deposits that are dominantly silt and clay. Areas are narrow and finger shaped or irregularly shaped and generally are small, less than 25 acres.

Included with this soil in mapping are areas where the surface layer is silty clay loam and some areas of nearly level Odessa soil. Also included are areas of moderately well drained to well drained Schoharie and Cayuga soils. In a few areas are Rhinebeck soils, which are browner in the lower part of the subsoil, and in some areas are Churchville soils, which are similar to the Odessa soil but are moderately deep over glacial till. Small areas where gravel, stones, or sand is in the surface layer are indicated by spot symbols on the soil map.

Runoff is medium, and the hazard of erosion is moderate. A seasonal high water table, the slow to very slow permeability, the hazard of erosion, and the high content of silt and clay are the main limitations.

This soil responds well to surface drainage. It crusts or forms hard clods if cultivated when wet. Unless artificially drained, it is best suited to short-season crops, hay, pasture, and trees. If adequately drained, it is suited to most crops commonly grown in the area. Adding organic matter by returning crop residue and applying manure is needed to maintain good soil tilth. Contour rows, stripcrops, and diversions reduce the hazard of erosion. Capability unit IIIw–3; woodland suitability group 3w1.

Ontario Series

The Ontario series consists of deep, nearly level to sloping, well drained soils on drumlins and till plains. These soils formed in glacial till derived mainly from limestone and sandstone.

In a representative profile the surface layer is dark grayish brown loam 8 inches thick. The subsoil is 30 inches thick. The upper 8 inches is brown, friable loam; the next 9 inches is brown ot dark brown, friable loam; and the lower 13 inches is reddish brown, firm, heavy loam. The substratum is brown, firm gravelly loam.

Permeability is moderate in the subsoil and slow in the substratum. Available moisture capacity is moderate to high. The capacity of these soils to supply nitrogen, phosphorus, and potassium is medium. The slow permeability of the substratum and the moderate hazard of erosion in sloping areas are the main limitations in farming and in town and country planning.

Representative profile of Ontario loam, 3 to 8 percent slopes, in a hayfield 4,500 feet east of N.Y. 98 and 1,600 feet south of Delano-Steele Road on a drumlin, in the town of Barre:

Ap—0 to 8 inches, dark grayish brown (10YR 4/2) loam; weak, medium, granular structure; very friable; many roots; many fine pores; 5 percent coarse fragments; slightly acid; abrupt, smooth boundary.

B2—8 to 16 inches, brown (7.5YR 5/4) loam; weak, medium, subangular blocky structure; friable; many roots; many fine pores; 10 percent coarse fragments; slightly acid; clear, wavy boundary.

B21t—16 to 25 inches, brown to dark brown (7.5YR 4/4) loam; weak, medium, subangular blocky structure; friable; common roots; common fine pores; brown (7.5YR 5/2), light gray (10YR 7/1) where dry, clean sand grains 1 to 3 millimeters thick extend down and around ped surfaces; few, patchy, thin clay films on ped faces and in pores; 10 percent coarse fragments; slightly acid; gradual, wavy boundary.

B22t—25 to 38 inches, reddish brown (5YR 4/4) heavy loam; moderate, medium, subangular blocky structure; firm; common fine roots; common fine pores; reddish brown (5YR 4/3) clay films on about 50 percent of ped surfaces and in most pores; 10 percent coarse fragments; neutral, clear, smooth boundary.

C1—38 to 44 inches, brown (7.5YR 5/4) gravelly loam; moderate, medium, platy structure; firm; few pores; 20 percent coarse fragments; mildly alkaline; gradual, smooth boundary.

C2—44 to 72 inches, brown (7.5YR 5/4) gravelly loam; moderate, medium, platy structure; firm; 20 percent coarse fragments; calcareous; moderately alkaline.

Solum thickness ranges from 36 to 48 inches. Depth to carbonates ranges from 34 to 48 inches. Depth to bedrock is greater than 40 inches. The content of coarse fragments ranges from 5 to 15 percent in the A horizon and from 5 to 30 percent in the B horizon. Reaction ranges from

slightly acid to neutral in the solum and is mildly alkaline or moderately alkaline in the C horizon.

The Ap horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2.

The B2 horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 3 or 4. It ranges from fine sandy loam to silt loam. The Bt horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 3 or 4. It ranges from fine sandy loam to silt loam. Thin patchy clay films are on 10 to 30 percent of the ped faces.

The C horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 2 to 4. It ranges from fine sandy loam to loam. The content of coarse fragments ranges from 10 to 35 percent in the C horizon.

Ontario soils are commonly near or are similar to Hilton, Appleton, Madrid, and Cazenovia soils. They formed in similar material and are in the same drainage sequence as the moderately well drained Hilton soils and somewhat poorly drained Appleton soils. Ontario soils have a finer textured Bt horizon than Madrid soils. They have a coarser textured Bt horizon than Cazenovia soils.

OnB—Ontario loam, 3 to 8 percent slopes. This gently sloping soil has the profile described as representative of the series. It is on moderately alkaline glacial till deposits on drumlins and till plains. Areas are oblong or irregular in shape and are mostly between 5 and 50 acres in size.

Included with this soil in mapping are areas where the surface layer is fine sandy loam or silt loam and some areas where the slope is less than 3 percent or more than 8 percent. Also included are areas of Hilton soils; a few areas of Cayuga and Cazenovia soils; areas of Madrid soils, which are similar to the Ontario soil but are coarser textured; and small areas of Appleton soils in depressions and along drainageways. A few small areas where the surface layer contains gravel, stones, clay, or sand are indicated by spot symbols on the soil map.

Runoff is medium, and the hazard of erosion is moderate. The slow permeability in the substratum and the moderate hazard of erosion are the main limitations. In places, stones in the surface layer are also a limitation. Contour rows, stripcrops, and diversions help to control erosion, especially on long slopes. This soil is well suited to most crops grown in the county. Capability unit IIe–1; woodland suitability group 2o1.

OnC—Ontario loam, 8 to 15 percent slopes. This sloping soil has a profile similar to the one described as representative of the series, but the combined surface layer and subsoil is slightly thinner. It is on moderately alkaline glacial till deposits on drumlins and till plains. Areas are crescent or irregular in shape and mostly between 5 and 25 acres in size.

Included with this soil in mapping are areas where the surface layer is fine sandy loam or silt loam and some areas where the slope is less than 8 percent or more than 15 percent. Also included are areas of Madrid soils, which are similar to the Ontario soil but coarser textured; areas of Hilton or Bombay soils in depressions or along drainageways; and a few areas of Cayuga or Cazenovia soils. Small areas where the surface layer contains gravel, stones, sand, or clay are indicated by spot symbols on the soil map.

Runoff is medium to rapid, and the hazard of erosion is moderate. The slow permeability and the moderate hazard of erosion are the main limitations. Contour rows, stripcrops, diversions, and sod crops at regular intervals help to control erosion. This soil is well suited to most crops grown in the county, but intensive management is needed to protect it from erosion. Capability unit IIIe–1; woodland suitability group 2o1.

OoB—Ontario stony loam, 3 to 8 percent slopes. This gently sloping soil has a profile similar to the one described as representative of the series, but the surface layer is stony. It is on moderately alkaline, stony glacial till deposits on drumlins and till plains. Areas are irregular in shape and between 10 and 50 acres in size.

Included with this soil in mapping are areas where the surface layer is fine sandy loam or silt loam and some areas where the slope is less than 3 percent or more than 8 percent. Also included are a few areas of Ontario loam, rock substratum; areas of nonstony Ontario soils; and many areas of Hilton-Cazenovia stony silt loams. Very stony spots are indicated by spot symbols on the soil map.

Runoff is medium, and the hazard of erosion is moderate. Surface stones and the hazard of erosion are the main limitations. Stones on the surface are abundant enough to interfere with cultivation.

In most areas this soil is used for hay, pasture, and small grain. If surface stones are removed, it is suited to cultivated crops, such as vegetables. If the soils are intensively cropped on the steeper, longer slopes, contour rows, stripcrops, and diversions are needed to reduce the hazard of erosion. Capability unit IIe–1; woodland suitability group 2o1.

OsC—Ontario very stony loam, 3 to 15 percent slopes. This gently sloping to sloping soil has a profile similar to the one described as representative of the series, but the surface layer is very stony (fig. 12). Stones are about 5 to 30 feet apart so that tillage is impractical. The soil is on moderately alkaline, very stony glacial till deposits on drumlins and till plains. Areas are narrow or irregular in shape and are generally adjacent to swampy areas.

Included with this soil in mapping are areas where the surface layer is silt loam or fine sandy loam. Also included are areas of other Ontario soils and some areas of Wassaic and Farmington soils or rock outcrop. Wet spots are indicated by spot symbols on the soil map.

Runoff is slow to medium, and the hazard of erosion is slight to moderate. The numerous stones on the surface, the main limitation, prevent mowing and other farming practices. This soil is used mostly for pasture and woodland. Because it is deep, medium textured, and well drained, it is well suited to native pasture and trees. Capability unit VIs–1; woodland suitability group 2o1.

OtB—Ontario loam, rock substratum, 0 to 8 percent slopes. This nearly level to gently sloping soil has a profile similar to the one described as representative of the series, but rock is at depths of 3½ to 6 feet. The soil is on moderately alkaline glacial till deposits. Areas are irregular in shape and are between 50 and 200 acres in size.

Included with this soil in mapping are areas where the surface layer is silt loam or fine sandy loam. Also included are areas of Hilton loam, rock substratum; some areas of moderately deep Wassaic soils and shallow Farmington soils; and a few areas of coarser

Figure 12.—**Pasture on Ontario very stony loam, 3 to 15 percent slopes.**

textured Madrid and Bombay soils. Stony spots, clay spots, and rock outcrop are indicated by spot symbols on the soil map.

Runoff is slow, and the hazard of erosion is slight. The slow permeability in the substratum and the depth over bedrock are the main limitations. In places stones interfere with tillage.

This soil is used mostly for hay, grain, and pasture. In a few areas it is used for vegetables. It is suited to most crops grown in the county, especially those that require a medium textured soil and good drainage. Capability unit IIe–1; woodland suitability group 2o1.

Ovid Series

The Ovid series consists of deep, nearly level or gently sloping, somewhat poorly drained soils on till plains. These soils formed in glacial till or glacial lake clays.

In a representative profile the surface layer is very dark grayish brown silt loam 8 inches thick. The subsurface layer is 5 inches of leached, mottled grayish brown silt loam. The upper 5 inches of the subsoil is mottled brown to dark brown, firm silty clay loam. The lower 10 inches of the subsoil is mottled reddish brown, firm silty clay loam.

These soils have a seasonal high water table. The subsoil is moderately slow to slowly permeable, and the substratum is slowly permeable. Available water capacity is moderate to high. The capacity of these soils to supply nitrogen and phosphorus is medium, and the capacity to supply potassium is high. The seasonal high water table, the slow permeability, and the hazard of erosion in sloping areas are the main limitations in farming and in town and country planning.

Representative profile of Ovid silt loam, 0 to 3 percent slopes, in a cultivated area one-fourth mile south of Lake Shore Road, one-fourth mile east of County Line Road, in the town of Yates:

Ap—0 to 8 inches, very dark grayish brown (10YR 3/2) silt loam; moderate, medium and fine, granular structure; friable; many roots; 5 percent coarse fragments; neutral; abrupt, smooth boundary.

A2g—8 to 13 inches, grayish brown (10YR 5/2) silt loam; common, medium, distinct, light gray (10YR 7/1) and few, fine, faint, yellowish brown (10YR 5/6) mottles; weak, fine, subangular blocky structure; friable; common roots; common pores; 2 percent coarse fragments; neutral; clear, wavy boundary.

B21t—13 to 18 inches, brown to dark brown (7.5YR 4/2) silty clay loam; common, medium, distinct, strong brown (7.5YR 5/6) and reddish brown (5YR 5/4) mottles; weak, fine and medium, subangular blocky structure; firm; few roots; common fine pores; thin, patchy, dark grayish brown (10YR 4/2) clay films on ped faces and lining pores; 10 percent coarse fragments; neutral; clear, wavy boundary.

B22t—18 to 28 inches, reddish brown (5YR 4/3) silty clay loam; common, medium, distinct, strong brown (7.5YR 5/6) and reddish brown (5YR 5/4) and few, fine, faint, light olive brown (2.5Y 5/4) mottles; moderate, medium, subangular blocky structure; firm; common fine pores; dark reddish gray (5YR 4/2) ped faces; thin patchy clay films on approximately 20 percent of ped faces and lining pores; weak, medium, platy structure in lower 3

inches; 10 percent coarse fragments; neutral; clear, wavy boundary.

C—28 to 72 inches, reddish brown (5YR 4/3) silty clay loam with numerous light gray (10YR 7/1) lime streaks; weak, thin to medium, platy structure; firm; 10 percent coarse fragments; calcareous; moderately alkaline.

Thickness of the solum ranges from 20 to 32 inches, and depth to carbonates ranges from 18 to 32 inches. Depth to bedrock is more than 40 inches. The content of coarse fragments ranges from 2 to 10 percent in the A horizon and from 2 to 20 percent in the B horizon.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 1 or 2. The A2g horizon has hue of 10YR, value of 5 or 6, and chroma of 1 or 2. It ranges from silt loam to silty clay loam.

The B horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 2 to 4. It is clay, loam, or silty clay loam. Thin patchy clay films are on 15 to 35 percent of ped surfaces. Reaction ranges from slightly acid to mildly alkaline in the lower few inches.

The C horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 2 to 4. It ranges from silt loam to clay loam. The content of coarse fragments ranges from 5 to 20 percent.

Ovid soils are commonly near or are similar to Cazenovia, Churchville, Appleton, and Lockport soils. They formed in similar material and are in the same drainage sequence as the moderately well drained to well drained Cazenovia soils. They have a coarser textured Bt horizon than Churchville soils and a finer textured Bt horizon than Appleton soils. They are deeper and have a coarser textured Bt horizon than Lockport soils.

OvA—Ovid silt loam, 0 to 3 percent slopes. This nearly level soil has the profile described as representative of the series. It is in areas of glacial till or areas of lake-influenced glacial till deposits. Areas are oblong or irregular in shape and range from less than 5 to more than 200 acres in size.

Included with this soil in mapping are areas where the surface layer is loam; areas of Cazenovia or Hilton soils on knolls or on higher, better drained spots; and areas of Lyons or Barre soils in depressions or along drainageways. Also included are many areas of Appleton soils, which are similar to the Ovid soil but have a coarser textured subsoil; some areas of Odessa, Churchville, or Niagara soils; and several areas of soils that are similar to the Ovid soil but are moderately deep over clay and silt. In many areas are moderately fine textured lake deposits that are moderately deep over glacial till.

Runoff is slow, and the hazard of erosion is slight. The seasonal high water table and the slow permeability are the main limitations. In places, stones or gravel in the surface layer interfere with cultivation.

This soil can be drained if a suitable outlet is available. A combination of tile and surface drainage is effective. Unless artificially drained, the soil is limited to growing short-season crops, hay, pasture, and trees. If adequately drained, it is suited to most crops grown in the county. Adding organic matter by returning crop residue and applying manure helps to maintain good soil tilth. Capability unit IIIw–1; woodland suitability group 3w1.

OvB—Ovid silt loam, 3 to 8 percent slopes. This gently sloping soil has a profile similar to the one described as representative of the series, but the combined surface layer and subsoil is slightly thinner. The soil is in areas of glacial till or lake-influenced glacial till deposits. Areas are roughly rectangular or irregular in shape and range from about 5 to 75 acres in size.

Included with this soil in mapping are areas where the surface layer is loam; areas of Cazenovia or Hilton soils on higher, drier spots; and areas of Lyons or Barre soils in depressions or along drainageways. Also included are many areas of Appleton soils, which are similar to the Ovid soil but have a coarser textured subsoil; a few areas of Odessa, Churchville, or Niagara soils; some areas of soils that are similar to Ovid soil but are moderately deep over silt and clay; and areas of a nearly level Ovid soil.

Runoff is medium, and the hazard of erosion is moderate. The seasonal high water table, the slow permeability, and the moderate hazard of erosion are main limitations. In places, stones or gravel in the surface layer interfere with cultivation.

This soil can be artificially drained by a combination of tile and surface drainage. Unless drained, it is limited to short-season crops, hay, pasture, and trees. If adequately drained it is suited to most crops grown in the county. Adding organic matter by returning crop residue and applying manure help to maintain desirable structure in the surface layer. Capability unit IIIw–3; woodland suitability group 3w1.

OwA—Ovid silt loam, shale substratum, 0 to 4 percent slopes. This nearly level soil has a profile similar to the one described as representative of the series, but shale rock is at depths of 3½ to 6 feet. The soil is in areas of glacial till or lake-influenced glacial till deposits. Areas are oblong or occur as strips and range from less than 10 to more than 100 acres in size.

Included with this soil in mapping are areas where the surface layer is loam; a few areas of a soil that is similar to the Ovid soil but has slopes of more than 4 percent; areas of Cazenovia or Hilton soils on higher, drier spots; and areas of Lakemont, shale substratum, in depressions or along drainageways. Also included are a few areas of moderately deep Lockport soils and a few areas in the central part of the county of a soil that is similar to the Ovid soil but is browner and is underlain by gray or olive shale instead of red shale. Sand spots, gravel spots, and stony spots are indicated by spot symbols on the soil map.

Runoff is slow, and the hazard of erosion is slight. The seasonal high water table, the slow permeability, and the depth over shale bedrock are the main limitations. Surface stones or gravel in the surface layer interfere with cultivation in places.

In many areas this soil is difficult to drain artificially because of the shallowness over shale bedrock and the lack of a suitable outlet. Unless drained, the soil is limited to growing short-season crops, hay, pasture, and trees. If adequately drained, it is suited to most crops grown in the county. Adding organic matter by returning crop residue and applying manure help to maintain desirable structure. Capability unit IIIw–1; woodland suitability group 3w1.

Palms Series

The Palms series consists of very poorly drained, level muck soils that are 16 to 51 inches thick over mineral soil material. These soils are in swamps and bogs, mostly in the southern parts of Orleans County.

They formed in herbaceous material that accumulated in basins formerly occupied by shallow ponds and lakes.

In a representative profile the surface layer is black muck 30 inches thick. The next layer is 4 inches of very dark brown, woody muck. The upper part of the substratum is greenish gray, firm, light silty clay loam and the lower part is mottled grayish brown, firm, light silty clay loam.

The water table is near the surface for long periods. Permeability is moderately rapid in the organic part and moderate in the mineral part. Available water capacity is high. The capacity of these soils to supply nitrogen is high, and the capacity to supply phosphorus and potassium is low. The prolonged high water table, ponding, and the high content of organic matter are the main limitations in farming and in town and country planning.

Representative profile of Palms muck, in a cultivated area three-fifths of a mile south of Browns Schoolhouse Road and three-fifths of a mile west of Chugg Road, in the town of Clarendon:

Oa1—0 to 16 inches, black (10YR 2/1) broken face and rubbed sapric material; about 5 percent fibers, less than 2 percent rubbed; moderate, fine and medium, granular structure; slightly compact but very friable; dry and loose in top 4 inches; common roots; woody fibers; slightly acid; clear, smooth boundary.

Oa2—16 to 30 inches, black (N 2/0) broken face and rubbed sapric material; about 30 percent woody fibers ranging from twigs and bark up to pieces of wood 3 inches in diameter; less than 5 percent woody fibers remain after rubbing; massive; friable; neutral; clear, smooth boundary.

Oa3—30 to 34 inches, very dark brown (10YR 2/2) broken and rubbed sapric material; about 50 percent woody fibers; less than 5 percent after rubbing; massive; friable; neutral; abrupt, smooth boundary.

IIC1g—34 to 40 inches, greenish gray (5GY 5/1) light silty clay loam, gray (5Y 5/1) rubbed; massive; firm; a few undecomposed, fine roots; few, medium, prominent, yellowish brown (10YR 5/6) mottles around roots; weakly alkaline.

IIC2g—40 to 54 inches, grayish brown (2.5Y 5/2) light silty clay loam; many, medium, distinct, greenish gray (5GY 5/1) and few, medium, prominent, yellowish brown (10YR 5/6) mottles; massive; firm; calcareous; moderately alkaline.

Thickness of the sapric material over the underlying mineral soil ranges from 16 to 51 inches. Reaction ranges from medium acid to neutral in the sapric material and mildly alkaline or moderately alkaline in the underlying mineral material. The mineral material ranges from fine sandy loam to silty clay loam.

Palms soils are commonly near or are similar to Carlisle, Fonda, Canandaigua, and Edwards soils. They have a thinner organic layer than Carlisle soils. They have a thicker organic surface layer than the mucky Fonda and Canandaigua soils. They are underlain by mineral soil material, whereas Edwards soils are underlain by marl.

Pm—Palms muck. This level soil is on organic deposits 16 to 51 inches thick over mineral soil material in swamps and bogs. Areas are irregular in shape and are generally more than 50 acres in size.

Included with this soil in mapping are areas of a soil that is similar to the Palms soil but has less than 16 inches of organic soil material. Southwest of Shelby is an area where the organic material is underlain by large limestone rocks. In a few areas are Edwards or Martisco soils, and in some areas is a soil that is similar to the Palms soil but is more than 35 percent clay in the underlying mineral soil.

Runoff is very slow, and the hazard of erosion is slight. The prolonged high water table, ponding, and the high content of organic matter are the main limitations. In places, stones in or below the organic part are a limitation.

If this soil is artificially drained, soil blowing is a hazard in large unprotected areas. Unless artificially drained, the soil is limited to growing water-tolerant trees, cattails, sedges, and other water-tolerant plants. If adequately drained, it is suited to such crops as potatoes, lettuce, and onions. Capability unit IVw–3; woodland suitability group 5w1.

Phelps Series

The Phelps series consists of deep, nearly level, moderately well drained soils on glacial outwash terraces and glacial beaches. These soils formed in water-sorted, sandy and gravelly materials derived mainly from limestone.

In a representative profile the surface is very dark grayish brown gravelly fine sandy loam 8 inches thick. The subsoil is 26 inches thick. The upper 11 inches is mottled brown, friable gravelly loamy fine sand; the next 8 inches is mottled brown, friable gravelly sandy loam; and the lower 7 inches is mottled reddish brown, friable gravelly loam. The substratum is mottled brown to dark brown, friable very gravelly loamy sand.

A temporary high water table occurs in spring and during other wet periods. Permeability is moderate to moderately rapid in the subsoil and moderately rapid to rapid in the subtratum. Available water capacity is moderate. The capacity of these soils to supply nitrogen, phosphorus, and potassium is medium. The seasonal high water table and the gravel in the surface layer are the main limitations in farming and in town and country planning.

Representative profile of Phelps gravelly fine sandy loam in a cultivated area 500 feet south of Howlett Road, 150 feet east of Kenyonville Road, in the town of Carlton:

Ap—0 to 8 inches, very dark grayish brown (10YR 3/2) gravelly fine sandy loam; weak, fine, granular structure; very friable; many roots; 15 percent gravel; medium acid; abrupt, smooth boundary.

B1—8 to 19 inches, brown (10YR 5/3) gravelly loamy fine sand; many, coarse, distinct, strong brown (7.5YR 5/6) mottles; weak, fine, granular structure; friable; common roots; common pores; 15 percent gravel; common, medium iron modules; slightly acid; abrupt, smooth boundary.

B21t—19 to 27 inches, brown (10YR 5/3) gravelly sandy loam; many, medium, faint, grayish brown (10YR 5/2) and common, medium, distinct, strong brown (7.5YR 5/6) mottles; massive; friable; common roots; common pores; light gray (10YR 7/2) clean sand grains surrounding the gravel; thin clay films 1 to 2 millimeters thick in upper part on gravel and sand particles; 20 percent gravel; neutral; clear, wavy boundary.

B22t—27 to 34 inches, reddish brown (5YR 4/3) gravelly loam; common, medium, distinct, yellowish red (5YR 4/6) mottles; massive; friable; common roots; common pores; thin clay films on most

gravel and sand particles and lining most pores; 30 percent gravel; neutral; clear, wavy boundary.

IIC—34 to 50 inches, brown to dark brown (7.5YR 5/2) very gravelly loamy sand; common, medium, distinct, olive brown (2.5Y 4/4) mottles; massive; friable; 35 percent gravel; mildly alkaline to moderately alkaline in lower part.

Thickness of the solum ranges from 26 to 36 inches, and depth to carbonates ranges from 26 to 40 inches. Depth to bedrock is more than 40 inches. The content of coarse fragments ranges from 5 to 30 percent in the solum and from 35 to 50 percent in the IIC horizon.

The Ap horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2.

The B1 and Bt horizons have hue of 10YR to 5YR, value of 4 or 5, and chroma of 3 or 4. The B horizon has common to many mottles of higher and lower chroma than the matrix in some or all subhorizons. The Bt horizon ranges from sandy loam to silt loam.

The IIC horizon ranges from very gravelly loamy sand to stratified sand and gravel. Reaction is mildly alkaline or moderately alkaline.

The Phelps soils in this county have slightly less clay in the B2t horizon than is defined as the range for the series, but this difference does not affect use and management.

Phelps soils are commonly near or are similar to Howard, Wampsville, Alton, and Fredon soils. They formed in similar material and are in the same drainage sequence as the well drained Howard and Wampsville soils. They are wetter and have a finer textured B horizon than Alton soils. They are better drained than Fredon soils.

Pp—Phelps gravelly fine sandy loam. This nearly level soil is on glacial beach and outwash deposits of sand and gravel. Areas are oblong or irregular in shape and range from about 10 to 100 acres in size.

Included with this soil in mapping are areas where the surface layer is loam or silt loam or gravelly equivalents. Also included are areas of well drained Howard or Alton soils and somewhat poorly drained Fredon or Massena soils; a few areas of a soil that is similar to the Phelps soil but is moderately deep over silt and clay; and an area near Waterport of a gravelly soil that is moderately deep over shale. Bombay soils are in areas where gravel deposits overlie glacial till. In a few areas is the gently sloping Phelps soil.

Runoff is slow, and the hazard of erosion is slight. A seasonal high water table and gravel in the surface layer are the main limitations.

This soil can be efficiently tile drained if a suitable outlet is available. It responds well to irrigation during dry periods. The gravel content in the surface layer interferes with the cultivation of some crops. Adding organic matter by returning crop residue and applying manure is beneficial. If adequately drained and managed, this soil is well suited to most crops grown in the county. Capability unit IIw–1; woodland suitability group 2o1.

Rhinebeck Series

The Rhinebeck series consists of deep, nearly level and gently sloping, somewhat poorly drained soils on lake plains. These soils formed in lacustrine deposits of silt and clay.

In a representative profile the surface layer is very dark grayish brown silt loam 8 inches thick. The subsoil is 14 inches of mottled brown to dark brown, firm silty clay. The upper 4 inches of the substratum is mottled brown silty clay loam, and the lower part is mottled brown to dark brown and greenish gray, varved silt, sand, and clay.

A seasonal high water table is generally perched above the slowly permeable subsoil. The substratum also is slowly permeable. Available water capacity is moderate to high. The capacity of these soils to supply nitrogen and phosphorus is medium and potassium high. The seasonal high water table, the slow permeability, and the hazard of erosion in sloping areas are the main limitations in farming and in town and country planning.

Representative profile of Rhinebeck silt loam, 0 to 2 percent slopes, in a cultivated area 25 feet north of Yates Center Road, three-fourths of a mile east of Breeze Road, in the town of Yates:

Ap—0 to 8 inches, very dark grayish brown (10YR 3/2) silt loam, light gray (10YR 7/1) when dry; moderate, medium, granular structure; friable; many roots; slightly acid; abrupt, smooth boundary.

B21t—8 to 11 inches, brown to dark brown (7.5YR 4/4) silty clay; common, medium, faint, strong brown (7.5YR 5/6) mottles; moderate, medium prisms parting to strong, medium, blocky structure; firm; common roots; common pores; light gray (10YR 7/2) silt coats on peds; thin, patchy, dark brown (7.5YR 4/2) clay films; neutral; clear, wavy boundary.

B22t—11 to 22 inches, brown to dark brown (7.5YR 4/4) silty clay; common, medium, distinct, strong brown (7.5YR 5/6) and pinkish gray (7.5YR 6/2) mottles; moderate, medium prisms parting to strong, medium, blocky structure; firm; common pores; few roots; brown to dark brown (7.5YR 4/2), thin, continuous clay films on ped faces and in pores; less than 2 percent coarse fragments; neutral; clear, wavy boundary.

C1—22 to 26 inches, brown (7.5YR 5/2) silty clay loam; many, medium, distinct, strong brown (7.5YR 5/6) and few, medium, distinct, gray (N 5/0) mottles; weak, thin, platy structure; firm; few roots; less than 2 percent coarse fragments; neutral; clear, broken boundary.

C2—26 to 52 inches, brown to dark brown (7.5YR 5/4), brown (10YR 5/3), and greenish gray (5GY 6/1), varved silt, sand, and clay; common, medium, distinct, strong brown (7.5YR 5/6) mottles; weak, medium, platy structure; firm; calcareous; moderately alkaline.

Thickness of the solum ranges from 20 to 36 inches, and depth to bedrock is greater than 6 feet. The content of coarse fragments ranges from 0 to 2 percent in all horizons. Reaction ranges from medium acid to neutral in the solum.

The Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 2.

The Bt horizon has hue of 7.5YR to 2.5Y, value of 4 or 5, and chroma of 2 to 4. High chroma mottles range from common to many and are faint to prominent. The texture is silty clay loam or silty clay. Clay films coat 10 to 50 percent of both vertical and horizontal ped faces.

The C horizon has hue of 7.5YR to 5Y, value of 4 or 5, and chroma of 2 or 3. It is silty clay loam, silty clay, or varved silt, fine sand, and clay. Reaction is mildly alkaline or moderately alkaline.

Rhinebeck soils are commonly near or are similar to Madalin, Churchville, Collamer, and Niagara soils. They formed in similar material and are in the same drainage sequence as poorly drained to very poorly drained Madalin soils. They lack the moderate depth over glacial till that is characteristic of somewhat poorly drained Churchville soils. They have a finer textured Bt horizon than Collamer and Niagara soils.

RhA—Rhinebeck silt loam, 0 to 2 percent slopes. This nearly level soil has the profile described as rep-

resentative of the series. It is on brownish colored, clayey, glacial lake deposits. Areas are irregular in shape and generally more than 25 acres in size.

Included with this soil in mapping are areas of Niagara soils, which are similar to the Rhinebeck soil but have a coarser textured subsoil; areas of Madalin and Canandaigua soils in depressions or along drainageways; and a few areas of Collamer soils on higher, drier spots. Also included are areas of the gently sloping Rhinebeck soil; a few small areas of Churchville soils, which are similar to the Rhinebeck soil but are moderately deep over glacial till; and a few areas of Odessa soils, which are similar to the Rhinebeck soil but are redder. Small areas where the surface layer contains gravel or sand are indicated by spot symbols on the soil map.

Runoff is slow, and the hazard of erosion is slight. A seasonal high water table and slow permeability are the main limitations.

This soil crusts or forms hard clods if cultivated when wet. Adding organic matter is beneficial. Plowing under crop residue, growing green manure crops, and applying manure help to maintain the organic-matter content. Surface drainage, such as land shaping and open drains, is effective. Unless artificially drained, this soil is limited to growing short-season crops, hay, pasture, and trees. If adequately drained and managed, it is suited to most crops grown in the county. Capability unit IIIw–2; woodland suitability group 3w1.

RhB—Rhinebeck silt loam, 2 to 6 percent slopes. This gently sloping soil has a profile similar to the one described as representative of the series, but the upper part of the subsoil has fewer mottles. It is on brownish colored clayey glacial lake deposits. Areas occur as narrow strips or are irregular in shape and generally are less than 50 acres in size.

Included with this soil in mapping are areas of the nearly level Rhinebeck soil and areas where the surface layer is fine sandy loam or silty clay loam. Also included are areas of Niagara soils, which are similar to the Rhinebeck soil but have a coarser textured subsoil; areas of Madalin or Canandaigua soils in depressions or along drainageways; areas of Collamer or Claverack soils on higher, drier spots; and some areas of Churchville soils, which are similar to the Rhinebeck soil but are moderately deep over glacial till. In a few areas are areas of Odessa soils, which are similar to the Rhinebeck soil but are redder. Small areas where the surface layer contains gravel, sand, or stones are indicated by spot symbols on the soil map.

Runoff is medium, and the hazard of erosion is moderate. A seasonal high water table, the slow permeability, and the hazard of erosion are the main limitations.

This soil crusts or forms hard clods if cultivated when wet. Adding organic matter by returning crop residue, plowing under green manure, and applying manure help to maintain good soil tilth. Surface drainage, such as diversions and graded rows, is generally more effective than tile drainage because of the slow permeability in the subsoil. Fall plowing is also beneficial. If adequately drained and managed, this soil is suited to most crops grown in the county. Capability unit IIIw–3; woodland suitability group 3w1.

Schoharie Series

The Schoharie series consists of deep, gently sloping, moderately well drained to well drained soils on glacial lake plains. These soils formed in reddish silt and clay lacustrine sediment.

In a representative profile the surface layer is dark grayish brown silt loam 8 inches thick. The upper 4 inches of the subsoil is mottled reddish brown, firm silty clay loam. The lower 16 inches is mottled reddish brown, firm silty clay. The upper part of the substratum is mottled reddish brown, moderately alkaline silty clay, and the lower part is reddish brown, firm silt loam.

A temporary high water table is generally perched above the slowly permeable subsoil in spring and during other wet periods. The substratum also is slowly permeable. Available water capacity is moderate to high. The capacity of these soils to supply nitrogen and phosphorus is medium, and potassium high. The slow permeability and the erosion hazard are the main limitations in farming and in town and country planning.

Representative profile of Schoharie silt loam, 2 to 6 percent slopes, in a cultivated area 100 yards east of Niagara-Orleans County Line Road (N.Y. 269), five-eighth mile south of U.S. 104, in the town of Ridgeway:

Ap—0 to 8 inches, dark grayish brown (10YR 4/2) silt loam; moderate, medium to fine, granular structure; friable; many roots; many fine pores; neutral; abrupt, smooth boundary.

B21t—8 to 12 inches, reddish brown (5YR 4/3) silty clay loam; reddish brown (5YR 5/4) ped coats; common, medium, distinct, yellowish red (5YR 4/6 and 5YR 5/6) mottles; moderate, medium, blocky structure; firm; many roots; many fine pores with clay linings; neutral; gradual, smooth boundary.

B22t—12 to 28 inches, reddish brown (5YR 4/3) silty clay; few, medium, distinct, yellowish red (5YR 5/6) mottles; moderate, medium, blocky structure; firm; common roots; common fine pores with clay linings; thin, dark reddish brown (5YR 3/3), patchy clay films on about 15 percent of ped surfaces; neutral; clear, wavy boundary.

C1—28 to 34 inches, reddish brown (5YR 4/4) silty clay; few, medium, distinct, yellowish red (5YR 5/6) mottles; medium, distinct, light gray (5YR 7/1) lime streaks; moderate, very thick, platy structure parting to moderate, medium, subangular blocky; firm; few roots; calcareous; moderately alkaline; abrupt, wavy boundary.

IIC2—34 to 50 inches, reddish brown (5YR 4/4) silt loam; moderate, medium, platy structure; firm; few roots; a few coarse fragments; calcareous; moderately alkaline.

Thickness of the solum and depth to carbonates range from 20 to 36 inches. The content of coarse fragments ranges from 0 to 5 percent.

The Ap horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2.

The B horizon has hue of 5YR or 2.5YR, value of 4 or 5, and chroma of 3 or 4. It ranges from silty clay loam to silty clay. Thin, patchy clay films are on 10 to 30 percent of ped surfaces. Clean silty films less than 1 millimeter thick are on ped surfaces in the upper 2 to 5 inches of some pedons. Reaction ranges from slightly acid to neutral, but commonly is mildly alkaline in the lower few inches.

The C horizon has hue of 7.5YR to 2.5YR, value of 4 or 5, and chroma of 2 to 4. It ranges from silt loam to silty clay. The content of coarse fragments ranges from 0 to 5 percent.

Schoharie soils are commonly near or are similar to Odessa, Lakemont, Cayuga, and Collamer soils. They formed in similar material and are in the same drainage sequence as the somewhat poorly drained Odessa soils and poorly drained to very poorly drained Lakemont soils. Schoharie soils are similar in texture and drainage to Cayuga soils, but they are underlain by lacustrine sediment, whereas those soils are underlain by glacial till. They have a finer textured Bt horizon than Collamer soils.

ScB—Schoharie silt loam, 2 to 6 percent slopes. This gently sloping soil is on reddish, clayey glacial lake deposits. Areas occur as strips or are irregularly shaped and are generally less than 50 acres in size.

Included with this soil in mapping are areas where the surface layer is fine sandy loam or silty clay loam and a few areas where the slope is less than 2 percent or more than 6 percent. Also included are areas of a soil that is similar in texture and drainage to the Schoharie soil but is browner, areas of Collamer soils where the subsoil is coarser textured, a few areas of coarser textured Claverack soils, and areas of the similar but wetter Odessa or Rhinebeck soils, in depressions or along drainageways. Small areas where the surface layer has sand or gravel are generally indicated by spot symbols on the soil map.

Runoff is medium, and the hazard of erosion is moderate. The slow permeability and the hazard of erosion are the main limitations. Locally, clay spots in the surface layer interfere with cultivation.

Returning crop residue and applying manure and providing diversions and grassed waterways help to control erosion. Adding organic matter also helps to maintain desirable structure. This soil is suited to most crops grown in the county. Capability unit IIe–5; woodland suitability group 2o1.

Shale Outcrop, Steep

ShE—Shale outcrop, steep. This mapping unit has slopes of 15 to 50 percent and is in bare bedrock areas of shale, limestone, or sandstone. It consists mostly of shaly outcrops that have been dissected by fast-flowing streams. A typical area of this mapping unit is southwest of Medina, a short distance west of Shelby Basin Road.

Included in this unit in mapping are alluvial soils that are shallow or moderately deep over bedrock. Also included are small areas of Lairdsville, Brockport, and Farmington soils.

Shale outcrop, steep, is best suited to wildlife and recreation. Each site needs to be investigated individually to determine its suitability for any proposed land use change. Capability unit VIIIs–1; woodland suitability group not assigned.

Sun Series

The Sun series consists of deep, nearly level, poorly drained to very poorly drained soils on till plains. These soils formed in glacial till derived from limestone and sandstone.

In a representative profile the surface layer is very dark gray silt loam 8 inches thick. The upper 4 inches of the subsoil is mottled light gray, friable fine sandy loam. The lower 10 inches is mottled reddish brown, friable fine sandy loam. The substratum is mottled reddish brown, firm gravelly loam.

The water table is near the surface for long periods. The subsoil and substratum are slowly permeable. Available water capacity is high. The capacity of these soils to supply nitrogen is high, and the capacity to supply phosphorus and potassium is low. The prolonged high water table, ponding, and the slow permeability are the main limitations in farming and in town and country planning.

Representative profile of Sun silt loam in a cultivated area 75 feet west of Murdock Road and 1⅜ miles north of U.S. 104 (Ridge Road), in the town of Ridgeway:

Ap—0 to 8 inches, very dark gray (10YR 3/1) silt loam, light gray to gray (10YR 6/1) dry; moderate, medium, granular structure; friable; many roots; 5 percent gravel; neutral; abrupt, smooth boundary.

B21g—8 to 12 inches, light gray (10YR 7/1) fine sandy loam; common, medium, prominent, light olive brown (2.5Y 5/6) mottles; weak, medium, subangular blocky structure; friable; common roots and pores; 5 percent coarse fragments; neutral; clear, smooth boundary.

B22—12 to 22 inches, reddish brown (5YR 4/3) fine sandy loam; common, medium, prominent, grayish brown (2.5Y 5/2) and light olive brown (2.5Y 5/4) mottles; weak, medium, subangular blocky structure; friable; few roots; few pores; brown (7.5YR 5/2) ped faces; 10 percent coarse fragments; neutral; clear, wavy boundary.

C1—22 to 26 inches, reddish brown (5YR 4/3) gravelly loam; common, medium, distinct, strong brown (7.5YR 5/6) mottles; weak, thick, platy structure; firm; few pores; 15 percent coarse fragments; calcareous; mildly alkaline; clear, smooth boundary.

C2—26 to 38 inches, reddish brown (2.5YR 4/4) gravelly loam; common, medium, distinct, strong brown (7.5YR 5/6) and yellowish red (5YR 5/6) mottles; massive; firm; 20 percent coarse fragments; calcareous; moderately alkaline; clear, smooth boundary.

C3—38 to 50 inches, reddish brown (5YR 4/3) gravelly loam; common, medium, distinct, strong brown (7.5YR 5/6) and yellowish red (5YR 5/6) mottles; massive; firm; 20 percent coarse fragments; calcareous; moderately alkaline.

Thickness of solum and depth to carbonates range from 20 to 30 inches. The content of coarse fragments ranges from 5 to 15 percent in the solum and from 15 to 30 percent in the C horizon. Reaction ranges from slightly acid to neutral in the solum.

The Ap horizon has hue of 10YR, value of 3, and chroma of 1 or 2.

The B21g horizon has hue of 10YR or N, value of 5 or 7, and chroma of 0 or 1. The B22 horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 2 to 4. Chroma of 3 or higher is dominant above a depth of 30 inches. The B horizon ranges from sandy loam to silt loam.

The C horizon has hue of 10YR to 2.5YR, value of 4 or 5, and chroma of 3 or 4.

Sun soils are commonly near or are similar to Bombay, Massena, Lyons, and Canandaigua soils. They formed in similar material and are in the same drainage sequence as the moderately well drained Bombay soils and somewhat poorly drained Massena soils. Sun soils have a coarser textured B horizon than Lyons and Canandaigua soils. They contain more coarse fragments than Canandaigua soils.

Su—Sun silt loam. This nearly level soil is in concave areas on glacial till plains where surface water accumulates. Areas occur as strips or are irregularly shaped and are generally more than 25 acres in size.

Included with this soil in mapping are areas where

the surface layer is loam or fine sandy loam and some areas where it is muck. Also included are areas of Lyons soils, which are similar to the Sun soil but have a finer textured subsoil, and a few areas of Lamson or Canandaigua soils. Small areas where the surface layer is very stony are indicated by spot symbols on the soil map.

Runoff is very slow, and the hazard of erosion is slight. A prolonged high water table and ponding are the main limitations. Locally, stones in the surface layer are a concern.

This soil can generally be drained artificially by tile and open ditches if suitable outlets are available. Unless artificially drained, its use is limited. If adequately drained and managed, it is suited to most cultivated crops. Capability unit IVw–2; woodland suitability group 4w1.

Teel Series

The Teel series consists of deep, nearly level, moderately well drained to somewhat poorly drained soils on flood plains. These soils formed in recent alluvial sediment of silt and very fine sand.

In a representative profile the surface layer is very dark grayish brown silt loam 8 inches thick. The upper 4 inches of the subsoil is dark grayish brown, friable very fine sandy loam. The lower 28 inches is mottled brown, friable silt loam. The substratum is mottled brown, friable silty clay loam.

Teel soils have a seasonal high water table. The subsoil and substratum are moderately permeable. Available water capacity is high. The capacity of these soils to supply nitrogen, phosphorus, and potassium is medium. The seasonal high water table and flooding are the main limitations in farming and in town and country planning.

Representative profile of Teel silt loam in a pasture 60 feet west of Marshall Road and one-fifth mile north of Mill Road on the north bank of Johnson Creek, in the town of Yates:

Ap—0 to 8 inches, very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) when dry; moderate, medium, granular structure; friable; many roots; neutral; abrupt, smooth boundary.

B21—8 to 12 inches, dark grayish brown (10YR 4/2) very fine sandy loam; moderate, fine, subangular blocky structure; friable; many roots; many fine pores; neutral; clear, wavy boundary.

B22—12 to 25 inches, brown to dark brown (10YR 4/3) silt loam; common, medium, faint, grayish brown (10YR 5/2) mottles; weak, medium, subangular blocky structure; friable; common roots; many pores; neutral; gradual, smooth boundary.

B23—25 to 40 inches, brown (7.5YR 5/2) silt loam; common, fine, distinct, reddish yellow (7.5YR 6/8) mottles; weak, fine and medium, subangular blocky structure; friable; few roots; common fine pores; neutral; clear, smooth boundary.

IIC—40 to 62 inches, brown (7.5YR 5/4) silty clay loam; many, medium, faint, strong brown (7.5YR 5/8) mottles; massive; friable; common fine pores in upper part; neutral.

Thickness of solum ranges from 24 to 40 inches. Depth to carbonates exceeds 40 inches. The content of coarse fragments is essentially none, but may range to 5 percent.

The Ap horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 1 or 2.

The B horizon has hue of 10YR to 7.5YR, value of 3 to 5, and chroma of 2 to 4. It is very fine sandy loam or silt loam. Reaction is slightly acid or neutral.

The C horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 to 4. It ranges from very fine sandy loam to silty clay loam. Reaction is neutral or mildly alkaline.

Teel soils are commonly near or are similar to Hamlin and Wayland soils and to the miscellaneous land type Udifluvents, frequently flooded. They formed in similar material and are in the same drainage sequence as the well drained Hamlin soils and poorly drained and very poorly drained Wayland soils. Teel soils are more uniform in texture and have better expressed profile development than Udifluvents, frequently flooded.

Te—Teel silt loam. This nearly level soil is adjacent to streams on flood plains of silt and very fine sand alluvial sediment. Areas are long and narrow and are generally more than 25 acres in size.

Included with this soil in mapping are areas where the surface layer is loam or very fine sandy loam. Also included are higher, drier areas of Hamlin soils; areas of Wayland soils in depressions or in cross channels; areas of soils that are similar to the Teel soil but are less than 40 inches deep over coarser soil material; and a few areas of soils that are similar but are moderately deep over bedrock.

Runoff is slow, and the hazard of erosion is slight. A seasonal high water table and flooding are the main limitations. In places, cross channeling by floodwater dissects soil areas and results in detrimental erosion or deposition. This soil is difficult to drain because it is low on the landscape and lacks suitable outlets. Most areas are pastured or wooded. Capability unit IIw–3; woodland suitability group 2o2.

Udifluvents, Frequently Flooded

UD—Udifluvents, frequently flooded. This unit consists of nearly level, recent alluvial deposits on narrow flood plains. Generally it is flooded early in spring and late in fall and is moist or wet the rest of the year. The deposits range from gravel and sand to clay. They are commonly less than 40 inches deep over lake-laid material or glacial till.

Included with this unit in mapping are small areas of deeper alluvial soils, such as the well drained Hamlin soils, the moderately well drained and somewhat poorly drained Teel soils, and the poorly drained to very poorly drained Wayland soils.

Narrowness of the flood plain, the varying texture, and flooding limit the use of this unit. Most areas are pastured or wooded. Onsite investigation is needed to determine the feasibility of any proposed land use change. Capability unit Vw–1; woodland suitability group 4w1.

Wampsville Series

The Wampsville series consists of deep, gently sloping, well drained soils on outwash terraces and glacial beaches. These soils formed in water-sorted deposits derived from red shale, limestone, and sandstone.

In a representative profile the surface layer is dark grayish brown, gravelly loam 8 inches thick. The subsoil is 32 inches thick. The upper 7 inches is brown,

friable, gravelly loam; the next 17 inches is dark brown to brown, firm, light gravelly clay loam; and the lower 8 inches is dark brown to brown, friable gravelly loam. The substratum is grayish brown, loose very gravelly loamy sand.

The subsoil is moderately rapidly permeable, and the substratum is rapidly permeable. Available water capacity is high. The capacity of these soils to supply nitrogen, phosphorus, and potassium is medium. Gravel in the surface layer and the erosion hazard are the main limitations in farming and in town and country planning.

Representative profile of Wampsville gravelly loam, 3 to 8 percent slopes, in an idle area in a drainage ditchbank approximately three-fifths of a mile south of N.Y. 31A and 75 feet west of N.Y. 237, near a small cemetery in the town of Clarendon:

Ap—0 to 8 inches, dark grayish brown (10YR 4/2) gravelly loam; weak, fine, granular structure; friable; many roots; 20 percent gravel; neutral; abrupt, smooth boundary.

B21—8 to 15 inches, brown (7.5YR 5/4) gravelly loam; weak, fine and medium, granular structure; friable; common roots; common fine pores; 25 percent gravel; neutral; clear, wavy boundary.

B22t—15 to 32 inches, dark brown to brown (7.5YR 4/4) light gravelly clay loam; weak, coarse, subangular blocky structure; firm; few roots; common fine pores; 30 percent gravel; light brown (7.5YR 6/4), pinkish gray (7.5YR 7/2) dry, clean sand 1 to 2 millimeters thick on ped faces in upper 4 inches; clay films in pores and coating most of the gravel fragments; neutral; clear, wavy boundary.

B3—32 to 40 inches, dark brown to brown (7.5YR 4/4) gravelly loam; massive; friable; few roots; 30 percent gravel; neutral; gradual, smooth boundary.

IIC—40 to 50 inches, grayish brown (10YR 5/2) very gravelly loamy sand; single grain; loose; few roots in upper part; 40 percent gravel; calcareous; moderately alkaline.

Thickness of the solum and depth to carbonates range from 30 to 40 inches. The content of coarse fragments ranges from 10 to 30 percent in the solum and from 25 to 50 percent in the C horizon. Reaction ranges from neutral to medium acid in the solum.

The Ap horizon has hue of 10YR to 7.5YR, value of 3 or 4, and chroma of 2.

The B horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 3 or 4. It ranges from loam to clay loam. The Bt part of the B horizon has clay films on ped faces or clay films on tops of pebbles or cobbles, or both.

The C horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 2 or 3. It ranges from stratified sand and gravel to very gravelly loam.

Wampsville soils are commonly near or are similar to Phelps, Howard, Ontario, and Madrid soils. They formed in similar material and are in the same drainage sequence as the moderately well drained Phelps soils. Wampsville soils have a finer textured and less gravelly Bt horizon than Howard soils. They have more gravel than Ontario and Madrid soils and are underlain by water-sorted material, whereas those soils are underlain by glacial till.

WmB—Wampsville gravelly loam, 3 to 8 percent slopes. This gently sloping soil is on water-sorted glacial beach and outwash terraces. Areas are irregularly shaped and are mainly less than 50 acres in size.

Included with this soil in mapping are areas where the surface layer is silt loam, fine sandy loam, or gravelly equivalents. Also included are a few areas where slopes are less than 3 percent or more than 8 percent; some areas of Howard soils; areas of a soil that is similar to the Wampsville soil but is less deep to coarse textured soil material; and a few areas of gravelly or stony soils formed in glacial till. Areas that have wet spots and a stony surface layer are indicated by spot symbols on the soil map.

Runoff is slow to medium, and the hazard of erosion is moderate. Gravel in the surface layer and a moderate hazard of erosion are the main limitations. In places, gravel, cobbles, or stones in the surface layer interfere with cultivation.

If well managed, this soil is suited to most crops grown in the county. It responds well to irrigation. A cropping system that includes minimum tillage and the addition of crop residue can help control erosion. Capability unit IIe–1; woodland suitability group 2o1.

Wassaic Series

The Wassaic series consists of moderately deep, nearly level and gently sloping, well drained to moderately well drained soils that are 20 to 40 inches deep over bedrock. These soils are on bedrock-controlled till plains. They formed in glacial till derived from limestone, sandstone, and shale.

In a representative profile the surface layer is dark grayish brown silt loam 9 inches thick. The upper 7 inches of the subsoil is brown, friable loam. The lower 11 inches is dark brown to brown, firm, heavy loam. The substratum is reddish brown and brown to dark brown, firm, flaggy loam. Limestone bedrock is at a depth of 36 inches.

The subsoil is moderately permeable. Available water capacity is low to moderate. The capacity of these soils to supply nitrogen, phosphorus, and potassium is medium. The erosion hazard in sloping areas and the moderate depth over bedrock are the main limitations in farming and in town and country planning.

Representative profile of Wassaic silt loam, 0 to 3 percent slopes, in an idle area 1,000 feet northeast of the junction of Sanderson and Martin Roads, 100 feet southeast of Sanderson Road, in the town of Shelby:

Ap—0 to 9 inches, dark grayish brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable; many roots; 5 percent coarse fragments; neutral; abrupt, smooth boundary.

B21—9 to 16 inches, brown (10YR 5/3) loam; weak, medium and coarse, subangular blocky structure; friable; common roots; common medium pores; dark brown to brown (10YR 4/3) ped coats; 10 percent coarse fragments; neutral; clear, wavy boundary.

B2t—16 to 27 inches, dark brown to brown (7.5YR 4/4) heavy loam; moderate, medium, subangular blocky structure; firm; common roots; common fine pores; dark brown (7.5YR 3/2) patchy clay films on 30 percent of ped surfaces; light gray (10YR 7/2) clean sand grains 1 to 3 millimeters thick on ped faces in upper part; 10 percent coarse fragments; neutral; abrupt, wavy boundary.

C—27 to 36 inches, reddish brown (5YR 4/3) and brown to dark brown (7.5YR 4/4) flaggy loam; massive; firm; 20 to 60 percent stone fragments; calcareous; moderately alkaline; abrupt, smooth boundary.

IIR—36 inches, dark gray (10YR 4/1), massive dolomitic limestone.

Thickness of the solum ranges from 20 to 36 inches, and depth to bedrock ranges from 20 to 40 inches. The bedrock is limestone or sandstone. The content of coarse fragments ranges from 5 to 20 percent in the solum and from 10 to 60

percent in the C horizon. Reaction is slightly acid or neutral in the solum and slightly acid to moderately alkaline in the C horizon.

The Ap horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2.

The B horizon has hue of 10YR to 5YR, value of 3 to 5, and chroma of 3 or 4. It is heavy silt loam or heavy loam. Clean sand or silt 1 to 3 millimeters thick coats the ped faces in the upper 2 to 4 inches of the Bt horizon. Patchy clay films are on 10 to 40 percent of ped faces in the Bt horizon.

The C horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 2 to 4.

Wassaic soils are commonly near or are similar to Newstead, Farmington, Ontario, and Hilton soils. They formed in similar material and are in the same drainage sequence as the somewhat poorly drained Newstead soils. Wassaic soils are deeper over rock than Farmington soils. They are similar to Ontario and Hilton soils in texture and drainage but are not so deep as those soils.

WsA—Wassaic silt loam, 0 to 3 percent slopes. This nearly level soil has the profile described as representative of the series. It is in areas of glacial till 20 to 40 inches deep over bedrock. Areas are rectangular or occur as strips and are generally less than 100 acres in size.

Included with this soil in mapping are areas where the surface layer is loam. Also included are areas of Hilton or Ontario soils, which are similar to the Wassaic soil but are deeper; a few areas of the shallower Farmington soils; areas of Newstead soils in depressions and along drainageways; and a few areas of the coarser textured and deeper Madrid soils. Small areas that have outcrop, surface stones, and wet spots are indicated by spot symbols on the soil map.

Runoff is slow, and the hazard of erosion is slight. The moderate depth over bedrock is the main limitation. In places, stones in the surface layer interfere with cultivation. Some wetness early in spring and late in fall can delay planting and interfere with harvesting some crops. This soil is suited to most crops, but is not so well suited to deep rooted crops. It responds well to irrigation. Most areas are cultivated. Capability unit IIs–1; woodland suitability group 2o1.

WsB—Wassaic silt loam, 3 to 8 percent slopes. This gently sloping soil has a profile similar to the one described as representative of the series, but the combined surface layer and subsoil is slightly thinner. The soil is in areas of glacial till 20 to 40 inches deep over bedrock. Areas are roughly rectangular or occur as strips and are generally less than 100 acres in size.

Included with this soil in mapping are areas where the surface layer is loam. Also included are areas of Hilton or Ontario soils, which are similar to the Wassaic soil but are deeper; a few areas of shallower Farmington soils; small areas of the nearly level Wassaic soil; and small areas where slope is more than 8 percent. Stony spots, wet spots, and a few very rocky areas are indicated by spot symbols on the soil map.

Runoff is medium, and the hazard of erosion is moderate. The erosion hazard and the moderate depth over rock are the main limitations. In places, stones in the surface layer or rock outcrops interfere with cultivation. Some wetness early in spring and late in fall can delay planting and interfere with harvesting some crops.

Contour rows, stripcrops, and diversions help to control runoff and reduce soil loss. This soil is suited to most crops, but it has a limited rooting depth for deep rooted crops, such as alfalfa. Capability unit IIe–2; woodland suitability group 2o1.

Wayland Series

The Wayland series consists of deep, nearly level, poorly drained and very poorly drained soils on flood plains. These soils formed in alluvial sediment, mainly of silt and, to a lesser extent, sand and clay.

In a representative profile the surface layer is very dark grayish brown silt loam 8 inches thick. Below this is mottled dark gray, friable silt loam; mottled gray, firm silty clay loam; mottled reddish gray, friable silt loam; and gray fine sandy loam.

Wayland soils are frequently flooded, and the water table is near the surface for long periods. Permeability is slow. Available water capacity is high, and excess water for plants is common. The capacity of these soils to supply nitrogen is high, but the release is slow because of wetness. The capacity to supply phosphorus and potassium is medium. The prolonged high water table, flooding, and ponding are the main limitations in farming and in town and country planning.

Representative profile of Wayland silt loam in an idle area 50 feet east of Densmore Road and one-fifth mile south of Zig Zag Road in the town of Gaines:

A1—0 to 8 inches, very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; common, fine, distinct, yellowish red (5YR 5/6) mottles lining old root channels; moderate, medium and coarse, granular structure; friable; many roots; neutral; gradual, smooth boundary.

C1g—8 to 22 inches, dark gray (5YR 4/1) silt loam; common, fine, distinct, yellowish red (5YR 4/6) mottles; massive; friable; common roots; common fine pores; neutral; gradual, smooth boundary.

C2g—22 to 36 inches, gray (10YR 5/1) silty clay loam; many (30 percent), medium, distinct, strong brown (7.5YR 5/6) mottles; massive and weak, thick, platy structure; firm; few roots; few fine pores; neutral; clear, smooth boundary.

C3g—36 to 48 inches, reddish gray (5YR 5/2) silt loam; many (30 percent), medium, faint, gray (5YR 5/1) and common, medium, distinct, yellowish red (5YR 4/6) mottles; massive and weak, thick, platy structure; friable; few fine pores; neutral; abrupt, smooth boundary.

IIC4g—48 to 54 inches, gray (5YR 6/1) fine sandy loam; massive; slightly sticky; calcareous; moderately alkaline.

Thickness of the silty deposits ranges from 36 inches to more than 60 inches. The content of coarse fragments is none or very few. Reaction ranges from neutral to medium acid in the upper 48 inches and from neutral to moderately alkaline below.

The A1 or Ap horizon has hue of 10YR or N, value of 2 or 3, and chroma of 0 to 2.

The C horizon has hue of 10YR to 5YR, value of 4 to 6, and chroma of 1 or 2. It ranges from silt loam to silty clay loam above a depth of 40 inches. It is massive or has weak, platy structure.

Wayland soils are commonly near or are similar to Hamlin and Teel soils and Udifluvents, frequently flooded. They are wetter and are finer textured below the A horizon than Hamlin and Teel soils. They are more uniform in texture and have better expressed profile development than Udifluvents, frequently flooded.

Wy—Wayland silt loam. This nearly level soil is in concave, low lying areas on flood plains of alluvial

deposits, mainly of silt and, to a lesser extent, sand and clay. Areas occur as strips or are irregularly shaped and are mainly less than 50 acres in size.

Included with this soil in mapping are higher, drier areas of Teel and Hamlin soils and a few marshy areas of Palms soils. Also included are areas of a soil that is similar to the Wayland soil but has a thin mucky surface layer; a few areas of soils that are similar but are moderately deep over glacial till, lake deposits, or shale bedrock; and a few areas where gravel or stones are in the surface layer.

Runoff is very slow, and the hazard of erosion is slight. A prolonged high water table, flooding, and ponding are the main limitations. This soil is difficult to drain because it is low on the landscape. Areas are generally small and isolated. This soil is limited to pasture and trees. Capability unit Vw–1; woodland suitability group 4w1.

Use and Management of the Soils

The following pages define general principles of management that apply to all soils used for farming in Orleans County. They explain the capability classification and list estimated yields per acre of the principal crops under two levels of management. Also on the pages that follow is information on woodland, wildlife habitat, and engineering, and on selected uses of soils to be considered in town and country planning and in planning recreational facilities.

General Principles of Soil Management [2]

Some principles of management are general enough to apply to all soils in the county suitable for farm crops. Specific management, however, is needed for individual soils.

Many soils in the county require lime or fertilizer or both. The amount needed depends on the natural content of lime and plant nutrients, as determined by laboratory analyses of soil samples, on the needs of the crop, and on the level of yield desired. For assistance in having tests made and interpreting results, farmers and others can consult the Cooperative Extension Agent. Timeliness of fertilization is important, particularly for application of nitrogen. Maximum benefits result when crop demand is highest. Nitrogen is easily lost through leaching, especially from coarse textured soils, such as Colonie soils. Small amounts applied at frequent or timely intervals give best results.

New research findings are presented in current editions of "Cornell Recommends for Field Crops," "Vegetable Production Recommendations," and "Tree-Fruit Production Recommendations," all prepared by the staff of the New York State College of Agriculture at Cornell University. In the absence of soil tests, these references, along with this publication, can be used as a guide in determining lime and fertilizer needs.

Most of the soils of Orleans County are fairly high in organic-matter content. Maintaining a high level is important, for example, by applying farm manure and returning plant residue, by growing sod crops and cover crops, and by plowing under green manure crops.

Tillage tends to reduce the organic-matter content and break down soil structure. It should be kept to the minimum needed for seedbed preparation and control of weeds. Maintaining a high level of organic matter in the plow layer helps to sustain desirable soil structure.

On wet soils, such as Appleton silt loam, yields of cultivated crops can be increased by open ditch or tile drainage. Tile drains are more costly to install, but they generally require less maintenance and are easier to farm than open ditches. Drainage on sloping soils is more effective if the ditches or tile lines intercept the water as it moves horizontally downslope on top of a fragipan or other impervious layer. Suitable outlets are needed for both tile and open ditch drainage.

Erosion is a principal source of sediment, which is a major cause of pollution. All of the gently sloping and steeper soils that are cultivated are subject to erosion. Runoff and erosion occur mainly while a cultivated crop is growing or soon after one has been harvested. On erodible soils, such as Collamer silt loam, 2 to 6 percent slopes, a suitable cropping system and erosion control are needed. A cropping system is the sequence of crops grown. Management to be considered consists of minimum tillage, mulch planting, crop residue, cover crops and green-manure crops, lime and fertilizer, contour cultivation, terracing, contour stripcropping, diversion of runoff, and grassed waterways. Windbreaks are sometimes needed to control soil blowing. The effectiveness of a particular combination of these measures differs from one soil to another. The local representative of the Soil Conservation Service is available to help plan an effective combination of practices for erosion control.

Pasture is effective in controlling erosion on all but a few soils that are subject to erosion. A high level of pasture management is needed on some soils to provide good ground cover and forage for grazing and enough ground cover to keep the soils from eroding. Such management provides for fertilization, grazing control, and careful selection of pasture and seeding mixtures. Grazing is controlled by rotating the livestock from one pasture to another to provide time for regrowth of the plants. On some soils it is important to establish pasture plants that require the least amount of renovation to maintain good ground cover and produce adequate forage.

Capability grouping

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

[2] HAROLD L. HANSEN, conservation agronomist, Soil Conservation Service, helped prepare this section.

apply to horticultural crops or other crops requiring special management.

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

In the capability system, all kinds of soil are grouped at three levels: the capability class, the subclass, and the unit. These levels are defined in the following paragraphs.

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

Class I soils have few limitations that restrict their use.

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

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

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

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture or to range, woodland, or wildlife habitat.

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

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

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

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

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

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol; for example, IIe–4, or IIIe–6. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

For the capability unit to which any mapping unit has been assigned, refer to the "Guide to Mapping Units" at the back of this survey or to the notation at the end of each mapping unit description. In this survey, use and management of soils is suggested in the descriptions of mapping units under the heading "Descriptions of the Soils."

Estimated yields [3]

Tables 2, 3, and 4 show estimated average yields per acre of major crops, vegetables, and tree fruits grown on the soils listed. The estimates are for two levels of management. Figures in column A represent yields that can be expected if management of soils, water, and crops is average, or less than half of the suggested conservation and management practices. The estimates are for yields obtained in 1974.

Figures in column B represent the approximate high yields attained by the top 10 percent of farmers in the county who used the best combinations of conservation and management practices. High level management consists of suitable crop rotations; appropriate rates of lime and fertilizer; adequate drainage and irrigation where needed; contour farming, stripcropping, sodded waterways, or other appropriate measures needed to conserve soil and water; control of weeds and insects; and tillage at the right time and in the proper way.

To obtain the yields shown in column B, management needs are those recommended in the annually published "Cornell Recommends for Field Crops," "Vegetable Production Recommendations," and "Tree-Fruit Production Recommendations," all prepared by the New York State College of Agriculture and Life Sciences at Cornell University.

From year to year actual estimated yields may vary from those listed by about 10 percent. Yields can be expected to increase in the future as new varieties of crops are developed and management is improved.

Cultivated muck soils in the county are used principally for the production of onions, lettuce, and potatoes. Estimated acre yields for crops grown on Carlisle muck are onions, 800 to 1,200 bushels; lettuce, 700 to 800 crates; and potatoes, 270 to 420 hundredweight

[3] HAROLD L. HANSEN, conservation agronomist, Soil Conservation Service, assisted in preparing the tables in this section. Also assisting were agents of the Cooperative Extension Service: Nathan R. Herendeen, the table on field crops; Richard S. Bostdorff, the table on vegetable crops; and Richard L. Norton, the table on fruit crops.

sacks. Estimated acre yields for crops grown on Edwards and Palms muck are onions, 600 to 900 bushels, and potatoes, 240 to 360 hundredweight sacks.

Woodland [4]

Approximately 11 percent of Orleans County, or 49,700 acres, is classified as commercial forest (*10*). The extent of commercial forest-type groups are white or red pine, 900 acres; plantations, 2,700 acres; oak, 2,500 acres; elm-ash-red maple, 20,500 acres; maple-beech-birch, 20,600; and aspen-birch, 2,500 acres.

Woodland suitability groups

The soils of Orleans County have been assigned to 11 woodland suitability groups to assist owners in planning the use of their soils for wood crops. Each group is made up of soils that are suited to the same kinds of trees, have the same potential productivity, and need similar management where the plant cover is similar.

Each woodland group is identified by a three-part symbol, such as 2o1, 2w1, or 3w1. The potential productivity of the soils in the group is indicated by the first number in the symbol: 1 means very high, 2 high, 3 moderately high, 4 moderate, and 5 low. These ratings are based on field determination of the average site index of an indicator species. Site index on a given soil is the average height, in feet, that the dominant and codominant trees reach in 50 years in a natural, essentially unmanaged stand. Site index can be converted into approximate expected growth and yield per acre. For a more complete discussion of site index and potential productivity, see references (*3*) and (*4*) under "Literature Cited."

The second part of the symbol identifying a woodland group is a small Arabic letter *w, d, s, r,* or *o*. Priority in placing of soil into a subclass must be in the order that the letters are listed above. Except for the letter *o,* the Arabic letter indicates an important soil property that imposes a hazard or limitation in woodland management. The letter *w* indicates excessive wetness, either seasonal or all year; *d* a restricted rooting depth; and *s* a dry, unstable, abrasive sandy soil that differs little in texture between the surface layer and subsoil. The letter *r* shows that the main limitation is steep slope and a resulting hazard of erosion and possible limitation to use of equipment. The letter *o* shows that the limitation, if any, is only slight.

The last part of the symbol, another number, differentiates groups of soils that have identical first and second parts in their identifying symbol. Soils in woodland group 2r1, for example, require different management or are suited to other species of trees than soils in group 2r2 because of differences in soil properties or other factors.

In table 5 each woodland group is rated according to various management hazards or limitations, which are expressed as *slight, moderate,* or *severe.*

Erosion hazard refers to the potential hazard of soil loss under average woodland management. The hazard is *slight* if the expected loss of soil is small; *moderate* if some loss is expected and care is needed during logging and construction; and *severe* if special management is needed to prevent excessive soil loss.

Equipment limitation depends on soil characteristics that restrict or prohibit the use of harvesting equipment, either seasonally or continually. *Slight* indicates no restriction in the kind of equipment or time of year it is used; *moderate* indicates that use of equipment is restricted for 3 months of the year or less; *severe* indicates that special equipment is needed and that its use is severely restricted for more than 3 months.

Seedling mortality refers to mortality of naturally occurring or planted tree seedlings, as influenced by kinds of soil or topographic conditions when plant competition is assumed not to be a factor. *Slight* means a loss of 0 to 25 percent; *moderate,* a loss of 25 to 50 percent; and *severe,* a loss of more than 50 percent of the seedlings. It is assumed that seed supplies are adequate.

Plant competition is the degree to which undesirable plants invade openings in the tree canopy. Considered in the ratings are available water capacity, fertility, drainage, and degree of erosion. Conifers and hardwoods are rated separately in table 5. *Slight* means that plant competition does not prevent adequate natural regeneration and early growth and does not interfere with seedling development; *moderate* means that competition delays natural or artificial establishment and growth rate, but does not prevent the development of fully stocked normal stands; *severe* means that competition prevents adequate natural or artificial regeneration, unless the site is prepared properly and managed.

Windthrow hazard, or windfirmness, is rated according to the ability of the soil to support trees during periods of high winds. A rating of *slight* indicates that trees are not expected to be blown down in commonly occurring winds. *Moderate* indicates that trees are stable except during short periods of excessive wetness. *Severe* indicates that the soil and tree roots do not give enough stability to keep trees from blowing over during moderate or high winds.

Table 5 also lists suitable species to be favored in existing stands and suitable species for planting. The estimated site index in table 5 is the average height, in feet, that the dominant and codominant trees reach in 50 years on the soils of each group.

The woodland group to which each soil is assigned is listed in the Guide to Mapping Units. Fluvaquents and Humaquepts, ponded, and Shale outcrop, steep, are not suitable for commercial production of trees. Udifluvents, frequently flooded, is in group 4w1 because it supports tree growth and in places is suitable for commercial production of wood crops.

Wildlife [5]

The kind and number of wildlife that live in a given area are closely related to land use; to the resulting kinds, amounts, and patterns of vegetation;

[4] Prepared by MEREDITH A. PETERS, woodland conservationist, Soil Conservation Service.

[5] This section was prepared by ROBERT E. MYERS, wildlife biologist, Soil Conservation Service, Syracuse, N.Y.

TABLE 2.—*Estimated average acre yields of specified*

[Figures in columns A are yields to be expected under ordinary management; those in columns B, under improved management.

Soil	Corn for—			
	Silage		Grain	
	A	B	A	B
	Tons	*Tons*	*Bu*	*Bu*
Alton gravelly sandy loam, 3 to 8 percent slopes	12	20	60	100
Appleton silt loam, 0 to 3 percent slopes	12	25	----	125
Appleton silt loam, 3 to 8 percent slopes	12	25	----	125
Arkport very fine sandy loam, 0 to 6 percent slopes	14	24	70	120
Arkport very fine sandy loam, 6 to 12 percent slopes	12	20	60	100
Arkport-Collamer complex, 6 to 20 percent slopes	----	----	----	----
Bombay fine sandy loam, 0 to 3 percent slopes	13	23	65	115
Bombay fine sandy loam, 3 to 8 percent slopes	13	23	65	115
Brockport silty clay loam, 0 to 2 percent slopes	----	18	----	100
Brockport silty clay loam, 2 to 6 percent slopes	----	18	----	100
Brockport silty clay loam, 6 to 12 percent slopes	----	----	----	----
Canandaigua soils	----	24	----	----
Cayuga silt loam, 2 to 6 percent slopes	16	26	80	130
Cazenovia silt loam, 0 to 3 percent slopes	16	26	80	130
Cazenovia silt loam, 3 to 8 percent slopes	16	26	80	130
Cazenovia gravelly silt loam, shale substratum, 0 to 3 percent slopes	15	25	75	125
Cazenovia gravelly silt loam, shale substratum, 3 to 8 percent slopes	15	25	75	125
Cheektowaga fine sandy loam	----	18	----	----
Churchville silt loam, 0 to 2 percent slopes	11	22	----	120
Churchville silt loam, 2 to 6 percent slopes	11	22	----	120
Claverack loamy fine sand, 0 to 6 percent slopes	12	20	60	100
Collamer silt loam, 0 to 2 percent slopes	14	24	70	120
Collamer silt loam, 2 to 6 percent slopes	14	24	70	120
Collamer silt loam, 6 to 12 percent slopes, severely eroded	11	22	55	100
Colonie loamy fine sand, 0 to 6 percent slopes	11	18	55	90
Colonie loamy fine sand, 6 to 12 percent slopes	----	16	----	80
Cosad loamy fine sand	----	20	----	100
Elnora loamy fine sand, 0 to 6 percent slopes	11	18	55	90
Farmington silt loam, 0 to 8 percent slopes	----	----	----	----
Farmington silt loam, 8 to 15 percent slopes	----	----	----	----
Fonda mucky silt loam	----	----	----	----
Fredon loam	12	25	----	115
Galen very fine sandy loam, 0 to 2 percent slopes	13	24	65	115
Galen very fine sandy loam, 2 to 6 percent slopes	13	24	65	115
Hamlin silt loam	16	26	80	130
Hilton loam, 0 to 3 percent slopes	14	26	70	125
Hilton loam, 3 to 8 percent slopes	14	26	70	125
Hilton loam, rock substratum, 0 to 3 percent slopes	14	24	70	120
Hilton loam, rock substratum, 3 to 8 percent slopes	14	24	70	120
Hilton-Cazenovia stony silt loams, 0 to 8 percent slopes	14	24	70	120
Howard gravelly loam, 3 to 8 percent slopes	13	22	65	110
Howard soils, 8 to 25 percent slopes	11	18	55	90
Junius loamy fine sand	----	18	----	90
Kendaia and Appleton silt loams, rock substratum, 0 to 3 percent slopes	12	24	----	120
Lairdsville silt loam, 0 to 6 percent slopes	13	22	65	110
Lakemont silty clay loam	----	----	----	----
Lakemont silt loam, shale substratum	----	----	----	----
Lamson soils	----	20	----	----
Lockport silty clay loam	----	18	----	100
Lyons silt loam	----	----	----	----
Lyons silt loam, rock substratum	----	----	----	----
Madalin silt loam	----	----	----	----
Madrid fine sandy loam, 8 to 15 percent slopes	14	24	70	120
Madrid fine sandy loam, 8 to 15 percent slopes	12	22	60	110
Massena fine sandy loam	11	22	----	110
Minoa very fine sandy loam	11	22	----	110
Newstead silt loam	----	----	----	----
Niagara silt loam, 0 to 2 percent slopes	12	25	----	120
Niagara silt loam, 2 to 6 percent slopes	12	25	----	120
Odessa silt loam, 0 to 2 percent slopes	11	25	----	100
Odessa silt loam, 2 to 6 percent slopes	11	25	----	100
Ontario loam, 3 to 8 percent slopes	16	26	80	130
Ontario loam, 8 to 15 percent slopes	14	24	70	120
Ontario stony loam, 3 to 8 percent slopes	14	24	70	120
Ontario loam, rock substratum, 0 to 8 percent slopes	14	24	70	120
Ovid silt loam, 0 to 3 percent slopes	12	25	----	110
Ovid silt loam, 3 to 8 percent slopes	12	25	----	110
Ovid silt loam, shale substratum, 0 to 4 percent slopes	12	25	----	110

field and forage crops under two levels of management
Dashes indicate that the crop is not suited to the soil or is not commonly grown on it. Only arable soils are listed]

Oats		Wheat		Soybeans		Forage mixtures (hay)					
						Alfalfa		Alfalfa-trefoil grass		Trefoil grass	
A	B	A	B	A	B	A	B	A	B	A	B
Bu	*Bu*	*Bu*	*Bu*	*Bu*	*Bu*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*
45	90	30	50	15	30	2.0	4.5	2.0	3.5	2.0	3.0
----	115	30	70	15	35	-----	6.0	2.5	5.0	2.5	4.0
----	115	30	70	15	35	-----	6.0	2.5	5.0	2.5	4.0
55	110	35	65	15	35	3.0	6.0	2.5	4.5	2.5	3.5
55	105	35	65	15	30	2.5	5.5	2.0	4.0	2.5	3.5
----	-----	----	----	----	----	2.5	5.5	2.0	4.0	2.0	3.0
60	110	35	65	15	35	3.5	6.0	2.5	4.5	2.5	3.5
60	110	35	65	15	35	3.5	6.0	2.5	4.5	2.5	3.5
----	95	----	60	----	30	-----	5.0	2.5	4.5	2.5	3.5
----	95	----	60	----	30	-----	5.0	2.5	4.5	2.5	3.5
----	-----	----	----	----	----	-----	5.0	2.5	4.5	2.5	3.5
----	-----	----	65	----	35	-----	5.0	-----	4.5	-----	3.5
65	120	40	70	20	40	3.5	7.0	3.0	5.0	3.0	4.0
65	120	40	70	20	40	3.5	7.0	3.0	5.0	3.0	4.0
65	120	40	70	20	40	3.5	7.0	3.0	5.0	3.0	4.0
60	115	35	65	20	40	3.0	6.5	2.5	4.5	2.5	3.5
60	115	35	65	20	40	3.0	6.5	2.5	4.5	2.5	3.5
----	-----	----	----	----	----	-----	-----	-----	3.5	-----	2.5
----	110	30	70	10	30	2.5	6.0	2.5	5.0	2.5	4.0
----	110	30	70	10	30	2.5	6.0	2.5	5.0	2.5	4.0
45	90	30	50	15	30	2.5	4.5	2.0	3.5	2.0	3.0
60	110	40	70	20	35	3.0	6.5	3.0	5.0	2.5	3.5
60	110	40	70	20	35	3.0	6.5	3.0	5.0	2.5	3.5
45	90	30	60	----	----	2.0	5.0	2.0	4.5	2.0	3.0
40	80	25	45	10	25	2.0	4.5	2.0	3.5	-----	-----
----	70	----	45	----	----	2.0	4.0	1.5	3.0	-----	-----
----	90	----	50	----	30	-----	4.5	2.0	3.5	2.0	3.0
45	85	30	50	15	25	2.5	4.5	2.0	3.5	2.0	3.0
----	-----	----	----	----	----	2.5	4.5	2.0	3.5	2.0	3.0
----	-----	----	----	----	----	-----	-----	-----	-----	2.0	2.5
----	-----	----	----	----	----	-----	-----	-----	3.0	-----	3.0
----	100	30	55	----	30	-----	5.0	2.0	4.0	2.0	4.0
50	100	35	65	15	35	2.5	5.5	2.0	4.0	2.0	3.5
50	100	35	65	15	35	2.5	5.5	2.0	4.0	2.0	3.5
65	120	40	70	20	40	3.5	7.0	3.0	5.0	3.0	4.0
60	115	40	70	20	40	3.5	6.5	3.0	5.0	3.0	4.0
60	115	40	70	20	40	3.5	6.5	3.0	5.0	3.0	4.0
60	115	40	70	20	40	3.5	6.5	3.0	5.0	3.0	4.0
60	115	40	70	20	40	3.5	6.5	3.0	5.0	3.0	4.0
60	115	40	70	20	40	3.5	6.5	3.0	5.0	3.0	4.0
60	100	35	65	20	35	3.0	6.0	2.5	4.5	2.5	4.0
50	85	30	55	----	----	3.0	5.5	2.5	4.5	2.0	3.5
----	85	----	50	----	25	-----	-----	2.0	3.5	2.0	3.0
----	110	30	65	----	35	-----	6.0	2.5	5.0	2.5	4.0
60	100	35	65	15	30	3.0	6.0	2.5	4.5	2.5	4.0
----	-----	----	----	----	----	-----	-----	-----	3.0	-----	3.0
----	-----	----	----	----	----	-----	-----	-----	3.0	-----	3.0
----	-----	----	65	----	----	-----	-----	-----	4.0	-----	3.5
----	95	----	60	----	30	-----	5.0	2.5	4.5	2.5	3.5
----	-----	----	----	----	----	-----	-----	-----	3.0	-----	3.0
----	-----	----	----	----	----	-----	-----	-----	3.0	-----	3.0
----	-----	----	----	----	----	-----	-----	-----	3.0	-----	3.0
60	115	40	70	20	40	3.5	6.5	3.0	5.0	2.5	4.0
55	110	35	65	15	35	3.5	6.5	3.0	5.0	2.5	4.0
----	100	30	65	----	35	-----	5.0	2.5	4.5	2.5	4.0
----	100	30	65	----	35	-----	5.0	2.5	4.5	2.5	4.0
----	-----	----	----	----	----	-----	4.0	2.5	4.0	2.5	3.5
----	100	30	65	----	35	-----	5.0	2.5	4.5	2.5	4.0
----	100	30	65	----	35	-----	5.5	2.5	5.0	2.5	4.0
----	100	30	65	----	35	-----	5.0	2.5	4.5	2.5	4.0
----	100	30	65	----	35	-----	5.0	2.5	4.5	2.5	4.0
65	120	40	70	20	40	3.5	7.0	3.0	5.0	3.0	4.0
60	120	40	70	20	40	3.5	7.0	3.0	5.0	3.0	4.0
60	120	40	70	20	40	3.5	7.0	3.0	5.0	3.0	4.0
60	120	40	70	20	40	3.5	7.0	3.0	5.0	3.0	4.0
----	100	30	70	15	30	-----	6.0	2.5	4.5	2.5	4.0
----	100	30	70	15	30	-----	6.0	2.5	4.5	2.5	4.0
----	100	30	70	15	30	-----	6.0	2.5	4.5	2.5	4.0

TABLE 2.—*Estimated average acre yields of specified field*

Soil	Corn for—			
	Silage		Grain	
	A	B	A	B
	Tons	*Tons*	*Bu*	*Bu*
Phelps gravelly fine sandy loam	13	23	65	115
Rhinebeck silt loam, 0 to 2 percent slopes	11	25	----	100
Rhinebeck silt loam, 2 to 6 percent slopes	11	25	----	100
Schoharie silt loam, 2 to 6 percent slopes	16	26	80	110
Sun silt loam	----	----	----	-----
Teel silt loam	----	----	----	-----
Wampsville gravelly loam, 3 to 8 percent slopes	15	25	75	125
Wassaic silt loam, 0 to 3 percent slopes	13	22	65	110
Wassaic silt loam, 3 to 8 percent slopes	13	22	65	110
Wayland silt loam	----	----	----	-----

TABLE 3.—*Estimated average acre yields of specified*

[Figures in column A are those to be expected under average management; those in column B, under improved management. Ab-

Soil	Cabbage [1]		Potatoes	
	A	B	A	B
	Crates	*Crates*	*Cwt*	*Cwt*
Alton gravelly sandy loam, 3 to 8 percent slopes	250	500	105	210
Appleton silt loam, 0 to 3 percent slopes	-----	625	-----	300
Appleton silt loam, 3 to 8 percent slopes	-----	625	-----	300
Arkport very fine sandy loam, 0 to 6 percent slopes	400	675	160	360
Arkport very fine sandy loam, 6 to 12 percent slopes	-----	-----	-----	-----
Bombay fine sandy loam, 0 to 3 percent slopes	400	750	160	360
Bombay fine sandy loam, 3 to 8 percent slopes	400	750	160	360
Brockport silty clay loam, 0 to 2 percent slopes	-----	550	-----	-----
Brockport silty clay loam, 2 to 6 percent slopes	-----	550	-----	-----
Cayuga silt loam, 2 to 6 percent slopes	350	750	-----	-----
Cazenovia silt loam, 0 to 3 percent slopes	450	750	-----	-----
Cazenovia silt loam, 3 to 8 percent slopes	450	750	-----	-----
Cazenovia gravelly silt loam, shale substratum, 0 to 3 percent slopes	450	750	-----	-----
Cazenovia gravelly silt loam, shale substratum, 3 to 8 percent slopes	450	750	-----	-----
Churchville silt loam, 0 to 2 percent slopes	-----	625	-----	-----
Churchville silt loam, 2 to 6 percent slopes	-----	625	-----	-----
Claverack loamy fine sand, 0 to 6 percent slopes	300	625	120	270
Collamer silt loam, 0 to 2 percent slopes	400	750	160	360
Collamer silt loam, 2 to 6 percent slopes	400	750	160	360
Colonie loamy fine sand, 0 to 6 percent slopes	250	500	105	210
Cosad loamy fine sand	-----	625	-----	270
Elnora loamy fine sand, 0 to 6 percent slopes	250	500	105	210
Fredon loam	-----	625	-----	300
Galen very fine sandy loam, 0 to 2 percent slopes	350	675	145	360
Galen very fine sandy loam, 2 to 6 percent slopes	350	675	145	360
Hamlin silt loam	450	750	180	360
Hilton loam, 0 to 3 percent slopes	400	750	160	360
Hilton loam, 3 to 8 percent slopes	400	750	160	360
Hilton loam, rock substratum, 0 to 3 percent slopes	400	750	-----	-----
Hilton loam, rock substratum, 3 to 8 percent slopes	400	750	-----	-----
Hilton-Cazenovia stony silt loams, 0 to 8 percent slopes	400	750	-----	-----
Howard gravelly loam, 3 to 8 percent slopes	350	675	160	360
Junius loamy fine sand	-----	450	-----	180
Kendaia and Appleton silt loams, rock substratum, 0 to 3 percent slopes	-----	-----	-----	-----
Lairdsville silt loam, 0 to 6 percent slopes	300	525	-----	-----
Lockport silty clay loam	-----	550	-----	-----
Madrid fine sandy loam, 3 to 8 percent slopes	400	750	160	360
Madrid fine sandy loam, 8 to 15 percent slopes	-----	-----	-----	-----
Massena fine sandy loam	-----	625	-----	300
Minoa very fine sandy loam	-----	625	-----	300
Niagara silt loam, 0 to 2 percent slopes	-----	625	-----	300
Niagara silt loam, 2 to 6 percent slopes	-----	625	-----	300
Odessa silt loam, 0 to 2 percent slopes	-----	625	-----	-----

and forage crops under two levels of management—Continued

Oats		Wheat		Soybeans		Forage mixtures (hay)					
						Alfalfa		Alfalfa-trefoil grass		Trefoil grass	
A	B	A	B	A	B	A	B	A	B	A	B
Bu	*Bu*	*Bu*	*Bu*	*Bu*	*Bu*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*
58	110	35	65	15	35	3.5	6.0	3.0	4.5	3.0	4.0
----	100	30	65	----	35	-----	5.0	2.5	4.5	2.5	4.0
----	100	30	65	----	35	-----	5.0	2.5	4.5	2.5	4.0
65	100	40	70	20	35	3.5	6.0	3.0	4.5	2.5	4.0
----	-----	----	----	----	----	-----	-----	-----	3.0	-----	3.0
----	-----	----	----	----	----	-----	-----	3.0	5.0	3.0	4.0
60	110	40	70	20	40	3.5	7.0	3.0	5.0	3.0	4.0
60	100	35	65	20	35	3.0	5.5	2.5	4.5	-----	-----
60	100	35	65	20	35	3.0	5.5	2.5	4.5	-----	-----
----	-----	----	----	----	----	-----	-----	-----	3.0	-----	3.0

vegetable crops under two levels of management

sence of yield figures indicates that crop is not suited to the soil or is not commonly grown on it. Only arable soils are listed]

Peas [2]		Cucumbers [3]		Sweet corn		Tomatoes		Beans			
								Dry		Snap [4]	
A	B	A	B	A	B	A	B	A	B	A	B
Bu	*Bu*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Bu*	*Bu*	*Bu*	*Bu*
----	-----	-----	9.5	2.5	5.0	10	18	10	30	-----	-----
----	-----	-----	15.6	-----	7.5	----	22	----	35	-----	240
----	-----	-----	15.6	-----	7.5	----	22	----	35	-----	240
----	-----	6.5	15.0	3.6	7.2	13	22	10	35	85	240
----	-----	-----	-----	-----	-----	----	----	10	30	-----	-----
----	145	6.5	16.8	3.6	8.0	13	25	15	35	85	265
----	145	6.5	16.8	3.6	8.0	13	25	15	35	85	265
----	-----	-----	12.0	-----	6.5	----	20	-----	30	-----	-----
----	-----	-----	12.0	-----	6.5	----	20	-----	30	-----	-----
70	165	6.5	16.8	4.0	8.0	15	25	20	40	100	265
70	165	7.2	16.8	4.0	8.0	15	25	20	40	100	265
70	165	7.2	16.8	4.0	8.0	15	25	20	40	100	265
----	-----	7.2	16.8	4.0	8.0	15	25	15	35	-----	-----
----	-----	7.2	16.8	4.0	8.0	15	25	15	35	-----	-----
----	-----	-----	13.2	-----	7.5	----	22	-----	30	-----	-----
----	-----	-----	13.2	-----	-----	----	22	-----	30	-----	-----
----	-----	-----	12.0	3.0	7.0	10	20	10	25	70	200
----	-----	6.5	16.8	3.6	8.0	13	25	10	35	85	265
----	-----	6.5	16.8	3.6	8.0	13	25	10	35	85	265
----	-----	-----	9.5	2.5	5.0	10	18	10	25	-----	-----
----	-----	-----	-----	-----	7.0	----	20	-----	----	-----	200
----	-----	-----	9.5	2.5	5.0	10	18	10	30	-----	-----
----	-----	-----	14.5	-----	7.5	----	22	-----	----	-----	240
----	-----	6.0	15.0	3.2	7.2	12	22	15	35	75	240
----	-----	6.0	15.0	3.2	7.2	12	22	15	35	75	240
----	-----	7.2	16.8	4.0	8.0	15	25	20	35	100	265
70	165	6.5	16.8	3.6	8.0	13	25	15	35	85	265
70	165	6.5	16.8	3.6	8.0	13	25	15	35	85	265
70	165	-----	-----	3.6	8.0	13	25	15	35	-----	-----
70	165	-----	-----	3.6	8.0	13	25	15	35	-----	-----
70	165	-----	-----	3.6	8.0	13	25	15	35	-----	-----
----	-----	6.5	15.0	3.6	7.2	13	22	15	35	85	240
----	-----	-----	-----	-----	5.0	----	18	-----	----	-----	-----
----	-----	-----	-----	-----	-----	----	----	-----	35	-----	-----
----	-----	5.0	12.0	2.8	5.6	10	17	15	30	70	185
----	-----	-----	11.0	-----	6.5	----	20	-----	30	-----	-----
70	165	6.5	16.8	3.6	8.0	13	25	20	35	85	265
----	-----	-----	-----	-----	-----	----	----	15	30	-----	-----
----	-----	-----	14.5	-----	7.5	----	22	-----	30	-----	240
----	-----	-----	13.2	-----	7.5	----	22	-----	30	-----	240
----	-----	-----	13.2	-----	7.5	----	22	-----	35	-----	240
----	-----	-----	13.2	-----	7.5	----	22	-----	35	-----	240
----	-----	-----	13.2	-----	7.5	----	22	-----	35	-----	-----

TABLE 3.—*Estimated average acre yields of specified*

Soil	Cabbage [1]		Potatoes	
	A	B	A	B
	Crates	*Crates*	*Cwt*	*Cwt*
Odessa silt loam, 2 to 6 percent slopes	-----	625	-----	-----
Ontario loam, 3 to 8 percent slopes	450	750	180	360
Ontario loam, 8 to 15 percent slopes	-----	-----	-----	-----
Ontario stony loam, 3 to 8 percent slopes	-----	-----	-----	-----
Ontario loam, rock substratum, 0 to 8 percent slopes	400	750	-----	-----
Ovid silt loam, 0 to 3 percent slopes	-----	625	-----	300
Ovid silt loam, 3 to 8 percent slopes	-----	625	-----	300
Ovid silt loam, shale substratum, 0 to 4 percent slopes	-----	625	-----	300
Phelps gravelly fine sandy loam	350	750	135	360
Rhinebeck silt loam, 0 to 2 percent slopes	-----	625	-----	-----
Rhinebeck silt loam, 2 to 6 percent slopes	-----	625	-----	-----
Schoharie silt loam, 2 to 6 percent slopes	350	750	-----	-----
Wampsville gravelly loam, 3 to 8 percent slopes	450	750	-----	-----
Wassaic silt loam, 0 to 3 percent slopes	350	600	-----	-----
Wassaic silt loam, 3 to 8 percent slopes	350	600	-----	-----

[1] One crate of cabbage weighs 80 pounds.
[2] One bushel of peas weighs 30 pounds.

TABLE 4.—*Estimated average acre yields of specified*

[Figures in column A are those to be expected under average management; those in column B, under improved management. Ab-

Soil	Apples [1]	
	A	B
	Bu	*Bu*
Alton gravelly sandy loam, 3 to 8 percent slopes	-----	550
Appleton silt loam, 0 to 3 percent slopes	400	800
Appleton silt loam, 3 to 8 percent slopes	400	800
Arkport very fine sandy loam, 0 to 6 percent slopes	550	900
Arkport very fine sandy loam, 6 to 12 percent slopes	500	800
Bombay fine sandy loam, 0 to 3 percent slopes	500	800
Bombay fine sandy loam, 3 to 8 percent slopes	500	800
Cayuga silt loam, 2 to 6 percent slopes	550	900
Cazenovia silt loam, 0 to 3 percent slopes	550	900
Cazenovia silt loam, 3 to 8 percent slopes	550	900
Cazenovia gravelly silt loam, shale substratum, 0 to 3 percent slopes	550	900
Cazenovia gravelly silt loam, shale substratum, 3 to 8 percent slopes	550	900
Churchville silt loam, 0 to 2 percent slopes	400	800
Churchville silt loam, 2 to 6 percent slopes	400	800
Claverack loamy fine sand, 0 to 6 percent slopes	300	650
Collamer silt loam, 0 to 2 percent slopes	550	900
Collamer silt loam, 2 to 6 percent slopes	550	900
Colonie loamy fine sand, 0 to 6 percent slopes	-----	500
Cosad loamy fine sand	-----	-----
Elnora loamy fine sand, 0 to 6 percent slopes	-----	500
Fredon loam	-----	800
Galen very fine sandy loam, 0 to 2 percent slopes	450	900
Galen very fine sandy loam, 2 to 6 percent slopes	450	900
Hilton loam, 0 to 3 percent slopes	500	800
Hilton loam, 3 to 8 percent slopes	500	800
Hilton loam, rock substratum, 0 to 3 percent slopes	500	800
Hilton loam, rock substratum, 3 to 8 percent slopes	500	800
Hilton-Cazenovia stony silt loams, 0 to 8 percent slopes	500	800
Howard gravelly loam, 3 to 8 percent slopes	450	800
Lairdsville silt loam, 0 to 6 percent slopes	-----	650
Madrid fine sandy loam, 3 to 8 percent slopes	550	900
Madrid fine sandy loam, 8 to 15 percent slopes	540	890
Massena fine sandy loam	350	750
Minoa very fine sandy loam	350	750
Niagara silt loam, 0 to 2 percent slopes	400	800
Niagara silt loam, 2 to 6 percent slopes	400	800
Ontario loam, 3 to 8 percent slopes	600	1,000
Ontario loam, 8 to 15 percent slopes	550	900

vegetable crops under two levels of management—Continued

Peas [2]		Cucumbers [3]		Sweet corn		Tomatoes		Beans			
								Dry		Snap [4]	
A	B	A	B	A	B	A	B	A	B	A	B
Bu	*Bu*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Bu*	*Bu*	*Bu*	*Bu*
----	-----	-----	13.2	-----	7.5	----	22	-----	35	-----	-----
70	165	7.2	16.8	4.0	8.0	15	25	20	40	100	265
----	-----	-----	-----	-----	-----	----	----	20	40	-----	-----
70	165	-----	-----	4.0	8.0	----	----	20	40	-----	-----
70	165	7.2	16.8	4.0	8.0	15	25	20	40	-----	-----
----	-----	-----	14.5	-----	7.5	----	22	-----	30	-----	240
----	-----	-----	14.5	-----	7.5	----	22	-----	30	-----	240
----	-----	-----	14.5	-----	7.5	----	22	-----	30	-----	240
55	145	6.0	16.8	3.2	8.0	12	25	15	35	70	265
----	-----	-----	13.2	-----	7.5	----	22	-------	35	-----	-----
----	-----	-----	13.2	-----	7.5	----	22	-------	35	-----	-----
70	165	6.5	16.8	4.0	8.0	15	25	15	30	100	265
70	165	-----	-----	4.0	8.0	15	25	15	40	-----	-----
55	145	-----	-----	3.2	6.4	12	20	15	35	-----	-----
55	145	-----	-----	3.2	6.4	12	20	15	35	-----	-----

[3] Graded yield.
[4] One bushel of snap beans weighs 30 pounds.

fruit crops under two levels of management

sence of yield figures indicates that crop is not suited to the soil or is not commonly grown on it. Only arable soils are listed]

Cherries				Grapes		Peaches		Pears		Prunes and plums	
Sour		Sweet									
A	B	A	B	A	B	A	B	A	B	A	B
Tons	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Bu*	*Bu*	*Bu*	*Bu*	*Bu*	*Bu*
2.5	6.0	2.8	5.5	3.0	6.5	75	200	125	300	150	250
-----	-----	-----	-----	3.0	6.0	-----	-----	100	200	100	200
-----	-----	-----	-----	3.0	6.0	-----	-----	100	200	100	200
3.0	7.0	3.5	6.5	3.0	7.0	100	300	175	350	170	300
2.4	5.9	2.5	5.0	3.0	6.5	75	275	150	325	150	275
2.4	5.9	2.5	5.0	3.0	6.5	75	275	150	325	150	275
2.4	5.9	2.5	5.0	3.0	6.5	75	275	150	325	150	275
-----	-----	-----	-----	3.0	6.5	-----	-----	150	325	150	275
2.5	6.0	3.0	6.0	3.0	6.5	75	275	150	325	150	275
2.5	6.0	3.0	6.0	3.0	6.5	75	275	150	325	150	275
2.5	6.0	3.0	6.0	3.0	6.5	75	275	150	325	150	275
2.5	6.0	3.0	6.0	3.0	6.5	75	275	150	325	150	275
-----	-----	-----	-----	3.0	6.0	-----	-----	100	200	100	200
-----	-----	-----	-----	3.0	6.0	-----	-----	100	200	100	200
2.5	5.0	-----	5.5	2.5	5.5	75	225	100	250	100	250
2.4	5.9	2.8	5.5	3.0	6.5	75	275	150	325	150	275
2.4	5.9	2.8	5.5	3.0	6.5	75	275	150	325	150	275
2.5	6.0	2.0	5.0	-----	-----	50	150	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----	-----	-----	-----	200	-----	200
-----	6.0	-----	4.9	-----	-----	-----	150	-----	200	-----	200
-----	-----	-----	-----	3.0	6.0	-----	-----	100	200	100	200
2.4	5.9	2.5	5.0	2.8	6.0	75	250	150	300	150	300
2.4	5.9	2.5	5.0	2.8	6.0	75	250	150	300	120	300
2.4	5.9	2.5	5.0	3.0	6.5	75	275	150	325	150	275
2.4	5.9	2.5	5.0	3.0	6.5	75	275	150	325	150	275
2.4	5.9	2.5	5.0	3.0	6.5	75	275	150	325	150	275
2.4	5.9	2.5	5.0	3.0	6.5	75	275	150	325	150	275
-----	-----	-----	-----	3.0	6.5	-----	-----	150	325	150	275
2.4	6.0	2.5	6.0	3.0	6.5	75	275	150	325	150	275
-----	-----	-----	-----	-----	4.0	-----	-----	-----	200	-----	200
2.5	6.0	3.0	6.0	3.0	6.5	75	275	150	325	150	275
2.4	5.9	2.9	5.9	2.9	6.4	70	265	145	315	145	265
-----	-----	-----	-----	2.5	5.5	-----	-----	100	200	100	200
-----	-----	-----	-----	2.5	5.5	-----	-----	100	200	100	200
-----	-----	-----	-----	3.0	6.0	-----	-----	125	225	125	225
-----	-----	-----	-----	3.0	6.0	-----	-----	125	225	125	225
3.0	6.5	3.5	6.5	3.5	7.0	100	300	175	350	170	300
2.5	6.0	3.0	6.0	3.0	6.5	75	275	150	325	150	275

TABLE 4.—*Estimated average acre yelds of specified*

Soil	Apples [1]	
	A	B
	Bu	*Bu*
Ovid silt loam, 0 to 3 percent slopes	400	800
Ovid silt loam, 3 to 8 percent slopes	400	800
Ovid silt loam, shale substratum, 0 to 4 percent slopes	400	800
Phelps gravelly fine sandy loam	----	850
Rhinebeck silt loam, 0 to 2 percent slopes	350	750
Rhinebeck silt loam, 2 to 6 percent slopes	350	750
Schoharie silt loam, 2 to 6 percent slopes	550	850
Wampsville gravelly loam, 3 to 8 percent slopes	550	900

[1] Yields are for free standing trees. For staked trees add 40 percent to yield figures.

and to the supply and distribution of water. These, in turn, are generally related to the kinds of soils.

In table 6 the soils are rated for seven elements of wildlife habitat: (1) grain and seed crops, (2) domestic grasses and legumes, (3) wild herbaceous plants, (4) hardwood plants, (5) coniferous plants, (6) wetland plants, and (7) shallow water areas. The soils are also rated for three types of wildlife habitat: (1) openland, (2) woodland, and (3) wetland.

A rating of *good* indicates that wildlife habitat is generally easily created, improved, or maintained. There are few or no soil limitations in habitat management, and satisfactory results can be expected.

A rating of *fair* indicates that wildlife habitat can generally be created, improved, or maintained, but the soils have moderate limitations. A moderate intensity of management and fairly frequent attention may be required to assure satisfactory results.

A rating of *poor* indicates that wildlife habitat can generally be created, improved, or maintained, but the soils have severe limitations. Habitat management may be difficult, expensive, and require intensive effort. Satisfactory results are questionable.

A rating of *very poor* indicates that wildlife habitat is impractical to create, improve, or maintain because of very severe soil limitations. Unsatisfactory results are probable.

Not considered in the ratings are the present land use, the location of a soil in relation to other soils, and the mobility of wildlife.

Habitat elements

Each soil is rated in table 6 according to its suitability for various kinds of plants and water developments that make up a wildlife habitat. These ratings can be used as an aid in (1) selecting the best soils for creating, improving, or maintaining specific elements of wildlife habitat; (2) determining the relative intensity of management required for individual elements of wildlife habitat; and (3) avoiding sites that would be difficult or not feasible to manage.

Grain and seed crops.—Among these crops are seed-producing annuals, such as corn, sorghum, wheat, barley, oats, millet, buckwheat, and sunflower. Soils that are rated *good* for these plants are deep, nearly level, medium textured, well drained or moderately well drained, and free or nearly free of stones. They also have high water holding capacity and are not subject to frequent flooding. These soils can be safely planted to a wide variety of grain crops each year. Soils that are not so well suited require more intensive management and are suited to fewer crops.

Domestic grasses and legumes.—In this group are domestic grasses and legumes that are established by planting. Among these are alfalfa, trefoil, clover, bluegrass, switchgrass, fescue, brome, timothy, orchardgrass, and reed canarygrass. Soils that are rated *good* have slopes of 0 to 15 percent, are well drained, moderately well drained, or somewhat poorly drained, and have moderately high or high water holding capacity. An adequate stand of many kinds of plants can be easily maintained on these soils for at least 10 years without renovation.

Wild herbaceous plants.—In this group are perennial grasses and weeds that generally are established naturally. They include bluestem, quackgrass, panicgrass, goldenrod, wild carrot, nightshade, and dandelion. Soils that are rated *good* for these plants vary widely in texture, drainage, and slope. Drainage ranges between well drained and somewhat poorly drained. Slope is not a limiting factor. Stoniness and occasional flooding are not of serious concern.

Hardwood plants.—These plants are nonconiferous trees, shrubs, and woody vines that produce nuts or other fruits, buds, catkins, twigs, or foliage that wildlife eat. These plants also serve as cover for wildlife. They generally are established naturally but can be planted. Among the native kinds are oak, beech, cherry, maple, birth, poplar, apple, hawthorn, dogwood, viburnum, grape, and briers. Soils that are rated *good* for these plants are deep or moderately deep, medium textured or moderately fine textured, and well drained to somewhat poorly drained. Slope and surface stoniness are of little significance.

Also in this group are several varieties of fruit-bearing shrubs that are raised commercially for planting. Among the shrubs that can be grown on soils rated *good* are autumn-olive, Amur honeysuckle, Tar-

fruit crops under two levels of management—Continued

Cherries				Grapes		Peaches		Pears		Prunes and plums	
Sour		Sweet									
A	B	A	B	A	B	A	B	A	B	A	B
Tons	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Bu*	*Bu*	*Bu*	*Bu*	*Bu*	*Bu*
-----	-----	-----	-----	3.0	6.0	-----	-----	100	200	100	200
-----	-----	-----	-----	3.0	6.0	-----	-----	100	200	100	200
-----	-----	-----	-----	3.0	6.0	-----	-----	100	200	100	200
-----	6.0	-----	6.0	3.0	7.0	-----	225	100	275	100	275
-----	-----	-----	-----	3.0	6.0	-----	-----	100	200	100	200
-----	-----	-----	-----	3.0	6.0	-----	-----	100	200	100	200
-----	-----	-----	-----	3.0	6.5	-----	-----	150	325	150	275
2.5	6.0	3.0	6.0	3.0	6.5	75	275	150	325	150	275

tarian honeysuckle, crabapple, multiflora rose, highbush cranberry, and silky dogwood. In addition, highbush cranberry, silky dogwood, and shrubs having similar site requirements can be planted on soils that have a rating of *fair*. Hardwoods that are not available commercially can commonly be transplanted successfully.

Coniferous plants.—This element consists of cone-bearing, evergreen trees and shrubs that are used by wildlife primarily for cover, although some provide browse and seeds. Among these are Norway spruce, white pine, whitecedar, and hemlock. It is important that living branches be maintained close to the ground so that food and cover are readily available to rabbits, pheasants, and other small animals. The lower branches die if trees are allowed to form a dense canopy that shuts out the light.

Soils that are rated *good* are those on which conifers grow at a moderate to rapid rate. These are the deeper soils that are either well drained, moderately well drained, or somewhat poorly drained and that have good available water capacity. Cover is more easily and quickly established than on less suited soils, but more intensive management is required to eliminate invading hardwoods. In addition, stands must be thinned more frequently or planted at a wider spacing to prevent canopy closure.

On soils rated *poor*, canopy closure is retarded as a result of slow growth. Seedling mortality is high, and considerable time is needed for conifers to reach an adequate size to provide effective cover.

Wetland plants.—These are wild, herbaceous, annual, and perennial plants that grow on moist to wet sites. Among them are smartweeds, wild millet, rushes, sedges, rice cutgrass, mannagrass, and cattails. These plants are used by wetland forms of wildlife for food and cover.

Soils that are rated *good* are nearly level and poorly drained or very poorly drained. Soils that are rated *fair* are nearly level and somewhat poorly drained. Depth, stoniness, and texture of the surface layer are of little concern.

Shallow water areas.—Open water is essential for waterfowl courtship, mating, and brood rearing. It is also essential for other kinds of wildlife associated with wetlands. Many upland types of wildlife, such as deer, use these areas as a source of drinking water.

Areas of shallow water, generally no more than 5 feet deep, are near food and cover for wetland wildlife. They may be natural wet areas or those created by the construction of a low dike to impound a shallow body of water, commonly called a marsh, or by the excavation or blasting of potholes and level ditches. Water supply for these impoundments is either surface runoff, a high ground water table, or a combination of the two. Deepwater farm ponds are not considered in this habitat element.

A detailed field investigation is needed to determine feasibility of water impoundments.

Table 8, in the section "Engineering," shows limitations of the soils for use in reservoir areas and embankments for ponds.

Types of wildlife

Table 6 rates the soils according to their suitability for the three types of wildlife habitat: openland, woodland, and wetland. These ratings can be used as an aid in (1) planning the broad use of land for wildlife refuge, nature-study areas, or other developments for wildlife; and (2) determining areas that are suitable for acquisition for wildlife developments.

Each rating under "Types of wildlife habitat" in table 6 is based on the ratings listed for selected essential habitat elements in the first part of the table.

Openland habitat.—Ratings are based on those listed for grain and seed crops, domestic grasses and legumes, wild herbaceous plants, hardwood plants, and coniferous plants. Examples of openland wildlife species are pheasants, meadowlarks, field sparrows, doves, woodcock, cottontail rabbits, red foxes, and woodchucks. These birds and mammals normally make their home in areas of cropland, pasture, meadow, and lawns and in areas overgrown with grasses, herbs, and shrubs.

Woodland habitat.—Ratings are based on those listed for all elements except grain and seed crops. Among the birds and mammals that prefer woodland are ruffed grouse, thrushes, vireos, scarlet tanagers, gray and

TABLE 5.—*Suitability of*

Woodland suitability groups	Indicator species	Estimated site index
Group 2o1: Deep or moderately deep, somewhat excessively drained to moderately well drained, nearly level to sloping, moderately coarse textured or medium textured soils; formed in a wide variety of materials ranging from sorted clay, silt, and fine sand to glacial till and outwash; few or no limitations. Arkport: ArB, ArC. Bombay: BoA, BoB. Cayuga: CcB. Cazenovia: CeA, CeB, CfA, CfB. Collamer: CmA, CmB. Galen: GaA, GaB. Hilton: HbA, HbB, HcA, HcB, HnB. Howard: HoB. Madrid: MdB, MdC. Ontario: OnB, OnC, OoB, OsC, OtB. Phelps: Pp. Schoharie: ScB. Wampsville: WmB. Wassaic: WsA, WsB.	Sugar maple	65–75
Group 2o2: Deep, well drained to somewhat poorly drained, level, medium textured soils; formed in recent alluvium; flooding is usually seasonal; few or no limitations. Hamlin: Ha. Teel: Te.	Sugar maple	65–75
Group 2r1: Deep, well drained or moderately well drained, sloping or rolling, medium textured soils; formed in water-sorted silt, very fine sand, and clay; slope is a limitation in places; hazard of erosion. Arkport: AsD. Collamer: CmC3.	Sugar maple	65–75
Group 2r2: Deep, well drained to somewhat excessively drained, undulating to rolling, medium textured or moderately coarse textured soils; formed in glacial outwash or kettle-kame deposits; slope is a limitation in places. Howard: HpC.	Sugar maple	65–75
Group 3o1: Deep or moderately deep, somewhat excessively drained to moderately well drained, level to gently sloping, medium textured and moderately coarse textured soils; formed in a wide variety of materials; few limitations. Alton: AlB. Lairdsville: LaB.	Sugar maple	60–65
Group 3s1: Deep, moderately well drained, nearly level to gently sloping, coarse textured soils; formed in a mantle of sandy material over clay of lacustrine origin; sandy texture of the surface layer and subsoil is a limitation in places. Claverack: ClB.	Sugar maple	60–65
Group 3w1: Deep or moderately deep, somewhat poorly drained, level to sloping, medium textured or moderately fine textured soils; formed in shaly glacial till or water-sorted clayey sediments; seasonal wetness is a limitation in places. Appleton: AnA, AnB. Brockport: BrA, BrB, BrC. Churchville: ChA, ChB. Fredon: Fr. Kendaia: KaA. Lockport: Lo. Massena: Mn. Minoa: Mo. Newstead: Ne. Niagara: NgA, NgB. Odessa: OdA, OdB. Ovid: OvA, OvB, OwA. Rhinebeck: RhA, RhB.	Sugar maple	60–65
Group 4s1: Deep, moderately well drained to excessively drained, nearly level to sloping, coarse textured soils; formed in water-deposited or wind-deposited fine sand; sandy texture is a limitation in places. Colonie: CoB, CoC. Elnora: ElB.	White pine	60–70
Group 4w1: Deep, somewhat poorly drained to very poorly drained, nearly level, medium textured to coarse textured soils; formed in glacial deposited materials; prolonged or seasonal wetness is a limitation in places.	Red maple	60–70

the soils for woodland

Hazards and limitations—						Tree species—	
Erosion hazard	Equipment limitations	Seedling mortality	Plant competition		Windthrow hazard	For planting	To favor in stand
			Hardwoods	Conifers			
Slight	Slight	Slight	Moderate	Severe	Slight	White pine, red pine, Norway spruce, white spruce, and larches.	Sugar maple, white oak, basswood, white pine, hemlock, and yellow birch.
Slight	Slight	Slight	Moderate	Severe	Slight	White pine, Norway spruce, black walnut, and larches.	Sugar maple, white pine, white ash, and basswood.
Moderate	Slight	Slight	Moderate	Severe	Slight	White pine, Norway spruce, larches, and black locust.	Sugar maple, white pine, basswood, white ash, and black cherry.
Moderate	Moderate	Slight	Moderate	Severe	Slight	White pine, red pine, and larches.	Sugar maple, white pine, red oak, and hemlock.
Slight	Slight	Slight	Slight	Moderate	Slight	White pine, Norway spruce, white spruce, and larches.	Sugar maple, white pine, basswood, white ash, red oak, and black cherry.
Slight	Slight	Slight	Slight	Moderate	Slight	White pine, Norway spruce, and white spruce.	Sugar maple, white pine, red oak, and black cherry.
Slight	Moderate	Moderate	Moderate	Severe	Moderate	White pine, white spruce, white-cedar, and Norway spruce.	Sugar maple, white pine, red oak, white ash, white-cedar, basswood, and hemlock.
Slight	Slight	Severe	Slight	Moderate	Slight	White pine, larches, and red pine.	White pine, sugar maple, red oak, and red pine.
Slight	Severe	Severe	Severe	Severe	Severe	White pine and white spruce.	Red maple, white pine, and white-cedar.

TABLE 5.—*Suitability of*

Woodland suitability groups	Indicator species	Estimated site index
Canandaigua: Ca. Cosad: Cs. Junius: Ju. Lamson: Ln. Lyons: Ly, Lz. Sun: Su. Udifluvents: UD. Wayland: Wy.		
Group 5d1: Shallow, well drained, level to sloping, medium textured soils; bedrock is at a depth of 10 to 20 inches; restricted rooting depth is a limitation in places. Farmington: FaB, FaC.	White pine	50–60
Group 5w1: Deep, very poorly drained and poorly drained, level soils that have moderately coarse textured to moderately fine textured surfaces and includes moderately deep and deep organic soils; formed in lake sediments and organic deposits; prolonged wetness is a limitation. Barre: Ba. Carlisle: Cb. Cheektowaga: Cg. Edwards: Ed. Fonda: Fo. Lakemont: Lk, Lm. Madalin: Ma. Martisco: Me. Palms: Pm.	Red maple	50–60

TABLE 6.—*Rating of*

[A rating of *good* means that limitations are slight, *fair* means that limitations are moderate, *poor* means

Soil series and map symbols	Wildlife habitat elements			
	Grain and seed crops	Domestic grasses and legumes	Wild herbaceous plants	Hardwood plants
Alton: AlB	Fair	Fair	Fair	Fair
Appleton: AnA AnB	Fair Fair	Good Good	Good Good	Good Good
Arkport: ArB ArC, AsD	Fair Fair	Good Good	Good Good	Fair Fair
Barre: Ba	Poor	Fair	Fair	Poor
Bombay: BoA BoB	Good Fair	Good Good	Good Good	Good Good
Brockport: BrA BrB BrC	Fair Fair Fair	Good Good Good	Good Good Good	Good Good Good
Canandaigua: Ca	Very poor	Poor	Poor	Poor
Carlisle: Cb	Very poor	Poor	Poor	Very poor
Cayuga: CcB	Good	Good	Good	Good
Cazenovia: CeA, CfA CeB, CfB	Good Fair	Good Good	Good Good	Good Good
Cheektowaga: Cg	Very poor	Poor	Poor	Poor

the soils for woodland—Continued

Hazards and limitations—						Tree species—	
Erosion hazard	Equipment limitations	Seedling mortality	Plant competition		Windthrow hazard	For planting	To favor in stand
			Hardwoods	Conifers			
Slight	Slight	Severe	Slight	Slight	Moderate	White pine, red pine.	White pine, red pine, red oak, hemlock, and sugar maple.
Slight	Severe	Severe	Severe	Severe	Severe	Generally unsuitable for planting.	Red maple and white-cedar.

the soils for wildlife

that limitations are severe; and *very poor* means that it is impractical to improve, maintain, or create habitat]

Wildlife habitat elements—Continued			Types of wildlife habitat		
Coniferous plants	Wetland plants	Shallow water areas [1]	Openland	Woodland	Wetland
Fair	Very poor	Very poor	Fair	Fair	Very poor.
Good	Fair	Fair	Good	Good	Fair.
Good	Poor	Very poor	Good	Good	Very poor.
Fair	Poor	Very poor	Good	Fair	Very poor.
Fair	Very poor	Very poor	Good	Fair	Very poor.
Poor	Good	Good	Fair	Poor	Good.
Good	Poor	Poor	Good	Good	Poor.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Fair	Fair	Good	Good	Fair.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Poor	Good	Good	Very poor	Poor	Good.
Very poor	Good	Good	Poor	Very poor	Good.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Poor	Poor	Good	Good	Poor.
Good	Poor	Very poor	Good	Good	Very poor.
Poor	Good	Good	Poor	Poor	Good.

TABLE 6.—*Rating of the*

Soil series and map symbols	Wildlife habitat elements			
	Grain and seed crops	Domestic grasses and legumes	Wild herbaceous plants	Hardwood plants
Churchville:				
ChA	Fair	Good	Good	Good
ChB	Fair	Good	Good	Good
Claverack: ClB	Poor	Fair	Good	Fair
Collamer:				
CmA	Good	Good	Good	Good
CmB	Good	Good	Good	Good
CmC3	Fair	Good	Good	Good
Colonie: CoB, CoC	Poor	Fair	Fair	Fair
Cosad: Cs	Poor	Fair	Fair	Fair
Edwards: Ed	Very poor	Poor	Poor	Poor
Elnora: ElB	Poor	Fair	Fair	Fair
Farmington:				
FaB	Poor	Poor	Fair	Poor
FaC	Poor	Poor	Fair	Poor
Fluvaquents and Humaquepts: FH	Very poor	Very poor	Very poor	Very poor
Fonda: Fo	Very poor	Poor	Poor	Poor
Fredon: Fr	Poor	Fair	Fair	Fair
Galen:				
GaA	Good	Good	Good	Good
GaB	Good	Good	Good	Good
Hamlin: Ha	Good	Good	Good	Good
Hilton:				
HbA, HcA	Good	Good	Good	Good
HbB, HcB	Fair	Good	Good	Good
HnB	Poor	Fair	Good	Good
Howard:				
HoB	Fair	Fair	Fair	Fair
HpC	Poor	Fair	Fair	Fair
Junius: Ju	Poor	Fair	Fair	Poor
Kendaia and Appleton: KaA	Fair	Good	Good	Good
Lairdsville: LaB	Fair	Good	Good	Good
Lakemont: Lk, Lm	Very poor	Poor	Poor	Poor
Lamson: Ln	Very poor	Poor	Poor	Poor
Lockport: Lo	Fair	Good	Good	Good
Lyons: Ly, Lz	Very poor	Poor	Poor	Poor
Madalin: Ma	Very poor	Poor	Poor	Poor
Madrid:				
MdB	Fair	Good	Good	Good
MdC	Fair	Good	Good	Good
Martisco: Me	Very poor	Poor	Poor	Poor
Massena: Mn	Poor	Fair	Fair	Fair
Minoa: Mo	Fair	Good	Good	Good
Newstead: Ne	Poor	Fair	Fair	Fair

soils for wildlife—Continued

Wildlife habitat elements—Continued			Types of wildlife habitat		
Coniferous plants	Wetland plants	Shallow water areas [1]	Openland	Woodland	Wetland
Good	Fair	Fair	Fair	Good	Fair.
Good	Poor	Very poor	Fair	Good	Very poor.
Fair	Poor	Poor	Fair	Fair	Poor.
Good	Poor	Poor	Good	Good	Poor.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Fair	Very poor	Very poor	Fair	Fair	Very poor.
Fair	Fair	Poor	Fair	Fair	Poor.
Poor	Good	Good	Poor	Poor	Good.
Fair	Poor	Poor	Fair	Fair	Poor.
Poor	Poor	Very poor	Poor	Poor	Very poor.
Poor	Very poor	Very poor	Poor	Poor	Very poor.
Very poor	Good	Good	Very poor	Very poor	Good.
Poor	Good	Good	Poor	Poor	Good.
Fair	Fair	Fair	Fair	Fair	Fair.
Good	Poor	Poor	Good	Good	Poor.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Poor	Poor	Good	Good	Poor.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Poor	Very poor	Fair	Good	Poor.
Fair	Very poor	Very poor	Fair	Fair	Very poor.
Fair	Very poor	Very poor	Fair	Fair	Very poor.
Poor	Fair	Fair	Fair	Poor	Fair.
Good	Fair	Fair	Good	Fair	Fair.
Good	Poor	Very poor	Good	Good	Very poor.
Poor	Good	Good	Poor	Poor	Good.
Poor	Good	Good	Poor	Poor	Good.
Good	Fair	Fair	Good	Good	Fair.
Poor	Good	Good	Poor	Poor	Good.
Poor	Good	Good	Poor	Poor	Good.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Good	Good	Very poor.
Poor	Good	Good	Poor	Poor	Good.
Fair	Fair	Fair	Fair	Fair	Fair.
Good	Fair	Fair	Good	Good	Fair.
Fair	Good	Fair	Fair	Fair	Fair.

TABLE 6.—*Rating of the*

Soil series and map symbols	Wildlife habitat elements			
	Grain and seed crops	Domestic grasses and legumes	Wild herbaceous plants	Hardwood plants
Niagara:				
NgA	Fair	Good	Good	Good
NgB	Fair	Good	Good	Good
Odessa:				
OdA	Fair	Good	Good	Good
OdB	Fair	Good	Good	Good
Ontario:				
OnB, OtB	Fair	Good	Good	Good
OnC	Fair	Good	Good	Good
OoB	Poor	Fair	Good	Good
OsC	Very poor	Poor	Good	Good
Ovid:				
OvA, OwA	Fair	Good	Good	Good
OvB	Fair	Good	Good	Good
Palms: Pm	Very poor	Poor	Poor	Poor
Phelps: Pp	Fair	Good	Good	Fair
Rhinebeck:				
RhA	Fair	Good	Good	Good
RhB	Fair	Good	Good	Good
Schoharie: ScB	Good	Good	Good	Good
Shale outcrop: ShE	Very poor	Very poor	Poor	Very poor
Sun: Su	Very poor	Poor	Poor	Poor
Teel: Te	Good	Good	Good	Good
Udifluvents: UD	Very poor	Poor	Fair	Poor
Wampsville: WmB	Fair	Good	Good	Good
Wassaic:				
WsA	Good	Good	Good	Good
WsB	Fair	Good	Good	Good
Wayland: Wy	Very poor	Poor	Poor	Poor

[1] Detailed investigation is needed at the site of a proposed shallow water development to determine feasibility. Table 8 in the

red squirrels, gray foxes, white-tailed deer, and raccoons.

Wetland habitat.—Ratings are based on those listed for wetland plants and shallow water areas. Ducks, geese, rails, herons, shore birds, redwing blackbirds, mink, muskrats, and beavers are familiar examples of birds and mammals that normally make their home in and around ponds, marshes, swamps, and other wet areas.

Engineering [6]

This section is useful to those who need information about soils used as structural material or as foundations upon which structures are built. Among those who can benefit from this section are planning boards, town and city managers, land developers, engineers, contractors, and farmers.

Among the soil properties most important in engineering are permeability, strength, compaction characteristics, drainage condition, shrink-swell potential, grain size, plasticity, and reaction. Also important are depth to water table, depth to bedrock, and slope. These properties, in various degrees and combinations, affect the construction and maintenance of roads, airports, pipelines, foundations for small buildings, irrigation systems, ponds and small dams, systems for disposal of sewage and refuse, and other structural works.

Information in this section of the soil survey can be helpful to those who:

1. Select potential residential, industrial, commercial, and recreational areas.
2. Evaluate alternate routes for roads, highways, pipelines, and underground cables.
3. Seek sources of gravel, sand, or clay.
4. Plan farm drainage systems, irrigation sys-

[6] EDWARD A. FERNAU, senior soils engineer, New York State Department of Transportation, Soil Mechanics Bureau, and DONALD W. SHANKLIN, assistant State conservation engineer, Soil Conservation Service, helped prepare this section.

soils for wildlife—Continued

Wildlife habitat elements—Continued			Types of wildlife habitat		
Coniferous plants	Wetland plants	Shallow water areas [1]	Openland	Woodland	Wetland
Good	Fair	Fair	Good	Good	Fair.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Fair	Fair	Good	Good	Fair.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Very poor	Very poor	Fair	Good	Very poor.
Good	Poor	Very poor	Fair	Good	Very poor.
Good	Very poor	Very poor	Poor	Good	Very poor.
Good	Fair	Fair	Good	Good	Fair.
Good	Poor	Very poor	Good	Good	Very poor.
Poor	Good	Good	Poor	Poor	Good.
Fair	Poor	Poor	Good	Fair	Poor.
Good	Fair	Fair	Good	Good	Fair.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Poor	Very poor	Good	Good	Very poor.
Very poor	Very poor	Very poor	Very poor	Very poor	Very poor.
Poor	Good	Good	Poor	Poor	Good.
Good	Poor	Poor	Good	Good	Poor.
Poor	Good	Good	Poor	Poor	Good.
Good	Poor	Very poor	Good	Good	Very poor.
Good	Poor	Poor	Good	Good	Poor.
Good	Poor	Very poor	Good	Good	Very poor.
Poor	Good	Good	Poor	Poor	Good.

[1] section "Engineering" lists soil features that affect the construction of the reservoir area and pond embankments.

tems, ponds, terraces, and other structures for controlling water and conserving soil.

5. Correlate performance of structures already built with properties of the soils on which they are built for the purpose of predicting performance of structures on the same or similar kinds of soils in other locations.
6. Predict the trafficability of soils for cross-country movement of vehicles and construction equipment.
7. Develop preliminary estimates pertinent to construction in a particular area.

Most of the information in this section is presented in tables 7, 8, and 9, which show respectively estimated soil properties significant in engineering; interpretations for various engineering uses; and results of engineering laboratory tests on soil samples. This information, along with the soil map and other parts of this publication, can be used to make interpretations in addition to those given in tables 7 and 8, and it also can be used to make other useful maps.

This information, however, does not eliminate the need for detailed investigation at sites selected for engineering works. Inspection of sites is critical because many delineated areas of a given mapping unit may contain small areas of other kinds of soils that have strongly contrasting properties and different suitabilities or limitations for engineering.

Some terms in this soil survey have special meaning in soil science that may not be familiar to engineers. The Glossary defines many of these terms.

Engineering classification systems

The two systems most commonly used in classifying soil samples for engineering uses are the Unified system used by the Soil Conservation Service engineers, Department of Defense, and others; and the AASHTO system adopted by the American Association of State Highway and Transportation Officials.

TABLE 7.—*Estimated physical and*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. Be-
other series that appear in the first column. No estimates for Fluvaquents and Humaquepts, ponded (FH); Shale outcrop, steep (ShE);
Absence of entry indicates

Soil series and map symbols	Hydrologic soil group	Depth to—		Depth from surface	USDA texture	Classification	
		Bedrock	Seasonal high water table			Unified	AASHTO
		Feet	*Feet*	*Inches*			
Alton: AlB	A	>6	>4	0–10	Gravelly sandy loam.	SM or GM	A–2 or A–1
				10–38	Very gravelly loam or sandy loam.	GM, GW–GM, or SW–SM	A–1
				38–60	Gravel, cobblestones, and sand.	GP or GW–GM	A–1
Appleton: AnA, AnB	C	>3½	½–1	0–14	Silt loam to fine sandy loam.	ML, CL, SM, or SC	A–4
				14–22	Loam to gravelly sandy clay loam.	CL, ML, SM, or SC	A–4 or A–2
				22–65	Gravelly fine sandy loam to silt loam.	CL, ML, SM, or SC	A–4 or A–6
*Arkport: ArB, ArC, AsD For Collamer part of AsD, see Collamer series.	B	>6	>4	0–15	Very fine sandy loam.	ML or SM	A–4
				15–28	Loamy very fine sand.	ML or SM	A–4
				28–92	Loamy fine sand	SM	A–2 or A–4
				92–106	Fine sand	SM	A–2
Barre: Ba	D	>3½	0–½	0–8	Silt loam	ML or CL	A–7
				8–25	Silty clay loam to clay.	CL or CH	A–7
				25–50	Gravelly loam to silt loam.	SM, SC, or ML	A–4
Bombay: BoA, BoB	B	>4	1½–2	0–10	Fine sandy loam	SM or ML	A–2 or A–4
				10–32	Fine sandy loam or loam.	SM or ML	A–2 or A–4
				32–50	Fine sandy loam or loam.	SM or ML	A–2 or A–4
Brockport: BrA, BrB, BrC	D	1½–3	½–1	0–9	Silty clay loam	CL, CH, or OL	A–7
				9–27	Clay or silty clay.	CL or CH	A–7 or A–6
				27–36	Soft shale bedrock.		
Canandaigua: Ca	D	>6	0–½	0–30	Silt loam to silty clay loam.	ML, CL or OL	A–4 or A–6
				30–50	Silt loam to varved layers of silt, fine sand, and clay.	ML or CL	A–4
Carlisle: Cb	D	>6	0	0–30	Muck	Pt	
				30–67	Peaty material	Pt	
				67–73	Silt	ML	A–4
Cayuga: CcB	C	>4	1½–2	0–12	Silt loam	ML or CL–ML	A–4 or A–6
				12–25	Silty clay to silty clay loam.	CL or CL–ML	A–7 or A–6
				25–60	Silt loam to gravelly fine sandy loam.	SM	A–4 or A–2
Cazenovia: CeA, CeB, CfA, CfB Units CfA and CfB are underlain by shale bedrock at a depth of 3 to 6 feet.	B	>3½	1½–2	0–13	Silt loam and gravelly silt loam.	ML, SM, or CL–ML	A–4
				13–27	Gravelly clay loam to silty clay loam.	ML or CL	A–4

chemical properties

cause these soils may have different properties and limitations it is necessary to follow carefully the instructions for referring to and Udifluvents, frequently flooded, (UD). Materials too variable. The symbol > means more than and the symbol < means less than. properties are too variable to rate]

Coarse fraction greater than 3 inches	Percentage less than 3 inches passing sieve—				Permeability	Available water capacity	Reaction	K factor
	No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)				
Percent					*Inches per hour*	*Inches per inch of soil*	*pH*	
<5	60–75	50–65	30–60	20–35	2.0–6.0	0.08–0.09	5.6–7.3	0.17
<10	40–60	25–45	15–40	5–30	>6.0	0.05–0.08	5.6–7.3	.20
<10	25–100	15–95	10–75	0–10	>6.0	0.01–0.02	6.6–8.4	.17
<5	80–100	75–95	55–90	40–85	0.6–2.0	0.13–0.16	5.6–7.3	.32
<5	80–100	70–95	55–90	25–70	0.6–2.0	0.12–0.16	6.1–7.8	.17
5–10	75–90	65–90	45–90	40–80	0.6–0.06	0.07–0.16	7.9–8.4	.17
0	100	95–100	85–95	45–65	2.0–6.0	0.10–0.17	5.1–7.3	.32
0	100	95–100	85–95	40–60	2.0–6.0	0.10–0.11	5.1–7.3	.43
0	100	95–100	65–85	25–40	2.0–6.0	0.06–0.10	5.1–7.3	.43
0	100	95–100	65–85	20–35	2.0–6.0	0.02–0.06	6.1–8.4	.43
0	100	95–100	95–100	80–90	0.6–2.0	0.17–0.20	6.1–7.8	.49
0	100	95–100	95–100	90–100	0.2–<0.06	0.12–0.14	6.1–7.8	.28
5–15	80–90	70–85	60–75	40–55	0.6–0.06	0.10–0.14	7.4–8.4	.28
<5	85–100	75–95	55–90	35–75	0.6–2.0	0.12–0.18	5.6–7.3	.32
<5	75–100	70–95	50–85	20–65	0.6–2.0	0.10–0.15	5.6–7.3	.28
<5	70–90	65–85	45–85	20–65	0.2–0.6	0.08–0.14	6.6–8.4	.24
0	95–100	90–100	85–100	75–95	0.2–0.6	0.15–0.20	6.1–7.8	.43
0	90–95	85–95	80–90	75–90	<0.06	0.12–0.13	6.1–7.8	.28
0	95–100	95–100	90–100	80–90	0.2–0.6	0.17–0.20	6.1–7.8	.49
0	95–100	95–100	90–100	70–95	0.2–0.6	0.17–0.20	6.1–7.8	.49
-------	--------	--------	--------	--------	2.0–6.0	0.25–0.35	6.1–7.3	--------
-------	--------	--------	--------	--------	2.0–6.0	0.25–0.35	6.1–7.3	--------
0	100	100	90–100	85–95	0.06–0.2	----------	7.4–8.4	--------
<2	95–100	90–100	85–100	70–90	0.6–0.2	0.17–0.20	5.6–7.3	.49
<2	95–100	90–100	95–100	90–100	0.06–0.2	0.13–0.17	5.6–7.3	.28
5–15	55–90	50–80	50–70	25–50	0.06–0.2	0.08–0.17	6.6–8.4	.28
<10	75–90	70–90	65–85	45–70	0.6–2.0	0.12–0.16	5.6–7.3	.37
<15	65–95	60–95	55–90	55–80	0.06–0.2	0.10–0.13	5.6–7.3	.37

TABLE 7.—*Estimated physical and*

Soil series and map symbols	Hydrologic soil group	Depth to—		Depth from surface	USDA texture	Classification	
		Bedrock	Seasonal high water table			Unified	AASHTO
		Feet	*Feet*	*Inches*			
				27–62	Loam and gravelly loam.	ML, CL–ML, or SM	A–4
Cheektowaga: Cg	D	>4	0–½	0–9	Fine sandy loam	SM	A–2 or A–4
				9–24	Loamy fine sand	SM	A–2
				24–50	Silty clay and silty clay loam.	CL or ML	A–6 or A–7
Churchville: ChA, ChB	D	>4	½–1	0–9	Silt loam	ML, CL, or MH	A–6 or A–4
				9–29	Silty clay loam to clay.	CL	A–6 or A–7
				29–52	Gravelly loam to silt loam.	SM or ML	A–4
Claverack: ClB	C	>4	1½–2	0–27	Loamy fine sand	SM	A–2
				27–50	Silty clay loam to clay.	CL or ML	A–6 or A–7
Collamer: CmA, CmB, CmC3.	C	>6	1½–2	0–10	Silt loam	ML	A–4
				10–28	Silt loam to silty clay loam.	CL or ML	A–6 or A–4
				28–50	Very fine sandy loam to silty clay loam.	ML or CL	A–4
Colonie: CoB, CoC	A	>4	>4	0–80	Loamy fine sand or fine sand.	SM	A–2
Cosad: Cs	C	>4	½–1	0–24	Loamy fine sand or fine sand.	SM	A–2
				24–51	Silty clay loam to clay.	CL or ML	A–6 or A–7
Edwards: Ed	D	>6	0	0–22	Muck	Pt	
				22–40	Marl		
				40–52	Clay or silty clay	CL or ML	A–6 or A–7
Elnora: ElB	B	>4	1½–2	0–45	Loamy fine sand or fine sand.	SM	A–2
				45–52	Fine, medium, and coarse sand.	SM	A–2
Farmington: FaB, FaC	C	1–2		0–14	Silt loam or flaggy silt loam.	ML or SM	A–4
Fonda: Fo	D	>6		0–9	Mucky silt loam	OL, ML, or CL	A–6 or A–7
				9–34	Silty clay or clay	CL or ML	A–6 or A–7
				34–50	Silty clay loam to clay.	CL or ML	A–6
Fredon: Fr	C	>4	0–1½	0–10	Loam	SM or ML	A–4 or A–2
				10–20	Gravelly loam or loam.	SM, ML, or GM	A–4 or A–2
				20–50	Very gravelly loamy sand and stratified sand and gravel.	GM, GP, SM, or GW–GM	A–2 or A–1
Galen: GaA, GaB	B	>6	1½–2	0–55	Very fine sandy loam, loamy fine sand and fine sand.	SM or ML	A–4 or A–2
Hamlin: Ha	B	>4	>3	0–37	Silt loam	ML	A–4
				37–64	Very fine sandy loam or silt loam.	ML	A–4

chemical properties—Continued

Coarse fraction greater than 3 inches	Percentage less than 3 inches passing sieve—				Permeability	Available water capacity	Reaction	K factor
	No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)				
Percent					*Inches per hour*	*Inches per inch of soil*	*pH*	
5–30	60–90	55–90	50–85	45–70	0.06–0.2	0.10–0.13	6.6–8.4	0.28
-------	95–100	95–100	80–95	25–40	6.0–20.0	0.09–0.17	5.6–7.3	.28
-------	95–100	95–100	60–80	25–35	6.0–20.0	0.05–0.07	5.6–7.3	.17
-------	100	100	90–100	75–95	<0.06	0.12–0.17	6.6–8.4	.28
<2	95–100	90–100	80–100	80–95	0.6–2.0	0.18–0.21	6.1–7.3	.49
<2	95–100	95–100	90–100	80–95	0.06–0.2	0.13–0.17	6.1–7.8	.28
5–15	75–85	65–80	50–70	35–60	0.06–0.2	0.07–0.17	7.4–8.4	.28
-------	95–100	95–100	65–85	25–35	6.0–20.0	0.09–0.11	5.6–7.3	.17
-------	95–100	95–100	90–100	80–95	<0.2	0.12–0.17	6.6–7.8	.28
0	100	100	90–100	80–90	0.6–2.0	0.17–0.20	5.6–7.3	.49
0	100	100	95–100	85–95	0.6–0.06	0.17–0.20	6.1–7.8	.43
0	100	100	95–100	80–95	0.6–0.06	0.12–0.20	7.4–8.4	.64
0	100	95–100	65–85	20–35	6.0–20.0	0.08–0.11	5.1–7.3	.24
0	100	95–100	65–85	10–35	6.0–20.0	0.09–0.11	5.6–7.3	.17
0	100	95–100	95–100	85–95	0.06–0.2	0.12–0.17	6.6–8.4	.28
-------	--------	--------	--------	--------	2.0–6.0	0.25–0.35	6.6–7.6	--------
-------	--------	--------	--------	--------	0.06–0.2	----------	7.9–8.4	--------
0	100	100	95–100	85–100	0.06–0.2	----------	7.9–8.4	--------
0	95–100	95–100	85–100	20–35	6.0–20.0	0.09–0.11	5.1–7.3	.24
0	95–100	90–100	70–100	20–35	6.0–20.0	0.03–0.06	6.1–7.3	.24
<10	70–90	65–85	60–80	45–70	0.6–2.0	0.15–0.19	5.6–7.8	.28
0	100	100	95–100	85–95	0.6–2.0	0.17–0.21	6.1–8.4	.49
0	100	100	95–100	90–100	0.06–0.2	0.12–0.14	6.1–8.4	.28
0	100	100	95–100	90–100	0.06–0.2	0.12–0.14	7.9–8.4	.28
<2	75–95	70–90	50–65	30–55	2.0–6.0	0.14–0.20	5.6–7.3	.24
<2	70–95	55–90	45–60	25–55	2.0–6.0	0.11–0.13	5.6–7.3	.24
<10	40–55	25–50	15–40	0–25	6.0–20.0	0.02–0.06	6.6–8.4	.17
0	100	95–100	60–100	20–70	2.0–6.0	0.14–0.16	5.6–7.8	.28
0	100	95–100	80–95	60–85	0.6–2.0	0.19–0.21	6.1–7.3	.49
0	95–100	90–100	75–95	55–85	0.6–2.0	0.17–0.19	6.6–7.8	.64

TABLE 7.—*Estimated physical and*

Soil series and map symbols	Hydrologic soil group	Depth to—		Depth from surface	USDA texture	Classification	
		Bedrock	Seasonal high water table			Unified	AASHTO
		Feet	*Feet*	*Inches*			
*Hilton: HbA, HbB, HcA, HcB, HnB. For Cazenovia part of HnB, see Cazenovia series. Units HcA and HcB are underlain by bedrock at a depth of 3½ to 6 feet.	B	>3½	1½–2	0–14	Loam or silt loam	ML or SM	A–4 or A–2
				14–30	Silt loam to fine sandy loam.	ML or SM	A–4 or A–2
				30–72	Loam to gravelly fine sandy loam.	SM, GM, or ML	A–2 or A–4
Howard: HoB, HpC	A	>6	>4	0–24	Loam to gravelly fine sandy loam.	GM, ML, or SM	A–4 or A–2
				24–48	Gravelly loam to very gravelly sandy loam.	GM or ML	A–4 or A–2
				48–60	Stratified sand and gravel.	GM, GW, or GP	A–1
Junius: Ju	C	<4	½–1½	0–27	Loamy fine sand	SM	A–2 or A–4
				27–50	Fine and medium sand.	SM	A–2 or A–4
*Kendaia: KaA For Appleton part, see the Appleton series.	C	>3½	½–1½	0–22	Silt loam	ML or SM	A–4 or A–6
				22–50	Silt loam or loam.	ML or SM	A–4 or A–6
Lairdsville: LaB	D	2–3½	1½–2	0–9	Silt loam	ML or CL	A–6 or A–7
				9–36	Silty clay loam to clay.	CL or ML	A–6 or A–7
				36–50	Soft shale bedrock.		
Lakemont: Lk, Lm Unit Lm is underlain by shale bedrock at a depth of 3½ to 6 feet.	D	>3½	0–½	0–12	Silty clay loam	CL or ML	A–6 or A–7
				12–30	Silty clay	CL, CH, or ML	A–6 or A–7
				30–60	Varved silty clay and clay.	CL or CH	A–6 or A–7
Lamson: Ln	D	>4	0–½	0–36	Very fine sandy loam to loamy very fine sand.	ML, SM, or OL	A–4
				36–50	Loamy fine sand to silt loam.	SM or ML	A–4 or A–2
Lockport: Lo	D	1½–3	½–1	0–11	Silty clay loam	ML, CL, or OL	A–6 or A–7
				11–24	Silty clay to silty clay loam.	CL	A–6 or A–7
				24	Shale bedrock.		
Lyons: Ly, Lz Unit Lz is underlain by bedrock at a depth of 3½ to 6 feet.	D	>3½	0–½	0–18	Silt loam	ML	A–5 or A–7
				18–50	Gravelly sandy loam to silt loam.	ML or SM	A–4
Madalin: Ma	D	<4	0–½	0–8	Silt loam	ML, CL, or OL	A–6 or A–7
				8–33	Silty clay to silty clay loam.	CL, CH, or MH	A–6 or A–7
				33–52	Varved silt and clay.	CL or ML	A–6
Madrid: MdB, MdC	B	>4	>3	0–25	Fine sandy loam	SM or ML	A–4
				25–40	Loam or fine sandy loam.	SM, GM, or ML	A–2 or A–4
				40–78	Fine sandy loam or loam.	SM, GM, or ML	A–2 or A–4
Martisco: Me	D	>6	0	10–0	Muck	Pt	
				0–23	Marl		
				23–50	Silt	ML	A–4

chemical properties—Continued

Coarse fraction greater than 3 inches	Percentage less than 3 inches passing sieve—				Permeability	Available water capacity	Reaction	K factor
	No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)				
Percent					*Inches per hour*	*Inches per inch of soil*	*pH*	
<10	80–95	70–95	60–85	30–60	0.6–2.0	0.11–0.16	6.1–7.3	0.32
<10	75–95	70–90	60–85	20–60	0.6–2.0	0.10–0.15	6.1–7.3	.28
5–15	60–80	65–85	55–75	20–55	0.06–0.2	0.08–0.14	6.6–8.4	.24
<5	55–80	50–75	30–70	15–65	2.0–6.0	0.10–0.13	5.6–7.3	.24
<5	45–65	40–60	25–55	10–55	2.0–6.0	0.08–0.11	5.6–7.3	.20
5–15	35–45	30–40	15–30	0–5	6.0–20.0	0.01–0.02	7.4–8.4	.17
0	100	95–100	65–85	20–40	6.0–20.0	0.09–0.11	6.1–7.3	.17
0	95–100	90–100	65–85	10–40	6.0–20.0	0.04–0.08	6.6–7.8	.17
<5	90–100	80–90	70–85	40–70	0.6–2.0	0.12–0.18	6.1–7.3	.32
<5	85–95	65–85	65–80	35–65	0.06–0.2	0.09–0.18	7.9–8.4	.28
0	95–100	75–100	70–95	55–90	0.6–2.0	0.19–0.20	5.6–7.3	.43
0	95–100	75–100	70–95	60–95	<0.06	0.12–0.17	6.6–8.4	.28
0	100	100	95–100	80–95	0.2–0.6	0.19–0.21	6.1–7.3	.49
0	100	100	95–100	90–100	<0.06	0.13–0.17	6.1–7.8	.49
0	100	100	95–100	80–95	<0.06	0.12–0.14	7.9–8.4	.49
0	100	95–100	70–90	40–55	2.0–6.0	0.12–0.16	6.1–7.3	.32
0	100	95–100	60–90	30–55	2.0–6.0	0.02–0.04	7.3–7.8	.43
<2	95–100	90–100	70–100	55–100	0.6–2.0	0.17–0.20	5.6–7.8	.43
0	95–100	90–100	80–100	75–95	<0.06	0.12–0.14	5.6–7.8	.28
<5	90–100	75–95	60–90	55–75	0.2–0.6	0.17–0.20	6.1–7.8	.32
<5	75–90	55–85	50–80	40–60	0.06–0.2	0.08–0.18	7.4–8.4	.28
0	100	95–100	90–100	75–90	0.2–0.6	0.17–0.20	6.1–7.8	.49
0	100	95–100	90–100	80–95	0.06–0.2	0.12–0.13	6.1–7.8	.49
0	100	100	90–100	75–95	<0.2	0.12–0.13	7.9–8.4	.49
<5	85–95	80–90	50–85	40–70	0.6–2.0	0.15–0.18	5.6–7.3	.32
<5	65–90	60–90	45–85	25–60	0.6–2.0	0.09–0.14	5.6–7.3	.28
5–15	60–85	55–80	40–70	20–60	0.2–0.6	0.09–0.14	6.1–8.4	.24
-------	--------	--------	--------	--------	0.6–6.0	0.25–0.35	7.9–8.4	--------
-------	--------	--------	--------	--------	0.06–0.2	----------	7.9–8.4	--------
-------	100	100	100	90–100	0.06–0.2	----------	7.4–7.8	--------

TABLE 7.—*Estimated physical and*

Soil series and map symbols	Hydrologic soil group	Depth to—		Depth from surface	USDA texture	Classification	
		Bedrock	Seasonal high water table			Unified	AASHTO
		Feet	*Feet*	*Inches*			
Massena: Mn	C	>4	½–1½	0–12	Fine sandy loam	SM, GM, or ML	A–4
				12–24	Loam to fine sandy loam.	ML or SM	A–2 or A–4
				24–50	Gravelly fine sandy loam to loam.	SM, GM, or ML	A–2 or A–4
Minoa: Mo	C	>6	½–1½	0–45	Very fine sandy loam to loamy fine sand.	SM or ML	A–4
				45–50	Silty clay loam	ML or CL	A–6
Newstead: Ne	C	1½–3½	½–1½	0–14	Silt loam	ML or SM	A–2 or A–4
				14–26	Flaggy silt loam to sandy loam.	SM, GM, or ML	A–2 or A–4
				26	Limestone bedrock.		
Niagara: NgA, NgB	C	>4	½–1½	0–13	Silt loam	ML	A–4
				13–24	Silt loam or silty clay loam.	ML or CL	A–4
				24–50	Silt loam to stratified layers of silt, fine sand, and clay.	ML	A–4
Odessa: OdA, OdB	D	>4	½–1	0–8	Silt loam	ML, CL, or OL	A–6 or A–7
				8–41	Silty clay to silty clay loam.	CL, CH, or ML	A–6 or A–7
				41–50	Silty clay loam to varved silt and clay.	CL or CH	A–6 or A–7
Ontario: OnB, OnC, OoB, OsC, OtB. Unit OtB is underlain by bedrock at a depth of 3½ to 6 feet.	B	>3½	>3	0–16	Loam	ML or SM	A–4 or A–2
				16–38	Silt loam to gravelly fine sandy loam.	SM, GM, or ML	A–4 or A–2
				38–72	Loam to gravelly fine sandy loam.	SM, GM, or ML	A–4 or A–2
Ovid: OvA, OvB, OwA. Unit OwA is underlain by shale bedrock at a depth of 3½ to 6 feet.	C	>3½	½–1½	0–13	Silt loam	ML, SM, or CL	A–4 or A–6
				13–28	Silty clay loam to gravelly clay loam.	CL or ML	A–4, A;6, or A–7
				28–72	Silty clay loam to gravelly clay loam.	CL, ML, or GC	A–4, A–6, or A–7
Palms: Pm	D	>6	0	0–34	Muck	Pt	
				34–54	Silty clay loam to fine sandy loam.	CL, ML, or SM	A–6 or A–4
Phelps: Pp	B	>3½	1½–2	0–8	Gravelly fine sandy loam.	SM or GM	A–2 or A–4
				8–34	Gravelly loamy fine sand, gravelly sandy loam, and gravelly loam.	SM or GM	A–2 or A–4
				34–50	Very gravelly loamy sand to stratified sand and gravel.	GM or GW–GM	A–1

chemical properties—Continued

Coarse fraction greater than 3 inches	Percentage less than 3 inches passing sieve—				Permeability	Available water capacity	Reaction	K factor
	No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)				
Percent					*Inches per hour*	*Inches per inch of soil*	*pH*	
<5	65–95	60–90	70–90	45–70	0.6–2.0	0.15–0.18	6.1–7.3	0.32
<5	75–95	65–90	50–80	30–60	0.6–2.0	0.09–0.14	6.1–7.3	.28
5–15	50–85	50–85	40–80	25–60	0.6–0.06	0.06–0.14	6.6–8.4	.24
0	100	95–100	70–95	40–65	0.6–2.0	0.08–0.17	5.6–7.6	.32
0	100	100	95–100	85–95	0.06–0.2	0.08–0.13	7.9–8.4	.32
<5	80–90	75–85	45–80	20–75	0.6–2.0	0.12–0.18	6.1–7.3	.32
5–20	60–90	55–85	30–80	15–60	0.6–2.0	0.09–0.15	6.1–7.3	.28
0	95–100	90–100	75–95	60–80	0.6–2.0	0.17–0.22	6.1–7.3	.49
0	95–100	95–100	90–100	80–90	0.2–0.6	0.16–0.20	6.1–7.3	.43
0	95–100	95–100	70–100	55–90	0.6–0.06	0.12–0.20	7.4–8.4	.64
<2	100	95–100	80–100	75–95	0.2–0.6	0.18–0.20	6.1–7.3	.49
0	100	95–100	90–100	85–100	0.06–0.2	0.12–0.14	6.1–7.8	.28
0	100	90–100	90–100	80–100	<0.2	0.12–0.14	7.9–8.4	.28
<10	85–95	70–90	60–85	30–60	0.6–2.0	0.13–0.20	6.1–7.3	.32
<15	65–90	60–85	55–80	20–60	0.6–2.0	0.10–0.18	6.1–7.3	.28
<20	55–80	55–70	50–65	20–55	0.06–0.2	0.08–0.14	7.4–8.4	.24
<5	90–100	85–100	70–90	40–80	0.6–2.0	0.18–0.20	6.1–7.8	.37
<5	65–100	70–95	70–90	70–90	0.6–0.06	0.14–0.17	6.1–7.8	.37
<10	75–100	70–95	65–90	45–85	0.06–0.2	0.11–0.16	7.9–8.4	.28
-------	--------	--------	--------	--------	2.0–6.0	0.35–0.45	5.6–7.3	--------
0	100	100	70–100	40–90	0.6–2.0	0.14–0.18	7.4–8.4	.43
<5	65–75	60–70	45–60	25–45	0.6–6.0	0.10–0.12	5.6–7.3	.24
<5	60–75	55–70	45–65	25–50	0.6–6.0	0.07–0.10	6.1–7.3	.28
<10	30–40	20–30	10–20	5–15	2.0–20.0	0.01–0.02	7.4–8.4	.17

TABLE 7.—*Estimated physical and*

Soil series and map symbols	Hydrologic soil group	Depth to—		Depth from surface	USDA texture	Classification	
		Bedrock	Seasonal high water table			Unified	AASHTO
		Feet	*Feet*	*Inches*			
Rhinebeck: RhA, RhB	D	>6	½–1½	0–8	Silt loam	ML or MH	A–6 or A–7
				8–22	Silty clay to silty clay loam.	CL, CH, or MH	A–6 or A–7
				22–52	Silty clay loam or varved silt and clay.	CL or ML	A–6
Schoharie: ScB	C	>4	1½–2	0–8	Silt loam	ML or CL	A–6 or A–7
				8–34	Silty clay to silty clay loam.	CL or ML	A–6 or A–7
				34–50	Silt loam to silty clay.	CL	A–6
Sun: Su	D	>4	0–½	0–8	Silt loam	ML or SM	A–4
				8–22	Sandy loam to silt loam.	ML or SM	A–4
				22–50	Gravel sandy loam to loam.	SM or GM	A–2 or A–4
Teel: Te	B	>3½	½–2	0–8	Silt loam	ML	A–4
				8–40	Very fine sandy loam to silt loam.	ML	A–4
				40–62	Very fine sandy loam to silty clay loam.	ML	A–4
Wampsville: WmB	B	>6	>4	0–8	Gravelly loam	ML, GM, or SM	A–4 or A–2
				8–40	Gravelly loam to clay loam.	GM, SM, or ML	A–4 or A–2
				40–50	Very gravelly loamy sand or stratified sand and gravel.	GM or GW–GM	A–1 or A–2
Wassaic: WsA, WsB	B	1½–3½	1½–2½	0–9	Silt loam	ML or SM	A–4
				9–27	Loam or silt loam.	ML or SM	A–4
				27–36	Flaggy loam	ML, SM, or GM	A–4
				36	Limestone bedrock.		
Wayland: Wy	D	>4	0–½	0–8	Silt loam	ML	A–5 or A–7
				8–48	Silty clay loam to silt loam.	ML or CL	A–6 or A–4
				48–54	Fine sandy loam	ML or SM	A–4

In the Unified system, soils are classified according to particle-size distribution, plasticity, liquid limit, and organic-matter content (*2*). This system classifies only material smaller than 3 inches. Soils are grouped into fifteen classes, which include 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 are designated by symbols for both classes, for example, CL–ML.

In the AASHTO system, soils are classified according to those properties that affect use in highway construction and maintenance (*1*). This system also classifies only material smaller than 3 inches. Soils are placed in one of seven basic groups, ranging from A–1 through A–7, on the basis of particle-size distribution, liquid limit, and plasticity index. In group A–1 are gravelly soils, which have high bearing strength and are the best soils for subgrade (foundation). At the other extreme, in group A–7, are clay soils, which have low strength when wet and are the poorest soils for subgrade. Where laboratory data are available to justify a further breakdown, the A–1, A–2, and A–7 groups are divided as follows: A–1–a, A–1–b, A–2–4, A–2–5, A–2–6, A–2–7, A–7–5, and A–7–6. The

chemical properties—Continued

Coarse fraction greater than 3 inches	Percentage less than 3 inches passing sieve—				Permeability	Available water capacity	Reaction	K factor
	No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)				
Percent					*Inches per hour*	*Inches per inch of soil*	*pH*	
<2	95–100	95–100	90–100	65–95	0.2–0.6	0.18–0.20	5.6–7.3	0.49
<2	95–100	95–100	90–100	70–95	0.06–0.2	0.12–0.14	5.6–7.3	.28
<2	95–100	95–100	90–100	70–95	0.06–0.2	0.12–0.14	7.4–8.4	.28
<5	100	95–100	85–100	65–90	0.2–0.6	0.18–0.20	5.6–7.3	.49
0	100	95–100	90–100	85–95	0.06–0.2	0.12–0.17	6.1–7.8	.28
0	100	95–100	90–100	80–95	0.06–0.2	0.12–0.14	7.4–8.4	.28
<5	90–100	75–90	65–85	45–65	0.6–2.0	0.14–0.18	6.1–7.3	.28
<5	75–95	70–90	60–80	40–60	0.06–0.2	0.12–0.14	6.1–7.3	.28
5–15	60–80	45–70	40–75	25–40	0.06–0.2	0.06–0.12	7.4–8.4	.28
<2	95–100	90–100	85–100	60–85	0.6–2.0	0.18–0.20	6.1–7.3	.49
0	95–100	95–100	85–100	65–90	0.6–2.0	0.17–0.19	6.1–7.3	.49
<2	90–100	90–100	75–95	55–90	0.6–2.0	0.12–0.19	6.6–7.8	.49
<5	65–85	50–75	40–70	20–60	0.6–2.0	0.15–0.19	5.6–7.3	.24
<5	50–70	40–75	30–70	25–55	2.0–6.0	0.10–0.14	5.6–7.3	.20
5–15	30–50	25–45	20–40	5–20	6.0–20.0	0.02–0.04	7.4–8.4	.17
<5	85–100	85–95	70–90	40–75	0.6–2.0	0.13–0.17	6.1–7.3	.32
<10	85–100	80–95	70–90	40–75	0.6–2.0	0.10–0.15	6.1–7.3	.37
<50	70–95	65–90	60–85	40–60	0.6–2.0	0.08–0.13	6.1–8.4	.24
0	100	95–100	90–100	70–95	0.2–2.0	0.18–0.20	6.6–7.8	.49
0	100	95–100	90–100	70–95	0.06–0.2	0.14–0.18	6.6–8.4	.49
0	100	95–100	65–95	40–90	0.06–0.2	0.11–0.16	6.6–8.4	.28

AASHTO classification for tested soils is shown in table 9; the estimated classification is given in table 7 for all soils mapped in the survey area.

In the system used by the U.S. Department of Agriculture, texture class is determined by the relative proportions of sand, silt, and clay in soil particles that are less than 2.0 millimeters in diameter (*8*). Sand, silt, clay, and other terms used in the USDA textural classification are defined in the Glossary.

Estimated soil properties significant in engineering

Estimated soil properties significant in engineering are listed in table 7. These estimates are made for typical profile horizons that differ significantly in suitability for engineering structures. The estimates are based on field observations made in the course of mapping, test data for these and similar soils, and experience with the same kinds of soils in other areas. Following are explanations of some of the columns in table 7.

Hydrologic soil groups estimate runoff potential after rainfall. Soil properties considered are those that influence the rate of infiltration on a bare soil after prolonged wetting. These properties are depth of seasonal high water table, intake rate and permeability after prolonged wetting, and depth to a

TABLE 8.—*Engineering*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. carefully the instructions for referring to other

Soil series and map symbols	Suitability as source of—			Soil features affecting—
	Topsoil	Sand and gravel	Fill material	Highway location
Alton: AlB	Poor: gravelly	Good to fair	Good	Features generally favorable.
Appleton: AnA, AnB	Fair: coarse fragments.	Unsuited	Fair: somewhat poorly drained.	Seasonal high water table.
*Arkport: ArB, ArC, AsD For Collamer part of AsD, see Collamer series.	Fair: sandy subsoil.	Poor for sand; excessive fines; unsuited for gravel.	Fair to good	Highly erodible when water is allowed to concentrate; susceptible to soil blowing.
Barre: Ba	Poor: poorly drained.	Unsuited	Poor: poorly drained.	Prolonged high water table; fair stability; lacustrine silt and clay at a depth of 3 feet; more stable till below.
Bombay: BoA, BoB	Fair: coarse fragments.	Unsuited	Good to fair	Features generally favorable.
Brockport: BrA, BrB, BrC	Fair: thin layer	Unsuited	Poor: excessive fines; bedrock at a depth of 1½ to 3 feet.	Seasonal high water table; bedrock at a depth of 1½ to 3 feet.
Canandaigua: Ca	Poor: poorly drained and very poorly drained.	Unsuited	Poor: poorly drained and very poorly drained.	Prolonged high water table; fair stability; medium compressibility.
Carlisle: Cb	Poor: organic deposit possibly can be used as amendment for mineral soil.	Unsuited	Unsuited: organic deposit.	Prolonged high water table; organic deposit; high compressibility; unsuitable material.
Cayuga: CcB	Fair: thin layer	Unsuited	Poor in upper 2- to 3-foot lacustrine deposit; good in till below 3 feet.	Seasonal high water table; poor stability; lacustrine silt and clay to a depth of 3 feet; more stable till below.
Cazenovia: CeA, CeB	Fair: coarse fragments.	Unsuited	Fair: excessive fines.	Seasonal high water table.

interpretations

The soils in such mapping units may have different properties and limitations, and for this reason it is necessary to follow series that appear in the first column of this table]

Soil features affecting—Continued					
Ponds		Agricultural drainage	Irrigation	Diversions	Waterways
Reservoir areas	Embankments				
Rapid permeability.	High permeability; good stability.	Well drained and somewhat excessively drained.	Low to moderate available water capacity; high intake rate.	Rapid permeability; droughty; gravelly.	Droughty; gravelly.
Moderately slow to slow permeability; seasonal high water table.	Good stability; medium to low permeability.	Seasonal high water table; moderately slow to slow permeability.	Seasonal high water table.	Seasonal seepage	Medium erodibility; hazard of channel siltation.
Moderately rapid permeability.	High erodibility; medium to high piping potential.	Well drained	Moderate to high available water capacity; moderate intake rate.	High erodibility; hazard of channel siltation.	High erodibility; hazard of channel siltation.
Slow to very slow permeability; prolonged high water table.	Fair to poor compaction characteristics; fair stability to a depth of 3 feet; stable material below 3 feet.	Poorly drained; slow to very slow permeability; unstable ditchbanks.	Prolonged high water table.	Nearly level relief.	Nearly level relief.
Moderate to slow permeability.	Fair to good compaction characteristics; medium to high piping potential.	Seasonal high water table; moderate to slow permeability.	Seasonal high water table; moderate available water capacity; moderate intake rate.	Sloughing in cuts; moderate to slow permeability.	Seepage; moderate available water capacity; medium erodibility.
Very slow permeability; bedrock at a depth of 1½ to 3 feet.	Fair stability; low permeability; bedrock at a depth of 1½ to 3 feet.	Seasonal high water table; very slow permeability; bedrock at a depth of 1½ to 3 feet.	Seasonal high water table; very slow intake rate; bedrock at a depth of 1½ to 3 feet.	Bedrock at a depth of 1½ to 3 feet.	High erodibility; heavy texture; limited root depth.
Prolonged high water table; moderately slow permeability.	Fair to poor compaction characteristics; high piping potential.	Prolonged high water table; moderately slow permeability; unstable ditchbanks.	Prolonged high water table.	Nearly level relief	Nearly level relief.
Moderately rapid permeability; prolonged high water table; organic deposit.	Unsuitable material; organic deposit.	Very high shrinkage when first drained; moderately rapid permeability; prolonged high water table.	High intake rate; high available water capacity.	Level relief	Level relief.
Slow permeability; seasonal high water table.	High to medium erodibility; poor to fair compaction characteristics; medium piping potential; more stable till below a depth of 3 feet.	Seasonal high water table; slow permeability.	High available water capacity; slow intake rate.	Sloughing in cuts; slow permeability.	High erodibility; hazard of channel siltation.
Moderately slow to slow permeabil-	Fair to poor compaction char-	Seasonal high water table; moder-	Moderate to high available water	Sloughing in cuts; seasonal seepage;	Seepage; high erodibility.

TABLE 8.—*Engineering*

Soil series and map symbols	Suitability as source of—			Soil features affecting—
	Topsoil	Sand and gravel	Fill material	Highway location
Cazenovia—Contd.				
CfA, CfB	Poor: gravelly	Unsuited	Fair: excessive fines.	Seasonal high water table; bedrock at a depth of 3 to 6 feet.
Cheektowaga: Cg	Poor: poorly drained and very poorly drained.	Poor to unsuited for sand; excessive fines; unsuited for gravel.	Poor: poorly drained and very poorly drained.	Prolonged high water table; poor stability; lacustrine silt and clay in substratum.
Churchville: ChA, ChB	Poor: clayey	Unsuited	Fair: somewhat poorly drained.	Seasonal high water table; poor stability; lacustrine silt and clay to a depth of 3 feet; more stable till below.
Claverack: ClB	Poor: sandy	Poor for sand; excessive fines; unsuited for gravel.	Poor: thin sand layer over silt and clay.	Seasonal high water table; poor stability; lacustrine silt and clay in substratum.
Collamer: CmA, CmB, CmC3	Good	Unsuited	Fair to poor: excessive fines.	Seasonal high water table; fair stability; medium compressibility; high erodibility.
Colonie: CoB, CoC	Poor: sandy	Poor for sand; excessive fines; unsuited for gravel.	Good	Cuts highly erodible when water is allowed to concentrate; susceptible to soil blowing.
Cosad: Cs	Poor: sandy	Poor for sand; excessive fines; unsuited for gravel.	Poor: thin sand layer over silt and clay.	Seasonal high water table; poor stability; lacustrine silt and clay in substratum.
Edwards: Ed	Unsuited: muck	Unsuited	Unsuited: muck	Prolonged high water table; organic deposit; high compressibility; unsuitable material.

interpretations—Continued

Soil features affecting—Continued					
Ponds		Agricultural drainage	Irrigation	Diversions	Waterways
Reservoir areas	Embankments				
ity; seasonal high water table.	acteristics; medium to low permeability; high piping potential.	ately slow to slow permeability.	capacity; moderate intake rate.	high erodibility.	
Moderately slow to slow permeability; seasonal high water table; bedrock at a depth of 3 to 6 feet.	Fair to poor compaction characteristics; medium to low permeability; high piping potential; bedrock at a depth of 3 to 6 feet.	Seasonal high water table; moderately slow to slow permeability; bedrock at a depth of 3 to 6 feet.	Moderate to high available water capacity; moderate intake rate; bedrock at a depth of 3 to 6 feet.	Sloughing in cuts; seasonal seepage; high erodibility; bedrock at a depth of 3 to 6 feet.	Seepage; high erodibility; bedrock at a depth of 3 to 6 feet.
Prolonged high water table; rapid permeability from a depth of 2 to 3 feet; slow permeability below.	High piping potential; poor compaction characteristics in substratum.	Prolonged high water table; poor stability of ditchbanks; slow permeability below a depth of 3 feet.	Prolonged high water table.	Nearly level relief.	Nearly level relief.
Seasonal high water table; slow permeability.	High to medium erodibility; poor to fair compaction characteristics; medium piping potential; more stable till below a depth of 3 feet.	Seasonal high water table; slow permeability; poor stability of ditchbanks.	Seasonal high water table; very slow intake rate.	High to medium erodibility; seasonal seepage; clayey.	High to medium erodibility; clayey; hazard of channel siltation.
Rapid permeability in upper 2 to 3 feet; slow to very slow permeability in substratum; seasonal high water table.	High to medium erodibility; medium piping potential; poor compaction characteristics in substratum.	Seasonal high water table; poor stability of ditchbanks; slow to very slow permeability in substratum.	Seasonal high water table; low to moderate available water capacity; moderate to high intake rate.	Hazard of channel siltation; rapid permeability in upper 2 to 3 feet.	Seepage; low to moderate available water capacity.
Moderately slow to slow permeability; seasonal high water table.	Fair to poor compaction characteristics; high erodibility; high piping potential.	Seasonal high water table; moderately slow to slow permeability.	Seasonal high water table; high available water capacity; slow intake rate.	Sloughing in cuts; high erodibility.	Seepage; high available water capacity; high erodibility; high siltation potential.
Rapid permeability.	Medium to high piping potential; medium to high permeability.	Well drained; rapid permeability.	Low available water capacity; rapid permeability; high intake rate.	Sandy; rapid permeability; hazard of channel siltation.	Well drained; low available water capacity; sandy; high erodibility.
Rapid permeability in upper 1½ to 3 feet; slow permeability below a depth of 3 feet; seasonal high water table.	High to medium erodibility; medium piping potential; poor compaction characteristics in substratum.	Seasonal high water table; poor stability of ditchbanks; slow permeability in substratum.	Seasonal high water table; mod erate available water capacity; slow intake rate.	Nearly level relief.	Nearly level relief.
Moderately rapid permeability; prolonged high water table; organic deposit.	Unsuitable material; organic deposit.	Prolonged high water table; unstable ditchbanks; organic deposit underlain	High intake rate; high available water capacity.	Level relief -------	Level relief.

TABLE 8.—*Engineering*

Soil series and map symbols	Suitability as source of—			Soil features affecting—
	Topsoil	Sand and gravel	Fill material	Highway location
Elnora: ElB	Poor: sandy	Poor for sand; excessive fines; unsuited for gravel.	Good	Seasonal high water table; highly erodible when water is allowed to concentrate; susceptible to soil blowing.
Farmington: FaB, FaC	Poor: surface outcrop; bedrock at a depth of 1 to 2 feet.	Unsuited	Poor: bedrock at a depth of 1 to 2 feet.	Limestone bedrock at a depth of 1 to 2 feet; medium erodibility in mantle.
Fluvaquents and Humaquepts, ponded: FH. Fresh water marsh.	Unsuited: ponded with shallow water.	Unsuited: ponded with shallow water.	Unsuited: ponded with shallow water.	Ponded with shallow water.
Fonda: Fo	Poor: very poorly drained; clayey.	Unsuited	Poor: very poorly drained; low strength.	Prolonged high water table; poor stability; lacustrine silt and clay.
Fredon: Fr	Poor: poorly drained.	Fair: excessive fines.	Poor: poorly drained.	Seasonal high water table; high susceptibility to frost heave in upper 2 feet.
Galen: GaA, GaB	Fair: sandy subsoil.	Poor for sand; excessive fines; unsuited for gravel.	Fair: excessive fines.	Seasonal high water table; highly erodible when water is allowed to concentrate; susceptible to soil blowing.
Hamlin: Ha	Good	Unsuited	Fair: low strength; high erodibility.	Subject to flooding; fair stability.
*Hilton: HbA, HbB, HnB. For Cazenovia part of HnB, see Cazenovia series.	Fair: coarse fragments.	Unsuited	Good to fair: fines.	Seasonal high water table.
HcA, HcB	Fair: coarse fragments.	Unsuited	Good to fair: bedrock at a depth of 3½ to 6 feet.	Seasonal high water table; bedrock at a depth of 3½ to 6 feet.
Howard: HoB, HpC	Poor: gravelly	Good	Good	Features generally favorable.

interpretations—Continued

Soil features affecting—Continued					
Ponds		Agricultural drainage	Irrigation	Diversions	Waterways
Reservoir areas	Embankments				
		with marl at a depth of 1½ to 3½ feet.			
Rapid permeability; seasonal high water table.	High piping potential; medium to high permeability.	Seasonal high water table; rapid permeability; unstable ditchbanks.	Seasonal high water table; low to moderate available water capacity; moderate intake rate.	Sandy; rapid permeability.	Seepage; low to moderate available water capacity; sandy; high erodibility.
Bedrock at a depth of 1 to 2 feet; moderate permeability.	Bedrock at a depth of 1 to 2 feet.	Well drained; bedrock at a depth of 1 to 2 feet.	Bedrock at a depth of 1 to 2 feet.	Bedrock at a depth of 1 to 2 feet.	Bedrock at a depth of 1 to 2 feet.
Ponded with shallow water.	Ponded with shallow water.	Ponded with shallow water.	Ponded with shallow water.	Ponded with shallow water.	Ponded with shallow water.
Prolonged high water table; slow permeability.	Poor stability; poor workability; poor compaction characteristics.	Prolonged high water table; slow permeability; unstable ditchbanks.	Prolonged high water table.	Nearly level relief.	Nearly level relief.
Seasonal high water table; rapid permeability in substratum.	Stable material; medium to high permeability.	Seasonal high water table; rapid permeability; unstable ditchbanks.	Seasonal high water table.	Nearly level relief.	Nearly level relief.
Moderately rapid permeability; seasonal high water table.	High erodibility; medium to high piping potential.	Seasonal high water table; moderately rapid permeability.	Seasonal high water table; low to moderate available water capacity; moderate intake rate.	Sandy; moderately rapid permeability.	Seepage; low to moderate available water capacity; high erodibility.
Moderate permeability.	High erodibility; high piping potential; medium compressibility.	Well drained ------	High available water capacity; moderate permeability; moderate intake rate.	Nearly level relief.	Nearly level relief.
Moderate to slow permeability; seasonal high water table.	Fair to good compaction characteristics; medium to low piping potential.	Seasonal high water table; slow permeability in substratum.	Seasonal high water table; high available water capacity.	Sloughing in cuts; seasonal high water table.	Seepage; high available water capacity.
Moderate to slow permeability; seasonal high water table; bedrock at a depth of 3½ to 6 feet; moderate to slow permeability.	Fair to good compaction characteristics; medium to low piping potential; bedrock at a depth of 3½ to 6 feet.	Seasonal high water table; slow permeability in substratum; bedrock at a depth of 3½ to 6 feet.	Seasonal high water table; high available water capacity; bedrock at a depth of 3½ to 6 feet.	Sloughing in cuts; seasonal high water table; bedrock at a depth of 3½ to 6 feet.	Seepage; high available water capacity; bedrock at a depth of 3½ to 6 feet.
Rapid permeability.	Medium to high permeability; good stability.	Well drained to somewhat excessively drained.	Moderate available water capacity; high intake rate.	Rapid permeability; gravelly.	Rapid permeability; gravelly.

TABLE 8.—*Engineering*

Soil series and map symbols	Suitability as source of—			Soil features affecting—
	Topsoil	Sand and gravel	Fill material	Highway location
Junius: Ju	Poor: sandy	Poor for sand; excessive fines; unsuited for gravel.	Fair: somewhat poorly drained.	Seasonal high water table.
Kendaia and Appleton: KaA	Fair: coarse fragments.	Unsuited	Fair: somewhat poorly drained; bedrock at a depth of 3½ to 6 feet.	Seasonal high water table; bedrock at a depth of 3½ to 6 feet.
Lairdsville: LaB	Fair: thin layer	Unsuited	Poor: excessive fines; shale bedrock at a depth of 2 to 3½ feet.	Shale bedrock at a depth of 2 to 3½ feet.
Lakemont:				
Lk	Poor: poorly drained and very poorly drained.	Unsuited	Poor: low strength.	Prolonged high water table; poor stability; lacustrine silt and clay.
Lm	Poor: poorly drained and very poorly drained.	Unsuited	Poor: low strength; bedrock at a depth of 3½ to 6 feet.	Prolonged high water table; bedrock at a depth of 3½ to 6 feet.
Lamson: Ln	Poor: poorly drained and very poorly drained.	Unsuited	Poor: poorly drained and very poorly drained.	Prolonged high water table.
Lockport: Lo	Fair: thin layer	Unsuited	Poor: excessive fines; shale bedrock at a depth of 1½ to 3 feet.	Seasonal high water table; shale bedrock at a depth of 1½ to 3 feet.
Lyons:				
Ly	Poor: poorly drained and very poorly drained.	Unsuited	Poor: poorly drained and very poorly drained.	Prolonged high water table.
Lz	Poor: poorly drained and very poorly drained.	Unsuited	Poor: poorly drained and very poorly drained; bedrock at a depth of 3½ to 6 feet.	Prolonged high water table; bedrock at a depth of 3½ to 6 feet.
Madalin: Ma	Poor: poorly drained and very poorly drained; clayey.	Unsuited	Poor: poorly drained and very poorly drained; low strength.	Prolonged high water table; poor stability; lacustrine silt and clay.

interpretations—Continued

Soil features affecting—Continued					
Ponds		Agricultural drainage	Irrigation	Diversions	Waterways
Reservoir areas	Embankments				
Seasonal high water table; rapid permeability.	Seasonal high water table; high piping potential; medium permeability.	Seasonal high water table; rapid permeability; unstable ditchbanks.	Seasonal high water table.	Nearly level relief.	Nearly level relief.
Seasonal high water table; moderate to slow permeability; bedrock at a depth of 3½ to 6 feet.	Good stability; medium to low permeability; bedrock at a depth of 3½ to 6 feet.	Seasonal high water table; medium to slow permeability; bedrock at a depth of 3½ to 6 feet.	Seasonal high water table; moderate to high available water capacity.	Nearly level relief.	Nearly level relief.
Shale bedrock at a depth of 2 to 3½ feet; very slow permeability.	Shale bedrock at a depth of 2 to 3½ feet; fair to good compaction characteristics.	Shale bedrock at a depth of 2 to 3½ feet; very slow permeability.	Moderate available water capacity; very slow permeability; very slow intake rate.	Shale bedrock at a depth of 2 to 3½ feet.	Shale bedrock at a depth of 2 to 3½ feet; highly erodible soil material.
Prolonged high water table; very slow permeability.	Poor stability; poor workability; poor compaction characteristics.	Prolonged high water table; ponding; very slow permeability; unstable ditchbanks.	Prolonged high water table.	Nearly level relief.	Nearly level relief.
Prolonged high water table; bedrock at a depth of 3½ to 6 feet.	Poor stability; poor workability; poor compaction characteristics; bedrock at a depth of 3½ to 6 feet.	Prolonged high water table; ponding; very slow permeability; unstable ditchbanks; bedrock at a depth of 3½ to 6 feet.	Prolonged high water table.	Nearly level relief.	Nearly level relief.
Prolonged high water table; moderately rapid permeability.	Fair compaction characteristics; medium to high piping potential.	Prolonged high water table; unstable ditchbanks; moderately rapid permeability.	Prolonged high water table.	Nearly level relief.	Nearly level relief.
Very slow permeability; shale bedrock at a depth of 1½ to 3 feet.	Fair stability; low permeability.	Seasonal high water table; very slow permeability; shale bedrock at a depth of 1½ to 3 feet.	Seasonal high water table; very slow intake rate; shale bedrock at a depth of 1½ to 3 feet.	Shale bedrock at a depth of 1½ to 3 feet.	High erodibility; heavy texture; limited root depth.
Prolonged high water table; moderately slow to slow permeability.	Fair to poor compaction characteristics; medium to high piping potential.	Prolonged high water table; moderately slow to slow permeability.	Prolonged high water table.	Nearly level relief.	Nearly level relief.
Prolonged high water table; moderately slow to slow permeability; bedrock at a depth of 3½ to 6 feet.	Bedrock at a depth of 3½ to 6 feet; fair to poor compaction characteristics; medium to high piping potential.	Prolonged high water table; moderately slow to slow permeability; bedrock at a depth of 3½ to 6 feet.	Prolonged high water table.	Nearly level relief.	Nearly level relief.
Prolonged high water table; slow to very slow permeability.	Poor stability; poor workability; poor compaction characteristics.	Prolonged high water table; slow to very slow permeability; unstable ditchbanks.	Prolonged high water table.	Nearly level relief.	Nearly level relief.

TABLE 8.—*Engineering*

Soil series and map symbols	Suitability as source of—			Soil features affecting—
	Topsoil	Sand and gravel	Fill material	Highway location
Madrid: MdB, MdC	Fair: coarse fragments.	Unsuited	Good	Features generally favorable.
Martisco: Me	Unsuited: muck	Unsuited	Unsuited: muck	Prolonged high water table; organic deposit; high compressibility; unsuitable material.
Massena: Mn	Fair: coarse fragments.	Unsuited	Fair: somewhat poorly drained.	Seasonal high water table.
Minoa: Mo	Fair: thin layer	Poor for sand; excessive fines; unsuited for gravel.	Fair: somewhat poorly drained.	Seasonal high water table; lacustrine silt and clay at a depth below 4 feet.
Newstead: Ne	Fair: coarse fragments; thin layer.	Unsuited	Poor: somewhat poorly drained to poorly drained; bedrock at a depth of 1½ to 3½ feet.	Seasonal high water table; bedrock at a depth of 1½ to 3½ feet.
Niagara: NgA, NgB	Good	Unsuited	Fair: somewhat poorly drained.	Seasonal high water table; fair stability; medium compressibility; high erodibility.
Odessa: OdA, OdB	Poor: clayey	Unsuited	Poor: low strength; poor workability.	Seasonal high water table; medium to high compressibility; moderate shrink-swell potential; poor stability.
Ontario:				
OnB, OnC, OoB, OsC	Fair: coarse fragments. Poor in unit OsC: very stony.	Unsuited	Good	Features generally favorable.
OtB	Fair: coarse fragments.	Unsuited	Fair: bedrock at a depth of 3½ to 6 feet.	Bedrock at a depth of 3½ to 6 feet.
Ovid:				
OvA, OvB	Fair: coarse	Unsuited	Fair: somewhat	Seasonal high

interpretations—Continued

Soil features affecting—Continued					
Ponds		Agricultural drainage	Irrigation	Diversions	Waterways
Reservoir areas	Embankments				
Moderate to moderately slow permeability.	Fair to good compaction characteristics; medium piping potential.	Well drained	Moderate to high available water capacity; moderate intake rate.	Moderate to moderately slow permeability.	Well drained; medium erodibility.
Prolonged high water table; organic deposit.	Unsuitable material; organic deposit.	Prolonged high water table; less than 1½ feet of organic deposit over marl.	Prolonged high water table.	Level relief	Level relief.
Seasonal high water table; moderately slow to slow permeability.	Fair to good compaction characteristics; medium piping potential.	Seasonal high water table; moderately slow to slow permeability; ditchbanks subject to seepage.	Seasonal high water table; moderate available water capacity.	Nearly level relief.	Nearly level relief.
Seasonal high water table; moderate to moderately rapid permeability.	Fair to poor compaction characteristics; medium to low permeability; medium to high piping potential.	Seasonal high water table; moderate to moderately rapid permeability; unstable ditchbanks.	Seasonal high water table.	Nearly level relief.	Nearly level relief.
Seasonal high water table; moderate permeability; bedrock at a depth of 1½ to 3½ feet.	Bedrock at a depth of 1½ to 3½ feet; fair to good compaction characteristics; medium to high piping potential.	Seasonal high water table; moderate permeability; bedrock at a depth of 1½ to 3½ feet.	Seasonal high water table.	Nearly level relief.	Nearly level relief.
Seasonal high water table; moderate to slow permeability.	Fair to poor compaction characteristics; high erodibility; high piping potential.	Seasonal high water table; moderate to slow permeability; unstable ditchbanks.	Seasonal high water table; high available water capacity; slow intake rate.	Sloughing in cuts; high erodibility.	Seepage; erodibility; high siltation potential.
Seasonal high water table; slow to very slow permeability.	Low strength; moderate shrink-swell potential; high compressibility; poor workability and compaction characteristics.	Seasonal high water table; slow to very slow permeability; cuts unstable.	Seasonal high water table; very slow intake rate.	Clayey; medium erodibility.	Clayey; medium erodibility; hazard of siltation.
Moderate to slow permeability.	Fair to good compaction characteristics; medium to low piping potential.	Well drained	Moderate to high available water capacity; moderate intake rate.	Moderate to slow permeability; sloughing in cuts.	Well drained; moderate to high available water capacity; medium erodibility.
Moderate to slow permeability; bedrock at a depth of 3½ to 6 feet.	Bedrock at a depth of 3½ to 6 feet; fair to good compaction characteristics; medium to low piping potential.	Well drained; bedrock at a depth of 3½ to 6 feet.	Moderate to high available water capacity; moderate intake rate.	Bedrock at a depth of 3½ to 6 feet.	Well drained; moderate to high available water capacity; medium erodibility; bedrock at a depth of 3½ to 6 feet.
Seasonal high water	Fair to poor com-	Seasonal high wa-	Seasonal high wa-	Sloughing in cuts;	Seasonal high water

TABLE 8.—*Engineering*

Soil series and map symbols	Suitability as source of—			Soil features affecting—
	Topsoil	Sand and gravel	Fill material	Highway location
Ovid—Contd.	fragments; thin layer.		poorly drained.	water table.
OwA	Fair: coarse fragments; thin layer.	Unsuited	Fair: somewhat poorly drained; bedrock at a depth of 3½ to 6 feet.	Seasonal high water table; bedrock at a depth of 3½ to 6 feet.
Palms: Pm	Unsuited: muck; possible to use as amendment for mineral soils.	Unsuited	Unsuited: muck	Prolonged high water table; organic deposit; high compressibility; unsuitable material.
Phelps: Pp	Poor: gravelly	Fair to good: fines in upper 3 feet.	Good	Seasonal high water table.
Rhinebeck: RhA, RhB	Poor: clayey	Unsuited	Poor: low strength; poor workability.	Seasonal high water table; medium to high compressibility; moderate shrink-swell potential; poor stability.
Schoharie: ScB	Poor: clayey	Unsuited	Poor: low strength; poor workability.	Season high water table: medium to high compressibility; moderate shrink-swell potential; poor stability.
Shale outcrop, steep: ShE	Unsuited	Unsuited	Unsuited	Exposed bedrock
Sun: Su	Poor: poorly drained and very poorly drained.	Unsuited	Poor: poorly drained and very poorly drained.	Prolonged high water table.
Teel: Te	Good	Unsuited	Fair: low strength; somewhat poorly drained.	Subject to flooding; seasonal high water table; fair stability.
Udifluvents, frequently flooded: UD Alluvial land.	Poor: can be wet in natural state; very gravelly in places.	Generally unsuited; can be granular in places.	Poor: highly variable; can be wet in natural state.	Subject to flooding; prolonged high water table.
Wampsville: WmB	Poor: gravelly	Fair to poor: excessive fines.	Good	Features generally favorable.

interpretations—Continued

Soil features affecting—Continued					
Ponds		Agricultural drainage	Irrigation	Diversions	Waterways
Reservoir areas	Embankments				
table; moderately slow to slow permeability.	paction characteristics; medium to low permeability; high piping potential.	ter table; moderately slow to slow permeability.	ter table; slow intake rate.	moderately slow to slow permeability.	table; high erodibility.
Seasonal high water table; bedrock at a depth of 3½ to 6 feet.	Fair to poor compaction characteristics; medium to low permeability; high piping potential; bedrock at a depth of 3½ to 6 feet.	Seasonal high water table; bedrock at a depth of 3½ to 6 feet.	Season high water table; slow intake rate.	Bedrock at a depth of 3½ to 6 feet.	Seepage; high erodibility; bedrock at a depth of 3½ to 6 feet.
Prolonged high water table; moderately rapid permeability; organic deposit.	Unsuitable material; organic deposit.	Very high shrinkage when first drained; moderately rapid permeability; organic deposit at a depth of 1½ to 4 feet.	High intake rate; high available water capacity.	Level relief	Level relief.
Seasonal high water table; moderately rapid to rapid permeability.	Medium to high permeability; good stability.	Seasonal high water table; moderately rapid to rapid permeability.	Seasonal high water table; moderate available water capacity; moderate intake rate.	Nearly level relief.	Nearly level relief.
Seasonal high water table; slow permeability.	Low strength; moderate shrink-swell potential; high compressibility; poor workability and compaction characteristics.	Seasonal high water table; slow permeability; cuts unstable.	Seasonal high water table; very slow intake rate.	Clayey; medium erodibility.	Clayey; medium erodibility; hazard of siltation.
Slow permeability; seasonal high water table.	Low strength; moderate shrink-swell potential; high compressibility; poor workability and compaction characteristics.	Seasonal high water table; cuts unstable; slow permeability.	Moderate to high available water capacity; slow intake rate.	Clayey; medium erodibility.	Clayey; medium erodibility; hazard of siltation.
Exposed bedrock	Exposed bedrock	Exposed bedrock	Exposed bedrock	Exposed bedrock	Exposed bedrock.
Prolonged high water table; slow permeability.	Good stability; medium to low permeability.	Prolonged high water table; slow permeability.	Prolonged high water table.	Nearly level relief.	Nearly level relief.
Seasonal high water table; moderate permeability.	High erodibility; high piping potential; medium compressibility.	Subject to flooding; seasonal high water table; moderate permeability; unstable ditchbanks.	Subject to flooding; moderate intake rate; high available water capacity.	Subject to flooding; nearly level relief.	Subject to flooding; nearly level relief.
Variable permeability; prolonged high water table.	Variable material; prolonged high water table; subject to flooding.	Prolonged high water table; frequently flooded.	Prolonged high water table.	Nearly level relief.	Nearly level relief.
Moderately rapid to rapid permeability.	Medium to high permeability.	Well drained	High available water capacity; moderate intake rate.	Moderately rapid to rapid permeability; medium erodibility.	High available water capacity; medium erodibility.

TABLE 8.—*Engineering*

Soil series and map symbols	Suitability as source of—			Soil features affecting—
	Topsoil	Sand and gravel	Fill material	Highway location
Wassaic: WsA, WsB	Fair: coarse fragments.	Unsuited	Poor: bedrock at a depth of 1½ to 3½ feet.	Bedrock at a depth of 1½ to 3½ feet.
Wayland: Wy	Poor: poorly drained and very poorly drained.	Unsuited	Poor: poorly drained and very poorly drained.	Prolonged high water table; subject to flooding.

TABLE 9.—*Engineering*

[Tests performed by the New York State Department of Transportation, Soil Mechanics Bureau, in accordance with indicates no determination was made. All profiles are considered

Soil name and location	Parent material	SCS report No. S71 NY37	Depth from surface	Moisture-density data [1]			Linear shrinkage	Reaction	Organic matter [2]	Estimated coarse fragments greater than 3 inches
				Maximum dry density	Optimum moisture	In-place moisture content				
			Inches	*lb per cu ft*	*Percent*	*Percent*	*Percent*	*pH*	*Percent*	*Percent*
Alton gravelly sandy loam: Town of Gaines, 400 feet south of US Route 104 and 50 feet west of Kenyonville. This soil has a coarser textured subsoil than the modal.	Gravelly and sandy beach deposit.	10–1	0–10	123	9	12	3	5.6	4.1	---
		10–2	10–19	130	9	9	2	6.1	1.2	---
		10–3	19–38	130	9	7	1	6.5	.5	---
		10–4	38–50	118	11	7	---	6.7	---	---
		10–5	50–60	105	17	6	---	6.8	---	---
Bombay loam: Town of Barre, 4,200 feet east of New York Route 98 and 300 feet south of Delane-Steele Road. This is an included soil within an area of Hilton soil.	Strongly calcareous loamy till.	2–1	0–8	98	20	28	4	7.2	6.4	---
		2–2	8–14	104	17	28	2	7.2	4.0	1
		2–3	14–26	119	12	18	2	7.2	1.0	4
		2–4	26–32	124	10	14	1	7.2	---	3
		2–5	32–54	129	9	14	1	7.4	---	5
Cayuga silt loam: Town of Barre, 500 feet west of Drake Island Road and 50 feet north of Gillett Road.	Lacustrine silt and clay over loamy till.	1–1	0–8	110	15	22	4	5.2	2.4	1
		1–2	8–12	112	15	19	4	6.1	1.0	1
		1–3	12–25	111	17	20	7	6.7	.8	1
		1–4	25–32	124	11	13	2	7.7	---	1
		1–5	32–49	128	10	15	---	8.2	---	2
		1–6	49–60	132	7	12	1	8.3	---	2
Cazenovia silt loam: Town of Clarendon, 50 feet south of New York Route 31A and 10 feet west of Hindsburg Road.	Loamy glacial till.	5–1	0–10	102	19	27	4	6.7	5.2	2
		5–2	10–30	112	16	20	4	7.2	1.0	12
		5–3	30–53	116	14	19	4	7.2	---	30
Elnora loamy fine sand: Town of Kendall, 80 feet north of New York Route 18 and 150 feet west of Norway Road.	Lake-laid sand.	4–1	0–6	99	19	33	2	4.7	4.5	---
		4–2	6–18	107	15	28	---	5.6	1.6	---
		4–3	18–26	101	16	23	---	5.6	.6	---
		4–4	26–40	100	16	21	---	5.8	---	---
		4–5	40–50	100	16	21	---	6.5	---	---

interpretations—Continued

Soil features affecting—Continued					
Ponds		Agricultural drainage	Irrigation	Diversions	Waterways
Reservoir areas	Embankments				
Moderate permeability; bedrock at a depth of 1½ to 3½ feet.	Medium to low permeability; limited material because of rock at a depth of 1½ to 3½ feet.	Well drained to moderately well drained; bedrock at a depth of 1½ to 3½ feet.	Low to moderate available water capacity; moderate intake rate.	Bedrock at a depth of 1½ to 3½ feet.	Well drained to moderately well drained; low to moderate available water capacity; medium erodibility.
Prolonged high water table; slow permeability.	Prolonged high water table; low to medium permeability; medium compressibility; high erodibility.	Prolonged high water table; frequently flooded.	Prolonged high water table; frequently flooded.	Nearly level relief; prolonged high water table.	Prolonged high water table; frequently flooded; nearly level relief.

test data

procedures of the American Association of State Highway and Transportation Officials (AASHTO). Absence of an entry to be modal for series except Alton gravelly sandy loam and Wassaic loam]

Mechanical analysis [3]											Liquid limit	Plasticity index	Classification	
Percentage passing sieve—							Percentage smaller than—						AASHTO [4]	Unified [5]
3 inches	1½ inches	¾ inches	No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)	0.05 mm	0.02 mm	0.005 mm	0.002 mm				
											Percent			
100	98	91	64	52	34	21	17	9	4	2	---	[6] NP	A–1–b	SM
100	98	93	56	40	18	9	7	4	2	1	---	NP	A–1–a	SW–SM
100	99	89	41	25	14	7	6	3	2	1	---	NP	A–1–a	GW–GM
100	61	33	26	23	19	2	(')	---	---	---	---	NP	A–1–a	GP
---	---	---	100	98	73	3	(')	---	---	---	---	NP	A–3	SP
---	100	93	87	85	81	61	50	26	11	6	30	2	A–4	CL
100	98	96	92	89	84	62	49	24	9	4	25	3	A–4	ML
100	98	96	91	89	82	55	45	23	12	7	17	1	A–4	ML
100	89	85	77	73	65	45	35	14	7	4	17	0	A–4	SM
100	95	88	79	74	66	43	34	14	7	4	---	NP	A–4	SM
---	---	100	99	98	94	72	60	36	18	10	25	6	A–4	CL–ML
---	---	---	100	98	95	83	76	58	34	23	23	6	A–4	CL–ML
---	---	100	99	99	98	91	82	59	38	28	31	15	A–6	CL
100	98	91	81	75	67	45	36	17	9	7	16	1	A–4	SM
100	90	85	76	71	63	35	28	11	5	4	---	NP	A–2–4	SM
100	98	92	80	74	64	42	34	17	7	5	16	1	A–4	SM
100	96	93	87	86	82	68	58	35	19	10	36	10	A–4	ML
100	97	96	94	92	89	76	67	46	23	17	23	8	A–4	CL
100	85	92	87	85	81	66	54	32	19	13	21	4	A–4	CL–ML
---	---	100	99	98	94	33	26	11	5	2	---	NP	A–2–4	SM
---	---	---	100	98	93	28	22	8	5	2	---	NP	A–2–4	SM
---	---	---	---	100	99	32	22	6	4	2	---	NP	A–2–4	SM
---	---	---	---	100	99	27	20	6	5	2	---	NP	A–2–4	SM
---	---	---	---	100	99	29	21	4	4	2	---	NP	A–2–4	SM

TABLE 9.—*Engineering*

Soil name and location	Parent material	SCS report No. S71 NY37	Depth from surface	Moisture-density data [1]			Linear shrinkage	Reaction	Organic matter [2]	Estimated coarse fragments greater than 3 inches
				Maximum dry density	Optimum moisture	In-place moisture content				
			Inches	*lb per cu ft*	*Percent*	*Percent*	*Percent*	*pH*	*Percent*	*Percent*
Galen very fine sandy loam: Town of Ridgeway, approximately 1½ miles north of US Route 104 and 50 feet east of New York Route 63.	Lake-laid sand.	9–1	0–9	97	21	23	2	6.2	3.4	---
		9–2	9–20	105	14	23	---	6.3	.4	---
		9–3	20–32	105	14	23	---	6.0	.1	---
		9–4	32–47	111	14	23	---	5.7	.7	---
		9–5	47–55	108	15	26	---	5.6	---	---
Lockport silt loam: Town of Murray, approximately 1½ miles north of US Route 104 and 50 feet east of Norway Road.	Thin glacial till.	3–1	0–8	96	23	39	8	6.0	5.3	2
		3–3	12–25	108	18	23	8	6.0	.7	---
		3–4	25–31	119	13	19	6	6.4	---	---
Madrid loam: Town of Barre, 25 feet north of Maple Street and 700 feet west of Johnny Cake Lane.	Stony sandy loam till.	8–1	0–8	108	16	20	4	6.1	3.1	1
		8–2	8–17	113	14	20	1	6.3	1.7	---
		8–3	17–30	121	11	15	1	7.2	.4	---
		8–4	30–53	130	9	11	---	8.5	---	---
Odessa silt loam: Town of Barre, 500 yards north of Trench Road and 25 feet east of Shelby-Barre Townline Road.	Lacustrine silt and clay.	7–1	0–9	87	28	45	8	6.8	6.6	---
		7–3	13–27	104	20	28	8	6.8	1.1	---
		7–4	27–37	103	21	23	11	7.8	.5	---
		7–5	37–53	111	16	20	7	7.9	---	---
Wassaic loam: Town of Albion, 2,800 feet east of Culver Road and 20 feet south of New York Route 31A. This soil contains less clay in the subsoil than modal.	Thin loamy till.	6–1	0–8	109	15	20	3	6.2	3.4	2
		6–2	8–24	116	13	17	3	7.6	.9	3
		6–3	24–36	124	10	12	1	8.2	---	50

[1] Maximum dry density and optimum moisture based on AASHTO Designation T 99–57, Method C (*1*). In-place dry density based on ASTM Designation D 1556–64. In-place moisture content based on ASTM Designation D 2216–63T.

[2] Determined by wet combustion method—based on 1942 Cornell University agronomy test procedure as modified by the Soil Mechanics Bureau.

[3] Mechanical analyses according to the AASHTO Designation T 88.

very slowly permeable layer. The plant cover, conservation practices, and topography are not considered in hydrologic soil groups. Soils are classified into four groups, A through D.

A. Low runoff potential.—Soils having high infiltration rates even when thoroughly wetted, chiefly deep, well drained to excessively drained sand or gravel. The rate of water transmission is high, that is, water is readily transmitted through the soil.

B. Moderately low runoff potential.—Soils having moderate infiltration rates when thoroughly wetted, chiefly deep, moderately well drained to well drained, moderately fine textured to moderately coarse textured soils. These soils have a moderate rate of water transmission.

C. Moderately high runoff potential.—Soils having slow infiltration rates when thoroughly wetted, chiefly soils having a layer that impedes downward movement of water, soils having a moderately fine to fine texture, or soils having a moderately high water table. These soils may be somewhat poorly drained. They have a slow rate of water transmission.

D. High runoff potential.—Soils having very slow infiltration rates when thoroughly wetted, chiefly clays having a high swell potential, soils having a permanent high water table, soils having 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.

Depth to bedrock is measured from the surface of the soil to the upper surface of the rock layer.

test data—Continued

Mechanical analysis [3]											Liquid limit	Plasticity index	Classification	
Percentage passing sieve—							Percentage smaller than—							
3 inches	1½ inches	¾ inches	No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)	0.05 mm	0.02 mm	0.005 mm	0.002 mm			AASHTO [4]	Unified [5]
											Percent			
---	---	---	---	100	99	52	41	15	6	4	---	NP	A–4	ML
---	---	---	---	100	99	53	40	10	5	3	---	NP	A–4	ML
---	---	---	---	100	98	55	41	10	6	4	---	NP	A–4	ML
---	---	---	---	100	99	61	46	13	8	6	---	NP	A–4	ML
---	---	---	---	100	99	66	51	15	6	4	---	NP	A–4	ML
---	---	---	---	---	100	99	86	52	32	18	40	13	A–6	OL
---	---	---	---	100	99	97	87	65	48	38	35	16	A–6	CL
---	---	---	100	99	96	92	70	46	26	18	26	9	A–4	CL
---	100	97	90	88	83	61	50	26	10	4	24	1	A–4	ML
100	98	96	89	85	79	57	45	19	5	3	---	NP	A–4	ML
100	95	90	80	75	68	50	40	20	8	5	18	3	A–4	SM
100	86	77	68	63	56	37	29	11	4	3	15	0	A–4	GM
---	---	---	100	98	95	91	82	61	39	23	47	15	A–7–5	OL
---	---	---	---	---	100	99	95	85	55	40	39	20	A–6	CL
---	---	---	---	100	99	98	96	90	67	51	47	27	A–7–6	CL
---	---	---	---	---	---	99	94	85	47	33	32	14	A–6	CL
100	98	95	89	86	81	63	52	27	13	7	25	4	A–4	CL–ML
100	95	92	86	82	76	57	46	25	12	8	21	3	A–4	ML
100	94	86	74	69	62	44	35	13	6	4	17	1	A–4	SM

[4] Based on AASHTO Designation M 145–49 (*1*).
[5] Based on ASTM Stand. Designation D 2487 (*2*).
[6] NP = nonplastic.
[7] No hydrometer analyses performed on sands of less than 10 percent passing No. 200 sieve.

Depth to the seasonal high water table is the distance from the surface of the soil to the highest level that ground water reaches in the soil in most years. This level is largely determined by the mottling in the soil profile, as a result of oxidation and reduction.

Soil texture is described in table 7 in the standard terms used by the Department of Agriculture. These terms take into account relative percentages of sand, silt, and clay in soil particles that are less than 2 millimeters in diameter. *Loam,* for example, is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the soil contains particles coarser than sand, an appropriate modifier is added, for example, gravelly loamy sand.

Permeability is the quality that enables a soil to transmit water or air. It is estimated on the basis of those soil characteristics observed in the field, particularly structure and texture. The estimates in table 7 do not take into account lateral seepage or such transient soil features as plowpans and surface crusts. The estimated values represent the downward movement of water in a saturated soil through an individual soil horizon. Each soil horizon is rated independently of the other horizons.

Available water capacity is the ability of soils to hold water for use by plants. It is commonly defined as the difference between the amount of water in the soil at field capacity and the amount at the wilting point of plants.

Reaction is the degree of acidity or alkalinity of a soil expressed in pH values. The pH value and terms used to describe soil reaction are explained in the Glossary.

The K factor is the soil erodibility factor used in the Universal Soil Loss Equation. Values represent the norm or average for the particular horizon. The soil erodibility ratings are related to the K factors and indicate only relative erodibility potential. The ratings

and their respective K factors are as follows: low, 0.10 to 0.20; medium, 0.24 to 0.32; high, 0.37 to 0.49; and very high, 0.55 to 0.64.

Engineering interpretations of soils

The interpretations in table 8 are based on the estimated engineering properties of soils in table 7, on test data for soils in this survey area and others nearby or adjoining, and on the experience of engineers and soil scientists with the soils of Orleans County. In table 8, ratings summarize the suitability of the soil as a source of topsoil, sand and gravel, and fill material. The table also lists soil features that affect highways, ponds, agricultural drainage, irrigation, diversions, and waterways.

Topsoil is used for topdressing an area where vegetation is to be established and maintained. The suitability of a soil for use as topsoil is affected mainly by ease of working and spreading, natural fertility, and absence of substances toxic to plants. Suitability is also affected by the texture of the soil material and its content of stone fragments. Also considered in the ratings is the damage that will result in the area from which topsoil is taken.

Sand and gravel are used in great quantities in many kinds of construction. The ratings in table 8 provide guidance about where to look for probable sources. A soil rated as a good or fair source generally has a layer of sand or gravel at least 3 feet thick, the top of which is within a depth of 6 feet. The ratings do not take into account thickness of overburden, location of the water table, or other factors that affect excavation of the materials, and they do not indicate the quality of the deposit.

Fill material is used in depressions and in embankments for roads. The suitability ratings reflect the predicted performance of soil after it has been placed in a fill that has been properly compacted and provided with adequate drainage and the relative ease of excavating the material at borrow areas.

The soil features considered most significant for highway and road location are load-supporting capacity and stability of the subgrade, stability and erodibility of the cut slopes, wetness and flooding condition of the subgrade, and depth to bedrock. The stability of the subgrade materials relates to the compressibility and strength of the soil when loads or structures are placed in it. The stability of the cut slopes materials relates to the strength in resisting slope or sliding failure. The AASHTO and Unified classifications of the soil materials generally indicate the strength, load-supporting capacity, and workability.

Pond reservoir areas hold water behind a dam or embankment. Soils suitable for pond reservoirs generally have a low seepage potential or a high water table. Seepage potential is related to the soil permeability, the depth to the water table, and the depth and nature of the bedrock.

Pond embankments require soil materials that are resistant to seepage and piping and that have favorable stability, shrink-swell potential, shear strength, and compactibility. The stability of embankment materials relates to the internal strength in resisting sliding and deformation. An excessive amount of stones or organic material, for example, is an unfavorable factor.

Drainage of cropland and pasture is affected by such soil properties as permeability; texture; structure; depth to fragipan, rock, or other layers that influence rate of water movement; and depth to the water table. It is also affected by such properties as drainage, slope, stability of ditchbanks, susceptibility to stream overflow, salinity or alkalinity, and availability of outlets for drainage.

Irrigation is affected by such soil features as slope, susceptibility to stream overflow, water erosion or soil blowing, soil texture, content of stones, and depth of root zone. It is also affected by rate of water intake at the surface; permeability of soil layers below the surface layer, in fragipans or other layers that restrict movement of water; amount of water held available to plants; need for drainage; and depth to the water table or bedrock.

Terraces and diversions are embankments or ridges constructed across the slope to intercept runoff and seepage so that water soaks into the soil or flows slowly to a stable outlet. The suitability of a soil for terraces is affected by such soil features as uniformity and steepness of slope, depth to bedrock or other unfavorable material, presence of stones, permeability, resistance to water erosion, soil sloughing, and soil blowing. A soil suitable for these structures provides outlets for runoff and is not difficult to vegetate.

Waterway layout and construction are affected by such soil properties as texture, depth, erodibility of the soil material, presence of stones or rock outcrops, steepness of slopes, seepage, natural drainage, available water capacity, susceptibility to siltation, and the ease of establishing and maintaining vegetation.

Soil test data

Table 9 contains engineering test data for some of the major soils in Orleans County. These tests were made to help evaluate the soils for engineering purposes. The engineering classifications given are based on data obtained by mechanical analyses and by tests to determine liquid limits and plastic limits. The mechanical analyses were made by combined sieve and hydrometer methods.

Compaction, or moisture-density, data are important in earthwork. If a soil material is compacted at successively higher moisture content, under a compactive effort that remains constant, the density of the compacted material increases until the optimum moisture content is reached. Past that point, the density decreases as the moisture content increases. The highest dry density obtained in the compactive test is termed maximum dry density. As a rule, maximum strength of earthwork for the compactive effort applied is obtained if the soil is compacted to the maximum dry density.

Moisture content is the ratio of the weight of water contained in a soil to the dry weight of the soil. It is generally expressed as a percentage.

Linear shrinkage is the decrease in one dimension of the soil mass when the moisture content is reduced from the given value to the shrinkage limit. It is expressed as a percentage of the original dimension.

Liquid limit and plasticity index indicate the effect of water on the strength and consistency of soil material. As the moisture content of a clayey soil is increased from a dry state, the material changes from a semisolid to a plastic state. If the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material changes from the semisolid to the plastic state; and the liquid limit is the moisture content at which the soil material changes from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is plastic. The liquid limits and plasticity indexes in table 9 are based on tests of soil samples.

Engineering properties of geologic deposits

The following geologic deposits occur in Orleans County: glacial till, outwash, kame, esker, lacustrine, alluvial, and organic. The engineering significance of each geologic deposit is influenced to a great extent by its mode of deposition which, in turn, determines the texture of the material and the internal structure. Other influences are the position on the landscape and the height of the water table. In Orleans County the geologic deposits are divided into the following categories: Deep Till Deposits, Shallow Till Deposits, Stratified Coarse Grained Deposits, Stratified Fine Grained Deposits, and Organic Deposits.

DEEP TILL DEPOSITS

Deep till deposits are thick, unstratified, highly variable mixtures of all particle sizes ranging from rock fragments to clay. This material was scoured and transported from nearby sources by glacial ice and deposited as drumlins, ground moraines, and recessional moraines. Isolated lenses or pockets of sorted material can occur, especially in the recessional moraine deposits. Bedrock is commonly more than 5 feet beneath the soil surface, but in some small areas it is less deep or occurs as rock outcrop. The individual rock and mineral fragments in the soil generally reflect the kinds of bedrock in the area.

Soils formed in mixed deep till deposits are Appleton, Bombay, Cazenovia, Hilton, Lyons, Madrid, Massena, Ontario, Ovid, and Sun soils. Barre, Cayuga, and Churchville soils formed in lacustrine, fine grained material underlain by glacial till at a depth of 20 to 36 inches.

These soils are the most dense and compacted of the unconsolidated deposits in the county because most of the till has been subjected to the compactive weight of overriding ice. Most deep till soils are gently sloping to sloping, and many landscapes are of such slope that cut and fill earthwork is involved in most construction. The soils generally provide stable, relatively incompressible foundations for engineering works. Fill material from these deposits, when properly compacted, generally provides stable embankments. Steep cut slopes commonly are subject to surface sloughing and erosion.

SHALLOW TILL DEPOSITS

Shallow till deposits are unstratified mixtures of glacially transported materials deposited as a thin veneer over bedrock. The till is generally 2 to 5 feet thick. Rock outcrop is common in some areas. The landforms and topography are generally bedrock-controlled.

Soils formed in shallow till over limestone or sandstone bedrock are Farmington; Hilton, rock substratum; Kendaia and Appleton, rock substratum; Lyons, rock substratum; Newstead; Ontario, rock substratum; and Wassaic soils. Brockport; Cazenovia, shale substratum; Lairdsville; Lockport; Ovid, shale substratum; and Shale outcrop, steep, formed in shallow till or residual material over shale. Lakemont, shale substratum, formed in lacustrine, fine grained material over shale. Bedrock in Orleans County is described under the headings "Physiography, Relief, and Drainage" and "Geology."

Soils formed in shallow till deposits generally have adequate foundation strength for light structures. The primary engineering concerns, however, relate to the underlying bedrock and ground water conditions. The topography can be such that cut and fill earthwork is necessary for extensive engineering works. Generally the shale bedrock is softer and more deeply weathered than the limestone and sandstone bedrock, but in places harder lenses occur. Fill material is limited in quantity because the till is shallow over bedrock.

STRATIFIED COARSE GRAINED DEPOSITS

Stratified coarse grained deposits are dominantly gravel and sand sorted by glacial melt water into layered or stratified deposits. They occupy such geologic landforms as outwash plains and terraces, kames, eskers, beaches and bars, and the coarser parts of deltas and other lacustrine shore deposits. Strata within these deposits may be well sorted or poorly sorted and particle sizes range from cobbles to silt. The deposits are generally loose and porous, but in places particles are cemented.

Soils formed in gravelly deposits of outwash, kame, esker, or beach and bar origin are Alton, Fredon, Howard, Phelps, and Wampsville soils. Colonie, Elnora, and Junius soils formed in sandy deposits of deltaic origin.

Coarse grained deposits generally have relatively high strength. Because of their loose and porous nature, most of these deposits are not highly erodible but are subject to settlement when vibrated. Colonie, Elnora, and Junius soils, however, are susceptible to soil blowing if topsoil is removed. Junius soils, which have a large content of fine sand and a seasonal high water table, are susceptible to frost action.

These deposits of gravel and sand have many uses as construction material. Depending on gradation, soundness, and plasticity, they may be used for such purposes as—

1. Fill material for highway embankments.
2. Fill material for parking areas and developments.
3. Fill material to decrease stress on underlying soils so construction operations can progress.
4. Subbase for pavements.
5. Wearing surfaces for driveways, parking lots, and some roads.

6. Material for highway shoulders.
7. Free-draining backfill for structures and pipes.
8. Outside shells of dams for impounding water.
9. Slope protection blankets to drain and help stabilize wet cut slopes.
10. Sources of sand and gravel for general use.

STRATIFIED FINE GRAINED DEPOSITS

Stratified fine grained deposits consist of lacustrine fine grained sediment transported by glacial melt water and deposited in quiet glacial lakes and ponds. Some are flood plain soils on more recent slack water deposits. Distinct layers or laminations, generally of silt- and clay-sized particles, occur. Although these deposits are mostly silt, there is generally enough clay to make them plastic and sticky.

Soils formed in deep, lake-laid silt and clay deposits are Fonda, Lakemont, Madalin, Odessa, Rhinebeck, and Schoharie soils. Arkport, Galen, and Minoa soils are on the deeper fine sand and silt parts of deltas, and Canandaigua, Collamer, and Niagara soils are on the deep silt parts of deltas. Cheektowaga, Claverack, and Cosad soils formed in stratified, coarse grained material underlain by fine grained sediment at a depth of 20 to 40 inches. Hamlin, Teel, Udifluvents, frequently flooded, and Wayland soils are alluvial soils on flood plains.

Because of their fine texture and high moisture content, these deposits have relatively low strength. They are generally highly compressible, and settlement can occur over long periods. Soils that have a high content of silt and fine sand are less compressible, but they are highly erodible and susceptible to frost. Hamlin, Teel, and Wayland soils and Udifluvents, frequently flooded, are subject to inundation.

Fine grained deposits are difficult to use for engineering work, especially where the soils are flat, wet, and subject to ponding, such as Fonda, Lakemont, and Madalin soils. Sites for embankments and heavy structures or buildings on all soils formed in these finer sediments must be investigated for strength, settlement characteristics, and effects of ground water.

ORGANIC DEPOSITS

Organic deposits are mostly accumulations of plant and animal remains. In places they include a minimal amount of mineral soil. They are in very poorly drained depressions and bogs.

Carlisle and Palms soils and Fluvaquents and Humaquepts, ponded, are underlain by mineral soil at varying depths. Edwards and Martisco are underlain by marl at varying depths.

Soils in organic deposits are entirely unsuitable for foundations because they are weak and highly compressible. Generally the organic material should be removed to provide a base of suitable underlying material and then replaced with suitable backfill. Filling over organic deposits causes long-term settlement.

Town and Country Planning

This section is of special interest to developers, planners, and others concerned with community and industrial expansion in Orleans County. It is also of interest to those concerned with the encroachment of urban expansion into farming areas.

This section provides information on the properties of soils and their effect on selected nonfarm uses of land. It can help community planners, developers, and individual landowners to determine the most suitable use for a particular area. Additional information can be found on the soil maps and in other parts of this survey, particularly in the sections "Descriptions of the Soils" and "Engineering."

Table 10 lists the estimated degree and kinds of limitations of soils for selected uses. The limitations are expressed as *slight, moderate,* or *severe.* If the rating is *moderate* or *severe,* the main limiting property or properties are mentioned. The ratings are based on the degree of the greatest single limitation. For example, if flooding severely limits the use of a soil in the disposal of sewage effluent from septic tanks, the limitation is rated *severe,* even though the soil is well suited to that use in all other respects. A rating of *slight* indicates that the soil has no important limitation to the specific use. *Moderate* shows that the soil has some limitations to the specified use, but limitations can be overcome or corrected. A rating of *severe* indicates that the soil has serious limitations that are difficult to overcome. The rating, however, does not mean that the soil cannot be used as specified.

TABLE 10.—*Limitations of the soils for town and country planning*

Symbol and mapping unit	Dwellings with basements	Dwellings without basements	Local roads and streets	Septic tank absorption fields	Shallow excavations	Sanitary landfill (trenches)[1]
AlB—Alton gravelly sandy loam, 3 to 8 per- slopes.	Slight	Slight	Slight	Slight: pollu- tion hazard.	Severe: cut banks are subject to caving.	Severe: rapid permeability; pollution hazard.
AnA—Appleton silt loam, 0 to 3 percent slopes.	Severe: sea- sonal high water table.	Severe: sea- sonal high water table.	Moderate: sea- sonal high water table.	Severe: sea- sonal high water table; moderately slow or slow permeability.	Severe: sea- sonal high water table.	Severe: sea- sonal high water table.

TABLE 10.—*Limitations of the soils for town and country planning*—Continued

Symbol and mapping unit	Dwellings with basements	Dwellings without basements	Local roads and streets	Septic tank absorption fields	Shallow excavations	Sanitary landfill (trenches)[1]
AnB—Appleton silt loam, 3 to 8 percent slopes.	Severe: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table; moderately slow or slow permeability.	Severe: seasonal high water table.	Severe: seasonal high water table.
ArB—Arkport very fine sandy loam, 0 to 6 percent slopes.	Slight	Slight	Slight	Slight: pollution hazard.	Slight	Severe: moderately rapid permeability; pollution hazard.
ArC—Arkport very fine sandy loam, 6 to 12 percent slopes.	Moderate: slope.	Moderate: slope.	Moderate: slope.	Moderate: slope; pollution hazard.	Moderate: slope.	Severe: moderately rapid permeability; pollution hazard.
AsD—Arkport-Collamer complex, 6 to 20 percent slopes.	Severe: slope; seasonal high water table.	Severe: slope	Severe: slope	Severe: slope; seasonal high water table.	Severe: slope; seasonal high water table.	Severe: variable permeability; seasonal high water table.
Ba—Barre silt loam.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding; slow to very slow permeability.	Severe: prolonged high water table; ponding; clayey.	Severe: prolonged high water table; ponding; clayey.
BoA—Bombay fine sandy loam, 0 to 3 percent slopes.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Slight	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.
BoB—Bombay fine sandy loam, 3 to 8 percent slopes.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Slight	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.
BrA—Brockport silty clay loam, 0 to 2 percent slopes.	Severe: seasonal high water table; shale bedrock at a depth of 20 to 40 inches.	Severe: seasonal high water table.	Moderate: seasonal high water table; shale bedrock at a depth of 20 to 40 inches.	Severe: seasonal high water table; shale bedrock at a depth of 20 to 40 inches; very slow permeability.	Severe: seasonal high water table; shale bedrock at a depth of 20 to 40 inches.	Severe: seasonal high water table; shale bedrock at a depth of 20 to 40 inches.
BrB—Brockport silty clay loam, 2 to 6 percent slopes.	Severe: seasonal high water table; shale bedrock at a depth of 20 to 40 inches.	Severe: seasonal high water table.	Moderate: seasonal high water table; shale bedrock at a depth of 20 to 40 inches.	Severe: seasonal high water table; shale bedrock at a depth of 20 to 40 inches; very slow permeability.	Severe: seasonal high water table; shale bedrock at a depth of 20 to 40 inches.	Severe: seasonal high water table; shale bedrock at a depth of 20 to 40 inches.
BrC—Brockport silty clay loam, 6 to 12 percent slopes.	Severe: seasonal high water table; shale bedrock at a depth of 20 to 40 inches.	Severe: seasonal high water table.	Moderate: seasonal high water table; shale bedrock at a depth of 20 to 40 inches.	Severe: seasonal high water table; shale bedrock at a depth of 20 to 40 inches; very slow permeability.	Severe: seasonal high water table; shale bedrock at a depth of 20 to 40 inches.	Severe: seasonal high water table; shale bedrock at a depth of 20 to 40 inches.

TABLE 10.—*Limitations of the soils for town and country planning*—Continued

Symbol and mapping unit	Dwellings with basements	Dwellings without basements	Local roads and streets	Septic tank absorption fields	Shallow excavations	Sanitary landfill (trenches)[1]
Ca—Canandaigua soils.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.
Cb—Carlisle muck.	Severe: prolonged high water table; ponding; organic deposit.	Severe: prolonged high water table; ponding; organic deposit.	Severe: prolonged high water table; ponding; organic deposit.	Severe: prolonged high water table; ponding; organic deposit.	Severe: prolonged high water table; ponding; organic deposit.	Severe: prolonged high water table; ponding; organic deposit.
CcB—Cayuga silt loam, 2 to 6 percent slopes.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Moderate: frost action.	Severe: seasonal high water table; slow permeability.	Moderate: seasonal high water table.	Severe: seasonal high water table.
CeA—Cazenovia silt loam, 0 to 3 percent slopes.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Moderate: frost action.	Severe: seasonal high water table; slow permeability.	Moderate: seasonal high water table.	Severe: seasonal high water table.
CeB—Cazenovia silt loam, 3 to 8 percent slopes.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Moderate: frost action.	Severe: seasonal high water table; slow permeability.	Moderate: seasonal high water table.	Severe: seasonal high water table.
CfA—Cazenovia gravelly silt loam, shale substratum, 0 to 3 percent slopes.	Severe: seasonal high water table; shale bedrock at a depth of 3 to 6 feet.	Moderate: seasonal high water table.	Moderate: frost action.	Severe: seasonal high water table; slow permeability; shale bedrock at a depth of 3 to 6 feet.	Moderate: seasonal high water table.	Severe: seasonal high water table; shale bedrock at a depth of 3 to 6 feet.
CfB—Cazenovia gravelly silt loam, shale substratum, 3 to 8 percent slopes.	Severe: seasonal high water table; shale bedrock at a depth of 3 to 6 feet.	Moderate: seasonal high water table.	Moderate: frost action.	Severe: seasonal high water table; slow permeability; shale bedrock at a depth of 3 to 6 feet.	Moderate: seasonal high water table.	Severe: seasonal high water table; shale bedrock at a depth of 3 to 6 feet.
Cg—Cheektowaga fine sandy loam.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding; very slow permeability.	Severe: prolonged high water table; ponding; clayey below a depth of 2 to 3 feet.	Severe: prolonged high water table; ponding; clayey below a depth of 2 to 3 feet.
ChA—Churchville silt loam, 0 to 2 percent slopes.	Severe: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table; slow permeability.	Severe: seasonal high water table.	Severe: seasonal high water table.
ChB—Churchville silt loam, 2 to 6 percent slopes.	Severe: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table; slow permeability.	Severe: seasonal high water table.	Severe: seasonal high water table.
ClB—Claverack loamy fine sand, 0 to 6 percent slopes.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Slight	Severe: seasonal high water table; slow to very slow permeability.	Severe: loamy fine sand surface layer and subsoil.	Severe: seasonal high water table.

TABLE 10.—*Limitations of the soils for town and country planning*—Continued

Symbol and mapping unit	Dwellings with basements	Dwellings without basements	Local roads and streets	Septic tank absorption fields	Shallow excavations	Sanitary landfill (trenches)[1]
CmA—Collamer silt loam, 0 to 2 percent slopes.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Moderate: low strength.	Severe: seasonal high water table; moderately slow or slow permeability.	Severe: seasonal high water table.	Severe: seasonal high water table.
CmB—Collamer silt loam, 2 to 6 percent slopes.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Moderate: low strength.	Severe: seasonal high water table; moderately slow to very slow permeability.	Severe: seasonal high water table.	Severe: seasonal high water table.
CmC3—Collamer silt loam, 6 to 12 percent slopes, severely eroded.	Severe: seasonal high water table.	Moderate: seasonal high water table; slope.	Moderate: low strength; slope.	Severe: seasonal high water table; moderately slow to very slow permeability.	Severe: seasonal high water table.	Severe: seasonal high water table.
CoB—Colonie loamy fine sand, 0 to 6 percent slopes.	Slight	Slight	Slight	Slight: pollution hazard.	Severe: cut banks are subject to caving.	Severe: rapid permeability; pollution hazard.
CoC—Colonie loamy fine sand, 6 to 12 percent slopes.	Moderate: slope.	Moderate: slope.	Moderate: slope.	Moderate: slope; pollution hazard.	Severe: cut banks are subject to caving.	Severe: rapid permeability; pollution hazard.
Cs—Cosad loamy fine sand.	Severe: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table; slow permeability.	Severe: seasonal high water table; clayey below a depth of 24 inches.	Severe: seasonal high water table; clayey below a depth of 24 inches.
Ed—Edwards muck.	Severe: prolonged high water table; ponding; organic deposit.	Severe: prolonged high water table; ponding; organic deposit.	Severe: prolonged high water table; ponding; organic deposit.	Severe: prolonged high water table; ponding; organic deposit.	Severe: prolonged high water table; ponding; organic deposit.	Severe: prolonged high water table; ponding; organic deposit.
ElB—Elnora loamy fine sand, 0 to 6 percent slopes.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Slight	Severe: seasonal high water table.	Severe: seasonal high water table; cut banks are subject to caving.	Severe: rapid permeability; seasonal high water table.
FaB—Farmington silt loam, 0 to 8 percent slopes.	Severe: bedrock at a depth of 10 to 20 inches.	Severe: bedrock at a depth of 10 to 20 inches.	Severe: bedrock at a depth of 10 to 20 inches.	Severe: bedrock at a depth of 10 to 20 inches.	Severe: bedrock at a depth of 10 to 20 inches.	Severe: bedrock at a depth of 10 to 20 inches.
FaC—Farmington silt loam, 8 to 15 percent slopes.	Severe: bedrock at a depth of 10 to 20 inches.	Severe: bedrock at a depth of 10 to 20 inches.	Severe: bedrock at a depth of 10 to 20 inches.	Severe: bedrock at a depth of 10 to 20 inches.	Severe: bedrock at a depth of 10 to 20 inches.	Severe: bedrock at a depth of 10 to 20 inches.
FH—Fluvaquents and Humaquepts, ponded.[2]	Severe: ponding; prolonged high water table.	Severe: ponding; prolonged high water table.	Severe: ponding; prolonged high water table.	Severe: ponding; prolonged high water table.	Severe: ponding; prolonged high water table.	Severe: ponding; prolonged high water table.

TABLE 10.—*Limitations of the soils for town and country planning*—Continued

Symbol and mapping unit	Dwellings with basements	Dwellings without basements	Local roads and streets	Septic tank absorption fields	Shallow excavations	Sanitary landfill (trenches)[1]
Fo—Fonda mucky silt loam.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding; low strength.	Severe: prolonged high water table; ponding; slow permeability.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding; clayey.
Fr—Fredon loam.	Severe: prolonged high water table.	Severe: prolonged high water table.	Severe: prolonged high water table.	Severe: prolonged high water table.	Severe: prolonged high water table.	Severe: prolonged high water table; rapid permeability.
GaA—Galen very fine sandy loam, 0 to 2 percent slopes.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Slight	Severe: seasonal high water table.	Severe: seasonal high water table; cut banks are subject to caving.	Severe: seasonal high water table; moderately rapid permeability.
GaB—Galen very fine sandy loam, 2 to 6 percent slopes.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Slight	Severe: seasonal high water table.	Severe: seasonal high water table; cut banks are subject to caving.	Severe: seasonal high water table; moderately rapid permeability.
Ha—Hamlin silt loam.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
HbA—Hilton loam, 0 to 3 percent slopes.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Moderate: frost action.	Severe: seasonal high water table; slow permeability.	Severe: seasonal high water table.	Severe: seasonal high water table.
HbB—Hilton loam, 3 to 8 percent slopes.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Moderate: frost action.	Severe: seasonal high water table; slow permeability.	Severe: seasonal high water table.	Severe: seasonal high water table.
HcA—Hilton loam, rock substratum, 0 to 3 percent slopes.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Moderate: frost action.	Severe: seasonal high water table; slow permeability; bedrock at a depth of 3½ to 6 feet.	Severe: seasonal high water table.	Severe: seasonal high water table; bedrock at a depth of 3½ to 6 feet.
HcB—Hilton loam, rock substratum, 3 to 8 percent slopes.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Moderate: frost action.	Severe: seasonal high water table; slow permeability; bedrock at a depth of 3½ to 6 feet.	Severe: seasonal high water table.	Severe: seasonal high water table; bedrock at a depth of 3½ to 6 feet.
HnB—Hilton-Cazenovia stony silt loams, 0 to 8 percent slopes.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Moderate: frost action.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.
HoB—Howard gravelly loam, 3 to 8 percent slopes.	Slight	Slight	Slight	Slight: pollution hazard.	Severe: cut banks are subject to caving.	Severe: rapid permeability.

TABLE 10.—*Limitations of the soils for town and country planning*—Continued

Symbol and mapping unit	Dwellings with basements	Dwellings without basements	Local roads and streets	Septic tank absorption fields	Shallow excavations	Sanitary landfill (trenches)[1]
HpC—Howard soils, 8 to 25 percent slopes.	Severe: slope	Severe: slope	Severe: slope	Severe: slope; pollution hazard.	Severe: slope; cut banks are subject to caving.	Severe: rapid permeability.
Ju—Junius loamy fine sand.	Severe: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table; cut banks are subject to caving.	Severe: seasonal high water table; rapid permeability.
KaA—Kendaia and Appleton silt loams, rock substratum, 0 to 3 percent slopes.	Severe: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table; bedrock at a depth of 3½ to 6 feet.	Severe: seasonal high water table.	Severe: seasonal high water table; bedrock at a depth of 3½ to 6 feet.
LaB—Lairdsville silt loam, 0 to 6 percent slopes.	Severe: seasonal high water table; shale bedrock at a depth of 20 to 40 inches.	Moderate: seasonal high water table; shale bedrock at a depth of 20 to 40 inches.	Severe: low strength.	Severe: seasonal high water table; very slow permeability; shale bedrock at a depth of 20 to 40 inches.	Severe: seasonal high water table; shale bedrock at a depth of 20 to 40 inches; clayey.	Severe: seasonal high water table shale bedrock at a depth of 20 to 40 inches; clayey.
Lk—Lakemont silty clay loam.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding; low strength.	Severe: prolonged high water table; ponding; very slow permeability.	Severe: prolonged high water table; ponding; clayey.	Severe: prolonged high water table; ponding; clayey.
Lm—Lakemont silt loam, shale substratum.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding; low strength.	Severe: prolonged high water table; ponding; very slow permeability; shale bedrock at a depth of 3½ to 6 feet.	Severe: prolonged high water table; ponding; clayey.	Severe: prolonged high water table; ponding; clayey; shale bedrock at a depth of 3½ to 6 feet.
Ln—Lamson soils.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding; moderately rapid permeability.
Lo—Lockport silty clay loam.	Severe: seasonal high water table; shale bedrock at a depth of 20 to 40 inches.	Severe: seasonal high water table.	Moderate: seasonal high water table; shale bedrock at a depth of 20 to 40 inches.	Severe: seasonal high water table; very slow permeability; shale bedrock at a depth of 20 to 40 inches.	Severe: seasonal high water table; shale bedrock at a depth of 20 to 40 inches; clayey.	Severe: seasonal high water table; shale bedrock at a depth of 20 to 40 inches; clayey.
Ly—Lyons silt loam.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding; slow permeability.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.
Lz—Lyons silt loam, rock	Severe: prolonged high	Severe: prolonged high	Severe: prolonged high	Severe: prolonged high	Severe: prolonged high	Severe: prolonged high

TABLE 10.—*Limitations of the soils for town and country planning*—Continued

Symbol and mapping unit	Dwellings with basements	Dwellings without basements	Local roads and streets	Septic tank absorption fields	Shallow excavations	Sanitary landfill (trenches)[1]
substratum.	water table; ponding.	water table; ponding.	water table; ponding.	water table; ponding; slow permeability; hard bedrock at a depth of 3½ to 6 feet.	water table; ponding.	water table; ponding; hard bedrock at a depth of 3½ to 6 feet.
Ma—Madalin silt loam.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding; low strength.	Severe: prolonged high water table; ponding; slow to very slow permeability.	Severe: prolonged high water table; ponding; clayey.	Severe: prolonged high water table; ponding; clayey.
MdB—Madrid fine sandy loam, 3 to 8 percent slopes.	Slight	Slight	Slight	Slight	Slight	Slight.
MdC—Madrid fine sandy loam, 8 to 15 percent slopes.	Moderate: slope.	Moderate: slope.	Moderate: slope.	Moderate: slope.	Moderate: slope.	Slight.
Me—Martisco muck.	Severe: organic deposit; prolonged high water table; ponding.	Severe: organic deposit; prolonged high water table; ponding.	Severe: organic deposit; prolonged high water table; ponding.	Severe: organic deposit; prolonged high water table; ponding.	Severe: organic deposit; prolonged high water table; ponding.	Severe: organic deposit; prolonged high water table; ponding.
Mn—Massena fine sandy loam.	Severe: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table; moderately slow to slow permeability.	Severe: seasonal high water table.	Severe: seasonal high water table.
Mo—Minoa very fine sandy loam.	Severe: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table; moderately rapid permeability.
Ne—Newstead silt loam.	Severe: seasonal high water table; bedrock at a depth of 20 to 40 inches.	Severe: seasonal high water table.	Moderate: seasonal high water table; bedrock at a depth of 20 to 40 inches.	Severe: seasonal high water table; bedrock at a depth of 20 to 40 inches.	Severe: seasonal high water table; bedrock at a depth of 20 to 40 inches.	Severe: seasonal high water table; bedrock at a depth of 20 to 40 inches.
NgA—Niagara silt loam, 0 to 2 percent slopes.	Severe: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table; low strength.	Severe: seasonal high water table; moderately slow to slow permeability.	Severe: seasonal high water table.	Severe: seasonal high water table.
NgB—Niagara silt loam, 2 to 6 percent slopes.	Severe: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table; low strength.	Severe: seasonal high water table; moderately slow to slow permeability.	Severe: seasonal high water table.	Severe: seasonal high water table.
OdA—Odessa silt loam, 0 to 2 percent slopes.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: low strength.	Severe: seasonal high water table; slow to very slow permeability.	Severe: seasonal high water table; clayey.	Severe: seasonal high water table; clayey.

TABLE 10.—*Limitations of the soils for town and country planning*—Continued

Symbol and mapping unit	Dwellings with basements	Dwellings without basements	Local roads and streets	Septic tank absorption fields	Shallow excavations	Sanitary landfill (trenches)[1]
OdB—Odessa silt loam, 2 to 6 percent slopes.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: low strength.	Severe: seasonal high water table; slow to very slow permeability.	Severe: seasonal high water table; clayey.	Severe: seasonal high water table; clayey.
OnB—Ontario loam, 3 to 8 percent slopes.	Slight	Slight	Slight	Severe: slow permeability.	Slight	Slight.
OnC—Ontario loam, 8 to 15 percent slopes.	Moderate: slope.	Moderate: slope.	Moderate: slope.	Moderate: slope.	Moderate: slope.	Slight.
OoB—Ontario stony loam, 3 to 8 percent slopes.	Slight	Slight	Slight	Severe: slow permeability.	Slight	Slight.
OsC—Ontario very stony loam, 3 to 15 percent slopes.	Moderate: surface stones; slope.	Moderate: surface stones; slope.	Moderate: slope.	Severe: slow permeability.	Moderate: surface stones; slope.	Moderate: surface stones.
OtB—Ontario loam, rock substratum, 0 to 8 percent slopes.	Moderate: bedrock at a depth of 3½ to 6 feet.	Slight	Slight	Severe: slow permeability; bedrock at a depth of 3½ to 6 feet.	Moderate: bedrock at a depth of 3½ to 6 feet.	Severe: bedrock at a depth of 3½ to 6 feet.
OvA—Ovid silt loam, 0 to 3 percent slopes.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: frost action.	Severe: seasonal high water table; slow permeability.	Severe: seasonal high water table.	Severe: seasonal high water table.
OvB—Ovid silt loam, 3 to 8 percent slopes.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: frost action.	Severe: seasonal high water table; slow permeability.	Severe: seasonal high water table.	Severe: seasonal high water table.
OwA—Ovid silt loam, shale substratum, 0 to 4 percent slopes.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: frost action.	Severe: seasonal high water table; slow permeability; shale bedrock at a depth of 3½ to 6 feet.	Severe: seasonal high water table.	Severe: seasonal high water table; shale bedrock at a depth of 3½ to 6 feet.
Pm—Palms muck.	Severe: organic deposit; prolonged high water table; ponding.	Severe: organic deposit; prolonged high water table; ponding.	Severe: organic deposit; prolonged high water table; ponding.	Severe: organic deposit; prolonged high water table; ponding.	Severe: organic deposit; prolonged high water table; ponding.	Severe: organic deposit; prolonged high water table; ponding.
Pp—Phelps gravelly fine sandy loam.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Slight	Severe: seasonal high water table.	Severe: cut banks are subject to caving.	Severe: seasonal high water table; moderately rapid to rapid permeability.
RhA—Rhinebeck silt loam, 0 to 2 percent slopes.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: low strength.	Severe: seasonal high water table; slow permeability.	Severe: seasonal high water table; clayey.	Severe: seasonal high water table; clayey.

TABLE 10.—*Limitations of the soils for town and country planning*—Continued

Symbol and mapping unit	Dwellings with basements	Dwellings without basements	Local roads and streets	Septic tank absorption fields	Shallow excavations	Sanitary landfill (trenches)[1]
RhB—Rhinebeck silt loam, 2 to 6 percent slopes.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: low strength.	Severe: seasonal high water table; slow permeability.	Severe: seasonal high water table; clayey.	Severe: seasonal high water table; clayey.
ScB—Schoharie silt loam, 2 to 6 percent slopes.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: low strength.	Severe: seasonal high water table; slow permeability.	Severe: seasonal high water table; clayey.	Severe: seasonal high water table; clayey.
ShE—Shale outcrop, steep.	Severe: bare rock; slope.	Severe: bare rock; slope.	Severe: bare rock; slope.	Severe: bare rock; slope.	Severe: bare rock; slope.	Severe: bare rock; slope.
Su—Sun silt loam.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding; slow permeability.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.
Te—Teel silt loam.	Severe: subject to flooding; seasonal high water table.	Severe: subject to flooding; seasonal high water table.	Severe: subject to flooding.	Severe: subject to flooding; seasonal high water table.	Severe: subject to flooding; seasonal high water table.	Severe: subject to flooding; seasonal high water table.
UD—Udifluvents, frequently flooded.	Severe: subject to frequent flooding; prolonged high water table.	Severe: subject to frequent flooding; prolonged high water table.	Severe: subject to frequent flooding; prolonged high water table.	Severe: subject to frequent flooding; prolonged high water table.	Severe: subject to frequent flooding; prolonged high water table.	Severe: subject to frequent flooding; prolonged high water table.
WmB—Wampsville gravelly loam, 3 to 8 percent slopes.	Slight	Slight	Slight	Slight: pollution hazard.	Moderate: gravelly.	Severe: rapid permeability.
WsA—Wassaic silt loam, 0 to 3 percent slopes.	Severe: bedrock at a depth of 20 to 40 inches.	Moderate: bedrock at a depth of 20 to 40 inches.	Moderate: bedrock at a depth of 20 to 40 inches.	Severe: bedrock at a depth of 20 to 40 inches.	Severe: bedrock at a depth of 20 to 40 inches.	Severe: bedrock at a depth of 20 to 40 inches.
WsB—Wassaic silt loam, 3 to 8 percent slopes.	Severe: bedrock at a depth of 20 to 40 inches.	Moderate: bedrock at a depth of 20 to 40 inches.	Moderate: bedrock at a depth of 20 to 40 inches.	Severe: bedrock at a depth of 20 to 40 inches.	Severe: bedrock at a depth of 20 to 40 inches.	Severe: bedrock at a depth of 20 to 40 inches.
Wy—Wayland silt loam.	Severe: frequent flooding; prolonged high water table.	Severe: frequent flooding; prolonged high water table.	Severe: frequent flooding; prolonged high water table.	Severe: frequent flooding; prolonged high water table.	Severe: frequent flooding; prolonged high water table.	Severe: frequent flooding; prolonged high water table.

[1] Onsite study is needed of the underlying strata, the water table, and the hazards of aquifer pollution and drainage into ground water in landfill deeper than 5 or 6 feet.
[2] Fresh water marsh.

In the following paragraphs are the properties considered in rating the limitations for each of the uses given in table 10.

Dwellings with basements.—The soils are rated for use as foundations for homes or other buildings of three stories or less with basements. The main features considered are depth to a seasonal or prolonged high water table, slope, depth to bedrock, stoniness, and the hazard of flooding. Slope is considered primarily for subdivision development, and it is less restrictive for isolated buildings on large lots. Problems of sewage disposal, water supply, stabilization, or maintenance of plant cover or access roads are not considered in the rating.

Dwellings without basements.—Ratings are the same as for dwellings with basements except for depth to

bedrock and depth to a seasonal high water table, neither of which is considered as a limiting factor for dwellings without basements.

Local roads and streets.—Local roads and streets have an all-weather surface expected to carry automobile traffic all year. They have a subgrade of underlying soil material; a base consisting of gravel, crushed rock, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly of asphalt or concrete. These roads are graded to shed water and have ordinary provisions for drainage. They are built mainly from the soil at hand, and most cuts and fills are less than 6 feet deep.

Soil properties that most affect design and construction of roads and streets are load-supporting capacity and stability of the subgrade and the workability and quantity of cut and fill material available.

The AASHTO and Unified classifications of the soil material and the shrink-swell potential indicate traffic-supporting capacity. Wetness and flooding affect stability of the material. Slope, depth to hard rock, content of stones and rocks, and wetness affect ease of excavation and amount of cut and fill needed to reach an even grade.

Septic tank absorption fields.—It is assumed that the soils are to be used as drainage fields for disposal of effluent from adequately designed and installed septic tank systems. Source of water, whether from individual or community systems, is not considered in the ratings. If septic waste is a possible pollution hazard to wells, springs, streams, or lakes, the hazard is noted in the rating.

Shallow excavations.—Shallow excavations are those that require digging or trenching to a depth of less than 6 feet, such as excavations for pipelines, sewer lines, phone and power transmission lines, basements, open ditches, and cemeteries. Desirable soil properties are good workability, moderate resistance to sloughing, gentle slopes, absence of rock outcrop or big stones, and freedom from flooding or a high water table.

Sanitary landfill (trenches).—This is a method of disposing of refuse. The waste is spread in thin layers, compacted, and covered with soil throughout the disposal period. Landfill areas are subject to heavy vehicular traffic. Some soil properties that affect suitability for landfill are ease of excavation, hazard of polluting ground water, and trafficability. The best soils have moderately slow permeability, withstand heavy traffic, are friable, and are easy to excavate. Unless otherwise stated, the ratings in table 10 apply only to a depth of about 6 feet, and, therefore, limitation ratings of *slight* or *moderate* may not be valid if trenches are to be much deeper. Every site should be investigated before it is selected.

Recreation

This section contains information about the suitability of soils for outdoor recreational facilities. The information does not preclude the need for more detailed onsite investigations. The sections "General Soil Map," "Descriptions of the Soils," and "Engineering" contain additional information useful in planning the use and development of outdoor recreation sites.

Table 11 gives the estimated degree and kind of limitation for each soil for specified recreational uses. The limitations are rated *slight, moderate,* or *severe.* If the rating is estimated to be *moderate* or *severe,* the soil feature affecting the limitation is named. Considered in the ratings were depth to water table, wetness and natural drainage, depth to bedrock, steepness of slope, permeability, surface stoniness, surface rockiness, surface texture, and the hazard of flooding from stream overflow.

A rating *of slight* indicates that the soil has few or no limitations and is considered desirable for the specified use. A rating of *moderate* indicates that the soil has one or more limitations that generally can be overcome or corrected. A rating of *severe* indicates that the soil is seriously limited by a hazard or restriction that is difficult to overcome. The rating does not imply, however, that a soil cannot be used as specified.

TABLE 11.—*Limitations of the soils for recreation*

Symbol and mapping unit	Lawns, landscaping, and golf fairways [1]	Picnic areas	Camp areas	Paths and trails	Athletic fields
AlB—Alton gravelly sandy loam, 3 to 8 percent slopes.	Moderate: gravelly surface layer.	Slight	Slight	Slight	Moderate: gravelly surface layer; slope.
AnA—Appleton silt loam, 0 to 3 percent slopes.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.
AnB—Appleton silt loam, 3 to 8 percent slopes.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.
ArB—Arkport very fine sandy loam, 0 to 6 percent slopes.	Slight	Slight	Slight	Slight	Moderate: slope.
ArC—Arkport very fine sandy loam, 6 to 12 percent slopes.	Moderate: slope	Moderate: slope	Moderate: slope	Slight	Severe: slope.

TABLE 11.—*Limitations of the soils for recreation*—Continued

Symbol and mapping unit	Lawns, landscaping, and golf fairways[1]	Picnic areas	Camp areas	Paths and trails	Athletic fields
AsD—Arkport-Collamer complex, 6 to 20 percent slopes.	Severe: slope	Severe: slope	Severe: slope	Moderate: slope	Severe: slope.
Ba—Barre silt loam	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.
BoA—Bombay fine sandy loam, 0 to 3 percent slopes.	Slight	Slight	Moderate: seasonal high water table.	Slight	Moderate: seasonal high water table.
BoB—Bombay fine sandy loam, 3 to 8 percent slopes.	Slight	Slight	Moderate: seasonal high water table.	Slight	Moderate: seasonal high water table; slope.
BrA—Brockport silty clay loam, 0 to 2 percent slopes.	Moderate: seasonal high water table; shale bedrock at a depth of 20 to 40 inches.	Moderate: seasonal high water table.	Severe: seasonal high water table; very slow permeability.	Moderate: seasonal high water table.	Severe: seasonal high water table.
BrB—Brockport silty clay loam, 2 to 6 percent slopes.	Moderate: seasonal high water table; shale bedrock at a depth of 20 to 40 inches.	Moderate: seasonal high water table.	Severe: seasonal high water table; very slow permeability.	Moderate: seasonal high water table.	Severe: seasonal high water table.
BrC—Brockport silty clay loam, 6 to 12 percent slopes.	Moderate: seasonal high water table; shale bedrock at a depth of 20 to 40 inches; slope.	Moderate: seasonal high water table; slope.	Severe: seasonal high water table; very slow permeability.	Moderate: seasonal high water table.	Severe: seasonal high water table; slope.
Ca—Canandaigua soils.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.
Cb—Carlisle muck	Severe: organic deposit; prolonged high water table; ponding.	Severe: organic deposit; prolonged high water table; ponding.	Severe: organic deposit; prolonged high water table; ponding.	Severe: organic deposit; prolonged high water table; ponding.	Severe: organic deposit; prolonged high water table; ponding.
CcB—Cayuga silt loam, 2 to 6 percent slopes.	Slight	Slight	Moderate: slow permeability; seasonal high water table.	Slight	Moderate: slow permeability; slope; seasonal high water table.
CeA—Cazenovia silt loam, 0 to 3 percent slopes.	Slight	Slight	Moderate: moderately slow to slow permeability; seasonal high water table.	Slight	Moderate: moderately slow to slow permeability; seasonal high water table.
CeB—Cazenovia silt loam, 3 to 8 percent slopes.	Slight	Slight	Moderate: moderately slow to slow permeability; seasonal high water table.	Slight	Moderate: moderately slow to slow permeability; seasonal high water table; slope.
CfA—Cazenovia gravelly silt loam, shale substratum, 0 to 3 percent slopes.	Moderate: gravelly surface layer.	Moderate: gravelly surface layer.	Moderate: moderately slow to slow permeability; seasonal high water table.	Slight	Severe: gravelly surface layer.
CfB—Cazenovia gravelly silt loam, shale substratum, 3 to 8	Moderate: gravelly surface layer.	Moderate: gravelly surface layer.	Moderate: moderately slow to slow permeability;	Slight	Severe: gravelly surface layer.

TABLE 11.—*Limitations of the soils for recreation*—Continued

Symbol and mapping unit	Lawns, landscaping, and golf fairways [1]	Picnic areas	Camp areas	Paths and trails	Athletic fields
percent slopes.			seasonal high water table.		
Cg—Cheektowaga fine sandy loam.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.
ChA—Churchville silt loam, 0 to 2 percent slopes.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.
ChB—Churchville silt loam, 2 to 6 percent slopes.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.
ClB—Claverack loamy fine sand, 0 to 6 percent slopes.	Severe: loamy fine sand surface layer.	Moderate: loamy fine sand surface layer; seasonal high water table.	Moderate: seasonal high water table; loamy fine sand surface layer.	Moderate: loamy fine sand surface layer.	Moderate: seasonal high water table; loamy fine sand surface layer; slope.
CmA—Collamer silt loam, 0 to 2 percent slopes.	Slight	Slight	Moderate: seasonal high water table; slow to moderately slow permeability.	Slight	Moderate: seasonal high water table; slow to moderately slow permeability.
CmB—Collamer silt loam, 2 to 6 percent slopes.	Slight	Slight	Moderate: seasonal high water table; slow to moderately slow permeability.	Slight	Moderate: seasonal high water table; slow to moderately slow permeability; slope.
CmC3—Collamer silt loam, 6 to 12 percent slopes, severely eroded.	Moderate: slope	Moderate: slope	Moderate: seasonal high water table; slow to moderately slow permeability; slope.	Slight	Severe: slope.
CoB—Colonie loamy fine sand, 0 to 6 percent slopes.	Severe: loamy fine sand surface layer.	Moderate: loamy fine sand surface layer.	Moderate: loamy fine sand surface layer.	Moderate: loamy fine sand surface layer.	Moderate: loamy fine sand surface layer.
CoC—Colonie loamy fine sand, 6 to 12 percent slopes.	Severe: loamy fine sand surface layer.	Moderate: loamy fine sand surface layer; slope.	Moderate: loamy fine sand surface layer; slope.	Moderate: loamy fine sand surface layer.	Severe: slope.
Cs—Cosad loamy fine sand.	Moderate: seasonal high water table; loamy fine sand surface layer.	Moderate: seasonal high water table; loamy fine sand surface layer.	Severe: seasonal high water table.	Moderate: seasonal high water table; loamy fine sand surface layer.	Severe: seasonal high water table.
Ed—Edwards muck	Severe: organic deposit; prolonged high water table.	Severe: organic deposit; prolonged high water table.	Severe: organic deposit; prolonged high water table.	Severe: organic deposit; prolonged high water table.	Severe: organic deposit; prolonged high water table.
ElB—Elnora loamy fine sand, 0 to 6 percent slopes.	Severe: loamy fine sand surface layer.	Moderate: loamy fine sand surface layer.	Moderate: loamy fine sand surface layer.	Moderate: loamy fine sand surface layer.	Moderate: loamy fine sand surface layer.
FaB—Farmington silt loam, 0 to 8 percent slopes.	Severe: bedrock at a depth of 10 to 20 inches.	Slight	Slight	Slight	Severe: bedrock at depth of 10 to 20 inches.
FaC—Farmington silt loam, 8 to 15 percent slopes.	Severe: bedrock at a depth of 10 to 20 inches.	Moderate: slope	Moderate: slope	Slight	Severe: bedrock at a depth of 10 to 20 inches.
FH—Fluvaquents and Humaquepts, ponded.[2]	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.

TABLE 11.—*Limitations of the soils for recreation*—Continued

Symbol and mapping unit	Lawns, landscaping, and golf fairways [1]	Picnic areas	Camp areas	Paths and trails	Athletic fields
Fo—Fonda mucky silt loam.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.
Fr—Fredon loam	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.
GaA—Galen very fine sandy loam, 0 to 2 percent slopes.	Slight	Slight	Moderate: seasonal high water table.	Slight	Moderate: seasonal high water table.
GaB—Galen very fine sandy loam, 2 to 6 percent slopes.	Slight	Slight	Moderate: seasonal high water table.	Slight	Moderate: seasonal high water table.
Ha—Hamlin silt loam.	Moderate: subject to flooding.	Moderate: subject to flooding.	Severe: subject to flooding.	Slight	Moderate: subject to flooding.
HbA—Hilton loam, 0 to 3 percent slopes.	Slight	Slight	Moderate: seasonal high water table; slow permeability.	Slight	Moderate: seasonal high water table; slow permeability.
HbB—Hilton loam, 3 to 8 percent slopes.	Slight	Slight	Moderate: seasonal high water table; slow permeability.	Slight	Moderate: seasonal high water table; slow permeability; slope.
HcA—Hilton loam, rock substratum, 0 to 3 percent slopes.	Slight	Slight	Moderate: seasonal high water table; slow permeability.	Slight	Moderate: seasonal high water table; slow permeability.
HcB—Hilton loam, rock substratum, 3 to 8 percent slopes.	Slight	Slight	Moderate: seasonal high water table; slow permeability.	Slight	Moderate: seasonal high water table; slow permeability; slope.
HnB—Hilton-Cazenovia stony silt loams, 0 to 8 percent slopes.	Slight	Slight	Moderate: seasonal high water table; slow permeability.	Slight	Moderate: seasonal high water table; slow permeability; surface stones.
HoB—Howard gravelly loam, 3 to 8 percent slopes.	Moderate: gravelly surface layer.	Slight	Slight	Slight	Severe: gravelly surface layer.
HpC—Howard soils, 8 to 25 percent slopes.	Severe: slope	Severe: slope	Severe: slope	Moderate: slope	Severe: slope.
Ju—Junius loamy fine sand.	Severe: loamy fine sand surface layer.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.
KaA—Kendaia and Appleton silt loams, rock substratum, 0 to 3 percent slopes.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.
LaB—Lairdsville silt loam, 0 to 6 percent slopes.	Moderate: shale bedrock at a depth of 20 to 40 inches.	Slight	Severe: very slow permeability.	Slight	Severe: very slow permeability.
Lk—Lakemont silty clay loam.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.
Lm—Lakemont silt loam, shale substratum.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.

TABLE 11.—*Limitations of the soils for recreation*—Continued

Symbol and mapping unit	Lawns, landscaping, and golf fairways [1]	Picnic areas	Camp areas	Paths and trails	Athletic fields
Ln—Lamson soils	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.
Lo—Lockport silty clay loam.	Moderate: seasonal high water table; shale bedrock at a depth of 20 to 40 inches.	Moderate: seasonal high water table.	Severe: seasonal high water table; very slow permeability.	Moderate: seasonal high water table.	Severe: seasonal high water table; very slow permeability.
Ly—Lyons silt loam	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.
Lz—Lyons silt loam, rock substratum.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.
Ma—Madalin silt loam.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.
MdB—Madrid fine sandy loam, 3 to 8 percent slopes.	Slight	Slight	Slight	Slight	Moderate: slope.
MdC—Madrid fine sandy loam, 8 to 15 percent slopes.	Moderate: slope	Moderate: slope	Moderate: slope	Slight	Severe: slope.
Me—Martisco muck	Severe: organic deposit; prolonged high water table; ponding.	Severe: organic deposit; prolonged high ponding.	Severe: organic deposit; prolonged high water table; ponding.	Severe: organic deposit; prolonged high water table; ponding.	Severe: organic deposit; prolonged high water table; ponding.
Mn—Massena fine sandy loam.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.
Mo—Minoa very fine sandy loam.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.
Ne—Newstead silt loam.	Moderate: seasonal high water table; bedrock at a depth of 20 to 40 inches.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.
NgA—Niagara silt loam, 0 to 2 percent slopes.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.
NgB—Niagara silt loam, 2 to 6 percent slopes.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.
OdA—Odessa silt loam, 0 to 2 percent slopes.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.
OdB—Odessa silt loam, 2 to 6 percent slopes.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.
OnB—Ontario loam, 3 to 8 percent slopes.	Slight	Slight	Slight	Slight	Moderate: slope.
OnC—Ontario loam, 8 to 15 percent slopes.	Moderate: slope	Moderate: slope	Moderate: slope	Slight	Severe: slope.

TABLE 11.—*Limitations of the soils for recreation*—Continued

Symbol and mapping unit	Lawns, landscaping, and golf fairways [1]	Picnic areas	Camp areas	Paths and trails	Athletic fields
OoB—Ontario stony loam, 3 to 8 percent slopes.	Slight	Slight	Slight	Slight	Moderate: slope; surface stones.
OsC—Ontario very stony loam, 3 to 15 percent slopes.	Severe: surface stones.	Slight	Moderate: surface stones; slope.	Moderate: surface stones.	Severe: surface stones; slope.
OtB—Ontario loam, rock substratum, 0 to 8 percent slopes.	Slight	Slight	Slight	Slight	Moderate: slope.
OvA—Ovid silt loam, 0 to 3 percent slopes.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.
OvB—Ovid silt loam, 3 to 8 percent slopes.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.
OwA—Ovid silt loam, shale substratum, 0 to 4 percent slopes.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.
Pm—Palms muck	Severe: organic deposit; prolonged high water table; ponding.	Severe: organic deposit; prolonged high water table; ponding.	Severe: organic deposit; prolonged high water table; ponding.	Severe: organic deposit; prolonged high water table; ponding.	Severe: organic deposit; prolonged high water table; ponding.
Pp—Phelps gravelly fine sandy loam.	Moderate: gravelly surface layer.	Slight	Moderate: seasonal high water table.	Slight	Moderate: seasonal high water table; gravelly surface layer.
RhA—Rhinebeck silt loam, 0 to 2 percent slopes.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.
RhB—Rhinebeck silt loam, 2 to 6 percent slopes.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.
ScB—Schoharie silt loam, 2 to 6 percent slopes.	Slight	Slight	Moderate: slow permeability; seasonal high water table.	Slight	Moderate: slow permeability; seasonal high water table; slope.
ShE—Shale outcrop, steep.	Severe: bare rock; slope.	Severe: bare rock; slope.	Severe: bare rock; slope.	Severe: bare rock; slope.	Severe: bare rock; slope.
Su—Sun silt loam	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.	Severe: prolonged high water table; ponding.
Te—Teel silt loam	Moderate: subject to flooding; seasonal high water table.	Moderate: subject to flooding; seasonal high water table.	Severe: subject to flooding.	Slight	Moderate: subject to flooding.
UD—Udifluvents, frequently flooded.[3]	Severe: subject to frequent flooding; prolonged high water table.	Severe: subject to frequent flooding; prolonged high water table.	Severe: subject to frequent flooding; prolonged high water table.	Severe: subject to frequent flooding; prolonged high water table.	Severe: subject to frequent flooding; prolonged high water table.
WmB—Wampsville gravelly loam, 3 to 8 percent slopes.	Moderate: gravelly surface layer.	Slight	Slight	Slight	Moderate: gravelly surface layer; slope.
WsA—Wassaic silt loam, 0 to 3 percent slopes.	Moderate: bedrock at a depth of 20 to 40 inches.	Slight	Slight	Slight	Moderate: bedrock at a depth of 20 to 40 inches.

TABLE 11.—*Limitations of the soils for recreation*—Continued

Symbol and mapping unit	Lawns, landscaping, and golf fairways [1]	Picnic areas	Camp areas	Paths and trails	Athletic fields
WsB—Wassaic silt loam, 3 to 8 percent slopes.	Moderate: bedrock at a depth of 20 to 40 inches.	Slight	Slight	Slight	Moderate: bedrock at a depth of 20 to 40 inches; slope.
Wy—Wayland silt loam.	Severe: subject to frequent flooding; prolonged high water table.	Severe: subject to frequent flooding; prolonged high water table.	Severe: subject to frequent flooding; prolonged high water table.	Severe: subject to frequent flooding; prolonged high water table.	Severe: subject to frequent flooding; prolonged high water table.

[1] Lawns and landscaping are considered as being a part of town and country planning.
[2] Fresh water marsh.
[3] Alluvial land.

The recreational uses for which soils are rated in table 11 are defined in the following paragraphs.

Lawns, landscaping, and golf fairways.—Among the soil properties that determine the suitability of soils for lawns and golf fairways are depth to seasonal or prolonged high water table, slope, depth to bedrock, surface texture, stoniness, and the hazard of flooding. Importation of fill or topsoil is not considered in the ratings, and traps or roughs are not considered as part of the fairway. Deep, well drained or moderately well drained soils that have a medium textured or moderately coarse textured surface layer and that are no more than moderately sloping are well suited to these uses.

Picnic areas.—These are park-type picnic areas that have provisions for tables and fireplaces for large numbers of people. It is assumed that most vehicular traffic is confined to access roads. These areas are left essentially in their natural state. Problems of water supply and sewage disposal are not considered in the rating. The soil properties considered are depth to seasonal high water table, slope, depth to bedrock, surface stoniness, surface texture, and the hazard of flooding during the period of heavy use.

Camp areas.—These are areas that are used intensively for tents and small camp trailers and associated activities of outdoor living. Little preparation of the site is required other than shaping and leveling for tent and parking areas. Camp areas are subject to heavy foot traffic and limited vehicular traffic. The soil features considered in the ratings are the hazard of flooding or ponding, depth to seasonal high water table, surface texture, slope, surface stoniness, and permeability.

Paths and trails.—These are areas used for local and cross country travel by foot or horseback. Design or layout should require little or no cutting or filling. The rating does not consider esthetic features or accessibility, which may be more important than soil features. The soil features considered in the ratings are the hazard of flooding or ponding, depth to seasonal high water table, surface texture, slope, and surface stoniness.

Athletic fields.—These are areas used intensively for baseball, football, tennis, and similar sports. Areas selected for these uses must be nearly level, have good drainage, and have a favorable surface texture. Importation of fill material or topsoil is not considered in the ratings.

Formation, Morphology, and Classification of the Soils

Soils are formed through the interaction of five major factors: climate, plant and animal life, parent material, relief, and time. The relative influence of each factor generally varies from place to place. Local variations in soils are the result of differences in kind of parent material and in relief and drainage. In places, one factor may dominate the formation of a soil and determine most of its properties.

Factors of Soil Formation

The five factors of soil formation, as they relate to the formation of soils in Orleans County, are explained in the following paragraphs.

Climate

Climate, particularly temperature and precipitation, is one of the most influential soil-forming factors. To a large degree, climate determines the weathering of mineral materials. It also affects the growth of vegetation and the leaching and translocation of weathered materials. In Orleans County the climate was cool and humid during the period of soil formation, which promoted the accumulation of organic matter in the surface layer of the soils. More detailed information on climate is given in the section "General Nature of the County."

Plant and animal life

All living organisms, including plants, animals, bacteria, and fungi, are important in the formation of soils. The kinds and amounts of vegetation are generally responsible for the organic-matter content and the color of the surface layer and for the amount of plant nutrients in the soils. Animals, such as earthworms, cicada, and burrowing animals, help keep the soil open and porous. Bacteria and fungi decompose the vegetation, and decomposition releases plant nutrients. In Orleans County, the native forests have had more

influence on soil formation than any other living organism.

By clearing the forests and cultivating the land, man has also greatly influenced the changes that occur in soils. He has added fertilizer, mixed some soil horizons, and even moved soil materials from place to place.

Parent material

Parent material is the unconsolidated masses in which the soil forms. It determines the mineralogical and chemical composition of the soil and, to a large extent, the rate at which the soil forms.

Most of the materials in which the soils formed were left after the glaciers melted, 10,000 to 15,000 years ago. In Orleans County soils formed in till, outwash, glaciolacustrine materials, recent stream alluvium, and organic materials. Soils formed in till are the most extensive in the county and have a wide range of characteristics. Ontario, Hilton, Appleton, and Sun soils are examples. Alluvial and organic material are of recent origin and are being deposited at the present time. Soils formed in outwash are generally loamy and commonly are underlain by stratified sand and gravel. Howard and Phelps soils are examples.

Soils formed in lacustrine materials have a surface layer that ranges from loamy fine sand to silty clay loam. Colonie, Elnora, and Claverack soils are examples of soils formed in coarse textured lacustrine material. Schoharie, Odessa, and Lakemont soils are examples of soils formed in fine textured lacustrine material. Soils on the stream bottoms formed in waterlaid material called recent alluvium. They are medium textured and have little or no soil development. Hamlin and Wayland soils are examples. Soils formed in organic materials are Carlisle, Edwards, Martisco, and Palms soils. Table 12 shows the relationship between position, parent material, and natural drainage in the soils of Orleans County, by soil series.

TABLE 12.—*Soil catenas in Orleans County*

Parent material	Well drained	Moderately well drained	Somewhat poorly drained	Poorly drained	Very poorly drained
SOILS ON FLOOD PLAINS					
Medium textured alluvial sediments mainly from limestone, sandstone, and shale.	Hamlin	Teel	Teel	Wayland	Wayland.
SOILS ON DELTAS AND LAKE PLAINS					
Medium textured deposits dominated by fine and very fine sand.	Arkport	Galen	Minoa	Lamson	Lamson.
Sandy deposits dominated by fine sand.	Colonie	Elnora	Junius		
Sandy deposits 20 to 40 inches thick over clayey sediments.	Claverack	Claverack	Cosad	Cheektowaga	Cheektowaga.
Medium textured deposits		Collamer	Niagara	Canandaigua	Canandaigua.
Clayey, reddish deposits	Schoharie	Schoharie	Odessa	Lakemont	Lakemont.
Clayey, grayish deposits			Rhinebeck	Madalin	Madalin.
Clayey deposits; no clay accumulation in subsoil.					Fonda.
SOILS ON OUTWASH TERRACES AND BEACHES					
Medium textured, gravelly, stratified deposits; 18 to 35 percent clay in subsoil.	Wampsville				
Medium textured and moderately coarse textured, gravelly, stratified deposits; clay accumulation in subsoil.	Howard	Phelps			
Medium textured and moderately coarse textured, gravelly, stratified deposits; no clay accumulation in subsoil.	Alton		Fredon	Fredon	
SOILS ON TILL PLAINS					
Deep, medium textured glacial till; 18 to 27 percent clay in subsoil.	Ontario	Hilton	Appleton	Lyons	Lyons.

TABLE 12.—*Soil catenas in Orleans County*—Continued

Parent material	Well drained	Moderately well drained	Somewhat poorly drained	Poorly drained	Very poorly drained
Deep, medium textured glacial till; no clay accumulation in subsoil.	----------	----------	Kendaia	----------	----------
Deep, medium textured and moderately coarse textured glacial till; less than 18 percent clay in subsoil.	Madrid	Bombay	Massena	Sun	Sun.
Deep, moderately fine textured and medium textured glacial till and lake sediments mainly from limestone and shale.	Cazenovia	Cazenovia	Ovid	----------	----------
Fine textured lacustrine deposits 20 to 40 inches thick over deep glacial till.	Cayuga	Cayuga	Churchville	Barre	Barre.
Moderately deep, medium textured glacial till over limestone or sandstone.	Wassaic	Wassaic	Newstead	----------	----------
Moderately deep, reddish, clayey glacial till over shale.	Lairdsville	Lairdsville	Lockport	----------	----------
Moderately deep, olive, clayey glacial till over shale.	----------	----------	Brockport	----------	----------
Shallow, medium textured glacial till over limestone or sandstone.	Farmington	----------	----------	----------	----------
SOILS ON BOGS					
Organic soils formed in deposits of organic material derived from plant remains:					
Deep	----------	----------	----------	----------	Carlisle.
Moderately deep over loamy material.	----------	----------	----------	----------	Palms.
Moderately deep over marl	----------	----------	----------	----------	Edwards.
Shallow over marl	----------	----------	----------	----------	Martisco.

Relief

The shape of the land surface, or lay of the land, the slope, and the position of the parent material in relation to the water table have influenced the formation of soils in the county. Soils that formed in sloping areas where runoff is moderate to rapid generally are well drained and have a bright colored, unmottled subsoil. In most places, these soils are leached to greater depths than wetter soils in the same general area. In more gently sloping areas where runoff is slower, the soils generally show some evidence of wetness, such as mottling in the subsoil. In level areas or in slight depressions where the water table is at or near the surface for long periods, the soils show evidence of wetness to a marked degree. These soils have a dark colored, thick, organic surface layer and a strongly mottled or grayish subsoil. Some soils, however, are wet because of a high water table or because of their position on the landscape. The permeability of the soil material and the length, steepness, and configuration of the slopes also influence the drainage of soils in different areas. Local differences in the soils are largely the result of differences in parent material and relief.

Time

The formation of soils requires time for changes to take place in the parent materials. The period of time is generally long if measured in years. The soils of Orleans County formed since glaciation, 10,000 to 15,000 years ago. Evidence of this relatively limited period of time can be seen in the soils. Soils formed

on low bottoms, subject to varying degrees of overflow, can receive new sediments with each flooding. These soils have only weak soil structure and weak differences in color between horizons. Hamlin soils are an example. Soils that have well-developed soil horizons, such as Ontario soils, have been forming for longer periods than the Hamlin soils.

Morphology of Soils

The results of the soil-forming factors can be distinguished by the different layers, or soil horizons, seen in a soil profile. The soil profile extends from the surface layer downward to materials that are little altered by the soil-forming processes.

Most soils contain three major horizons, namely the A, B, and C horizons. These major horizons can be further divided by the use of letters and numbers to indicate changes within the major horizon. An example is the B2t horizon. It represents a layer within the B horizon that contains translocated clay moved from the A horizon.

The A horizon is the surface layer. This is the layer that has the largest accumulation of organic matter, and it is called an A1 or Ap horizon. It is also the layer of maximum leaching or eluviation of clay and iron. If considerable leaching has taken place, an A2 horizon is formed. The A2 horizon of some soils in Orleans County is brownish because of the oxidation of iron.

The B horizon underlies the A horizon and is commonly called the subsoil. It is the horizon of maximum accumulation, or illuviation, of clay, iron, aluminum, or other substances leached from the A horizon. In some soils, the B horizon is formed by alteration in place rather than by illuviation. The alteration may be caused by oxidation and reduction of iron or by weathering of clay minerals. The B horizon has blocky or prismatic structure and and is generally firmer and lighter colored than the A horizon but darker colored than the C horizon.

The C horizon is below the A or B horizon. It consists of material that is little altered by the soil-forming processes, but it is modified by weathering in some places.

Several processes are involved in the formation of soil horizons in the soils of Orleans County. Among these are the accumulation of organic matter, the leaching of soluble salts, the formation and translocation of clay minerals, and the reduction and transfer of iron. These processes are continually taking place at the same time throughout the profile. The processes are very slow and have been going on for thousands of years.

The accumulation of organic matter takes place with the decomposition of plant residue. This process darkens the surface layer and helps to form the A1 horizon. If organic matter is lost, a long time is required to replace it. The surface layer of the soils in Orleans County has an average organic-matter content of about 3.5 percent.

For soils to have distinct horizons, it is believed that some of the lime and other soluble salts are leached before the translocation of clay minerals. Among the many factors that affect this leaching are the kinds of salts originally present, the depth to which the soil solution percolates, and the texture of the soil profile.

The most important process in the formation of horizons in the soils of Orleans County is the formation and translocation of silicate clay minerals. The amount of clay minerals in a soil profile depends on the parent materials, but amounts of clay vary from one soil horizon to another. Clay minerals are generally eluviated from the A horizon and illuviated in the B horizon as clay films on the ped faces and in the pores and root channels. In some soils an A2 horizon forms when considerable clay minerals are eluviated to the B horizon. The A2 horizon is light colored and has a platy structure in some profiles. In Ontario soils clay minerals have been translocated from the A horizon to the B.

The reduction and transfer of iron occurs mainly in the wetter, more poorly drained soils. This process is called gleying. Moderately well drained to somewhat poorly drained soils have yellowish brown and reddish brown mottles that indicate the segregation of iron. Canandaigua, Lakemont, Sun, and similar poorly drained and very poorly drained soils have a grayish colored subsoil that indicates reduction and transfer of iron.

Classification of Soils

Soils are classified so that we can more easily remember their significant characteristics. Classification enables us to assemble knowledge about the soils, to see their relationship to one another and to the whole environment, and to develop principles that help us to understand their behavior and their response to manipulation. First through classification and then through use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

The narrow categories of classification, such as those used in detailed soil surveys, allow us to organize and then apply knowledge about soils to managing farms, fields, and woodlands; to developing rural areas; and to studying and comparing large areas such as countries and continents.

The system of soil classification currently used (*9*) was adopted by the National Cooperative Soil Survey in 1965. Because this system is under continual study, readers interested in developments of the current system should refer to the latest literature available (*6*).[7]

The current system of classification has six categories. Beginning with the broadest, these categories are the order, the suborder, the great group, the subgroup, the family, and the series. The criteria used as a basis for classification are soil properties that are observable and measurable, but the properties are chosen so that the soils of similar genesis, or mode of origin, are grouped. In table 13, the soil series of Orleans County are classified according to the current

[7] Also see the unpublished working document, *Preliminary, Abridged Text Soil Taxonomy.* It is ordinarily available in the Soil Conservation Service State Office and is a good source of information on current soil classification.

system. Classes of the current system are briefly described in the following paragraphs.

ORDER.—Ten soil orders are recognized. The properties used to differentiate soil orders are those that tend to give broad climatic groupings of soils. The two exceptions to this are Entisols and Histosols, which occur in many different climates. Each order is named with a word of three or four syllables ending in *sol* (Hist-o-sol).

SUBORDER.—Each order is divided into suborders, primarily on the basis of those soil characteristics that indicate the greatest genetic similarity. The suborders narrow the broad climatic range in the orders. The soil properties used to separate suborders are mainly those that reflect either the presence or absence of waterlogging or soil differences resulting from the climate or vegetation. The names of suborders have two syllables. The last syllable indicates the order. An example is *Saprist* (*Sapr,* meaning highly decomposed plant materials, and *ist,* from *Histosol.*

GREAT GROUP.—Soil suborders are divided into great groups on the basis of uniformity in the kinds and sequence of major soil horizons and features. The horizons used to differentiate great groups are those in which clay, iron, or humus has accumulated; those that have pans that interfere with growth of roots, movement of water, or both; and thick, dark colored surface horizons. The features used are the self-mulching properties of clay, soil temperature, major differences in chemical composition (mainly calcium, magnesium, sodium, and potassium), dark red and dark brown colors associated with basic rocks, and similar features. The names of great groups have three or four syllables and are formed by adding a prefix to the name of the suborder. An example is *Medisaprists* (*Med,* meaning a soil of midlatitudes, *sapr* for highly decomposed, and *ist* from *Histosols.*

SUBGROUP.—Great groups are divided into subgroups, one representing the central (typic) segment of the group, and others called intergrades that have properties of the group and also one or more properties of another great group, suborder, or order. Subgroups may also be made in those instances where soil properties intergrade outside the range of any other great group, suborder, or order. The names of subgroups are formed by placing one or more adjectives before the name of the great group. An example is Typic Medisaprists (a typical Medisaprist).

FAMILY.—Families are established within a subgroup primarily on the basis of properties important to plant growth or on the behavior of soils when used for engineering. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence. A family name consists of a series of adjectives preceding the subgroup name. The adjectives are the class names for texture, mineralogy, and so on, that are used as family differentiae, as in table 13. An example is the *euic, mesic* family of Typic Medisaprists.

SERIES.—Series are collections of soils essentially uniform in differentiating characteristics and in arrangement of horizons. They are defined on morphological characteristics below plow depth. Soils of the same series that have contrasting surface textures are designated as phases of that series. Among the differentiating characteristics that separate soil series are arrangement of horizons, color, structure, texture, reaction, consistence, coarse fragments, mottling, and mineralogical and chemical composition.

As soil scientists increase their knowledge about soil genesis and morphology, it becomes necessary to revise established soil series and to create new series where necessary. A proposed new series has tentative status until it has been reviewed at the State, regional, and national levels of responsibility for soil classification. All of the soil series described in this publication are established series.

Laboratory data for profiles of the Arkport, Colonie, Hilton, and Lockport series sampled in Orleans County are published in Soil Survey Investigations Report Number 25, New York. This report is available in most Soil Conservation Service field offices in New York and in the State office at Syracuse.

General Nature of the County

Orleans County was established as a separate political unit when it was set off from Genesee County on November 11, 1824 (*7*). It was named for the French Royal House of Orleans. The territory originally was part of the domain of the Seneca Indians. Additional land was obtained from Genesee County on April 5, 1825, when the town of Shelby was annexed and the present boundaries established. The earliest settlers emigrated chiefly from the New England States, eastern New York, and Pennsylvania.

A tremendous impetus to farming and settlement of the land resulted with the construction of the Erie Barge Canal. In November 1825, when the canal was opened from Buffalo to Troy, the economic condition of the county underwent a marked change as ready markets for farm products were made available in other parts of the State and in foreign countries. When the canal became navigable, Albion, Holley, Knowlesville, Medina, and many other small villages were built on its banks. As the land was cleared and drained, many peach and apple orchards were planted.

Medina, Albion, and Holley are the principal villages. Their respective populations according to the 1970 census are 6,415, 5,122, and 1,868. Albion, the county seat, is in the central part of the county.

The rural population is evenly distributed, except for some influence from the growing Rochester metropolitan area in the towns of Clarendon, Murray, and Kendall. In 1880, the rural population was 26,496, or 87.9 percent of the total for the county; since that time, however, population in the towns and villages has increased, and the number of people in rural areas has gradually decreased. The Federal Census for 1970 reports a total county population of 37,305. Of this total, the villages of Medina, Albion, Holley, and Lyndonville make up 14,293, or 38 percent of the county total.

TABLE 13.—*Soil series classified according to the current system*

Series	Family	Subgroup	Order
Alton	Loamy-skeletal, mixed, mesic	Dystric Eutrochrepts	Inceptisols.
Appleton	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Arkport	Coarse-loamy, mixed, mesic	Psammentic Hapludalfs	Alfisols.
Barre	Fine, illitic, mesic	Udollic Ochraqualfs	Alfisols.
Bombay	Coarse-loamy, mixed, mesic	Glossoboric Hapludalfs	Alfisols.
Brockport	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols.
Canandaigua	Fine-silty, mixed, nonacid, mesic	Mollic Haplaquepts	Inceptisols.
Carlisle	Euic, mesic	Typic Medisaprists	Histosols.
Cayuga	Fine, illitic, mesic	Glossoboric Hapludalfs	Alfisols.
Cazenovia	Fine-loamy, mixed, mesic	Glossoboric Hapludalfs	Alfisols.
Cheektowaga	Sandy over clayey, mixed, mesic	Typic Haplaquolls	Mollisols.
Churchville	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols.
Claverack	Sandy over clayey, mixed, nonacid, mesic	Aquic Udorthents	Entisols.
Collamer	Fine-silty, mixed, mesic	Glossoboric Hapludalfs	Alfisols.
Colonie	Mixed, mesic	Alfic Udipsamments	Entisols.
Cosad	Sandy over clayey, mixed, nonacid, mesic	Aquic Udorthents	Entisols.
Edwards [1]	Marly, euic, mesic	Limnic Medisaprists	Histosols.
Elnora	Mixed, mesic	Aquic Udipsamments	Entisols.
Farmington	Loamy, mixed, mesic	Lithic Eutrochrepts	Inceptisols.
Fonda	Fine, illitic, nonacid, mesic	Mollic Haplaquepts	Inceptisols.
Fredon	Coarse-loamy over sandy or sandy-skeletal, mixed, nonacid, mesic.	Aeric Haplaquepts	Inceptisols.
Galen	Coarse-loamy, mixed, mesic	Psammentic Hapludalfs	Alfisols.
Hamlin	Coarse-silty, mixed, mesic	Dystric Fluventic Eutrochrepts	Inceptisols.
Hilton	Fine-loamy, mixed, mesic	Glossoboric Hapludalfs	Alfisols.
Howard [1]	Loamy-skeletal, mixed, mesic	Glossoboric Hapludalfs	Alfisols.
Junius	Mixed, mesic	Typic Psammaquents	Entisols.
Kendaia	Fine-loamy, mixed, nonacid, mesic	Aeric Haplaquepts	Inceptisols.
Lairdsville	Fine, illitic, mesic	Typic Hapludalfs	Alfisols.
Lakemont	Fine, illitic, mesic	Udollic Ochraqualfs	Alfisols.
Lamson	Coarse-loamy, mixed, nonacid, mesic	Aeric Haplaquepts	Inceptisols.
Lockport	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols.
Lyons	Fine-loamy, mixed, nonacid, mesic	Mollic Haplaquepts	Inceptisols.
Madalin	Fine, illitic, mesic	Mollic Ochraqualfs	Alfisols.
Madrid	Coarse-loamy, mixed, mesic	Glossoboric Hapludalfs	Alfisols.
Martisco	Fine-silty, carbonatic, mesic	Histic Humaquepts	Inceptisols.
Massena	Coarse-loamy, mixed, nonacid, mesic	Aeric Haplaquepts	Inceptisols.
Minoa	Coarse-loamy, mixed, mesic	Aquic Dystric Eutrochrepts	Inceptisols.
Newstead	Coarse-loamy, mixed, nonacid, mesic	Aeric Haplaquepts	Inceptisols.
Niagara	Fine-silty, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Odessa	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols.
Ontario	Fine-loamy, mixed, mesic	Glossoboric Hapludalfs	Alfisols.
Ovid	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Palms	Loamy, mixed, euic, mesic	Terric Medisaprists	Histosols.
Phelps [1]	Fine-loamy over sandy or sandy-skeltal, mixed, mesic	Glossaquic Hapludalfs	Alfisols.
Rhinebeck	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols.
Schoharie	Fine, illitic, mesic	Typic Hapludalfs	Alfisols.
Sun	Coarse-loamy, mixed, nonacid, mesic	Aeric Haplaquepts	Inceptisols.
Teel	Coarse-silty, mixed, mesic	Fluvaquentic Eutrochrepts	Inceptisols.
Wampsville	Fine-loamy, mixed, mesic	Glossoboric Hapludalfs	Alfisols.
Wassaic	Fine-loamy, mixed, mesic	Glossoboric Hapludalfs	Alfisols.
Wayland	Fine-silty, mixed, nonacid, mesic	Mollic Fluvaquents	Entisols.

[1] These soils are taxadjuncts to the series. They are outside the defined range for the series in the following respects:

Edwards soils have a mineral layer more than 12 inches thick with an upper boundary within the control section but below the IIIca layer.

Howard soils have less than 35 percent coarse fragments in the particle-size control section.

Phelps soils have subhorizons of sandy loam in the B horizon and have less than 18 percent clay in that part of the particle-size control section above the sand and gravel.

Climate [8]

Orleans County has a climate classified as humid-continental. It is governed primarily by atmospheric flow and weather systems moving from various parts of the North American continent. Generous amounts of moisture are carried to this region from the Gulf of Mexico and the Atlantic Ocean by the major circulation patterns of the atmosphere. The weather is warm and occasionally humid if airflow is from the south or southwest and dry and cold if prevailing winds are from the north or northwest. A secondary influence on the climate is exerted by air masses of moderate, maritime characteristics, which occasionally reach the area from the Atlantic Ocean.

Table 14 gives temperature and precipitation data for Orleans County. Summers are pleasantly warm.

[8] By A. BOYD PACK, senior research associate, Division of Atmospheric Sciences, Department of Agronomy, Cornell University, Ithaca, New York.

Winters are long and cold. Severe cold occurs only occasionally. The colder months have frequent periods of cloudy, unsettled weather. On the average, precipitation is evenly distributed during the year, but a slight minimum in monthly amounts occurs in winter. Summer rainfall from thundershowers is reduced by the moderating influence of the cool waters of the nearby Great Lakes.

Orleans County is affected by most weather systems as they move northeasterly across the continent or up the Atlantic Coast from lower latitudes. The result is a variety of weather. Temperature and other atmospheric conditions generally undergo noticeable change within a few days. The weather during a given week is commonly quite different on the average from that during the preceding or following week. Seasonal weather as a rule differs from one year to the next.

The climate is greatly influenced by Lakes Ontario and Erie. In spring the cold lake waters function as a heat sink, and the normal warming of the air temperature is retarded. Vegetative growth is thus delayed, and tender crops must be aided in passing safely through critical periods of freezing temperatures. The lakes tend to restrict the occurrence of extreme high temperatures in summer. In autumn the lake waters function as a heat source. Cooling at night is consequently reduced, and the length of the freeze-free growing season is increased. Lake Ontario and to a lesser extent Lake Erie remain largely unfrozen in winter, thus modifying the occurrence of extreme cold temperatures in comparison with more inland areas of similar elevation and latitude.

In winter a temperature of 0° F or colder may be expected on an average of 2 to 4 days near Lake Ontario and on 5 or 6 days in more inland sections of Orleans County. Extreme minimums of 15° to 20° below zero have been recorded, but in most winters the coldest temperatures range between 0° and 10° below zero.

Daytime maximum temperatures in summer generally range from the mid 70's to the low 80's. Temperatures of 90° or higher occur on an average of 10 days per year in southern sections of the county, but on less than 5 days in shore areas in the north. Long periods of high temperatures and high humidity are not common.

The freeze-free season averages approximately 170 days in much of Orleans County, but extends to about 180 days in the vicinity of Lake Ontario. The average date of the last freeze in spring is about May 1 in the northern half of the county, but is delayed until May 10 in the southern border areas. The average date of the first freeze in fall is October 15 in most sections, but extends to about October 20 near the lake.

Orleans County is one of New York State's three areas of relatively light precipitation. The average annual total varies from 29 inches in the northern third of the county to 32 inches in the southern third. During the May–September part of the growing season, precipitation averages 13 to 14 inches. By comparison, most of New York State averages 16 inches or more during the same 5 months. Precipitation, however, is normally adequate in amount and distribution to support diversified farming and to maintain water resources. Severe droughts are rare, but in most growing seasons there are temporary periods of deficient soil moisture.

The amount of winter snowfall varies considerably. The average annual total ranges from 45 to 50 inches in the northwest corner of the county to 70 to 75 inches in the southeastern quarter. The seasonal total may range from less than 36 inches up to 95 inches. Lake Ontario is an important factor in the snow climate of the county. Airflow across open waters of the lake frequently results in substantial snowfall over a wide area and very heavy amounts in narrow, localized bands. Orleans County, however, is less subject to very heavy lake-effect snowfalls than are counties to the east along Lake Ontario.

Persistent cloudiness late in fall and in winter is characteristic of the climate, and during this period the amount of sunshine received averages only 25 to 35 percent of the maximum possible. In summer, however, the average is 65 to 70 percent of the possible sunshine.

Geology

The soils in Orleans County formed in parent material of glacial origin and reflect the lithology and mineralogy of the local bedrock. The final event that deposited glacial material was the Wisconsin glaciation. As the glacier moved southwestward, it scoured and picked up older glacial deposits, bedrock, and soil and finally deposited unconsolidated material as the glacier melted and receded.

Of the various types of glacial deposits, the most common that occurs and influences soil formation is glacial till. Till is a heterogeneous mixture of particles carried and deposited directly from the glacier and preconsolidated by the glacier. After the ice sheet made its farthest advance and receding began, melt water poured from the ice mass and carried with it the eroded material. The resulting features are kames, eskers, terraces, and outwash plains, each containing stratified outwash and fluvial deposits. A good example of outwash material is in the Pine Hill area, north of West Barre.

The soils of Orleans County as related to their parent material and origin are shown in table 12.

The finer material, such as silt and clay, settled out in small and large bodies of water. It is called lacustrine deposits. Where a lake, such as postglacial Lake Tonawanda (*5*), overflowed into another large lake, such as Lake Iroquois, a delta was formed by a stream dumping its suspended load at the mouth of a lake. A good example of this is the large, sandy area between Ridgeway and Lyndonville. Occasionally a lake remained for a long period and built up a distinctive shoreline. Gravel deposited by glacial Lake Iroquois is a good example of an old shoreline, now the site of Ridge Road (U.S. Highway 104). The area north of Ridge Road was occupied by glacial Lake Iroquois. The many cobblestone areas near the Lake Iroquois beach were formed by the incessant movement of the waves near the shoreline.

During one of the earlier glacial periods, the entire county was covered by glacial Lake Lundy. This lake

TABLE 14.—*Temperature and precipitation*

[Data recorded at Albion]

Month	Temperature				Precipitation				
			7 years in 10 will have—			3 years in 10 will have—		Snow	
	Average daily maximum	Average daily minimum	Minimum equal to or higher than—	Maximum equal to or lower than—	Average total	More than—	Less than—	Average monthly total	7 years in 10 will have more than—
	°F	°F	°F	°F	Inches	Inches	Inches	Inches	Inches
January	32	17	46	1	2.0	2.3	1.6	17	11
February	33	18	50	2	1.9	2.4	1.4	14	9
March	42	25	58	13	2.2	2.7	1.7	9	4
April	56	36	74	26	2.9	3.4	2.5	3	1
May	67	45	80	33	3.1	3.8	2.3	(1)	0
June	78	56	90	44	2.7	3.6	1.7	0	0
July	83	60	90	50	2.9	3.4	2.0	0	0
August	81	59	90	47	2.8	3.8	1.9	0	0
September	74	52	87	39	3.0	3.5	2.0	0	0
October	63	43	79	31	2.5	3.6	1.4	(1)	0
November	48	33	65	21	3.1	3.8	2.2	5	2
December	36	23	57	7	2.3	2.6	1.9	13	8
Year	58	39	93	−1	31.4	33.5	28.5	61	55

[1] Trace.

is responsible for much of the reddish lake sediment. Among soils that formed principally in these lake sediments are Odessa, Lakemont, and Schoharie soils. Much of the reddish glacial till area was modified by these lake sediments. Somewhat later, the present swampy areas in the southern part of the county were covered by glacial Lake Tonawanda. This lake received deposits of olive and brownish sediments. The olive sediments underlie most of the muck soils, such as Carlisle and Palms soils. The last large lake to disappear was glacial Lake Iroquois. The water that covered the area north of Ridge Road (U.S. Highway 104) was relatively shallow. In many areas are Lockport, Lairdsville, Hilton, Appleton, Cazenovia, and Ovid soils. The deepest water of Lake Iroquois that covered the present land surface was near the present shoreline of Lake Ontario. Consequently, the soil areas near Lake Ontario have deeper lake sediments. Some of these deeper sediments contain lacustrine soils, such as Collamer, Niagara, and Rhinebeck soils.

The following bedrock formations occur in Orleans County: Queenston Shale in the northern half of the county; Medina and Clinton Groups (Rochester Shale) in a narrow band through the center of the county; and Lockport and Salina Groups in the southern part. Queenston Shale is well exposed in the spillway areas of former glacial Lake Tonawanda. The major areas are along Oak Orchard Creek between Medina and Waterport and along Sandy Creek north of Holley. Rochester Shale is well exposed in a road cut south of the hamlet of Fancher. Lockport dolomitic limestone is exposed along Oak Orchard Creek near the hamlet of Shelby and near an escarpment area near the hamlet of Clarendon. As the glacier rode over the Niagara escarpment, it plucked large boulders and rock fragments, and many of these large fragments were deposited a short distance south of the escarpment area. Some of the soils, especially the rock substratum and stony phases of Ontario and Hilton soils, contain these large fragments buried in the soil or lying on the surface. Good examples of these stony areas are near the hamlet of Manning and adjacent to the swampy areas in the southern part of Orleans County.

Physiography, Relief, and Drainage

Orleans County lies within the Lake States fruit, truck, and dairy region. This region is made up of several plains, including the Ontario-Mohawk Plain. In Orleans County, the Ontario-Mohawk plain is separated into three parts, which are referred to as the northern, central, and southern plains.

The northern plain is a moderately flat or undulating plain that has no abrupt or sudden changes in relief. The shoreline bordering Lake Ontario is fairly even, having no bays or deep indentations. Along the edge of the lake, an abrupt bluff 5 to 40 feet high rises from the lakeshore to the plain. A narrow gravel beach is at the toe of the bluff. The southern edge of the lake plain terminates at the foot of a well defined, narrow, gravelly sandy ridge extending east and west across the county and into adjoining counties. This ridge marks the shoreline of a former glacial body of water known as Lake Iroquois, which was an expanded or enlarged part of the present Lake Ontario. The ridge ranges from about 8 to 30 feet in height.

The central plain, which lies south of the ridge, is a flat or gently undulating area 4 to 6 miles wide. In Ridgeway, it is characterized by several comparatively smooth, small benches rising from one level to another.

The southern plain is an undulating or gently rolling area that has some included belts of flat land. The elevation increases gradually southward. The relief is generally more uneven in this part of the county than in other parts. Along the southern boundary is a long, narrow belt of flat land that has small, narrow, fingerlike projections extending into the hilly area. A large area of the lower part of this belt is saturated

with water or is subject to inundation during some seasons.

The elevation of the plateau of the northern plain ranges from the level of Lake Ontario, which is 246 feet above sea level, to about 400 feet at the foot of the ridge. The top of the ridge is 409 to 432 feet high. Elevations increase gradually southward to about 600 feet or more. The highest elevations in the county are 681 feet near East Shelby, 700 feet near South Barre, and 737 feet near West Barre.

Drainage flows into Lake Ontario through several small streams. Oak Orchard Creek and its tributaries control the largest drainage area. Dissection by stream action has not been thorough, and valleys are generally less than a quarter of a mile wide. Most of the flood plains are only 100 to 300 feet wide. The channels of the larger streams are still young, and valley walls have not been cut very deep below the level of the surrounding landscape. Along the upper reaches of tributaries, the flood plains are not well defined, and they merge without pronounced cuts or drops into the adjoining slopes or uplands. Farther downstream, the valley bluffs become more distinct, and the depth to the valley floors ranges from about 10 to 30 feet. Near Lake Ontario and for short distances elsewhere in the northern part of the county, streams have formed gorges 40 to 60 or more feet deep. Geological rock formations are exposed in the more precipitous gorges, and short falls occur in some streams as they flow across geologic formations that differ in durability and hardness.

Farming

The favorable climate, the large acreage of soils suitable for farming, and the excellent markets contribute to a diversified and prosperous farming area. The moderation of temperature by air currents passing over Lake Erie and Lake Ontario makes the northern part of the county ideal for growing such fruits as peaches and cherries. The area is markedly free of hurricanes and excessive storms. Moderate temperatures, long frost-free periods, and good soils help make the county an outstanding area for growing fruit and vegetables.

The 1969 census shows that 65 percent of Orleans County is in farms. This percentage includes 129,628 acres in cropland; 14,036 acres in woodland; and 22,512 acres in buildings and farm lanes and in idle, nonwooded areas. The number of farms has been declining since 1964, especially the smaller family-type farms, but the average size of individual farms has been increasing steadily since 1964. The increase has been in farms of 500 to 999 acres, whereas the decline has been in farms under 100 acres. Relating to the types of farming from 1964 to 1969, the number of dairy farms decreased 2 percent, the number of fruit farms decreased 30 percent, and the number of vegetable farms decreased 30 percent. The number of dairy animals has remained about the same, however, the acres in fruit has increased by 1 percent, and the acres in vegetables decreased by only 12 percent.

Water Supply

Orleans County has access to abundant water. It is bordered by Lake Ontario on the north, and a large section of the New York State Barge Canal is in the central part of the county. Four village water systems serve approximately 45 percent of the county. About half of the present demand is met by local utilization of Lake Ontario by the water systems in the villages of Albion and Lyndonville. The village of Holley has a local well supply supplemented by water purchased from the village of Brockport in Monroe County. The hamlets of Kendall and Morton are supplied by Brockport through the Kendall-Hamlin Joint Water District. Water purchased from the Niagara County Water District supplies the villages of Medina and the hamlets of Millers and County Line in the town of Yates.

Areas not served by public water systems rely on individual wells, both deep and shallow. Deep wells north of the limestone escarpment are generally in red or gray shale formations. The quantity and quality of water is erratic. Digging or drilling wells into the shale often results in water that has a high salt or sulfide content. Water yield from these shale formations is often inadequate.

Deep wells on or south of the limestone escarpment generally yield water that is high in bases, especially in calcium. The high content of bases results in hard water, and water softeners are needed for most efficient use. The water yield is generally higher in the limestone than in the shale formation.

The best areas for springs and shallow wells are in soil associations 14 through 19 and 27 through 29 (see general soil map). These nine general soil areas are dominantly sand and gravel and, therefore, are the most likely areas for aquifers.

The increase in the number of septic tank sewage disposal systems creates hazards of pollution and contamination for shallow wells and springs.

Transportation, Industries, and Markets

The major transportation systems in Orleans County are highways, railroads, and the New York State Barge Canal. The principal east-west highways are U.S. Highway 104 and State Route 31. These two highways are the major connections between Rochester and the Niagara Frontier urban centers of Niagara Falls and Lockport. State Route 31 connects the incorporated villages and population centers of Holley, Albion, and Medina.

The principal north-south highways are State Route 98 and State Route 63. State Route 98 connects Albion and all of Orleans County with the Thruway (Interstate 90) at Batavia. State Route 63 connects the villages of Lyndonville, Medina, and Shelby with Batavia to the south. When this soil survey was written, the Ontario State Parkway was partially completed. It eventually will become a scenic, limited access, four lane, east-west highway along and near the shores of Lake Ontario.

The Penn Central Railroad extends through the center of the county in an east-west direction, connecting the villages of Holley, Albion, and Medina. The New

York State Barge Canal is used for commercial and recreational traffic and is also a source of water for irrigation.

Farming is the major enterprise in Orleans County. A canning factory, a farm cooperative, apple processors, and vinegar production provide local markets for farm products. Most of the farm products are marketed outside of the county. Many other industries are in the county. The principal items of manufacture are toys, package soup, tire molds and castings, leisure time equipment, and furniture.

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Glossary

Acidity. See reaction, soil.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well-aerated soil is similar to that in the atmosphere; but that in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as crumbs, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern.

Available water capacity (also termed available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Base saturation. The degree to which material that has base-exchange properties is saturated with exchangeable cations other than hydrogen, expressed as a percentage of the cation-exchange capacity.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Catena. A sequence, or "chain," of soils on a landscape, developed from one kind of parent material but having different characteristics because of differences in relief and drainage.

Channery soil. A soil that contains thin, flat fragments of sandstone, limestone, or schist, as much as 6 inches in length along the longer 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.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are —

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Contour farming. Plowing, cultivating, planting, and harvesting in rows that are at right angles to the natural direction of the slope or that are parallel to terrace grade.

Diversion, or diversion terrace. A ridge of earth, generally a terrace, that is built to divert runoff from its natural course and, thus, to protect areas downslope from the effects of such runoff.

Drainage class (natural). Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low available water capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have a uniform color in the A and upper B horizons and mottling in the lower B and the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and some soils commonly have mottling at a depth below 6 to 16 inches.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Drift (geology). See glacial drift.

Drumlin (geology). A smooth, elongated hill of glacial drift, normally compact and unstratified. Commonly asymmetric in shape, having a blunt nose pointing in the direction from which the vanished glacier advance, and a more gentle, longer slope pointing in the opposite direction.

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

Erratic, glacial (geology). A stone or boulder carried by a glacier from its place of origin and embedded in a till de-

posit or left stranded on bedrock of different composition.

Esker (geology). A winding, steep-walled ridge of stratified sand and gravel showing evidence of deposition by water. Eskers are only a few feet wide, but range from a fraction of a mile to more than 100 miles in length. Commonly 10 to 50 feet high, but a few range to heights of more than 100 feet.

Fertility, soil. The quality of a soil that enables it to provide compounds, in adequate amounts and in proper balance, for the growth of specified plants, when other growth factors such as light, moisture, temperature, and the physical condition of the soil are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the oven-dry weight, after the gravitational, or free, water has been allowed to drain away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Fragipan. A loamy, brittle, subsurface horizon that is very low in organic-matter content and clay but is rich in silt or very fine sand. The layer is seemingly cemented. When dry, it is hard or very hard and has a high bulk density in comparison with the horizon or horizons above it. When moist, the fragipan tends to rupture suddenly if pressure is applied, rather than to deform slowly. The layer is generally mottled, is slowly or very slowly permeable to water, and has few or many bleached fracture planes that form polygons. Fragipans are a few inches to several feet thick; they generally occur below the B horizon, 15 to 40 inches below the surface.

Glacial drift (geology). Rock material transported by glacial ice and then deposited; also includes the assorted and unassorted materials deposited by streams flowing from glaciers.

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 in the form of kames, eskers, deltas, and outwash plains.

Gleyed soil. A soil in which waterlogging and lack of oxygen have caused the material in one or more horizons to be neutral gray in color. The term "gleyed" is applied to soil horizons with yellow and gray mottling caused by intermittent waterlogging.

Green manure (agronomy). A crop grown for the purpose of being turned under in an early stage of maturity or soon after maturity for soil improvement.

Ground moraine. Till laid down, as the main body of the glacier melts, to form gently rolling plains across the valley floor. The till may be a thin veneer over the bedrock or a deposit hundreds of feet thick.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons.

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Kame (geology), An irregular, short ridge or hill of stratified glacial drift.

Mapping unit, soil. Areas of soil of the same kind outlined on the soil map and identified by a symbol.

Mottling, soil. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent.* The size measurements are these: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Munsell notation. A system for designating color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with a hue of 10YR, a value of 6, and a chroma of 4.

Parent material. Disintegrated and partly weathered rock from which soil has formed.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

Permeability. The quality that enables the soil to transmit water or air. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Phase, soil. A subdivision of a soil, series, or other unit in the soil classification system made because of differences in the soil that affect its management but do not affect its classification in the natural landscape. A soil series, for example, may be divided into phases because of differences in slope, stoniness, thickness, or some other characteristic that affects its management but not its behavior in the natural landscape.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4:5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.5 and higher

Recessional moraine. A ridge of till marking the position where the glacier front was stabilized temporarily during the retreat of the glacier.

Relief. The elevations or inequalities of a land surface, considered collectively.

Rill. A steep-sided channel resulting from accelerated erosion. A rill normally is a few inches in depth and width and is not large enough to be an obstacle to farm machinery.

Sand. Individual rock or mineral fragments in a soil that range in diameter from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Series, soil. A group of soils developed from a particular type of parent material and having genetic horizons that, except for texture of the surface layer, are similar in differentiating characteristics and in arrangement in the profile.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of

the silt textural class is 80 percent or more silt and less than 12 percent clay.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

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 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). The separates recognized by the International Society of Soil Science are as follows: I (2.0 to 0.2 millimeter); II (0.2 to 0.02 millimeter); III (0.02 to 0.002 millimeter); IV (less than 0.002 millimeter).

Soil variant. See variant, soil.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles) adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically, the part of the soil below the solum.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

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 may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand*, *loamy sand*, *sandy loam*, *loam*, *silt loam*, *silt*, *sandy clay loam*, *clay loam*, *silty clay loam*, *sandy clay*, *silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Till. See glacial till.

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Variant, soil. A soil having properties sufficiently different from those of other known soils to suggest establishing a new soil series, but a soil of such limited known area that creation of a new series is not believed to be justified.

Varves. Distinctly marked annual deposits of sediment, regardless of their origin.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

GUIDE TO MAPPING UNITS

Map symbol	Mapping unit	Page	Capability unit	Woodland group
			Symbol	Number
AlB	Alton gravelly sandy loam, 3 to 8 percent slopes	19	IIIs-1	3o1
AnA	Appleton silt loam, 0 to 3 percent slopes	19	IIIw-1	3w1
AnB	Appleton silt loam, 3 to 8 percent slopes	19	IIIw-3	3w1
ArB	Arkport very fine sandy loam, 0 to 6 percent slopes	20	IIe-3	2o1
ArC	Arkport very fine sandy loam, 6 to 12 percent slopes	21	IIIe-2	2o1
AsD	Arkport-Collamer complex, 6 to 20 percent slopes	21	IVe-1	2r1
Ba	Barre silt loam	22	IVw-1	5w1
BoA	Bombay fine sandy loam, 0 to 3 percent slopes	22	IIw-1	2o1
BoB	Bombay fine sandy loam, 3 to 8 percent slopes	23	IIe-2	2o1
BrA	Brockport silty clay loam, 0 to 2 percent slopes	23	IIIw-2	3w1
BrB	Brockport silty clay loam, 2 to 6 percent slopes	24	IIIw-3	3w1
BrC	Brockport silty clay loam, 6 to 12 percent slopes	24	IIIe-3	3w1
Ca	Canandaigua soils	25	IIIw-5	4w1
Cb	Carlisle muck	25	IIIw-6	5w1
CcB	Cayuga silt loam, 2 to 6 percent slopes	26	IIe-5	2o1
CeA	Cazenovia silt loam, 0 to 3 percent slopes	27	IIw-1	2o1
CeB	Cazenovia silt loam, 3 to 8 percent slopes	27	IIe-2	2o1
CfA	Cazenovia gravelly silt loam, shale substratum, 0 to 3 percent slopes	27	IIw-1	2o1
CfB	Cazenovia gravelly silt loam, shale substratum, 3 to 8 percent slopes	27	IIe-2	2o1
Cg	Cheektowaga fine sandy loam	28	IIIw-5	5w1
ChA	Churchville silt loam, 0 to 2 percent slopes	29	IIIw-2	3w1
ChB	Churchville silt loam, 2 to 6 percent slopes	29	IIIw-3	3w1
ClB	Claverack loamy fine sand, 0 to 6 percent slopes	30	IIw-2	3s1
CmA	Collamer silt loam, 0 to 2 percent slopes	30	IIw-1	2o1
CmB	Collamer silt loam, 2 to 6 percent slopes	31	IIe-4	2o1
CmC3	Collamer silt loam, 6 to 12 percent slopes, severely eroded	31	IVe-1	2r1
CoB	Colonie loamy fine sand, 0 to 6 percent slopes	32	IIIs-1	4s1
CoC	Colonie loamy fine sand, 6 to 12 percent slopes	32	IVs-1	4s1
Cs	Cosad loamy fine sand	33	IIIw-4	4w1
Ed	Edwards muck	33	IVw-3	5w1
ElB	Elnora loamy fine sand, 0 to 6 percent slopes	34	IIw-2	4s1
FaB	Farmington silt loam, 0 to 8 percent slopes	36	IIIs-2	5d1
FaC	Farmington silt loam, 8 to 15 percent slopes	36	IVe-2	5d1
FH	Fluvaquents and Humaquepts, ponded	36	VIIIw-1	---
Fo	Fonda mucky silt loam	37	IVw-1	5w1
Fr	Fredon loam	37	IIIw-1	3w1
GaA	Galen very fine sandy loam, 0 to 2 percent slopes	38	IIw-2	2o1
GaB	Galen very fine sandy loam, 2 to 6 percent slopes	38	IIw-2	2o1
Ha	Hamlin silt loam	39	IIw-3	2o2
HbA	Hilton loam, 0 to 3 percent slopes	40	IIw-1	2o1
HbB	Hilton loam, 3 to 8 percent slopes	40	IIe-2	2o1
HcA	Hilton loam, rock substratum, 0 to 3 percent slopes	40	IIw-1	2o1
HcB	Hilton loam, rock substratum, 3 to 8 percent slopes	40	IIe-2	2o1
HnB	Hilton-Cazenovia stony silt loams, 0 to 8 percent slopes	41	IIs-2	2o1
HoB	Howard gravelly loam, 3 to 8 percent slopes	41	IIs-1	2o1
HpC	Howard soils, 8 to 25 percent slopes	42	IVe-3	2r2
Ju	Junius loamy fine sand	42	IIIw-4	4w1
KaA	Kendaia and Appleton silt loams, rock substratum, 0 to 3 percent slopes	43	IIIw-1	3w1
LaB	Lairdsville silt loam, 0 to 6 percent slopes	44	IIe-5	3o1
Lk	Lakemont silty clay loam	45	IVw-1	5w1
Lm	Lakemont silt loam, shale substratum	45	IVw-1	5w1
Ln	Lamson soils	46	IIIw-5	4w1
Lo	Lockport silty clay loam	46	IIIw-2	3w1
Ly	Lyons silt loam	47	IVw-2	4w1
Lz	Lyons silt loam, rock substratum	47	IVw-2	4w1
Ma	Madalin silt loam	48	IVw-1	5w1
MdB	Madrid fine sandy loam, 3 to 8 percent slopes	49	IIe-1	2o1
MdC	Madrid fine sandy loam, 8 to 15 percent slopes	49	IIIe-1	2o1
Me	Martisco muck	50	Vw-2	5w1

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Page	Capability unit	Woodland group
			Symbol	Number
Mn	Massena fine sandy loam	50	IIIw-1	3w1
Mo	Minoa very fine sandy loam	51	IIIw-1	3w1
Ne	Newstead silt loam	52	IIIw-7	3w1
NgA	Niagara silt loam, 0 to 2 percent slopes	53	IIIw-1	3w1
NgB	Niagara silt loam, 2 to 6 percent slopes	53	IIIw-3	3w1
OdA	Odessa silt loam, 0 to 2 percent slopes	54	IIIw-2	3w1
OdB	Odessa silt loam, 2 to 6 percent slopes	54	IIIw-3	3w1
OnB	Ontario loam, 3 to 8 percent slopes	55	IIe-1	2o1
OnC	Ontario loam, 8 to 15 percent slopes	55	IIIe-1	2o1
OoB	Ontario stony loam, 3 to 8 percent slopes	55	IIe-1	2o1
OsC	Ontario very stony loam, 3 to 15 percent slopes	55	VIs-1	2o1
OtB	Ontario loam, rock substratum, 0 to 8 percent slopes	55	IIe-1	2o1
OvA	Ovid silt loam, 0 to 3 percent slopes	57	IIIw-1	3w1
OvB	Ovid silt loam, 3 to 8 percent slopes	57	IIIw-3	3w1
OwA	Ovid silt loam, shale substratum, 0 to 4 percent slopes	57	IIIw-1	3w1
Pm	Palms muck	58	IVw-3	5w1
Pp	Phelps gravelly fine sandy loam	59	IIw-1	2o1
RhA	Rhinebeck silt loam, 0 to 2 percent slopes	59	IIIw-2	3w1
RhB	Rhinebeck silt loam, 2 to 6 percent slopes	60	IIIw-3	3w1
ScB	Schoharie silt loam, 2 to 6 percent slopes	61	IIe-5	2o1
ShE	Shale outcrop, steep	61	VIIIs-1	---
Su	Sun silt loam	61	IVw-2	4w1
Te	Teel silt loam	62	IIw-3	2o2
UD	Udifluvents, frequently flooded	62	Vw-1	4w1
WmB	Wampsville gravelly loam, 3 to 8 percent slopes	63	IIe-1	2o1
WsA	Wassaic silt loam, 0 to 3 percent slopes	64	IIs-1	2o1
WsB	Wassaic silt loam, 3 to 8 percent slopes	64	IIe-2	2o1
Wy	Wayland silt loam	64	Vw-1	4w1

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