SOIL SURVEY

Seneca County New York

Issued April 1972

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
CORNELL UNIVERSITY AGRICULTURAL EXPERIMENT STATION

Major fieldwork for this soil survey was done in the period 1955–65. Soil names and descriptions were approved in 1966. Unless otherwise indicated, statements in this publication refer to conditions in the county in 1966. This survey was made cooperatively by the Soil Conservation Service and the Cornell University Agricultural Experiment Station. It is part of the technical assistance furnished to the Seneca County Soil and Water Conservation District. The Seneca County Board of Supervisors provided additional funds to accelerate the completion of this survey.

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

HOW TO USE THIS SOIL SURVEY

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

Locating Soils

All the soils of Seneca 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 group of each. It also shows the page where each soil is described and the page for the capability unit in which the soil has been placed.

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

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

Foresters and others can refer to the section "Use of Soils as 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 nonindustrial buildings and for recreation areas in the section "Nonfarm Uses of the Soils."

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

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

Newcomers in Seneca 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 information about the county given in the section "General Nature of the County."

U.S. GOVERNMENT PRINTING OFFICE: 1972

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

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SOIL SURVEY OF SENECA COUNTY, NEW YORK

BY FRANK Z. HUTTON, JR., SOIL CONSERVATION SERVICE

SOILS SURVEYED BY FRANK Z. HUTTON, JR., JOHN A. NEELEY, AND CARL S. PEARSON, SOIL CONSERVATION SERVICE,[1] AND BY ROBERT H. M. VAN DE GRAAFF, J. C. DIJKERMAN, PETER BULLOCK, ALAN COMSTOCK, AND G. W. OLSON OF CORNELL UNIVERSITY AGRICULTURAL EXPERIMENT STATION

UNITED STATES DEPARTMENT OF AGRICULTURE IN COOPERATION WITH CORNELL UNIVERSITY AGRICULTURAL EXPERIMENT STATION

SENECA COUNTY is near the center of New York and of the Finger Lakes region (fig. 1). Seneca Lake forms part of the western boundary, and Cayuga Lake forms part of the eastern boundary. Seneca County is roughly rectangular. It extends 35 miles from north to south and about 8 to 10 miles from east to west. Seneca County has an area of 330 square miles, or 211,200 acres. Both Waterloo and Ovid serve as county seats.

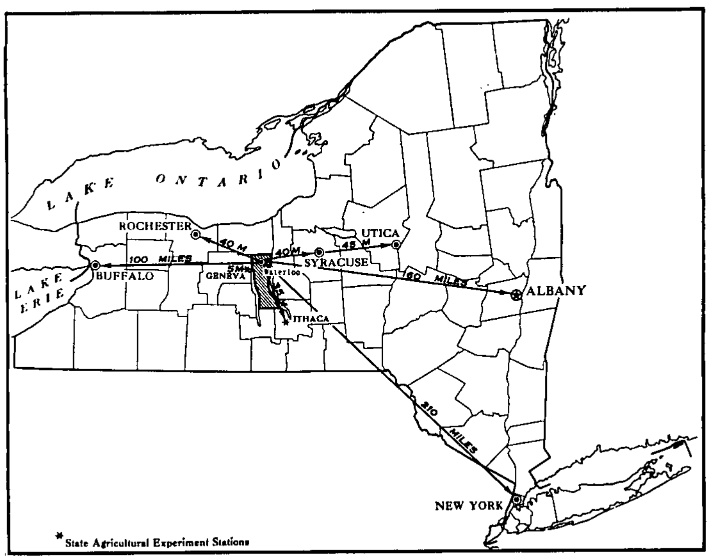

Figure 1.—**Location of Seneca County in New York.**

The southern two-thirds of the county is a rural area. The main trading centers are the villages of Waterloo and Seneca Falls in the northern third of the county and the neighboring cities of Ithaca, Geneva, and Auburn. Most trading and industrial activity within the county is in the vicinity of Waterloo and Seneca Falls. Traffic and transportation passing east and west is all concentrated in the northern third of the county.

About half of the county is in farms. Dairying and general farming are the main farm enterprises. The largest crop acreage is in hay, approximately half of which is alfalfa. Next in order of importance are corn, for silage and grain, and oats. The main cash crops are winter wheat and dry field beans. Sugar beets, introduced in 1965, are expected to become an important crop because of the large acreage of soils to which they are suited.

About 18 percent of the county is forested. Most of the forested area is in scattered woodlots and in extensive forests on the wetlands of Montezuma Marsh. About 10 percent of the land is federally owned. Most of the federally owned land is in the Seneca Ordnance Depot, near Romulus; the Montezuma National Wildlife Refuge, in the northeastern corner of the county; and in the Hector Land Use Area, in the southern part of the county. There are three State parks in Seneca County: Cayuga Lake State Park, at the northern end of Cayuga Lake (188 acres); Seneca Lake State Park, at the northern end of Seneca Lake (141 acres); and Sampson State Park, in the town of Romulus (1,552 acres).

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Seneca 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* (*24*) [2] are the categories of soil classification most used in a local survey.

[1] Others who contributed to field mapping of limited acreage were C. H. ATKINSON and L. M. FRENCH, Soil Conservation Service.

[2] Italicized numbers in parentheses refer to Literature Cited, page 140.

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

Soils of one series can differ in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Ontario fine sandy loam, 2 to 8 percent slopes, is one of several phases within the Ontario 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 in 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 are shown on the soil map of Seneca County: soil complexes and undifferentiated groups.

A soil complex consists of areas of two or more soils, so intermingled or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. The name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Darien-Danley-Cazenovia silt loams, 3 to 8 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. The name of an undifferentiated group consists of the names of the dominant soils, joined by "and." Ontario silt loam, moderately shallow variant, and Farmington soils, 2 to 8 percent slopes, is an example.

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

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

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

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

General Soil Map [3]

The general soil map at the back of this survey shows, in color, the soil associations in Seneca 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 eleven soil associations in Seneca County are grouped either according to the content of lime in the dominant soils or according to the nature of the material in which the dominant soils formed. Research indicates that acidity, or low pH value, limits crop production more commonly than does any other single factor. The grouping of soils by lime content indicates, in a general way, the amount of lime needed where a particular crop is grown. The soils in an association designated as high lime, for example, may need additional lime for optimum production of legumes, but they do not need such heavy

[3] By CARL S. PEARSON, soil scientist, Soil Conservation Service.

or such frequent applications as do the soils in the medium-lime and low-lime groups.

Areas Dominated by High-Lime Soils Developed in Glacial Till

These associations occur on uplands in the northern part of the county and on slopes adjacent to Cayuga and Seneca Lakes. The soils range in slope from nearly level to steep, and drumlins are a prominent topographic feature. The major soils formed in till derived mainly from limestone and high-lime shale. These associations are farmed extensively, and there are numerous summer cottages along the lake shores.

1. Ontario-Ovid association

Deep, well-drained to somewhat poorly drained soils that have a loam to silty clay loam subsoil

This association is located only in the northern part of the county, mainly in the towns of Junius and Tyre, and extends along the west side of Montezuma Marsh to the vicinity of Seneca Falls. The soils of this association occur on drumlins, or long, oval hills, and on the glacial lake plain that surrounds the drumlins. The drumlins are 20 feet to more than 50 feet higher than the lake plain. These drumlins have an axis extending north to south and consist of deposits of high-lime glacial till. Soils that developed in glacial-lake material finger into the drumlin region in the south.

The soils in this association occupy 9 percent of the county. The well drained Ontario soils make up 50 percent of the association; somewhat poorly drained Ovid soils, which formed in reworked materials, make up 16 percent; and moderately well drained and well drained Cazenovia soils make up 10 percent. The remaining 19 percent of the association consists of scattered areas of Appleton, Collamer, Lakemont, Lima, Madalin, and Schoharie and muck soils.

Most crops adapted to this region are suited to these soils. Dairying and general farming are the main farming enterprises. The main crops grown are alfalfa hay, winter wheat, kidney beans, and corn for silage and grain. The somewhat poorly drained soils that formed in lake-laid materials between the drumlins are heavy and difficult to work.

Little or no irrigation is practiced on these soils at present.

Erosion is a hazard on the moderately steep to steep slopes of the drumlins, and many areas on the sides of the drumlins have lost as much as 2 feet of soil. Despite the erosion, however, the drumlin soils are well suited to deep-rooted legumes, such as alfalfa, because of their high lime content and the nature of their subsoil and substratum.

Flooding is a slight hazard in the drumlin areas because it usually occurs in winter and early in spring. The flat soils between the drumlins, however, are sometimes flooded during periods of heavy precipitation.

The glacial till substratum of the upland soils is good subgrade and roadfill material, but the silty and clayey material of the interspersed lake-laid soils is poor for these purposes. The deposits of sand and gravel generally are not large enough to warrant development for commercial purposes. Neither are the soils in this association considered to be a good source of topsoil in commercial quantities.

The drumlin areas of these soils are too steep to provide satisfactory sites for industrial development. The drumlins do, however, provide many sites of esthetic value for rural residents. The interdrumlin soils generally provide poor building sites because of their poor drainage and high clay content.

Many drumlin slopes should be reforested with trees that are adapted to high-lime soils. Many areas are well suited to the development of habitat for upland game, such as pheasant. The heavy silty and clayey soils between the drumlins furnish good sites for ponds where a source of water is available.

2. Honeoye-Lima association

Deep, well drained and moderately well drained soils that have a heavy silt loam to heavy loam subsoil

This association consists of long, relatively narrow strips of land along slopes adjacent to Seneca and Cayuga Lakes (fig. 2). These strips of high-lime soils are 1 to 2 miles wide, but widen to 3 miles near Interlaken. Much of the area lies below the 1,000-foot contour, where glaciation was most active. The ice lobes that extended down the troughs of the Seneca and Cayuga valleys carried in a large amount of limestone material from regions to the north. Along Cayuga Lake these soils extend from the village of Fayette to Tompkins County, and along Seneca Lake they extend from near the north end of the lake to Schuyler County.

This association occupies 21 percent of the county. The well drained Honeoye soils make up 25 percent of the association; moderately well drained Lima soils, 22 percent; and Cazenovia soils, 16 percent. The remaining 37 percent consists of Angola, Appleton, Aurora, Collamer, Conesus, Darien, Farmington, Lyons, Ovid, Schoharie, and Sloan soils.

General farming and dairying are the main farm enterprises, and most of the soils are now farmed. Alfalfa, corn for silage and grain, winter wheat, and kidney beans are the main crops. The steep, shallow soils on the slopes above Cayuga and Seneca Lakes are not suited to crops and are generally idle, abandoned, or forested. Productive hardwood forests grow on these slopes or as scattered woodlots on the more nearly level soils.

The topography of the dominant soils is favorable to irrigation, but the crops commonly grown generally do not respond well enough to warrant the investment. Also, the water supply in this area is not dependable.

Erosion is a hazard in areas where slopes are more than 5 percent, and excessive erosion has been partly responsible for the abandonment of cropland on the steep slopes along the lakes. Intensive conservation practices are needed on the moderate to steep slopes.

Flooding is not a hazard on these soils. The area is crossed by many small streams that drain into the lakes. These streams have cut channels of considerable depth, especially where the slopes are steep, and therefore little or no flooding takes place.

The 8-inch surface layer of the dominant soils is suitable for use as topsoil, but even this thin layer is absent from the eroded slopes along the lakes. These areas are not a suitable source of topsoil in commercial quantities.

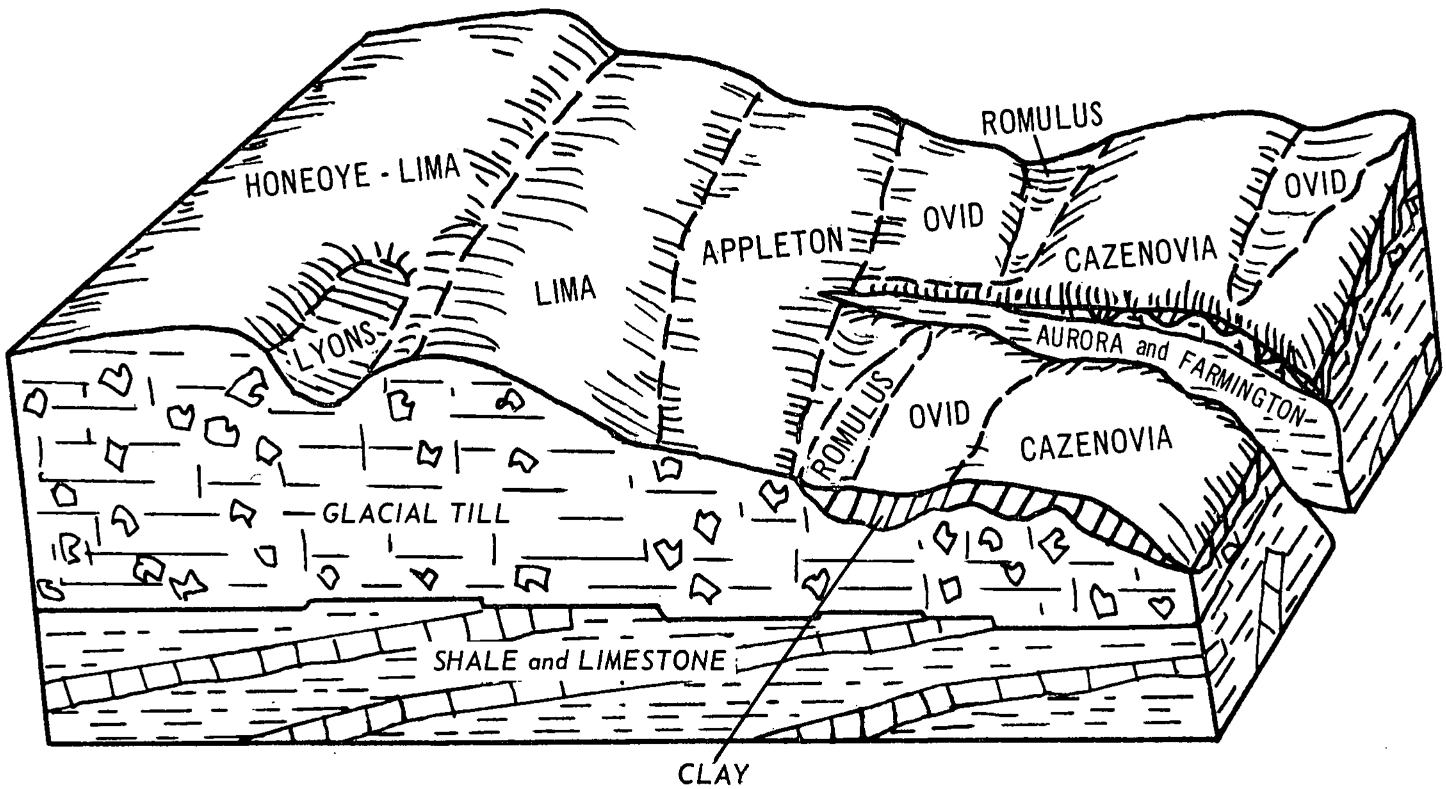

Figure 2.—**Cross section of Honeoye-Lima association.**

The substratum material of the dominant soils is suitable for hard fill and subgrade. Bedrock close to the surface makes the slopes adjacent to the lakes unsuitable as a source of borrow material. The most extensive of the deltaic areas in the association are at Sheldrake, along Lake Cayuga, and at Lodi Landing, along Seneca Lake. Small gravel pits have been opened in some of these deposits, and the material is used mostly for surfacing local roads.

This association is in a strictly rural area. Some residences are being built, mainly on the slopes overlooking Cayuga Lake, but no commercial development is taking place at this time. The immediate lakeshore is used entirely for lodge and cottage sites.

Areas Dominated by High-Lime Soils Developed in Glacial Lake Sediments

These associations occur in the lake plain area in the northern part of the county in the vicinity of Waterloo and Seneca Falls. The soils generally are nearly level to gently sloping, but in places they are moderately steep. The major soils formed in lacustrine clay and silt that are high in lime. Much of the area in these associations is used for dairy farming.

3. Schoharie-Odessa association

Deep, well-drained to somewhat poorly drained soils that have a silty clay loam to clay subsoil

This association consists of one large area of nearly level or gently sloping soils near Waterloo and Seneca Falls. It extends from the north end of Cayuga Lake south to a point 4 miles below Canoga. The dominant soils formed in heavy, pinkish to reddish-brown lake-laid sediments and contain no stones or gravel.

This association occupies 9 percent of the county. The moderately well drained to well drained Schoharie soils (fig. 3) make up 50 percent of the association; somewhat poorly drained Odessa soils, 16 percent; and poorly drained Cazenovia soils, which formed in glacial till reworked with lacustrine material, make up 9 percent. The remaining 25 percent consists mainly of Angola, Darien, Fonda, Lakemont, Ontario, and Ovid soils.

Dairying is the main farming enterprise. A large acreage is used for rotation and permanent pasture. Hay,

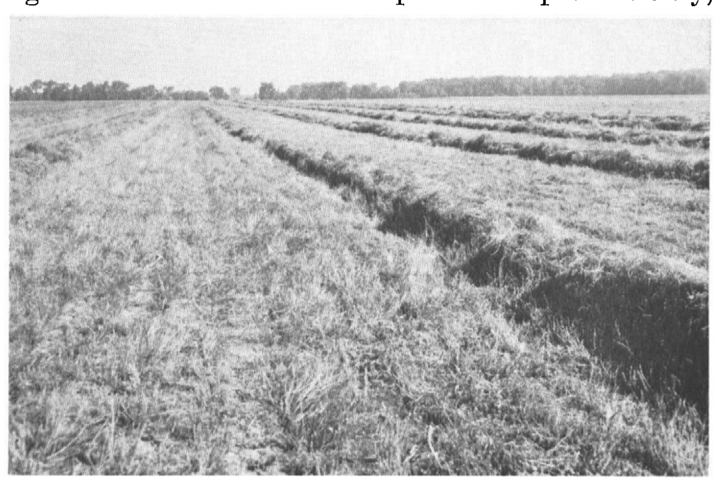

Figure 3.—**An area of Schoharie silty clay loam in the Schoharie-Odessa association.**

mainly alfalfa and mixtures of alfalfa and grass, is grown on most of the acreage. Oats and corn for either grain or silage are also important crops. The more nearly level areas appear to be well suited to sugar beets, a new crop introduced in 1965.

Topography generally is favorable for irrigation of these soils, but their slow permeability and slow water intake rate are unfavorable. Only general farm crops are grown, and these usually do not respond well enough to justify supplemental irrigation.

These soils are subject to erosion, even on the gentle slopes, because their high content of silt and clay reduces the rate at which water enters and moves through the soils.

Flooding occurs only along the narrow flood plains of the small streams that flow through this area. Since these flood plains occupy only a small acreage, however, they are not a significant part of the association.

Thickness of the surface layer of the dominant soils averages about 8 inches. It is not considered to be a good source of topsoil because of its high clay content, although it is used locally for this purpose. These soils are only a fair source of fill material, because the subsoil and substratum are high in content of silt and clay. Few, if any, sand or gravel deposits occur in this association.

This area is not well suited to industrial and residential development, because of the slow drainage and the difficulty of working these clayey soils, particularly when they are wet. Nearly all of the development that is taking place near Seneca Falls is on the dominant soils of the association. This development is mainly residential or light industrial. The dominant soils are severely limited as sites for septic tank disposal fields.

Since most of the land in this association is used for farming, except for the slope next to Cayuga Lake, it is not available for recreation. The immediate lakeside is used for year-round residences. The level to gently sloping topography of Cayuga State Park, which is entirely within this association, is suitable for development of playing fields. The slow permeability of the silt and clay soil materials makes the soils suitable for ponds where an adequate source of water is available.

Only a small part of land in this association has been reforested. Tree growth is satisfactory for species that are adapted to the drainage conditions in this area. The marshland along the shore and at the north end of Cayuga Lake is ideally suited to migratory wildfowl. A national refuge has been established in Montezuma Marsh, which is just north of this area.

4. Odessa-Lakemont association

Deep, dominantly somewhat poorly drained and poorly drained soils that have a silty clay loam to silty clay subsoil

This association consists of a low, nearly level lake plain on which there are many low hills consisting mainly of reworked glacial till and lacustrine material. It occurs only in the north-central part of the county and includes parts of the towns of Junius, Tyre, Waterloo, and Seneca Falls. The dominant soils are pink to reddish-brown clay and silty clay.

This association occupies 6 percent of the county. The somewhat poorly drained Odessa soils make up 19 percent of the association; the poorly drained Lakemont soils, 16 percent; and the Cazenovia soils, which formed in glacial till and reworked lacustrine clay, make up 9 percent. The remaining 56 percent of the association is made up of Appleton, Canandaigua, Claverack, Collamer, Cosad, Dunkirk, Fonda, Lima, Madalin, Niagara, Odessa, Ontario, Ovid, Romulus, Schoharie, and Sloan soils and Muck.

Dairying is the main farming enterprise. The somewhat poor and poor drainage of the dominant soils limits their use and makes irrigation neither practical nor necessary. Most land that is not forested is in permanent pasture, or is so situated that excess water can be removed by open ditches so that hay can be grown. The better drained soils of the association are used for growing small grain, corn for grain and silage, and kidney beans.

Erosion is generally not a hazard on this association.

The depressional areas may be under water in winter, in spring, or when precipitation is abnormally heavy. Flooding does little damage because much of the land is in long-term hay or permanent pasture that is little affected by flooding.

The surface layer of the level, wet soils is from 8 to 12 inches thick. The texture is generally silt loam or coarse silty clay loam, and the material is free of gravel and stones. The topsoil is of good quality where the clay content is low, but these soils cannot be considered as a commercial source of this material. These soils are a poor source of fill material and are unsuitable as a source of sand and gravel.

The somewhat poorly drained and poorly drained condition of these soils severely limits 80 to 90 percent of this association for industrial and residential development.

Impoundments and dug ponds are practical where sufficient water is available, since these soils are so slowly permeable that little or no water is lost through seepage. Much of the association is in native forests of elm, soft maple, willow, ash, and other wetland species. The seedlings available for reforestation are not adapted to these poorly drained soils.

Areas Dominated by Medium-Lime Soils Developed in Glacial Till

These associations are located in the central and south-central parts of the county on the uplands between Cayuga and Seneca Lakes. The soils are nearly level to rolling and formed in till derived mainly from limy shale or from shale and sandstone that contain some limestone. Except for the Seneca Ordnance Depot, most of the land in these associations is used for dairying or for general farming.

5. Conesus-Lansing association

Deep, moderately well drained and well drained soils that have a heavy silt loam to heavy loam subsoil

This association consists of one area in the south-central part of the county. The soils are generally rolling and are gently to moderately sloping. They occupy the higher positions between the high-lime soils on the east and west. These soils are located north of the low-lime soils of the Langford-Erie association and are in slightly lower positions. The dominant soils formed in glacial till consisting mostly of sandstone and shale and containing a small amount of limestone (see fig. 5 p. 9).

This association occupies 8 percent of the county. The moderately well drained Conesus soils make up 35 percent of the association; well drained Lansing soils, 25 percent; and somewhat poorly drained Appleton soils, 8 percent. The remaining 32 percent of the association consists of Angola, Darien, Honeoye, Langford, Lima, and Lyons soils and some areas of soils on bottom lands.

Dairying is the main farming enterprise on these soils, and most of the association is used to grow crops for dairy herds. Winter wheat and dry field beans are important cash crops. The medium texture, good depth, lack of strong acidity, and favorable topography of these soils result in high productivity and good response to proper management.

These soils are not irrigated. The kind of crops grown and the generally limited water supply ordinarily do not justify the expense.

The hazard of erosion is moderate on these flaggy and gravelly soils. Ordinary good farming practices, such as tillage across the slope and planting on the contour, control loss of soil by erosion. Flooding is not a problem.

This association generally is not suitable as a commercial source of topsoil. The 6- to 8-inch surface layer of some of these soils can be used as topsoil, but generally it is too gravelly. The substratum furnishes good material for subgrade and hard fill. No extensive areas of stratified granular material occur. The small spots that have been exploited for gravel are not suitable for aggregate but can be used for road material.

The dominant soils are fairly well suited to community development. They are moderately well drained, relief is generally favorable, the substratum material has good bearing strength, and the soil and parent material are suitable for use as hard fill. The topography is interesting enough to make this area desirable for the construction of rural residences, which is the only development presently taking place. These soils, however, are moderately to severely limited as sites for septic tank disposal fields.

Although these rolling soils are ideally suited to many forms of recreation, little of the acreage is used for this purpose. The soils are suited to nearly all species of trees and shrubs available for planting and reforestation in New York.

6. Darien-Angola association

Deep and moderately deep, somewhat poorly drained soils that have a silty clay loam and clay loam subsoil

This association consists of one large area in the center of the county (fig. 4). This area extends from Ovid on the south to within 2 miles of Waterloo on the north.

The soils of this association formed in glacial till in which the soft, dark underlying shale, together with some limestone and a few igneous erratics, is the main rock constituent. Shale bedrock is close to the surface in this generally smooth, nearly level to gently sloping association. In the gently sloping areas, where shale bedrock is at a depth of 4 to 6 feet, many small areas of moderately well drained Danley and Cazenovia soils are so intermixed with the somewhat poorly drained Darien soils that they form a complex mapping unit.

This association occupies 22 percent of the county. The Darien soils make up 37 percent of the association; Angola soils, 16 percent; and moderately well drained Danley soils, 9 percent. The remaining 38 percent consists of Appleton, Aurora, Cazenovia, Farmington, Honeoye, Lima, Ilion, Odessa, Ovid, Schoharie, and Varick soils.

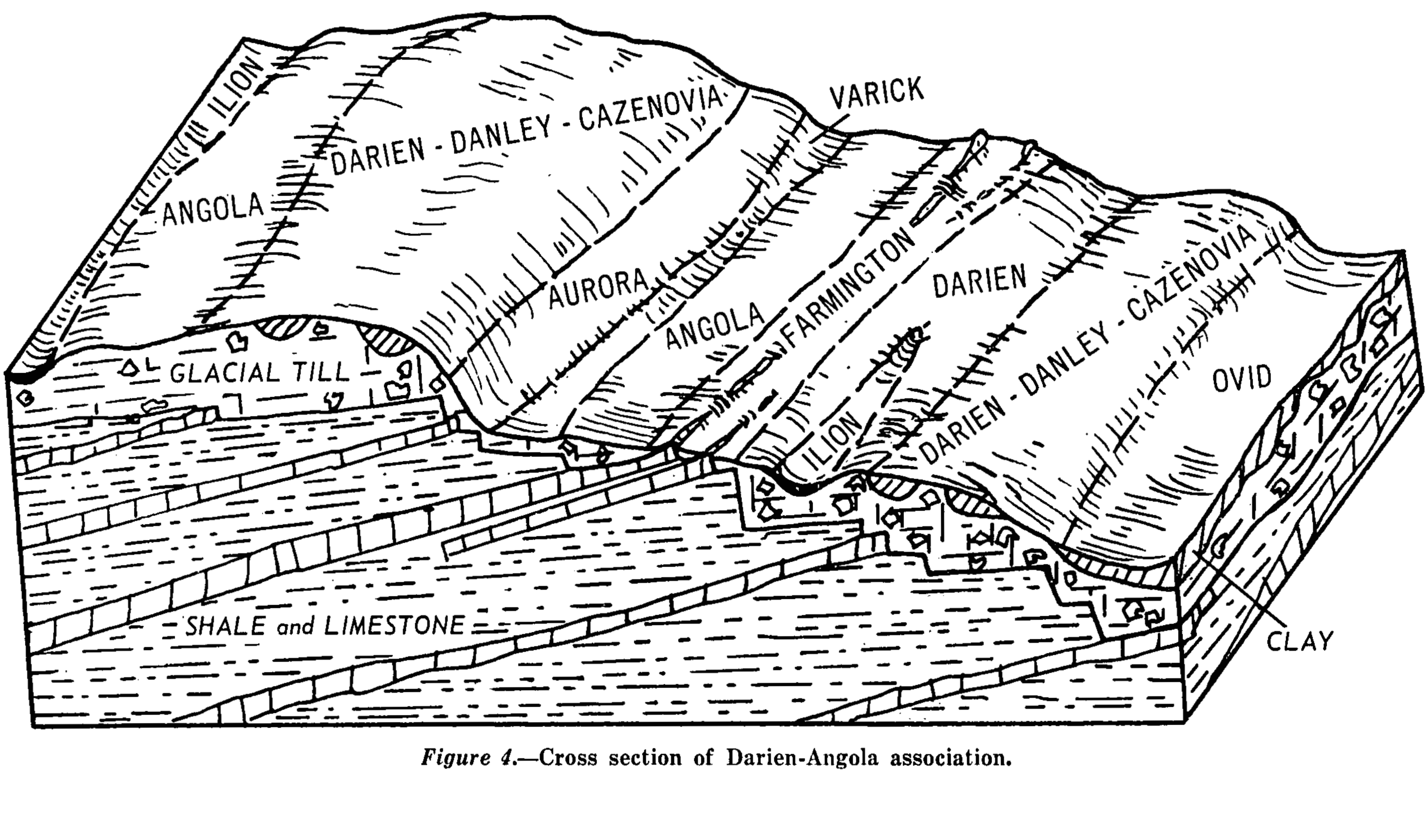

Figure 4.—Cross section of Darien-Angola association.

General farming is the main farming enterprise, but sale of milk is also an important source of income. Corn, oats, and hay are grown to feed the dairy herds, but large quantities of corn for grain, winter wheat, kidney beans, and sugar beets are also produced. The soils of this association are limited mainly by their moderately fine texture, which makes them difficult to work if moisture content is not right, and by slow drainage, which necessitates artificial drainage in places.

Topography is favorable for irrigation, but the soils take in water slowly. No crops that are normally irrigated are now grown on these soils.

Hazard of erosion is greater than on some soils because of the moderately fine texture and slow permeability, but simple erosion control measures and proper farming practices control soil loss.

Flooding is not serious. Streams are small and their drainage areas are limited. In spring, when severe storms occur, the lower flatland may be flooded locally. These floods, however, usually occur before the growing season starts and seldom cause extensive damage.

This area is suitable for industrial development where somewhat poorly drained soils are not a limitation. The bedrock, which is close to the surface in many places, provides a good bearing surface for structures. Rural development is limited by the slowly permeable subsoil and the impervious shale bedrock, which severely restrict the operation of septic tank disposal fields.

The 8- to 10-inch surface layer of the dominant soils is a source of topsoil, which normally is used in local construction. As with other soils in the upland parts of the county, however, these soils are unsuitable as sources of topsoil in commercial quantities.

Where limestone has contributed strongly to the parent material, the deeper soils of this association furnish borrow material of good quality for use as subgrade and hard fill. Some of the soils, however, are too shallow to shale bedrock to be suitable for this purpose. Several shale quarries in this association furnish material to build and surface roads, although it is too soft to be of good quality. Many of the secondary roads in the southern part of the county, south of the Barge Canal, have been built or surfaced with shale. No gravel deposits occur in this part of the county.

More than 10,000 acres of the land in this association is included in the Seneca Ordnance Depot. The abandoned Sampson Naval Training Station, now Sampson State Park, is also in this association. No other nonfarm development has taken place on these soils.

Little of the land in this association is available for recreational development or for reforestation. Poor drainage, heavy soil texture, and high lime content necessitates care in selection of seedlings for reforestation. A considerable amount of native timber is grown in small, scattered woodlots. The area is suitable for wildlife habitat. Where an adequate water supply is available, these soils are suited to the construction of ponds and impoundments.

Areas Dominated by Medium-Lime Soils Developed in Glacial Lake Sediments

These associations are located on the lake plain in the northwestern and north-central parts of the county. The soils are nearly level to undulating or rolling. They formed mainly in lacustrine silt and fine sand, but some of them formed in islands of shaly and clayey till. All of the soils contain some lime. Dairy farming is the main farm enterprise. A considerable amount of acreage of the more sandy areas is idle or abandoned.

7. Dunkirk-Collamer association

Deep, well drained and moderately well drained soils that have a silt loam to silty clay loam subsoil

This association consists of one area south of the Barge Canal, between the towns of East Geneva and Waterloo. The soils are rolling or undulating, although some areas are nearly level, and occur mainly in an old glacial lake plain. The highly sorted lake-laid sediment consists mainly of yellowish-brown silt and very fine sand, which in places overlie the reddish silt and clay that is characteristic of the Schoharie and Odessa soils.

The soils of this association occupy 3 percent of the county. Dunkirk soils make up 30 percent of the association; Collamer soils, 25 percent; and Schoharie soils, 11 percent. The remaining 34 percent is made up of Angola, Arkport, Darien, Cazenovia, Niagara, and Ovid soils.

Most crops commonly grown in this area are suited to these soils if they are properly managed. Dairying is an important farming enterprise, and a considerable part of the association is used to grow forage crops for dairy herds. Most of the acreage is in corn for grain and silage, oats, and hay, but winter wheat and field beans are important cash crops. Since they are underlain by calcareous sediments, these soils in places are so acid in the surface layer that a moderate amount of lime is needed for new seedings of alfalfa and other deep-rooted legumes.

Hazard of erosion is severe, even on relatively gentle slopes, because these soils are made up of uniform very fine sand and silt, free of gravel and surface stones.

Flooding takes place only on the narrow flood plain of Kendig Creek. Most of this flood plain is in permanent pasture, and flooding, which usually occurs in spring, does little damage.

The 6- to 8-inch surface layer of the dominant soils is an excellent source of topsoil, which generally is used around new rural residences. The very fine sand, silt, and clay in the subsoil and substratum is fair material for subgrade and hard fill. No deposits of sand or gravel occur in the area.

Little development, either industrial or residential, has yet taken place, and some engineering problems are encountered when these soils are subjected to the stresses imposed by industrial structures or roads. The area provides attractive sites for residences, but limitations for septic tank disposal fields are moderate to severe.

The topography of this association is well suited to the development of golf courses, and the soils are excellent for the establishment of turf. No development of this nature, however, has taken place. Seneca and Cayuga Lakes probably offer enough recreational opportunities to keep any new development to a minimum. The soils are suited to many of the available species of tree seedlings, but the value of the soils for cropland precludes any significant amount of reforestation. Since a fair number of native woodlots remain, and hedgerows have not been removed to any extent, this area provides good habitat for indigenous game, such as pheasants and rabbits.

8. Dunkirk-Cazenovia association

Moderately deep and deep, well drained and moderately well drained soils that have a silt loam to silty clay loam subsoil that overlies limestone

This association consists of one small area of silty, nearly level soils that is located about 3 miles south of Seneca Falls.

The soils of this association occupy 2 percent of the county. The Dunkirk soils, limestone substratum, which are underlain by limestone at a depth of 3½ to 5 feet, makes up 20 percent of the association. Dunkirk soils that are more than 5 feet deep over limestone make up 12 percent. Cazenovia soils, which formed in reworked or mixed lake-laid clay and limestone glacial till, make up 20 percent. The remaining 48 percent of the association consists of Angola, Collamer, Darien, Honeoye, Lakemont, Lima, Odessa, Ontario, Farmington, Ovid, and Schoharie soils.

General farming and dairying are the main farming enterprises. Most of the acreage farmed is in forage crops grown to feed dairy cattle, but winter wheat and field beans are important cash crops.

Crops grown on these soils are not the kinds that are normally irrigated, although crops grown on areas where bedrock is close to the surface respond to irrigation. Finding an adequate supply of water for irrigation is a major problem in this area.

The nearly level topography of these soils reduces the risk of soil loss through erosion. Where the slopes are more than 2 to 4 percent, however, these sandy and silty soils are highly erodible.

Flooding in this area occurs only along the small streams in winter and in spring.

The 6- to 8-inch surface layer of these soils is too thin to warrant commercial use for topsoil. The surface layer, subsoil, and substratum material from the dominant soils is fair to good for subgrade and hard fill. Deposits of gravel and sand do not occur in the area.

This is the only place in the county where the Onondaga limestone is exposed or is close enough to the surface to make exploitation economically feasible. Limestone for road and highway material is processed here on a large scale. This is the only nonfarm development in the area, although the land is suitable for industrial and residential development. The underlying porous limestone, however, severely limits roadbuilding.

Only the more extensive areas of these soils are forested and support good growth of native hardwoods.

9. Arkport-Claverack association

Deep, dominantly well drained and moderately well drained soils that are loamy fine sand and fine sandy loam throughout or that have a loamy fine sand subsoil over silty clay or clay

This association consists of one area in the northwest corner of the county along the Ontario County line. It extends from Wayne County on the north to Seneca Lake on the south and to Waterloo on the east. The Barge Canal and the Seneca River separate this association from the Dunkirk-Collamer soils to the south. The entire area is part of a large delta built in the predecessor of Seneca Lake during the glacial period and modified in places by wind action. The soils of this association are dominantly of fine sand but include some areas underlain by stratified sand and gravel and other areas underlain by silt and clay at a depth of 20 to 40 inches. Silty or clayey soils, several areas of muck, and a few islands of Ontario soils also occur in scattered areas.

This association occupies about 8 percent of the county. The well drained Arkport soils make up about 27 percent of the association; moderately well drained Claverack soils, which formed in 20 to 40 inches of sand over clay, make up 10 percent; and the somewhat poorly drained Cosad soils, 7 percent. The remaining 56 percent of the association consists of Collamer, Cazenovia, Dunkirk, Elnora, Lakemont, Lamson, Ontario, Odessa, Ovid, Palmyra, Niagara, and Stafford soils.

This association varies considerably in soils, topography, and drainage. It is not farmed intensively, and a considerable amount of acreage, especially in the southern part, is idle or abandoned. Many of the farms are small, and some of them are part-time operations. The largest farms, located in the northern part of the association, probably derive most of their income from dairying. In the southern and central parts of the association are some small, specialized operations producing small fruits, nursery stock, and vegetables.

The dominant soils are sandy. They are easily worked but are not retentive of moisture. They show a marked response to heavy fertilization. One of the best uses for these soils is the growing of small fruits and vegetables.

These soils respond well to irrigation. A good supply of water is generally available at a fairly shallow depth, and there are many large, poorly drained to marshy areas that can be developed to supply water for irrigation.

Unprotected areas of these soils are subject to both soil blowing and erosion. Erosion is a special hazard during freezing and thawing. When saturated sands thaw at the surface, they slide down the slopes on the still-frozen subsoil. The present topography is partially the result of soil blowing.

The surface layer of the well-drained soils in this association is 6 to 8 inches thick and provides good topsoil. The sandy underlying material provides good material for building up low spots and for grading sodded areas. The surface layer of the poorly drained areas is 8 to 12 inches thick. It has high organic-matter content and provides good topsoil because of its sandy texture. This area has not been used for topsoil, but it has better potential for this purpose than most other soil associations in the county.

The physical properties of the dominant soils make the area suitable for development. The only development that has taken place, however, is the use of some areas for sand and the underlying gravel. The gravel deposits are small, and most of the material is used locally. The rolling topography and good drainage of the higher areas make them suitable for rural residential development. In these places the soils are generally only slightly limited for septic tank disposal fields.

The dominant soils are fine sand and very fine sand in texture and contain some silt. This material can be used for hard fill, but it is less desirable than the material available in the small areas of included Ontario soils, which formed in glacial till. A few small areas that are underlain by beds of gravel and sand have been exploited for hard fill. The materials are all used locally, mainly for road surfacing.

This association has a rolling, dunelike terrain that is ideal for golf courses. The well-drained parts can be reforested with species of trees that are adapted to these dry, light-textured soils, but the large areas of poorly drained soils are too wet to be reforested except by natural reproduction. Numerous marsh areas, small ponds, and boggy areas surrounding ponds provide wildlife habitat. The excellent cover furnished by the brushy idle and abandoned land is ideal for small game, but the small acreage in grains does not favor a large pheasant population.

Areas Dominated by Low-Lime Soils Developed in Glacial Till

The one association in this category is located on the higher upland areas in the southern part of the county along the Schuyler County line. The soils are nearly level to moderately steep and have fairly uniform slopes. They formed in till derived mainly from sandstone and shale but partly from limestone. Dairying is the main farm enterprise. A considerable amount of the acreage in this association is idle.

10. Langford-Erie association

Deep, moderately well drained and somewhat poorly drained soils that have a channery silt loam to channery loam fragipan

This association consists of one area along the Schuyler County line, which includes the highland between Seneca and Cayuga Lakes (fig. 5). The nearly level to moderately steep soils of this association formed in low-lime glacial till derived from gray sandstone and shale. The slopes are mainly smooth and gentle. These soils occur at the higher elevations in the county.

This association occupies 8 percent of the county. The moderately well drained Langford soils make up 42 percent of the association; and the somewhat poorly drained Erie soils, 26 percent. The remaining 32 percent of the association consists of Arnot, Alden, Aurora, Conesus, Farmington, Lansing, and Sloan soils.

Dairying is by far the most important farming enterprise, and much land is in permanent pasture. The main crops are hay, oats, and corn for silage. The Langford soils have a dense fragipan at a depth of 15 to 24 inches, and the Erie soils have one at a depth of 12 to 18 inches. This fragipan interferes with roots and with the movement of water through the soils. The growing season is short because of the high elevation.

Irrigation is not practiced, because of the kinds of crops normally grown, the nature of the soils, and the short growing season.

Hazard of erosion is moderate. The high content of stone fragments reduces runoff, but on slopes of more than 2 to 3 percent, erosion control is needed if the soils are used intensively for clean-tilled crops.

The only flooding that takes place in this upland area is along the small streams. Even this flooding is not a problem, since the soils are idle, abandoned, forested, or in permanent pasture.

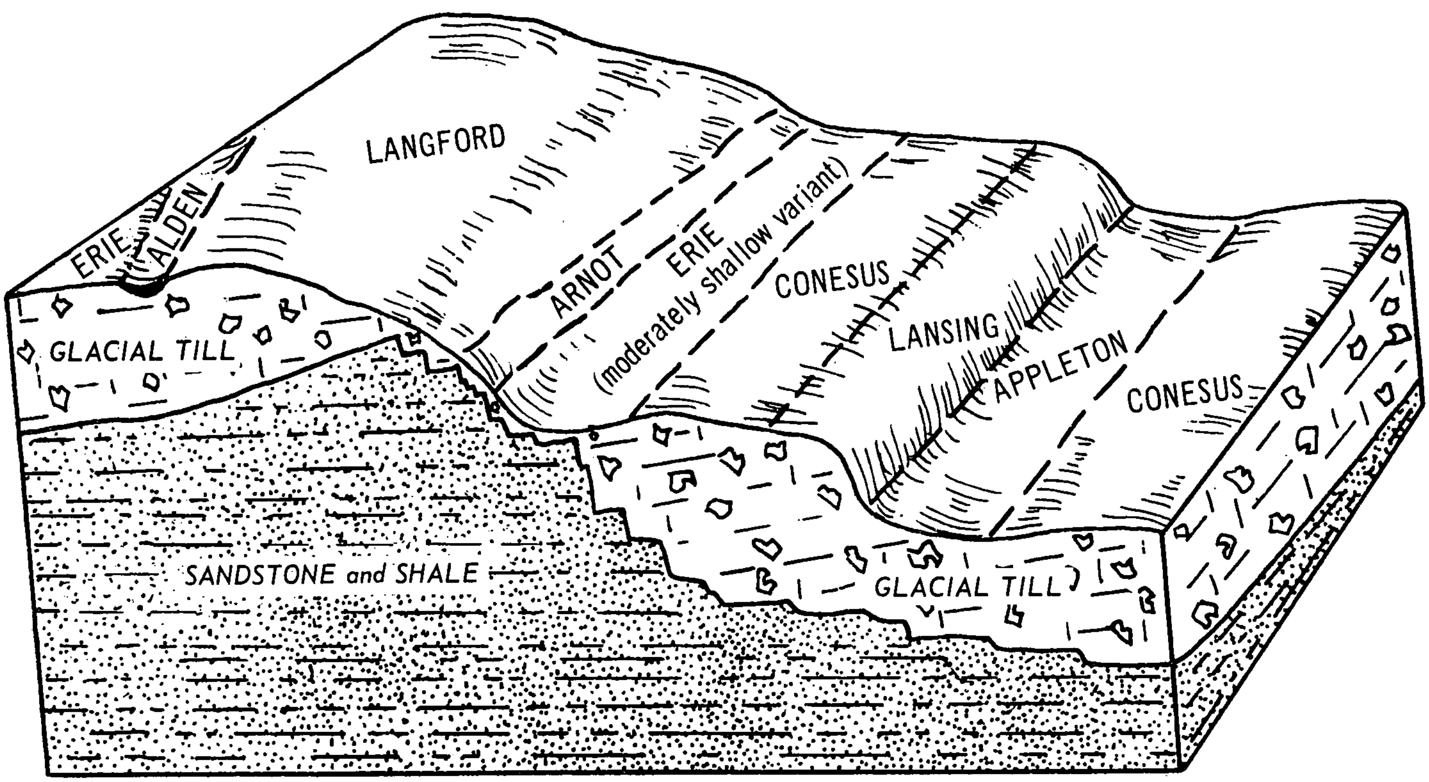

Figure 5.—Cross section of Langford-Erie and Conesus-Lansing associations in southern part of Seneca County.

The channery silt loam surface layer of the dominant soils of this association is 6 to 8 inches thick and is a poor or unsuitable source of topsoil. The soil and substratum materials are used, however, for hard fill and subgrade. The soil materials make waterproof dikes, and ponds built on these soils do not leak if bedrock is not exposed during construction. The harder shale and sandstone bedrock is used for roadbuilding with fair success. A few small areas of poorly stratified, silty, granular material are found in this association, but they are not extensive enough to warrant commercial exploitation.

This association is in an isolated part of the county that has no villages and few residents. Much of the land is under Federal jurisdiction, in the Hector Land Use Area, and a considerable amount of acreage is idle or abandoned. No industrial development has taken place, and little is likely in the future. Most of the soils are severely limited for septic tank disposal fields.

This area is well suited to recreation. The Federal land, which is also a public hunting area, is under the supervision of the Forest Service. The Forest Service has developed picnic and camping areas and trails for hiking. There has been much reforestation, which is usually successful where species suited to the soil conditions are planted.

Areas Dominated by Soils Developed in Organic Material

The one association in this category is located in the northeastern corner of the county at the northern end of Cayuga Lake. The major soils occur in the flat, depressional areas of the Montezuma Marsh. They formed in deposits of organic matter of varying thickness over mineral material. Some areas of the association have been drained and are used for growing vegetables. Part of the Montezuma National Wildlife Refuge is in this association.

11. Muck-Peat-Fresh water marsh association

Deep to shallow, very poorly drained organic soils

This association consists of one area in the Montezuma Marsh in the northeastern corner of the county. Most of the area is low or depressional, but there are a few isolated areas of uplands, or drumlins, which occurred as islands in the former shallow lakes.

This association occupies about 4 percent of the county. Muck makes up 32 percent of the association, and Fresh water marsh, 28 percent. The remaining 40 percent consists of Canandaigua, Cazenovia, Eel, Niagara, Ontario, Schoharie, Sloan, and Wallkill soils.

The types of muck are Muck, deep; Muck, shallow, which is 12 to 20 inches deep and is underlain by sand, silt, or clay; and Edwards muck, which is 12 to 40 inches deep and is underlain by marl. Most of the Fresh water marsh is manmade and consists of extensive shallow-water, diked areas within the Montezuma National Wildlife Refuge. These shallow-water areas are mainly underlain by muck or peat but include extensive areas of bottom-land and lake-laid soils. This wildlife area also includes a large area of natural Fresh water marsh, which is at the north end of Cayuga Lake and is assumed to be underlain by muck or peat.

Muck is suitable for farming when it is diked and drained. The several hundred acres that is cropped is used mainly for potatoes, some celery, and onions. Cultivated areas of these mucks are subject to severe soil blowing when they are drained.

Areas of muck now cropped are oxidizing and subsiding and eventually will be abandoned. Abandoned areas will revert to cattail marshes and become habitat for waterfowl and other marsh species. Most of the muck in the natural state supports swamp woods that consist mainly of soft maple and elm. Many of the smaller wooded areas can be diked and the water impounded for shallow-water developments for waterfowl habitat.

Drained muck is well suited to irrigation, and high-value crops show a marked response. Some crops on these soils are now irrigated by sprinkler systems. The nearby Clyde and Seneca Rivers keep the water table at a level that facilitates pumping.

Flooding generally occurs late in winter or early in spring, and undrained and undiked muck may be ponded for 6 to 10 months of the year. The mucks along the Clyde and Seneca Rivers may also be flooded.

Muck is not suitable for hard fill or as a source of sand and gravel. It is commonly used for topsoil, but it rapidly oxidizes and burns up. Muck is more suitable as a soil conditioner, for it adds organic matter to the topsoil or serves as a thin mulch to be used in establishing new lawns. It is also used in local greenhouses to condition soils or as a potting medium for young plants.

Muck is severely limited for both industrial and residential development. The included small knolls of well-drained upland soils are suitable sites for individual buildings or houses.

Use and Management of the Soils

The first part of this section discusses the general management of soils used for farming in Seneca County. The second part explains how soils are grouped according to their capability and describes the capability units in the county. In the third part, estimated acre yields are given for the principal crops under two levels of management. Next are discussions on the use of soils as woodland, for wildlife, and in engineering. Finally, there is a part that gives information about the nonfarm uses of soils.

General Management for Farming [4]

Farmers and those who advise farmers need to choose combinations of soil and crop management suitable for the soils on the farm and appropriate for conditions prevailing at the time they make their choice. They modify choices from year to year to take advantage of rapid advances in soil and crop management that result from agricultural research. Among the major choices are those that relate to need for lime and fertilizer and selection of

[4] This subsection prepared by E. L. McPherron, agronomist, Soil Conservation Service, from material furnished by Reeshon Feuer, associate professor of agronomy, Cornell University. Unless otherwise noted, the material is based on the results of research performed at the Aurora and Mount Pleasant Research Farms by staff members and associates of the New York State College of Agriculture at Cornell University.

a crop appropriate for the root zone and the water supply the soil provides.

Acidity.—The natural lime content of Seneca County soils ranges from low to high. Figure 6 illustrates the relationship of the different lime levels to a depth of 60 inches in four different profiles. The general soil map at the back of this survey shows areas of high-lime, medium-lime, and low-lime soils in the county.

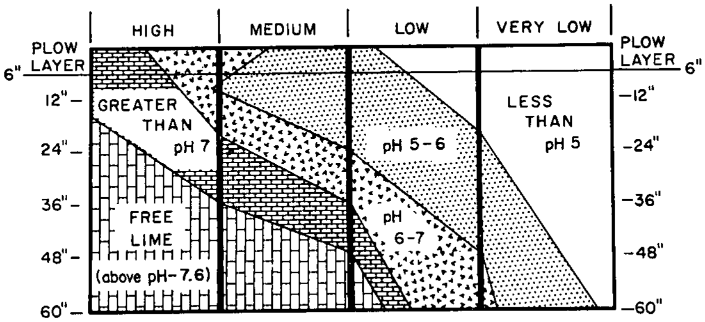

***Figure 6.*—Lime level at different depths in Seneca County.**

High-lime soils, such as the Honeoye, Schoharie, and Cazenovia, are commonly neutral or slightly acid in the upper part and are less acid with depth. They generally have free lime at a depth of 16 to 30 inches. Medium-lime soils, such as the Angola, Darien, Conesus, and Ontario, are strongly acid to a depth of more than 12 inches but are less acid as depth increases. Free lime generally occurs at a depth of more than 30 to 40 inches. Low-lime soils, such as the Langford, Erie, and Arkport, are very strongly acid to strongly acid to a depth of more than 24 inches, but in places they are calcareous deep in the substratum, commonly beyond the reach of plant roots.

Nitrogen.—The average organic-matter content of the surface layer of soils on uplands in the county is 3.5 percent, as determined by soil test data. Nitrogen is released from this organic matter at a rate of 40 to about 160 pounds per acre per year. Poorly drained soils that warm up slowly in spring need additional nitrogen.

Phosphorus.—Most of the soils in the county are naturally somewhat low in ability to supply phosphorus, and the addition of appropriate amounts of phosphorus in the form of commercial fertilizer is essential for good crop production. The medium-textured, moderately fine textured, and fine textured soils have moderate phosphorus supplying power. This means that they can release the equivalent of 10 to 25 pounds of phosphate annually. The coarse-textured soils have low phosphorus supplying capacity, which is equivalent to about 10 pounds of phosphate per year. A skillful farmer, by use of appropriately timed applications of phosphate, can profitably increase crop production or can achieve high production more economically.

Potassium.—In the section "Descriptions of the Soils," each soil series in the county is rated high, moderate, or low in potassium supplying power. Soils rated *high* supply more than 120 pounds of potash annually, soils rated *moderate* supply 70 to 120 pounds, and soils rated *low* generally supply less than 70 pounds. Clayey soils, such as those of the Odessa series, have very high potassium supplying power. Medium-textured soils that have a clay accumulation in the subsoil, such as the Honeoye and Ontario soils, have moderate potassium supplying capacity. This has been confirmed by extensive research trials on Honeoye, Lima, and Kendaia soils at the Aurora Research Farm in Cayuga County.

Effect of subsoil on root growth.—In choosing the crops to be grown on a given soil, the characteristics of the subsoil should be considered. Some soils, such as the Honeoye, Ontario, and Palmyra, have a subsoil that is easily penetrated by roots, and crops grown on these soils can send their roots to a great depth to obtain nutrients and moisture. Other soils, such as Lakemont soils that contain heavy clay layers, Erie soils that have a fragipan, or Arnot soils that are shallow to bedrock, have features that inhibit root growth.

Nearly all the high-lime and medium-lime soils have blocky structure in the subsoil. Crops can root deeply in these soils if drainage is good. Tile drainage is effective in moderately well drained to very poorly drained, medium-textured soils that have blocky structure in the subsoil. Open-ditch drainage is more effective in soils having fine-textured subsoil. Figure 7 shows the effect of soil drainage on root development.

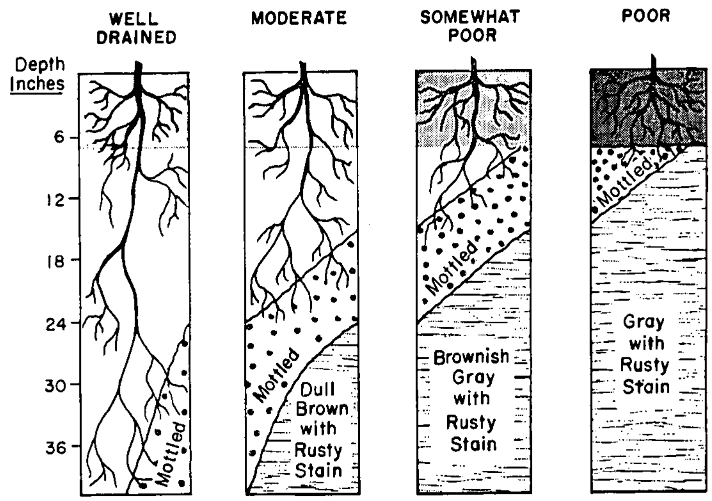

***Figure 7.*—Effect of soil drainage on root development.**

Crop adaptation.—The choice of an adapted crop variety depends largely on the natural drainage class or on the degree of artificial drainage. As new varieties are developed, and results of new research and observations are put into use, changes will be recommended. The annually revised "Cornell Recommends" publications, prepared by the staff of the New York State College of Agriculture at Cornell University, are designed to keep New York farmers and those who advise farmers abreast of the latest applicable research findings on soil and crop management. The user of this soil survey is strongly urged to use current editions of these publications.

New research findings are reported currently in annually revised editions of "Cornell Recommends for Field Crops" and "Cornell Recommends for Vegetable Crops." Cornell Miscellaneous Bulletin Number 47 and current editions of other applicable publications on soil and crop management should also be consulted. A great body of constantly revised but unpublished information is available upon request from the local office of the Soil Conservation Service and of the Cooperative Extension Service. Currently applicable information concerning soil and crop management is also available to the user of this survey from industry representatives who serve the farmers of Seneca County.

Capability Grouping [5]

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

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

In the capability system, all kinds of soils are grouped at three levels, the capability class, subclass, and unit. These are discussed in the following paragraphs.

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

- Class I soils have few limitations that restrict their use.
- Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.
- Class III soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.
- Class IV soils have very severe limitations that reduce the choice of plants, require very careful management, or both.
- Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife.
- Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife.
- Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture or range, woodland, or wildlife.
- Class VIII soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife, or water supply, or to esthetic purposes.

Capability Subclasses are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in some parts of the United States but not in Seneca County, shows that the chief limitation is climate that is too cold or too dry.

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

In the following pages the capability units in Seneca County are described and suggestions for the use and management of the soils are given.

CAPABILITY UNIT I-1

This unit consists of soils of the Howard and Palmyra series. These are deep, nearly level to gently undulating, well-drained, medium-textured soils on outwash terraces. Howard soils have a strongly acid to neutral subsoil, and the Palmyra soils have a medium acid to mildly alkaline subsoil. Available moisture capacity is moderate to high. Ability to supply plant nutrients is moderate.

These are the most productive soils in the county. They are easy to work, can be worked early in spring, and respond well to proper management. They respond well to intensive irrigation and are suited to all crops grown in the county, especially to deep-rooted crops. Economic return is generally greater for crops grown in rotation than for permanent pasture or forest. Row crops can be grown continuously if minimum tillage, crop residue, cover crops, and an occasional year of sod are used to maintain good soil structure. Stones on the surface interfere with the operation of some farm machinery.

CAPABILITY UNIT IIe-1

This unit consists of soils of the Honeoye, Lansing, and Ontario series. These are deep, well-drained, gently sloping or gently undulating soils. The subsoil is medium-textured to moderately fine textured and is slightly acid to mildly alkaline in reaction. Available moisture capacity is high, and runoff and hazard of erosion are moderate.

[5] This section prepared by Ernest L. McPherron, conservation agronomist, Emil J. Kahabka, soil conservationist, and Frank Z. Hutton, Jr., soil scientist, Soil Conservation Service.

These are among the best farming soils in the county and are suited to locally grown crops. Their ability to supply plant nutrients is moderate to high. They are easy to work and respond well to proper management. Stones may interfere with the operation of precision equipment that operates close to the ground, such as combines or sugar-beet harvesters and thinners. The uneven topography in some areas may require land shaping for the best use of farm machinery.

Erosion control measures should be used, and the maximum intensity of cropping should not exceed 3 years of row crops followed by 1 year of small grain and 1 year of hay. Contour farming should be used where practical to conserve moisture and help control erosion. For more intensive use of these soils, crop residue should be used on gently undulating slopes to supplement contour farming. Natural drainage is good, but for good row crop management small wet areas and waterways require random tile lines.

CAPABILITY UNIT IIe-2

Arkport loamy fine sand, 1 to 6 percent slopes, is the only soil in this unit. This is a deep, well-drained to excessively drained, gently sloping to gently undulating soil. The subsoil is coarse textured and contains bands of moderately coarse textured material. The surface layer is strongly acid to neutral; the lime content gradually increases with depth.

This soil is leachy, has moderate to low available moisture capacity, and is very low in natural fertility. Its ability to hold fertilizer is low, and its ability to supply fertilizer to plants is moderate to high if adequate moisture is available. If this soil is left bare, it is susceptible to soil blowing, and on the steeper slopes, to water erosion. Measures to conserve moisture and reduce wind velocity are needed.

This soil is suited to specialized vegetable and fruit crops. It is easy to work and warms up for early planting. Irrigation may be needed for the most favorable yields, and water can be applied rapidly. Erosion and gullying, however, may increase with irrigation. The use of cover crops and residue management is important in the control of soil blowing and erosion. Row crops should be grown no more than 3 years consecutively before at least 1 year of sod is grown. Deep-rooted forage species, which should be favored over shallow-rooted ones, require lime and topdressing to maintain stands. Because leaching is often serious, fertilizer should be applied as the plants are ready to use it.

CAPABILITY UNIT IIe-3

This unit consists of soils of the Conesus and Lima series. These are deep, gently sloping, moderately well drained soils. The surface layer ranges in reaction from strongly acid to neutral, and the medium-textured subsoil is mildly alkaline to medium acid. Free lime occurs in most places at a depth of 16 to 48 inches.

These soils are easy to work, but planting may be delayed in spring because of slight wetness. Available moisture capacity is moderate to high. Hazard of erosion is moderate, so measures to conserve soil and water are needed. Ability to supply plant nutrients is moderate to high.

These soils are well suited to cropping, pasture, or forest. Alfalfa and orchards, as well as general farm crops, can be grown if tile drainage is used. Tilth is not a serious problem. Unless erosion control practices are used, intensity of the cropping system should not be more than 1 year of row crop, 1 year of small grain, and 1 year of hay. These soils can be used more intensively by use of tile drainage, cultivation across the slope, and management of residue. Contour stripcropping and sodded waterways may be needed on the steeper slopes, and random drainage of included wet spots is desirable in most places regardless of how intensively this soil is used.

CAPABILITY UNIT IIe-4

This unit consists of soils of the Collamer series and of the Collamer series, moderately shallow variant. These are deep, gently sloping to undulating, medium-textured, moderately well drained soils that have a medium-textured to moderately fine textured subsoil. In places these soils are underlain by stratified silt, clay, or fine sand. The subsoil restricts water movement, and seeps are common where clay strata are at or near the surface. The surface layer is strongly acid to neutral, and lime content increases with depth.

These soils are easy to work, but planting may be delayed in spring because of slight wetness. Available moisture capacity is high. Ability to supply plant nutrients is moderate. These soils are well suited to most crops, to pasture, and to forest. The soils of this unit need careful management that reduces crusting, erosion, and compaction below the surface. Because these silty soils are highly susceptible to erosion when left bare, measures that conserve soil and water are needed. On slopes subject to runoff, maximum intensity of use should be 1 year of row crop, 1 year of small grain, and 1 year of hay. Use of cultivation across the slope, crop residue, minimum tillage, and cover crops reduces erosion. Because good structure is difficult to maintain, movement of vehicles and equipment across the soils should be avoided when the water table is less than 18 inches below the surface. These soils are made more suitable for all crops if pockets of surface water are removed by use of land shaping and random tile systems.

CAPABILITY UNIT IIe-5

This unit consists of soils of the Schoharie series. These are deep, gently sloping or undulating, moderately well drained to well drained soils that have a moderately fine textured to fine textured subsoil. The surface layer is mildly alkaline to strongly acid, and free lime occurs at a depth of 16 to 30 inches.

Most crops commonly grown in the area are well suited to these soils. Their use for growing intertilled crops is limited by tilth, but they are well suited to alfalfa hay if properly managed.

Careful management is needed on these soils, especially when growing cultivated crops on the silty clay loam. Planting is slightly delayed in spring because the subsoil restricts movement of water, which results in slight wetness. These soils are highly erodible if they are left bare, and they need measures to conserve water and soil. They become cloddy or severely crusted over after 1 or 2 years in row crops. Plowing or travel over the soils when they are too wet sometimes results in cloddiness and compaction that require the growing of a grass-legume sod to correct. Areas of wet soils in depressions can be drained by a random tile system. Maximum intensity of cropping should not exceed 1 year of corn, 1 year of grain, and 3 years of sod, unless slopes are shortened by diversions and a system is established for the safe disposal of surface water.

Control of erosion is difficult when growing crops such as beans and sugar beets, since the topography is generally too uneven for contour farming. Close-growing crops, crops that produce a large amount of residue, or year-round cover should be grown on the steeper slopes. A combination of tiled and sodded waterways is needed for drainage.

CAPABILITY UNIT IIe–6

This unit consists of soils of the Dunkirk series. These are deep, gently sloping to undulating, well-drained soils that have a medium-textured to moderately fine textured subsoil. Included in this unit are soils that are underlain by stratified clay or limestone bedrock. Where present, the limestone bedrock occurs at a depth of 3½ to 5 feet. The surface layer is strongly acid to neutral, and the lime content increases with depth. Ability to supply phosphorus and potassium is moderate.

Crops commonly grown in the county are suited to these soils. They are highly erodible, and measures to conserve water and soil are needed. These soils provide favorable conditions for root development and for air and water exchange. They respond well to application of lime and fertilizer.

These soils should not be plowed in fall, because subsequent freezing and thawing destroy structure in the surface layer. The plowed soil settles into a compact mass that makes seedbed preparation difficult the following spring. If good tilth is destroyed, sod must be grown for several years to rebuild structure.

Other good management practices that are adequate to control erosion on slopes of less than 3 percent are use of cover crops, crop residue, and minimum tillage. On slopes of 3 to 6 percent, these measures should be supplemented with contour stripcropping, where the topography permits, and use of sodded waterways. If these soils are not protected where cultivated, the maximum intensity of cropping should not exceed 1 year of row crop, 1 year of grain, and 3 years of sod. Random tile lines are needed to drain many local wet areas and natural waterways.

CAPABILITY UNIT IIe–7

This unit consists of soils of the Aurora and Cazenovia series. These are deep and moderately deep, gently sloping to undulating, moderately well drained to well drained soils that have a medium-textured to moderately fine textured subsoil. The surface layer is neutral to strongly acid, and lime content increases with depth. The moderately deep Aurora soil is underlain by bedrock at a depth of 20 to 40 inches. The soils in this unit have high available moisture capacity. Ability to supply plant nutrients is moderate to high. They are erodible.

These soils are suited to most crops grown in the county. Planting may be briefly delayed in spring because their subsoil restricts movement of water and causes slight wetness. If good soil structure is to be maintained, these soils should be tilled only when they are slightly moist.

Good management requires use of cover crops, minimum tillage, and crop residue. These measures should be supported by farming on the contour, where the topography permits, and use of stripcropping and sodded waterways. Waterways should be tiled where slope is more than 3 or 4 percent. Year-round cover and cropping systems consisting mostly of close-growing crops are needed on the uneven, steeper slopes. If these slopes are not protected where cultivated, the maximum intensity of cropping should not exceed 1 year of row crop, 1 year of grain, and 2 years of sod. Before orchards or vineyards are established, adequate tile drainage systems for disposal of surface water should be installed. Removal of excess water from local wet spots, seeps, and drainageways makes these soils easier to use. These soils erode readily if irrigated water is applied rapidly.

CAPABILITY UNIT IIe–8

This unit consists of soils of the Langford series. These are gently sloping, deep to moderately shallow, moderately well drained, acid soils that have a well-expressed fragipan at a depth of 15 to 24 inches. The fragipan ranges in reaction from moderately acid to neutral. It causes a slight wetness that may delay planting in spring. The fragipan also causes moderate available moisture capacity, limits the rooting depth, and restricts the zone in which nutrients are available. Where unlimed, the surface layer is strongly acid to medium acid, and lime content increases with depth. Hazard of erosion is moderate, and measures to conserve soil and moisture are needed.

These soils are suited to early maturing grains and hay if they are properly managed. They may be limited for certain crops because they are in the higher positions and have stones on the surface in places.

Loss of soil and water is reduced on the more gentle slopes by leaving crop residue on the surface over winter and by cultivating across the slope. On slopes of more than 5 percent, use of graded contour stripcropping and sodded waterways permits more intensive use. Random tile systems for draining small, wet areas are desirable.

CAPABILITY UNIT IIs–1

This unit consists of one mapping unit: Ontario silt loam, moderately shallow variant, and Farmington soils, 2 to 8 percent slopes. These are moderately deep to shallow, well-drained, nearly level to gently sloping soils. Limestone bedrock occurs mostly at a depth of 10 to 40 inches, but there are spots where the soils are very shallow and spots where they are deep. Reaction ranges from strongly acid to neutral. These soils have low to moderate available moisture capacity, depending on depth to bedrock. Ability to supply plant nutrients is moderate to high. Erosion is not a severe hazard, unless runoff from adjacent areas is excessive.

Most crops commonly grown in the county are suited to these soils. They are well suited to early planted crops, but supplemental irrigation may be needed for summer production. Good tilth is not difficult to keep under proper management.

These soils provide favorable conditions for root development and air and water exchange, but lack of adequate moisture may limit crop yields. If the supply of moisture is not limited, the high fertility of these soils compensates for their shallow depth.

Proper management includes measures to keep all soil in place to maintain depth, since shallow spots or rock outcrops may damage farm equipment. Water intake rate will be increased and soil structure improved by use of cover crops, crop residue, and minimum tillage.

CAPABILITY UNIT IIw-1

This unit consists of soils of the Claverack, Collamer, and Elnora series. These are deep, nearly level, moderately well drained, sandy and silty soils in moderately low positions. They have a fluctuating, moderately high water table or are underlain at a depth of 2 to 3 feet by a clayey substratum that restricts the movement of water. Reaction of the surface layer is very strongly acid to neutral, and lime content increases with depth. The sandy Claverack and Elnora soils have low available moisture capacity and ability to supply plant nutrients. The silty Collamer soils have high available moisture capacity and moderate ability to supply plant nutrients.

Most crops commonly grown in the area are well suited to these soils if they are properly managed, and the sandy soils are well suited to specialized crops such as vegetables. Planting in spring may be briefly delayed by the slight wetness.

These soils can be intensively cultivated if they are given a high level of management. Proper management includes use of minimum cultivation, mulching, crop residue, and cover crops. Soil blowing is a hazard on the sandy soils if they are left bare, so windbreaks should be constructed in broad, exposed areas. Soil blowing can also be controlled by mixing crop residue into the surface layer. On the more leachy, sandy soils, the use of a nitrogen sidedressing during the growing season is preferable for crops that require a high soil fertility. Drainage, especially of small, wet spots, increases the utility of the soils in this capability unit, but some areas lack adequate outlets. Where tile drainage is used, measures must be taken to keep silt and sand from filling the tile lines.

CAPABILITY UNIT IIw-2

Schoharie silty clay loam, 0 to 2 percent slopes, is the only soil in this unit. This is a deep, nearly level, moderately well drained to well drained soil that has a moderately fine textured surface layer and subsoil. The surface layer is mildly alkaline to strongly acid, and free lime occurs at a depth of 16 to 30 inches. Available moisture capacity is moderate to high. Ability to supply plant nutrients is moderate to high.

Most crops commonly grown in the county are well suited to this soil, but its usefulness for row crops is severely limited unless it is properly managed. The subsoil restricts movement of water downward, and the nearly level surface restricts movement laterally. This delays planting in spring and hinders harvesting if fall weather is especially wet.

Measures to remove excess water are needed for easier cultivation. The wet surface layer may crust, and the packed subsoil may get hard. Good soil structure is difficult to maintain. This soil becomes very cloddy or crusts over severely after 1 or 2 years in row crops. Also, plowing or traveling across this soil when it is too wet can cause cloddiness, crusting, and compaction, which may require the growing of a grass and legume sod to correct. Use of land shaping to insure quick removal of surface water, and random tile drainage to remove water from depressions, may be beneficial in some fields.

CAPABILITY UNIT IIw-3

Eel silt loam is the only soil in this unit. This is a deep, moderately well drained soil on bottom land that occasionally receives damaging overflow. Reaction of the surface layer is neutral to slightly acid, and in places the lower part of the soil contains free lime. Available moisture capacity and ability to supply plant nutrients are high.

This soil is limited by flooding, which commonly occurs in spring but may occur anytime. Once the limitation of flooding is overcome, this soil can be used continuously for row crops if it is properly managed. The soil is easy to work, although wetness in spring may cause a brief delay in planting. Land shaping to achieve better surface drainage may be needed in some places. Measures that reduce streambank cutting and prevent scouring or deposition of detrimental rubble are needed in places. Keeping good tilth and maintaining organic-matter content are seldom problems on this soil.

CAPABILITY UNIT IIw-4

This unit consists of soils of the Conesus and Lima series. These are deep, nearly level, medium-textured soils. They are only moderately well drained because the movement of water in the subsoil or substratum is restricted. Reaction of the surface layer ranges from neutral to strongly acid, and lime content increases with depth. Available moisture capacity is moderate to high. Ability to supply plant nutrients is excellent.

Most crops commonly grown in the area are suited to these soils, and they respond well to proper management. These soils are easy to work, but slight wetness may delay planting briefly in spring. Drainage of surface water makes field conditions more uniform and permits earlier planting in spring. Random drainage of wet spots is beneficial. Stones, especially on the Conesus soil, may hinder the operation of some farm machinery.

CAPABILITY UNIT IIw-5

This unit consists of soils of the Claverack and Elnora series. These are deep, gently sloping, moderately well drained soils that have a coarse-textured surface layer. They are moderately well drained because a fluctuating high water table or a clayey substratum limits the movement of water. Available moisture capacity is low. Ability to supply nutrients is low.

Crops commonly grown in the county are suited to these soils. Specialized crops, such as vegetables, are well suited to these soils if they are properly managed. Planting may be slightly delayed in spring because of slight wetness. These soils are easy to till and are suited to minimum tillage.

The soils of this unit are susceptible to soil blowing and water erosion if they are left bare. Soil blowing and washing are controlled by growing cover crops and leaving residue on the surface over winter. These soils are so undulating in many places that vegetation is the only means of controlling erosion.

Response to underdrainage ranges from rapid in the soil that has a coarse, sandy subsoil to slow in the soil that has a fine silt or clayey substratum. Where tile drainage is used, measures must be taken to keep sand from filling the tile lines. Where open-ditch drainage is used, erosion control is essential to maintenance.

Crops grown on these soils respond well to lime and fertilizer. Application of nitrogen in spring is needed for growing most crops. Excessive leaching necessitates frequent fertilization as needed by the crop grown. Organic-matter content is difficult to maintain under intensive farming, so crop residue and cover crops should be returned annually.

CAPABILITY UNIT IIIe-1

This unit consists of soils of the Honeoye, Lansing, and Ontario series. These are deep, well-drained, sloping soils that have a medium-textured to moderately fine textured subsoil. The surface layer is neutral to very strongly acid, and the lime content increases with depth. Hazard of erosion is moderate. Available moisture capacity is high, but runoff is so great that measures to conserve both soil and moisture are needed. Ability to supply plant nutrients is moderate to high.

Crops commonly grown in the county are suited to these soils, but erosion control is needed if cultivated crops are grown. Erosion control increases infiltration and offsets the moisture shortages that are common on these soils during the growing season.

Contour farming, contour stripcropping, and use of sodded waterways allow slopes to be farmed intensively. A suitable cropping system using these measures is 1 year of a cultivated crop, 1 year of oats or wheat, and 2 years of sod. Proper management of these soils includes the use of fertilizer, crop residue, cover crops, and minimum tillage. Wet spots and waterways should be tiled. Use of farm machinery is limited by stoniness and slope.

CAPABILITY UNIT IIIe-2

This unit consists of soils of the Howard and Palmyra series. These are deep, well-drained, sloping or rolling soils that formed in gravelly and sandy materials. They have a medium-textured surface layer that is underlain by stratified sand and gravel. Reaction of the surface layer is very strongly acid to mildly alkaline, and lime content increases with depth. Available moisture capacity is moderate to high, but runoff is so rapid that measures to conserve moisture are needed. Ability to supply nutrients is moderate.

Crops commonly grown in the county are suited to these soils. Intensity of farming should not exceed 1 year of cultivated crops, 1 year of small grain, and 1 year of sod, unless appropriate conservation practices are used. Best use of the soils in this unit can often be made by growing deep-rooted crops, such as bromegrass and alfalfa. These soils can be grazed early in spring.

Slope increases runoff and restricts the use of these soils. Runoff and erosion are generally controlled by heavy fertilization as needed, growing of cover crops, use of crop residue, and farming on the contour where practicable. These soils can be planted to crops early. They have fair to good ability to hold fertilizer. If intensive rotations are used on the steeper slopes, additional measures, such as use of sodded or tiled waterways and stripcropping, may be needed to control runoff and erosion. Addition of lime to the surface, extra potash on legumes, and extra nitrogen on grasses, grain, and corn help to achieve favorable production.

CAPABILITY UNIT IIIe-3

This unit consists of soils of the Langford series and of the Langford series, moderately shallow variant. These are moderately sloping, deep and moderately shallow, moderately well drained soils that have a well-expressed fragipan at a depth of 15 to 24 inches. The fragipan causes slight wetness in spring, limits the available moisture capacity to moderate, and restricts the roots to the zone above the fragipan. The soil above the fragipan has moderate ability to supply plant nutrients. The surface layer is strongly acid to medium acid where unlimed. Runoff is rapid, and hazard of erosion is moderate.

All soils commonly grown in the county are suited to these soils, but intensity of use is limited by slope. Unless appropriate conservation practices are used, maximum intensity of cropping should not exceed 1 year of row crop, 1 year of small grain, and 5 years of hay. More intensive cropping systems can be used if erosion is controlled by use of graded stripcropping, contour farming, sodded waterways, cover crops, crop residue, or similar practices. In some places these soils are best suited to mixtures that include alfalfa-trefoil because of slight frost heaving and spring seeps in waterways. Tile drainage of wet spots generally is needed for grain crops and for alfalfa. Lime content and fertility should be kept at a high level, even for moderate productivity.

CAPABILITY UNIT IIIe-4

Collamer silt loam, 6 to 12 percent slopes, is the only soil in this unit. This is a deep, moderately well drained, medium-textured soil. Available moisture capacity is high, and ability to supply plant nutrients is moderate. Runoff is rapid, and this soil is highly erodible.

This soil is suited to most crops, to pasture, and to forest. Control of runoff and erosion may be difficult, especially in eroded areas, because of rills, gullies, poor soil structure, and the topography. Large areas of this soil that cannot be protected by use of contour farming and diversions should be kept in a permanent cover or in long-term hay rotations. Where the topography is suitable, a safe cropping system consists of no less than 2 years of hay in a 4-year rotation. This should be supported by use of cover crops, crop residue management, minimum tillage, fertilizing to maintain a high level of fertility, sodded waterways, and contour farming or stripcropping. Good soil structure is difficult to maintain in areas that are eroded.

A slight wetness delays planting in spring. Seeps during wet periods, which are common where clay layers are near the surface, affect the growth of crops. Random tile lines are needed to drain wet spots.

CAPABILITY UNIT IIIe-5

This unit consists of soils of the Aurora and Cazenovia series. These are deep to moderately deep, moderately sloping, moderately well drained to well drained soils. They have a medium-textured surface layer and a medium-textured to moderately fine textured subsoil. The surface layer is neutral to strongly acid, and lime content increases with depth. Available moisture capacity is high. Runoff is rapid, and hazard of erosion is severe. Ability to supply nitrogen and phosphorus is medium, and potassium is high.

Most crops commonly grown in the county are well suited to these soils if adequate measures are taken to conserve soil and moisture and to maintain fertility. Cover crops, crop residue, and minimum tillage should be used as much as practical. Permanent cover and long-term hay rotations are other relatively safe ways to use these soils. Forage production can be maintained at a high level if plants are supplied with adequate nutrients and crops are harvested at a stage of growth that maintains a strong root system.

Soil and moisture conservation can also be achieved by use of contour stripcropping together with sodded waterways and diversions to break up the long slopes. The maximum intensity of cropping should not exceed 1 year of cultivated crop and 2 years of sod. Sodded waterways should have underdrains and surface water inlets for their protection. Shale bedrock may interfere with installation of tile used for draining included wet spots and drainageways.

CAPABILITY UNIT IIIe-6

Cazenovia silt loam, 3 to 8 percent slopes, eroded, is the only soil in this unit. This is a deep, moderately well drained to well drained, gently sloping soil that has a moderately high clay content. Severe erosion of this soil has depleted the organic matter, and the present surface layer contains more clay than the uneroded Cazenovia soils as a result of the subsoil being plowed up. The present surface layer is neutral to slightly acid, and lime content increases with depth. Hazard of further erosion is severe. Although this soil is slightly wet in spring, its capacity to supply moisture in dry periods may be limited by rapid runoff. Ability to supply plant nutrients is moderate.

Most crops commonly grown in the county are suited to this soil. Control of erosion is the main need in management but is difficult because of rills and gullies. Erosion control measures include use of contour farming, sodded waterways, and diversion ditches. Sodded waterways should have underdrains and surface water inlets for their protection. Soil-building rotations no more intensive than 1 year of row crop, 1 year of close-growing crop, and 2 years of hay should be used.

Maintaining good soil structure is very difficult on this soil. Measures that restore and maintain good soil structure are residue management and use of minimum tillage. Plowing in fall should be avoided if practical.

CAPABILITY UNIT IIIw-1

Muck, deep, is the only soil in this unit. This is a very poorly drained organic soil that is more than 40 inches deep over mineral soil material that consists of sand, silt, clay, or various combinations of these. The muck is very strongly acid to moderately alkaline, and the underlying mineral material is generally calcareous.

This soil is well suited to selected crops if it is adequately drained. If it is not drained, it is suited only to swamp woods and low-quality pasture. Productivity and length of use depend on the thickness of the muck. After muck is drained, measures are needed to control its gradual decrease in thickness, which occurs through subsidence, oxidation, and soil blowing.

An adequate drainage plan includes provisions for suitable outlets, rights-of-way, pumping units, dikes, open ditches, tile drainage, and water control structures. Because the cost of constructing, maintaining, and operating the drainage system is generally high, this soil needs to be farmed intensively to be most profitable. Many crops can be grown after drainage, but heavy fertilization is necessary.

Muck settles as it is farmed, and cropping systems, field layout, and windbreaks should be planned in relation to the drainage system. Large areas that are subject to soil blowing require artificial or living windbreaks. The moderately deep muck north of Waterloo is not farmed so intensively as the deep muck in the northeastern part of the county. These more shallow areas should be checked in detail for the depth of the muck before drainage and other development is undertaken.

Frost late in spring and early in fall is common in these low areas because of poor air drainage. Use of sprinkler irrigation is often profitable for frost protection as well as for good plant growth.

CAPABILITY UNIT IIIw-2

This unit consists of soils of the Appleton, Cosad, Niagara, and Stafford series. These are deep, level to nearly level soils that have a medium-textured to coarse-textured surface layer. The soils are somewhat poorly drained because they have a fluctuating high water table or because subsoil and substratum layers restrict water movement. Reaction of the surface layer ranges from mildly alkaline to very strongly acid, and lime content increases with depth. Available moisture capacity is moderate to high. Ability to supply nutrients to plants is variable. The available nitrogen is about the same for all the soils, but Appleton and Niagara soils are high or moderately high in their ability to supply potassium, and the sandy Cosad and Stafford soils are low.

All field crops and vegetables commonly grown are well suited to these soils if they are adequately drained. If they are not drained, they are limited to forage crops that tolerate seasonal wetness. Adequate liming and fertilizing are essential, regardless of the drainage condition. Tile drainage is usually feasible, but some of the soils are sandy or silty, and drainage systems plug if the joints are not wrapped.

Continuous row crops can be grown, but crop residue and minimum tillage should be used. Soil structure is maintained by including a sod or green-manure crop in the cropping system and leaving the soils undisturbed for a winter-summer-winter period.

CAPABILITY UNIT IIIw-3

This unit consists of soils of the Erie series and of the Erie series, moderately shallow variant. These are deep to moderately shallow, nearly level, medium-textured, somewhat poorly drained soils that have a dense, slowly permeable fragipan at a depth of 12 to 18 inches. These soils contain more than 15 percent stone fragments by volume. The surface layer is strongly acid to medium acid, and the fragipan is medium acid to neutral. The fragipan limits the amount of available water and the depth to which roots can penetrate.

Available moisture capacity is low, and lack of moisture can be critical after a week or more without rain. Ability to supply plant nutrients is moderate.

These soils are poorly suited to cultivation if they are not drained, and water-tolerant forage species should be used. Forage harvests are better managed if runoff from adjacent higher areas is diverted. Land shaping is about the only feasible method of assuring proper drainage. Lime and complete fertilizers are needed. Heavy annual application of nitrogen on water-tolerant grass sod results in good forage production when these soils are properly managed. Random tile drainage of wet spots improves the utility of these soils.

CAPABILITY UNIT IIIw-4

This unit consists of soils of the Sloan and Wallkill series. These are deep, level bottom-land soils. They are dominantly medium textured, have high organic-matter content, and are underlain at a depth of 2 to 4 feet by gravel, sand, clay, marl, or muck. These soils are subject to occasional flooding during the growing season. They are poorly drained to very poorly drained because they have a high water table that is dependent on the level of the water in the stream. Reaction ranges from slightly acid to mildly alkaline. Capacity to supply moisture and nutrients is high.

Most crops commonly grown in the area are suited to these soils if they are drained and flooding is controlled. Stream channel improvements often must be made to help lower the water table, and dikes must be built to prevent flooding. Tile is used where outlets of suitable depth are available. When these soils are drained, they can be farmed intensively if they are properly managed. There are few or no tilth problems, and organic-matter content remains high.

If these soils are not drained, they have limited use and are usually kept in native pasture. Reed canarygrass is suited to these soils, and birdsfoot trefoil and timothy are also well suited where surface drainage permits water to drain off within 2 or 3 days. Application of nitrogen fertilizer is needed each year.

CAPABILITY UNIT IIIw-5

This unit consists of soils of the Angola, Darien, Odessa, and Ovid series. These are deep and moderately deep, level to nearly level, somewhat poorly drained soils that have a moderately fine textured to fine textured subsoil. The surface layer is strongly acid to mildly alkaline, and lime content increases with depth. The heavy subsoil restricts drainage, and the resulting moderate wetness delays planting and affects plant growth during wet periods. Available moisture capacity is high. Ability to supply plant nutrients is moderate to high.

Crops commonly grown in this area are suited to these soils if they are properly managed. Internal drainage is essential to intensive cropping. Intensive-pattern underdrainage systems are necessary and generally are economically justified for crop production. The slowly permeable subsoil requires close spacing of tile drains. Land smoothing to supplement tile drainage is commonly needed. The soft bedrock under the Angola soils can usually be dug with a trencher but may present some problems to the installation of tile drains.

Maintaining good soil structure may be difficult (fig. 8). Careful tilth management in all its forms is essential for moderately intensive use of these soils. The soil should not be plowed when wet, and crop residue should be returned to the soil. Minimum tillage, including the disking of stubble before plowing and pulling a pulverizer behind the plow, is desirable. These soils should not be plowed more than 3 years in succession before they are planted to at least 1 year of sod.

Figure 8.—Severe crusting on Darien silt loam, 0 to 3 percent slopes.

These soils are not stony and lend themselves to use of most farm machinery. They respond well to fertilization and may need lime. Moisture-tolerant sod crops should predominate in the cropping system if adequate drainage is lacking. These soils tend to crust over quickly if irrigation water is applied at a high rate.

CAPABILITY UNIT IIIw-6

This unit consists of soils of the Angola, Darien, Danley, Cazenovia, Odessa, and Ovid series. These are deep and moderately deep, gently sloping, somewhat poorly drained to well-drained soils. They have a moderately fine textured and fine textured subsoil that restricts drainage. The surface layer is strongly acid to mildly alkaline, and the lime content increases with depth. These soils are highly erodible. Available moisture capacity is high. Ability to supply plant nutrients is moderate to high.

Selected crops are suited to these soils if they are properly managed. Proper management includes measures to improve drainage and control erosion, and an intensive program of fertilization and harvesting management should be used in undrained areas that are kept in sod. Terraces, contour farming, graded stripcropping, and sodded waterways are needed where the topography permits, especially if cropping systems do not provide adequate winter cover. These soils need careful tilth management each year that they are cultivated. Proper tilth management includes not plowing when the soils are wet, disking stubble before plowing, and returning all crop residue.

CAPABILITY UNIT IIIw-7

This unit consists of soils of the Alden, Canandaigua, and Lamson series. These are level, poorly drained to very poorly drained, moderately coarse textured to medium-textured soils that occur in low areas. In places they are very wet and have a mucky surface. The surface layer is mildly alkaline to slightly acid, and lime content increases with depth. Available moisture capacity and ability to supply plant nutrients is high.

Selected crops are suited to these soils if they are drained and well managed, but they are too wet for cropping if they are not drained. Adequate drainage outlets may be difficult to establish because of the depressional positions of these soils, and land shaping may be needed. A pattern drainage system is needed for adequate drainage. Once the soils are drained, a high level of management and a fairly intensive cropping system made up of annual crops can be used. Proper supporting management includes use of cover crops, crop residue, and minimum tillage.

Areas not drained normally return to hardwoods, such as soft maple. Control of these woody plants is necessary if these areas are to be used for productive pasture.

CAPABILITY UNIT IIIw-8

This unit consists of soils of the Erie series and of the Erie series, moderately shallow variant. These are deep and moderately shallow, gently sloping, somewhat poorly drained soils that have a dense, slowly permeable fragipan at a depth of 12 to 18 inches. These soils contain a moderate amount of angular stone fragments. The surface layer is strongly acid to medium acid, and the fragipan is medium acid to neutral. The fragipan restricts drainage and limits the amount of water and nutrients available to plants, since roots cannot penetrate the fragipan. Hazard of erosion is slight to moderate.

Crops commonly grown in the county can be grown on these soils if properly managed. These soils are limited mainly by wetness, but they are also erodible, and plants grown on them show moisture stress after a week without rain. Response to tile drainage is limited, so only small, localized spots should be underdrained. Surface stones may interfere with the machine harvesting of crops.

Because of the shallow root zone, these soils are best suited to long hay rotations. Small grains in rotation with sod crops also may be grown on these soils. Where it is practical to use such supporting practices as graded contour stripcropping, sodded waterways, diversions, crop residue management, cover crops, and minimum tillage, the cropping system can be 1 year of a cultivated crop followed by 2 years of hay.

Control of erosion is very critical because of the shallow depth of these soils above the fragipan. Runoff can be controlled and safely disposed of with a planned system of diversion terraces, which also control erosion and permit more intensive cultivation.

CAPABILITY UNIT IIIw-9

This unit consists of soils of the Appleton series. These are deep, somewhat poorly drained, medium-textured, gently sloping soils that formed in limy glacial till. Reaction of the surface layer is mildly alkaline to slightly acid, and free lime occurs at a depth of 18 to 30 inches. Hazard of erosion is moderate. Moderate wetness delays planting and affects plant growth during wet periods. Available moisture capacity is high. Ability to supply plant nutrients is moderate to high.

Nearly all crops commonly grown in the county are suited to these soils if they are adequately drained. If properly managed they are highly productive. Maximum suggested intensity of cropping, if all needed tilth and erosion control measures are used, is at least 1 year of sod for each 5 years of row crops. Among the measures appropriate for control of erosion are minimum tillage, avoiding plowing when the soils are wet, and disking before plowing stubble. If the slopes are not protected, maximum safe intensity of cropping is 1 year of a cultivated crop, 1 year of a small grain, and 2 years of sod.

Water management, including use of diversions and terraces to dispose of runoff from higher soils, is commonly needed. Response to deep underdrainage is excellent.

CAPABILITY UNIT IVe-1

This unit consists of soils of the Honeoye and Lansing series. These are deep, well-drained, moderately steep to hilly soils that are moderately eroded. The surface layer ranges in reaction from strongly acid to neutral. Lime content increases with depth. Available moisture capacity is high. Capacity to supply plant nutrients is moderate to high. Runoff is rapid. Hazard of erosion is severe.

Much of the acreage of these soils is best suited to pasture, especially where the slopes are more than 20 percent, but woodland, wildlife, or recreational uses should also be considered. If these soils are properly managed, they are suited to deep-rooted hay crops. Stones make tillage impractical in places. Slopes either are too steep to make use of machinery safe when it is operated on the contour or they are too strongly rolling for contour tillage.

The more gentle slopes can be used for long cropping systems, such as corn, oats, and hay in a 6-year rotation; wheat, oats, and hay in a 5-year rotation; and, if stripcropping is used, corn, oats, and hay in a 2-year rotation. If corn is cut for silage, a fall grain or cover crop should be planted immediately. Crop residue, stripcropping, sodded waterways, and minimum tillage should be used wherever practical. Tile lines may be needed to drain local wet spots or to protect drainageways. Use of diversions generally is not practical.

CAPABILITY UNIT IVe-2

This unit consists of soils of the Lansing and Ontario series. These are deep, well-drained, moderately sloping, severely eroded soils. Erosion has depleted the organic matter over much of the area, and the present surface layer contains more clay than uneroded soils. Reaction of the present surface layer is strongly acid to neutral, and lime content increases with depth. Available moisture capacity is moderate to high, and ability to supply plant nutrients is moderate. Hazard of erosion is severe.

Crops commonly grown in the area are suited to these soils if proper management, including erosion control measures, is used. Erosion control may be difficult because of the rills, gullies, or heavier surface layer produced by past erosion. These soils seal over, erode, and clod readily, and they are more difficult to cultivate because of their past treatment. They are suited to hay and pasture crops if they are fertilized and properly managed.

If the cause of the severe erosion hazard is corrected, these soils can be used in long cropping systems with crops that produce a large amount of residue and that provide winter cover. If contour farming is used, the maximum cropping intensity should not exceed 1 year each of grain, oats, and wheat followed by sod for 6 years, or 1 year each of silage corn and wheat followed by 3 years of hay or other sod crop. If row crops are grown, contour stripcropping, sodded waterways, and similar measures should be used. These measures should be supported by use of cover crops, minimum tillage, and maintenance of a high level of fertility. The alternative is to keep these soils in long-term hay and, where necessary, to reseed them in narrow strips as nearly on the contour as is practical.

CAPABILITY UNIT IVe-3

Langford channery silt loam, 15 to 25 percent slopes, is the only soil in this unit. This is a deep, moderately well drained, moderately steep to hilly soil that has a well-developed fragipan at a depth of 15 to 24 inches. Reaction of the surface layer is strongly acid to medium acid, and reaction of the fragipan is medium acid to neutral. Available moisture capacity of the soil above the fragipan is moderate. Because runoff is rapid to very rapid, however, the amount of moisture retained for plant use is limited and the hazard of erosion is severe. Ability to supply plant nutrients is moderate.

Crops commonly grown in the county are moderately well suited to this soil if it is properly managed, but the best field crop use is for producing livestock forage. Measures to conserve both soil and water are needed for the most effective use of this soil.

Eroded areas need to have a large amount of crop residue and manure returned annually, and winter cover is essential when row crops are grown. Use of minimum tillage where this soil is cultivated, together with cover crops or crop residue to protect the soil surface, helps to reduce loss of soil and water. Sodded waterways are needed to carry the rapid runoff away safely. Lime and fertilizer are needed to maintain productive sod. On these steep slopes, operation of machinery is hazardous and the reduced amount of soil moisture limits yields. Alternate use of this soil for woodland, wildlife habitat, or recreation should be considered.

CAPABILITY UNIT IVe-4

Langford channery silt loam, 8 to 15 percent slopes, eroded, is the only soil in this unit. This is a deep, moderately sloping, moderately well drained soil that has a well-expressed fragipan. Reaction of the surface layer is strongly acid to slightly acid, and reaction of the fragipan is medium acid to neutral. Erosion has depleted the organic-matter content of this soil and decreased the depth of the fragipan to 10 to 15 inches. The reduction in the depth to the fragipan has resulted in moderate wetness in spring and in a moisture deficiency in dry periods. It also has reduced the zone in which plants can root and obtain nutrients and has increased the hazards of runoff and erosion.

Large areas of this soil are most easily managed when seeded to long-term hay. Selected crops can be grown, however, if this soil is properly managed. Proper management includes measures to control erosion and conserve moisture. Erosion can be controlled by use of diversion ditches, sodded waterways, tile drainage, and graded contour stripcropping. Maintenance of a high level of fertility and use of cover crops, crop residue, and minimum tillage should be practiced where practical. The maximum intensity of the rotation should not exceed 1 year of cultivated crop to 4 years of sod.

CAPABILITY UNIT IVe-5

Schoharie silty clay loam, 6 to 12 percent slopes, eroded, is the only soil in this unit. This is a moderately well drained to well drained, sloping to rolling, moderately fine textured soil. Severe erosion has depleted the organic matter in this soil and exposed a moderately fine textured or fine textured layer in most areas. The reaction of the surface layer is slightly acid to mildly alkaline, and the lime content increases with depth. This soil can be slightly wet in spring, and although the available moisture capacity is moderate, its capacity to store moisture for use in dry periods is limited by rapid runoff.

When it is properly treated with a complete fertilizer, this soil produces good forage, including deep-rooted legumes. It can be used for commonly grown field crops, but because of past treatment, it is better suited to plants that provide permanent cover.

If it is cultivated, this soil requires use of intensive erosion control measures, including crop residue management or growing of winter grains to protect the surface layer. Extreme care is needed to keep tilth under cultivation. If stripcropping is used, a cropping system including 1 year of corn and 4 years of sod may be used safely. Contour tillage, however, is generally difficult or impractical because the soil is strongly undulating or rolling.

CAPABILITY UNIT IVe-6

Dunkirk silt loam, 12 to 20 percent slopes, is the only soil in this unit. This is a deep, well-drained, medium-textured, strongly rolling to moderately steep, dominantly silty soil. Reaction of the surface layer is strongly acid to neutral, and lime content increases with depth. Available moisture capacity is high, but this soil is droughty because of rapid runoff. Hazard of erosion is severe. This soil is moderate in its ability to supply phosphorus and potassium and generally low in its ability to supply nitrogen.

The use of this soil is limited by slope, but it is suited to hay and pasture if it is properly managed. Proper management includes use of measures to control erosion and conserve moisture. Row crops should not be grown on this soil. It can be used safely for long-term hay rotations if the crops are of the kind that produce much residue or that provide winter cover. Cover crops, crop residue management, and minimum tillage should be used wherever practical. Maintaining a high level of fertility is important. Reseeding by renovation is advisable, and harvests should be planned so that strong root systems are maintained. All farming operations should be across the slopes where practical, although contour tillage is limited in most places by the complex slopes.

CAPABILITY UNIT IVe-7

Dunkirk silt loam, 6 to 12 percent slopes, eroded, is the only soil in this unit. This is a deep, well-drained, medium-textured, moderately sloping or undulating soil. Severe erosion has depleted the organic matter, and in places the present surface layer contains more clay than the uneroded soil. Reaction of the present surface layer is medium acid to neutral, and lime content increases with depth. Available moisture capacity is moderate to high. Rapid runoff, however, reduces the amount of water that is stored for use in dry periods. Hazard of erosion is severe. Ability to supply phosphorus and potassium is moderate, and nitrogen is low.

This soil is most easily managed under permanent cover. Where adequate erosion control measures are taken, however, fair to good production of selected crops can be expected. The structure of this soil is difficult to maintain, and it breaks down with frequent tillage. This leads to crusting, which results in restricted water intake, severe erosion, and loss of organic matter. Irrigation of this soil can also cause severe erosion damage.

Forage crops respond well to lime and fertilizer, and a high level of fertility should be maintained on both hay and cropland. Sodded waterways and diversions are usually needed. Cover crops, crop residue management, and minimum tillage should be used as much as practical. Cropping systems including crops that produce a large amount of residue and provide winter cover, for example, 1 year of cultivated crop, 1 year of winter grain, and 6 years of sod, should be the maximum intensity of use. Erosion may be severe, however, on soils planted to winter grain. Where it is practical to install erosion control measures, a rotation of 1 year of cultivated crop to 4 years of sod may be used.

CAPABILITY UNIT IVe-8

This unit consists of soils of the Aurora and Cazenovia series. These are deep and moderately deep, moderately steep and hilly, well drained to moderately well drained soils that have a moderate clay content. Available moisture capacity is high. Rapid runoff, however, limits the amount of moisture that is stored for use in dry periods. Ability to supply plant nutrients is moderate to high. Hazard of erosion is severe.

Hay and forage crops are suited to these soils if they are properly managed. These soils may be plowed occasionally and seeded to small grain to rejuvenate the hay or forage crop. Tillage should be on the contour where practical, and longer slopes should be plowed in strips to reduce runoff and control erosion. Use of modern farm machinery is limited by the moderately steep or hilly topography.

CAPABILITY UNIT IVe-9

Cazenovia silt loam, 8 to 15 percent slopes, eroded, is the only soil in this unit. This is a deep, well-drained to moderately well drained, moderately sloping, somewhat clayey soil. Severe erosion has depleted the organic matter and in some places exposed a surface layer that contains more clay than the uneroded soil. Reaction of the surface layer is slightly acid to mildly alkaline, and lime content increases with depth. This soil may be slightly wet in spring. Available moisture capacity is high, but rapid runoff limits the amount of moisture that is available in dry periods. Ability to supply plant nutrients is high. Hazard of erosion is severe.

Long-term hay is suited to this soil. Under favorable conditions cropping systems can be planned that provide a large amount of residue or that include winter grain. An example of such a cropping system is 1 year of cultivated crop, 1 year of winter grain, and 6 years of sod.

Control of erosion may be difficult because of rills and gullies, but if adequate measures are taken, fair to good production of selected crops can be expected. If supporting erosion control measures are used, this soil can be farmed in a rotation consisting of 1 year of cultivated crop and 2 years of sod.

Maintenance of good soil structure is difficult. This soil crusts easily and puddles if it is worked while wet. Because of past treatment, extreme care is needed to keep the tilth of the surface layer. Disking before plowing and fall plowing on the contour may reduce the number of times a field needs to be worked before planting in spring. When it is necessary to plow, crop residue, cover crops, contour farming, and stripcropping should be used where practical.

CAPABILITY UNIT IVe-10

This unit consists of soils of the Arkport series. These are deep, well-drained to excessively drained, coarse-textured, dominantly rolling or hilly soils. Reaction of the surface layer is strongly acid to neutral, and lime content increases with depth. Hazard of runoff and erosion is severe. Available moisture capacity is low to moderate. Ability to supply plant nutrients is low. Soil blowing is a hazard in exposed areas.

These rolling soils are better suited to deep-rooted hay and pasture crops or to trees than to cultivated crops. Intensity of cropping should be limited to 1 year of corn and 5 or 6 years of sod. Deep-rooted, close-growing plants generally give the best return.

Measures to conserve moisture and control erosion are needed but are difficult to apply. Although these soils can be grazed or worked early in spring, every precaution is needed to protect the surface layer. Conserving crop residue, growing winter grain, and growing cover crops are ways to prevent loss of soil moisture and nutrients. Lime and fertilizer should be applied frequently, since leaching and erosion can quickly change the available supply of nutrients. Contour tillage is generally impractical on these soils. No-plow cropping systems can be used in areas where use of machinery is not restricted by slope.

CAPABILITY UNIT IVe-11

This unit consists of Palmyra and Howard soils, 15 to 25 percent slopes. These are deep, well-drained, moderately steep or hilly soils that formed in gravelly and sandy materials. They have a medium-textured surface layer and become coarser textured as depth increases. Reaction of the surface layer is very strongly acid to mildly alkaline, and lime content increases with depth. Runoff is rapid. Available moisture capacity is moderate to high, so measures to conserve moisture are needed. Ability to supply plant nutrients is moderate.

Most areas are too steep for growing crops, except possibly orchards with sod cover. The soils are suited to alfalfa if proper fertilization and management, including topdressing, are used every year. Reseeding should be in narrow strips as nearly on the contour as is practical. Short slopes or moderately steep areas occasionally may be planted to cultivated crops, grain, or sod crops that provide winter cover or a large quantity of residue. A high level of fertility should be maintained. In areas where machinery can be used safely, a no-plow cropping system can be used. Nitrogen and potash fertilizer should be applied as nearly as possible to the time the crop will use them, since these soils are subject to leaching.

CAPABILITY UNIT IVw-1

This unit consists of soils of the Fonda, Ilion, Lakemont, Madalin, Odessa, and Romulus series. These are deep, mainly poorly drained to very poorly drained, moderately fine textured soils. The Odessa soil is somewhat poorly drained. Reaction of the surface layer of these soils is strongly acid to mildly alkaline, and lime content increases with depth. Available moisture capacity and ability to supply plant nutrients are moderate to high.

These soils occur in low, level areas that are subject to ponding in wet periods. If undrained, they are too wet for cultivated crops, and ponding in winter may result in a damaging ice cover. Possible exceptions are small areas in fields used mostly for hay and other extensive crops.

If these soils are drained and cultivated, the difficulty of maintaining good soil structure poses additional limitations. Use and response of the soils depend on the effectiveness of measures taken to overcome these limitations. If these soils are partially drained, permanent grass sod that tolerates flooding can be maintained for the production of forage by using a high-nitrogen fertilization program.

Drainage outlets in these slowly permeable soils must be closely spaced. Because these soils are in low, pocketed positions, adequate outlets may be difficult to establish. After drainage, intensive measures are needed to keep the soils in good tilth. These measures include fall plowing, cultivating at the ideal moisture content, return of crop residue, land smoothing, and plowing no more than three times between sod crops. Travel across these soils should be avoided when any part of the top 15 inches of soil can be pressed into a firm ball. A high level of fertility should be maintained.

Additional limitations on these soils are frost heaving, droughtiness in summer, and late-harvest problems. All of these limitations make major improvement of these soils of doubtful value. Where these soils occur as an inclusion with other soils, and are properly managed, moderate yields of the most common crops can be expected.

CAPABILITY UNIT IVw-2

Lakemont silty clay loam, 2 to 6 percent slopes, is the only soil in this unit. This is a deep, poorly drained, moderately fine textured, gently sloping soil. Reaction of the surface layer is slightly acid to mildly akaline, and lime content increases with depth. Hazard of erosion is slight to moderate. The subsoil is moderately fine textured to fine textured. Available moisture capacity is moderate to high. This soil is wet in spring and during wet periods. Wetness delays planting and affects plant growth. In dry periods there may be a slight moisture deficiency. Ability to supply phosphorus is moderate, and potassium is high. The supply of nitrogen is low in spring when the soil is wet.

This soil is suited mainly to pasture or forest if it is not drained. With adequate drainage it is suited to corn, oats, and hay. In most places drainage can be improved by intercepting runoff from adjacent areas.

The suitability of this soil for crops depends on the effectiveness of the measures used to overcome the limitations of wetness, cloddiness, and erosion. The soil clods readily, and good soil structure is difficult to maintain. This soil should not be exposed to traffic when the upper 15 inches of the soil is damp enough to form a firm ball. Cover crops and crop residue should be used. To control erosion, this soil should be tilled on a slight grade toward natural or constructed waterways.

CAPABILITY UNIT IVw-3

This unit consists of soils of the Alden and Lyons series. These are deep, poorly drained and very poorly drained, medium-textured soils. They are level or nearly level and occupy depressional areas that receive a considerable amount of runoff from adjacent areas and are often ponded. Reaction of the surface layer is medium acid to neutral, and lime content increases with depth. Ability to supply potassium is moderate to high, and that for phosphorus is moderate. Ability to supply nitrogen is low in spring.

Cultivated crops are suited if the soils are drained, and systematic drainage is needed on large areas. It is usually economically feasible to drain small areas of these soils where they occur in more favorable surroundings so that the field can be farmed as a unit. Structures for the removal of surface water are needed if improved hay and forage are grown.

Forage grown on these soils from grasses that are tolerant of limited drainage may be profitable if proper fertilization is used, including the topdressing of fields annually with a complete fertilizer that is high in nitrogen. The forage produced on this soil can also be used for summer feed, especially in dry years when other pasture is dormant or less productive.

CAPABILITY UNIT IVw-4

Varick silty clay loam is the only soil in this unit. This is a moderately deep, poorly drained, level to very gently sloping, moderately fine textured soil. Underlying shale bedrock occurs mainly at a depth of 30 to 40 inches but is as shallow as 20 inches in some places. The upper 12 to 18 inches of the underlying shale bedrock is generally so soft or weathered that it can be readily excavated. Available moisture capacity is moderate to high. Ability to supply potassium is high, and that for phosphorus is moderate. Ability to supply nitrogen is low in spring.

Use of this soil generally is limited to sod crops, woodland, wildlife habitat, and recreation. Management is made difficult by frost heaving, slow subsoil permeability, unfavorable tilth, summer droughtiness, and wetness during fall harvest. Selected crops are moderately well suited if this soil is drained. Even then, good soil structure is difficult to maintain, as the soil clods readily. Undrained areas can be used to produce summer forage by topdressing those grasses that are tolerant of wet sites. Complete fertilizers that are high in nitrogen are needed.

CAPABILITY UNIT IVw-5

This unit consists of Edwards muck and Muck, shallow. These are very poorly drained, moderately deep and shallow mucks over marl or over sand, silt, or clay, or mixtures of these. They are generally slightly acid to calcareous. The marl consists of precipitated lime containing shell fragments and is highly calcareous. Included mineral soil materials are ordinarily calcareous, but in places they range from moderately alkaline to medium acid.

If they are not drained, Edwards muck and Muck, shallow, are suited only to swamp woods, low-quality pasture, or wildlife habitat. If adequately drained, they are suited to selected crops, but the type of crop grown depends on the thickness of the muck. Small areas of these mucks included in large fields may be cultivated, but drainage is needed.

If these mucks are drained, they gradually decrease in thickness by subsidence, oxidation, and soil blowing. Water control is needed to reduce the rate of subsidence and oxidation, and measures are needed to reduce the velocity of the wind.

Where these mucks are not already developed, and are less than 3 feet thick, their useful lifespan may be too short to pay for development. In addition, drainage systems, water-level control, and living windbreaks should be planned and coordinated on all muck developments. Maintaining high fertility, managing crop residue, and controlling soil blowing are all necessary for favorable crop production. Careful selection of lime-tolerant crops is necessary, especially on the shallower muck.

CAPABILITY UNIT Vw-1

Only Alluvial land is in this unit. This is a miscellaneous land type that is flooded frequently, commonly by flash floods. Texture ranges from coarse to fine. Alluvial land is dominantly poorly drained but ranges from excessively drained to very poorly drained.

This land type is so variable that each area must be considered separately. Areas of Alluvial land are not suitable for cultivation in their natural state, but they are suitable for permanent vegetation or grazing. When protected from overflow, some of the better drained areas can be farmed as part of adjoining fields.

Management of small areas ordinarily consists of clearing brush and debris and then seeding to reed canarygrass or birdsfoot trefoil and timothy and adding lime and fertilizer as needed. Some areas are moderately well suited to hay and pasture. Normally, areas that cannot be mowed periodically for brush and weed control should not be seeded. Grazing should be regulated to maintain regrowth and avoid soil compaction. In places a mixture of orchardgrass and Ladino clover is grown in the better drained areas, and when lightly grazed in spring, it provides good nesting areas for wildlife.

CAPABILITY UNIT VIe-1

This unit consists of soils of the Cazenovia, Honeoye, Howard, Lansing, Ontario, Palmyra, and Schoharie series. These are well drained and moderately well drained soils that are mainly steeply sloping. The Schoharie and Ontario soils are moderately steep and are severely eroded. In places the slope of these soils is too steep to permit operation of machinery. Reaction of the surface layer is very strongly acid to mildly alkaline, and lime content increases with depth. Available moisture capacity is moderate to high, but since runoff is very rapid, the supply of moisture retained for use by plants is limited during most of the growing season.

Erosion is a constant hazard, and the soils should therefore be left in permanent sod and trees. On the moderately steep, severely eroded Schoharie and Odessa soils, where lime and fertilizer can be spread and mowers operated, it is worth-while to manage and improve these soils and to grow long-lived pasture grasses and legumes. Moderately good growth of suitable pasture plants can be expected in the first part of the growing season. Generally, these steep soils are suited to early field grazing.

Limitations to the use of these soils, such as slope and depth of soil, must be determined by onsite investigation. If cultivated, the surface layer should be protected by crop residue, and exposure of the surface should be kept to a minimum. If the stand is to last as long as possible, it is necessary that all forage plants have ample time after harvest for replenishing root reserves.

CAPABILITY UNIT VIe-2

Arnot channery silt loam, 15 to 25 percent slopes, is the only soil in this unit. This is a shallow, moderately steep, well drained to moderately well drained soil. Reaction is very strongly acid to medium acid. The underlying bedrock is impervious to water and roots, and this soil tends to be droughty in summer.

Only long-lived crops that tolerate summer drought are suited to this soil. Because runoff is rapid, this soil should be left in permanent sod or woodland. Birdsfoot trefoil and timothy for pasture is the best forage seeding. This soil is so steep that use of machinery is difficult or hazardous. Rock outcrops are common.

Management should be based upon maximum encouragement of early season growth and on harvest by field grazing. Lime and fertilizer should be added as needed, and grazing should be regulated to assure regrowth of plants between grazing periods and before frost in fall. Control of brush and weeds is needed to support the other management practices.

CAPABILITY UNIT VIIs-1

Aurora and Farmington soils, 25 to 75 percent slopes, are the only soils in this unit. These are steep or very steep, very rocky soils that occur between rock outcrops and rock ledges. Runoff is very rapid, and erosion is a constant threat. Bare areas are subject to severe gullying or slipping.

These soils are best suited to woodland or to recreational development. The lower slopes could provide some early grazing, but the quality would be poor.

CAPABILITY UNIT VIIs-1

Fresh water marsh is a miscellaneous land type that occurs along the margins of lakes and ponds. Areas of Fresh water marsh are saturated to the surface. Drainage is not considered feasible, because the water level is determined by the level of the lake or pond. Wetness limits Fresh water marsh to use for recreation, as wildlife habitat, or for the supply of water.

Estimated Yields [6]

Table 1 gives estimated average acre yields of principal crops for those soils of the county suitable for cultivation. The estimates are for two levels of management. In columns A are yields that can be expected if management of soils, water, and crops is average. The estimates in columns A are a little above the average yields obtained by farmers in the county in the early 1960's.

The yields shown in columns B are those that can be expected under highly skilled, or improved, management. This management consists of using suitable crop rotations; using the best fertilizer and liming practices; providing adequate drainage and irrigation, where needed; using contour farming, stripcropping, sodded waterways, or other measures needed for conserving soil and water; thoroughly controlling weeds and insects; and tilling at the right time and in the right way.

For obtaining the yields in columns B, the management needed is that recommended in the annually revised editions of "Cornell Recommends for Field Crops" and "Cornell Recommends for Vegetable Crops."

Use of Soils as Woodland [7]

About 18 percent, or 38,800 acres (*23*), of Seneca County is forested. Forested areas consist mainly of small farm woodlots that average about 12 acres per farm. In the town of Fayette, woodlots average 7 acres per farm, and in the nine other towns of Seneca County they average from 10 to 17 acres per farm.

There is no State forest land in Seneca County, but the Federal government owns about 20,500 acres of land in the county. The most extensive Federal holding is the 10,587-acre Seneca Ordnance Depot near Romulus. About 20 percent of the Seneca Ordnance Depot consists of scattered woodlots that are harvested by private individuals under contract with the army.

The second largest Federal holding is the 6,431-acre Montezuma National Wildlife Refuge in the northeastern corner of the county. It contains 1,170 acres of forest, which consists mainly of swamp woods that are not managed for timber. One 600-acre block of swamp woods in this refuge is under green timber reservoir experiment. It is diked and maintained under controlled flooding and drainage so that the effect of flooding on wildlife and the forest community can be assessed. An additional 108-acre block is used for conducting research under natural conditions.

The third Federal holding is the part of the Hector Land Use Area that is in the southern part of Seneca County. This is a 3,508-acre area that is under the management of the U.S. Forest Service. In this area 549 acres of scattered woodlots is managed for production of timber.

Forests in Seneca County are characteristically on excellent sites, and the trees show rapid growth and superior form. Because the climate and lime content are favorable, hardwoods generally grow fast and are well adapted to the soils. Heavily stocked elm and soft maple stands commonly grow in somewhat poorly drained to very poorly drained areas. Such stands make up the bulk of the native forest. Forests on the well drained and moderately well drained soils consist mostly of hard maple, beech, white ash, basswood, and tulip-poplar, and all except beech are species of commercial value. In addition, oak and hickory commonly grow on the steep slopes of drumlins. Scattered clumps of black locust grow on the slopes adjacent to Seneca Lake.

Merchantable stands of hardwood often yield 2,000 to 3,000 board feet per acre (*18*), which is several times the State average for privately owned forests.

Woodland suitability groups

To assist owners of woodland in planning the use of their soils, the soils of Seneca County have been placed in 10 major woodland suitability groups. Subgroups are shown where hazards or limitations vary slightly within major groups. Each group is made up of soils that are similar in potential productivity, are suited to similar trees, and require similar management.

Listed in table 2 are the 10 major woodland groups in the county. To find the names of the soils in any given group, refer to the "Guide to Mapping Units" at the back of this survey.

The potential productivity of the soils in a group or subgroup is expressed as an adjective rating of *good*, *fair*, or *poor*. Each rating indicates the capacity of the soils to produce wood crops. Soils rated poor generally are not suitable for tree planting, except in areas where trees are needed to control erosion or to provide food and cover for wildlife.

Also given in table 2 are ratings of hazards and limitations that affect management, as well as lists of trees to be used in planting and trees to be favored in existing stands. Some terms used in the table require explanation.

Seedling mortality refers to the expected degree of mortality of naturally occurring or planted seedlings as influenced by soil texture, depth, drainage, flooding, height of the water table, and degree of erosion. Normal rainfall, good planting stock, and proper planting are assumed. Mortality is *slight* if the expected loss is less than 25 percent; *moderate*, 25 to 50 percent; or *severe*, more than 50 percent.

Plant competition refers to the invasion or growth of unwanted trees, shrubs, vines, or other plants when openings are made in the canopy. Competition is *slight* if it does not hinder the establishment of a desirable stand of trees. It is *moderate* if competing plants delay the establishment of a desirable stand. Competition is *severe* if it prevents the establishment of a desirable stand unless intensive cultural measures are applied. Among the soil properties that affect plant competition are available moisture capacity, degree of erosion, and drainage.

The ratings for equipment limitations are based on the degree to which soils and topographic features restrict or prohibit the use of equipment normally employed in tending a crop of trees or in harvesting the trees. The limitation is *slight* if there is little or no restriction on

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[6] Prepared by E. L. McPherron, agronomist, Soil Conservation Service, with the assistance of Emil J. Kaharka, Soil Conservation Service; William Brown, Cooperative Extension Service; and George Utzman, Agricultural Stabilization and Conservation Service.

[7] By Meredith Peters, woodland conservationist, Soil Conservation Service, in consultation with personnel of the New York State College of Forestry, Syracuse, New York; Department of Forest Soils, Cornell University; and the New York State Conservation Department.

the type of equipment that can be used or the time of year that equipment can be used. It is *moderate* if the use of equipment is seasonally limited or if modified equipment or methods of harvesting are needed. The limitation is *severe* if special equipment is needed or if the use of such equipment is severely restricted by one or more unfavorable soil characteristics. Limitations on the use of equipment are affected by the degree of slope, height of the water table, rockiness, and soil texture.

Erosion hazard is rated according to the risk of erosion on woodland where normal practices are used in managing and harvesting the trees. It is *slight* if erosion control is not an important concern. The hazard is *moderate* if some attention must be given to check soil losses. It is *severe* if special treatment or special methods of operation are necessary for minimizing erosion.

Windthrow hazard depends on the development of roots and the capacity of soils to hold trees firmly. The hazard is *slight* if trees are not expected to be blown down in commonly occurring winds. It is *moderate* if roots hold the trees firmly, except when the soil is excessively wet or when the wind is strongest. The hazard is *severe* if many trees are expected to be blown over because their roots do not provide enough stability.

Wildlife [8]

Wildlife is an important natural resource in Seneca County, and waterfowl is the most abundant kind of wildlife. This Lake Plains Region, which fringes the Allegheny Plateau, also has populations of ring-necked pheasants, cottontail rabbits, woodcocks, white-tailed deer, ruffed grouse, and gray squirrels.

While the Lake Plains Region generally is known for its high population of pheasants, relative to the rest of the region, Seneca County has a fair to good population of pheasants.

The Montezuma National Wildlife Refuge in the northeastern corner of the county and Cayuga and Seneca Lakes, which border the county on the east and west, are the key elements that make waterfowl the most abundant kind of wildlife. These bodies of water attract thousands of migrating waterfowl each year. Geese and dabbling ducks move from the lakes to the upland agricultural grainfields to feed during the day and then return to the water late in the evening. The flocks of diving ducks, however, remain on the lakes and feed on the aquatic life. Many large flocks of diving ducks winter over on Seneca Lake, which seldom freezes.

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; and to the supply and distribution of water. These, in turn, are generally related to the kinds of soils.

In table 3 the soils are rated for eight elements of wildlife habitat: (1) grain and seed crops, (2) grasses and legumes, (3) wild herbaceous upland plants, (4) hardwood plants, (5) coniferous woody plants, (6) wetland food and cover plants, (7) shallow diked impoundments, and (8) shallow excavated impoundments. Also, the soils are rated for three classes of wildlife: (1) open-land, (2) woodland, and (3) wetland (*1*).

A rating of 1 shown on table 3 indicates that the soil is well suited with few limitations; 2, that it is suited with moderate limitations; 3, that it is poorly suited because of severe limitations; and 4, that it is not suited.

Wildlife habitat elements

Each soil is rated in table 3 according to its suitability for various kinds of plants and water developments that make up 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 habitat elements, and (3) avoiding soils 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 well suited to these plants are deep, nearly level or very gently sloping, medium textured, well drained, and free or nearly free of stones. They also have high available moisture 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.

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 well suited have slopes of 0 to 15 percent, are well drained or moderately well drained, and have moderately high or high available moisture capacity. An adequate stand of many kinds of plants can be easily maintained on these soils for at least 10 years without renovation. Occasional flooding and surface stones are not of serious concern, because the soils are seldom tilled.

Wild herbaceous upland 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 well suited to 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. They generally are established naturally but can be planted. Among the native kinds are oak, beech, cherry, maple, birch, poplar, apple, hawthorn, dogwood, viburnum, grape, and briers. Soils that are well suited to these plants are deep or moderately deep, medium textured or moderately fine textured, and well drained to somewhat poorly drained. Slopes and surface stoniness are of little significance.

Also in this group are several varieties of fruiting shrubs that are raised commercially for planting. Among the shrubs that can be grown on soils rated well suited are autumn-olive, Amur honeysuckle, Tatarian honey-

[8] By Robert E. Myers, wildlife biologist, Soil Conservation Service, Syracuse, New York.

TABLE 1.—*Estimated average acre yields of the*

[Yields in columns A are those to be expected under average management; those in columns suited to the soil or is not commonly grown on it, or that no

Soil	Corn for silage		Corn for grain		Oats		Wheat	
	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*
Alden mucky silt loam	--------	20	--------	100	--------	--------	--------	--------
Alden mucky silt loam, till substratum	--------	16	--------	80	--------	--------	--------	--------
Alluvial land	--------	--------	--------	--------	--------	--------	--------	--------
Angola silt loam, 0 to 3 percent slopes	8	18	40	90	40	70	25	40
Angola silt loam, 3 to 8 percent slopes	10	18	50	90	40	70	30	40
Appleton gravelly silt loam, 0 to 3 percent slopes	10	17	50	85	40	90	25	50
Appleton gravelly silt loam, 3 to 8 percent slopes	12	17	60	85	50	90	30	50
Appleton silt loam, 0 to 3 percent slopes	10	20	50	100	40	90	25	50
Appleton silt loam, 3 to 8 percent slopes	12	20	60	100	50	90	30	50
Arkport loamy fine sand, 1 to 6 percent slopes	10	16	50	80	35	60	25	40
Arkport loamy fine sand, 6 to 12 percent slopes	8	14	40	70	30	50	25	40
Arkport loamy fine sand, 12 to 20 percent slopes	--------	--------	--------	--------	--------	--------	--------	--------
Arnot channery silt loam, 15 to 25 percent slopes	--------	--------	--------	--------	40	50	--------	--------
Aurora silt loam, 3 to 8 percent slopes	8	16	40	80	45	70	30	40
Aurora silt loam, 8 to 15 percent slopes	8	14	40	70	40	60	25	30
Aurora silt loam, 15 to 25 percent slopes	--------	--------	--------	--------	--------	--------	--------	--------
Aurora and Farmington soils, 25 to 75 percent slopes	--------	--------	--------	--------	--------	--------	--------	--------
Canandaigua silt loam	--------	20	--------	100	--------	--------	--------	--------
Cazenovia silt loam, 3 to 8 percent slopes	12	20	60	100	55	80	40	60
Cazenovia silt loam, 3 to 8 percent slopes, eroded	8	18	40	90	40	60	30	35
Cazenovia silt loam, 8 to 15 percent slopes	10	15	50	75	50	70	35	50
Cazenovia silt loam, 8 to 15 percent slopes, eroded	7	10	35	50	30	40	25	30
Cazenovia soils, 15 to 25 percent slopes	--------	--------	--------	--------	--------	--------	--------	--------
Cazenovia soils, 25 to 40 percent slopes	--------	--------	--------	--------	--------	--------	--------	--------
Claverack loamy fine sand, 0 to 2 percent slopes	12	18	60	90	45	70	35	45
Claverack loamy fine sand, 2 to 6 percent slopes	12	18	60	90	45	70	40	45
Collamer silt loam, 0 to 2 percent slopes	12	22	60	110	45	80	35	60
Collamer silt loam, 2 to 6 percent slopes	16	22	80	110	55	80	40	60
Collamer silt loam, 6 to 12 percent slopes	12	20	60	100	40	70	35	50
Collamer silt loam, moderately shallow variant, 0 to 2 percent slopes	10	20	50	100	40	70	35	50
Collamer silt loam, moderately shallow variant, 2 to 6 percent slopes	10	18	50	90	50	80	40	55
Conesus gravelly silt loam, 0 to 3 percent slopes	10	18	60	90	50	90	35	50
Conesus gravelly silt loam, 3 to 8 percent slopes	12	18	60	90	60	90	35	50
Cosad loamy fine sand	8	18	40	90	40	70	--------	50
Darien silt loam, 0 to 3 percent slopes	10	18	50	90	50	90	35	55
Darien-Danley-Cazenovia silt loams, 3 to 8 percent slopes	12	18	60	90	55	80	40	55
Dunkirk silt loam, 1 to 6 percent slopes	12	20	60	100	60	80	45	60
Dunkirk silt loam, 6 to 12 percent slopes, eroded	8	16	40	80	30	50	30	40
Dunkirk silt loam, 12 to 20 percent slopes	--------	--------	--------	--------	30	50	25	30
Dunkirk silt loam, limestone substratum, 1 to 6 percent slopes	10	17	50	85	50	90	40	60
Edwards muck	8	20	--------	100	--------	--------	--------	--------
Eel silt loam	10	18	50	90	40	70	--------	--------
Elnora loamy fine sand, 0 to 2 percent slopes	10	18	50	90	40	80	--------	40
Elnora loamy fine sand, 2 to 6 percent slopes	10	18	50	90	50	80	--------	45
Erie channery silt loam, 0 to 3 percent slopes	--------	16	--------	80	--------	--------	--------	--------
Erie channery silt loam, 3 to 8 percent slopes	10	16	50	80	50	70	25	30
Erie channery silt loam, moderately shallow variant, 0 to 3 percent slopes	--------	16	--------	80	--------	--------	--------	--------
Erie channery silt loam, moderately shallow variant, 3 to 8 percent slopes	10	16	50	80	45	55	--------	--------
Fonda mucky silty clay loam	--------	16	--------	80	--------	--------	--------	--------
Fresh water marsh	--------	--------	--------	--------	--------	--------	--------	--------
Honeoye silt loam, 2 to 8 percent slopes	15	22	75	110	70	100	50	60
Honeoye silt loam, 8 to 15 percent slopes	12	16	60	80	60	90	40	50

principal crops under two levels of management

B, under improved management. Absence of an entry in a column indicates that crop is not information is available on which to base an estimate]

Dry beans		Sugar beets		Forage mixtures (hay)						Fruit			
				Alfalfa-grass		Alfalfa-birdsfoot trefoil-grass		Birdsfoot trefoil-grass		Grapes		Peaches	
A	B	A	B	A	B	A	B	A	B	A	B	A	B
Bu.	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Bu.*	*Bu.*
----	40	----	22	----	----	----	----	1. 5	2. 5	----	----	----	----
----	35	----	18	----	----	----	----	1. 5	2. 5	----	----	----	----
----	----	----	----	----	----	----	----	----	----	----	----	----	----
15	30	10	15	2. 5	3. 5	2. 5	3. 5	2. 0	3. 0	----	----	----	280
20	30	10	15	2. 5	3. 5	2. 5	3. 5	2. 0	3. 0	----	----	----	----
15	30	----	----	----	4. 5	2. 0	3. 5	2. 0	3. 0	----	----	----	----
20	30	----	----	----	4. 5	2. 5	3. 5	2. 0	3. 0	----	----	----	----
15	35	----	22	----	5. 0	2. 0	4. 0	2. 0	3. 0	----	----	----	----
20	35	10	20	----	5. 0	2. 5	4. 0	2. 0	3. 0	----	----	----	----
15	25	10	15	2. 5	3. 5	2. 0	3. 0	1. 5	2. 0	----	----	----	----
15	20	----	----	2. 5	3. 5	2. 0	3. 0	1. 5	2. 0	----	----	----	----
----	----	----	----	2. 0	3. 0	1. 5	2. 5	1. 0	1. 5	----	----	----	----
----	----	----	----	2. 5	3. 0	2. 0	2. 5	1. 5	2. 0	----	----	----	----
15	25	10	10	3. 0	4. 0	2. 5	3. 0	2. 0	2. 5	----	----	----	----
----	----	----	----	3. 0	4. 0	2. 5	3. 0	2. 0	2. 5	----	----	----	----
----	----	----	----	----	----	2. 0	2. 5	1. 5	2. 0	----	----	----	----
----	----	----	----	----	----	----	----	----	----	----	----	----	----
----	40	----	22	----	----	----	----	. 5	----	----	----	----	----
25	30	15	20	3. 0	5. 0	2. 5	4. 0	3. 0	----	4. 0	6. 5	200	300
15	20	10	10	2. 5	4. 0	2. 0	3. 5	1. 5	3. 0	----	----	----	----
20	30	----	----	3. 0	4. 5	2. 5	4. 0	2. 0	3. 0	4. 0	6. 5	200	300
15	15	----	----	2. 5	4. 0	2. 0	3. 5	1. 5	3. 0	----	----	----	----
----	----	----	----	2. 5	4. 0	2. 0	3. 5	1. 5	2. 5	----	----	----	----
----	----	----	----	----	----	----	----	1. 0	2. 0	----	----	----	----
20	30	10	15	2. 0	3. 0	2. 0	3. 0	1. 5	2. 5	----	----	----	----
25	30	10	15	3. 0	3. 5	2. 5	3. 0	1. 5	2. 5	----	----	----	----
20	35	10	20	2. 5	3. 5	2. 5	4. 0	2. 0	----	----	----	----	----
30	35	15	20	3. 0	4. 0	3. 0	4. 0	2. 0	----	----	----	----	----
20	30	----	----	3. 0	4. 0	3. 0	4. 0	2. 0	3. 0	----	----	----	----
15	30	10	20	3. 0	4. 0	3. 0	4. 0	2. 0	3. 0	----	----	----	----
20	35	10	20	3. 0	5. 0	3. 0	4. 0	2. 0	3. 0	4. 0	9. 0	150	200
20	35	----	----	2. 0	3. 5	2. 5	3. 5	2. 0	3. 0	4. 0	8. 0	150	225
30	35	----	----	2. 5	3. 5	2. 5	3. 5	2. 0	3. 0	4. 0	8. 0	150	225
----	30	----	15	----	4. 0	----	3. 5	2. 0	3. 0	----	----	----	----
20	35	10	20	2. 5	4. 0	3. 0	4. 0	2. 0	----	4. 0	8. 0	150	200
30	35	15	20	3. 0	4. 0	3. 0	4. 0	2. 0	3. 0	4. 0	8. 0	150	200
30	35	20	20	3. 0	5. 0	2. 5	4. 0	2. 0	----	5. 0	10. 0	175	225
----	----	----	----	3. 0	4. 0	2. 5	3. 5	2. 0	3. 0	----	----	----	----
----	----	----	----	3. 0	4. 0	2. 5	3. 0	2. 0	3. 0	----	----	----	----
25	30	10	15	2. 5	5. 0	2. 5	4. 0	2. 0	----	4. 0	9. 0	150	200
20	30	15	25	----	----	----	----	----	3. 0	----	----	----	----
20	30	10	20	2. 0	3. 5	2. 5	3. 5	2. 0	2. 5	----	----	----	----
20	30	10	15	2. 0	4. 0	2. 0	3. 0	1. 5	2. 0	----	----	----	----
25	30	10	15	2. 0	4. 0	2. 0	3. 0	1. 5	2. 0	----	----	----	----
----	----	----	----	----	----	2. 0	3. 0	2. 0	3. 0	----	----	----	----
----	----	----	----	----	----	2. 5	3. 0	2. 0	3. 0	----	----	----	----
----	----	----	----	----	----	2. 0	2. 5	2. 0	3. 0	----	----	----	----
----	----	----	----	----	----	3. 0	3. 5	2. 5	3. 0	----	----	----	----
----	30	----	20	----	----	----	3. 5	2. 0	3. 0	----	----	----	----
----	----	----	----	----	----	----	----	----	----	----	----	----	----
30	40	15	20	3. 5	5. 0	3. 0	4. 0	----	----	4. 5	10. 0	200	300
----	----	----	----	3. 5	5. 0	3. 0	4. 0	----	----	4. 0	10. 0	200	300

TABLE 1.—*Estimated average acre yields of the principal*

Soil	Corn for silage		Corn for grain		Oats		Wheat	
	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*
Honeoye silt loam, 15 to 25 percent slopes								
Honeoye, Ontario, and Lansing soils, 25 to 40 percent slopes								
Howard gravelly loam, 0 to 5 percent slopes	16	20	80	100	65	90	40	50
Howard gravelly loam, 5 to 15 percent slopes	14	18	70	90	50	70	35	45
Ilion silty clay loam		20		100		50		
Lakemont silty clay loam, 0 to 2 percent slopes	8	18	40	90				
Lakemont silty clay loam, 2 to 6 percent slopes	10	18	50	90	50	80	20	50
Lamson fine sandy loam and mucky fine sandy loam		18		90				
Langford channery silt loam, 2 to 8 percent slopes	10	18	50	90	50	75	30	40
Langford channery silt loam, 8 to 15 percent slopes	8	17	40	85	50	70	30	35
Langford channery silt loam, 8 to 15 percent slopes, eroded	8	16	40	80	40	50	25	30
Langford channery silt loam, 15 to 25 percent slopes	8	16	40	80	40	60	20	30
Langford channery silt loam, moderately shallow variant, 2 to 8 percent slopes	8	17	40	85	50	70	25	35
Langford channery silt loam, moderately shallow variant, 8 to 15 percent slopes	7	16	35	80	50	70	20	30
Lansing gravelly silt loam, 2 to 8 percent slopes	12	20	60	100	60	100	45	55
Lansing gravelly silt loam, 8 to 15 percent slopes	10	18	50	90	50	80	35	50
Lansing gravelly silt loam, 8 to 15 percent slopes, eroded	8	16	40	80	40	70	30	40
Lansing gravelly silt loam, 15 to 25 percent slopes	7	12	35	60	30	60	25	35
Lima silt loam, 0 to 3 percent slopes	12	22	60	110	60	100	40	60
Lima silt loam, 3 to 8 percent slopes	13	22	65	110	70	100	40	60
Lyons silt loam		18		90		100		60
Madalin and Odessa silty clay loams	8	18	40	90				
Made land, tillable								
Muck, deep	10	18						
Muck, shallow	10	16						
Niagara silt loam	8	18	40	90	40	90	25	55
Odessa silt loam, 0 to 2 percent slopes	8	18	40	90	40	90	25	50
Odessa silt loam, 2 to 6 percent slopes	10	18	50	90	50	90	30	50
Ontario fine sandy loam, 2 to 8 percent slopes	12	18	60	110	60	80	40	50
Ontario fine sandy loam, 8 to 15 percent slopes, eroded	10	16	50	80	50	70	40	45
Ontario loam, 2 to 8 percent slopes	13	24	65	120	65	90	75	15
Ontario loam, 8 to 15 percent slopes	11	20	55	100	50	70	40	50
Ontario loam, 8 to 15 percent slopes, eroded	8	18	40	90	40	60	25	35
Ontario loam, 15 to 25 percent slopes, eroded	7	12	35	60	30	50	20	30
Ontario silt loam, moderately shallow variant, and Farmington soils, 2 to 8 percent slopes	12	18	60	90	60	80	40	45
Ovid silt loam, 0 to 3 percent slopes	10	18	50	90	50	90	30	55
Ovid silt loam, 3 to 8 percent slopes	12	18	60	90	60	90	35	55
Palmyra gravelly loam, 0 to 5 percent slopes	12	22	70	110	60	100	35	55
Palmyra gravelly loam, 5 to 15 percent slopes	12	22	70	110	60	100	35	55
Palmyra and Howard soils, 15 to 25 percent slopes								
Palmyra and Howard soils, 25 to 35 percent slopes								
Romulus silty clay loam	7	17	35	85	30	90	20	50
Schoharie silt loam, 2 to 6 percent slopes	12	21	60	105	60	90	35	60
Schoharie silty clay loam, 0 to 2 percent slopes	8	18	40	90	40	80	25	55
Schoharie silty clay loam, 2 to 6 percent slopes	10	18	50	90	50	80	30	50
Schoharie silty clay loam, 6 to 12 percent slopes, eroded	7	15	35	75	30	70	25	40
Schoharie silty clay loam, 12 to 20 percent slopes, eroded								
Sloan silt loam		17		85		80		40
Stafford loamy fine sand	8	17	40	85	40	80	25	40
Varick silty clay loam		13		65		50		30
Wallkill soils		20		100		80		

crops under two levels of management—Continued

Dry beans		Sugar beets		Forage mixtures (hay)						Fruit			
				Alfalfa-grass		Alfalfa-birdsfoot trefoil-grass		Birdsfoot trefoil-grass		Grapes		Peaches	
A	B	A	B	A	B	A	B	A	B	A	B	A	B
Bu.	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Bu.*	*Bu.*
---	---	---	---	---	---	2. 5	3. 5	2. 0	3. 0	---	---	---	---
---	---	---	---	---	---	2. 0	3. 0	1. 5	2. 5	---	---	---	---
30	35	---	---	3. 0	4. 5	2. 5	3. 5	---	---	4. 5	12. 0	200	300
25	30	---	---	3. 0	4. 5	2. 5	3. 5	---	---	4. 5	12. 0	200	300
---	30	---	22	2. 0	3. 0	2. 5	3. 5	2. 0	3. 0	---	---	---	---
---	30	---	22	---	---	---	3. 5	2. 0	3. 0	---	---	---	---
---	30	---	20	---	---	2. 0	3. 5	2. 0	3. 0	---	---	---	---
---	30	---	---	---	---	---	---	1. 5	2. 5	---	---	---	---
20	30	---	---	2. 0	3. 5	2. 5	4. 0	2. 0	3. 0	3. 0	7. 0	150	200
---	---	---	---	2. 5	3. 5	3. 0	4. 0	2. 0	3. 0	3. 0	7. 0	150	200
---	---	---	---	2. 0	3. 0	2. 5	3. 5	2. 0	3. 0	---	---	---	---
---	---	---	---	2. 0	3. 0	2. 5	3. 5	2. 0	3. 0	---	---	---	---
20	25	---	---	2. 0	3. 0	2. 5	3. 0	2. 0	3. 0	---	---	---	---
---	---	---	---	2. 5	3. 0	2. 5	3. 0	2. 0	3. 0	---	---	---	---
25	40	15	20	3. 0	4. 5	3. 0	4. 0	---	---	4. 0	6. 0	200	270
---	---	---	---	3. 0	4. 5	3. 0	4. 0	2. 0	3. 0	4. 0	6. 0	200	270
---	---	---	---	3. 0	4. 5	3. 0	4. 0	2. 0	3. 0	---	---	---	---
---	---	---	---	2. 5	4. 0	2. 0	3. 0	1. 5	2. 5	---	---	---	---
25	40	15	20	3. 0	5. 0	3. 0	4. 0	2. 0	3. 0	4. 0	6. 0	---	270
30	40	15	20	3. 5	5. 0	3. 0	4. 0	2. 0	3. 0	4. 5	6. 0	---	270
---	35	---	20	---	4. 0	2. 0	4. 0	2. 0	---	---	---	---	---
---	35	---	20	---	4. 5	2. 5	4. 0	2. 0	3. 0	---	---	---	---
---	---	---	---	---	---	---	---	---	---	---	---	---	---
25	35	10	25	---	---	---	---	1. 5	3. 0	---	---	---	---
18	25	10	25	---	---	---	---	1. 5	3. 0	---	---	---	---
20	35	10	22	---	3. 5	3. 0	4. 0	2. 0	---	---	---	---	---
20	35	10	20	---	4. 5	3. 0	4. 0	2. 5	---	---	---	---	---
20	35	10	20	2. 5	4. 5	3. 0	4. 0	3. 0	---	---	---	---	---
30	35	15	20	2. 5	4. 5	2. 5	3. 5	---	---	---	---	---	---
25	30	---	---	2. 5	4. 5	2. 5	3. 5	2. 0	2. 5	---	---	---	---
30	40	15	20	3. 0	4. 5	3. 0	3. 5	---	---	4. 5	6. 5	200	300
25	30	---	---	3. 0	4. 5	3. 0	3. 5	---	---	4. 5	6. 5	200	300
---	---	---	---	3. 0	4. 5	3. 0	3. 5	2. 0	2. 5	---	---	---	---
---	---	---	---	1. 5	3. 0	2. 0	3. 0	2. 0	2. 5	---	---	---	---
25	30	10	15	3. 0	4. 5	2. 5	3. 0	2. 0	2. 5	---	---	---	---
20	35	10	20	3. 0	4. 5	3. 0	4. 0	2. 5	---	4. 0	8. 0	---	250
25	35	10	20	3. 0	4. 5	3. 0	4. 0	2. 5	---	4. 0	8. 0	---	250
30	40	15	20	3. 0	5. 0	3. 0	4. 0	---	---	4. 0	10. 0	---	300
30	35	10	15	3. 0	5. 0	3. 0	4. 0	---	---	4. 0	12. 0	---	300
---	---	---	---	3. 0	5. 0	3. 0	4. 0	2. 0	3. 0	---	---	---	---
---	---	---	---	---	---	2. 0	3. 0	1. 5	2. 0	---	---	---	---
---	35	---	20	---	4. 5	2. 5	4. 0	2. 0	3. 0	---	---	---	---
30	40	15	20	3. 0	5. 0	2. 5	4. 0	2. 0	3. 0	4. 0	9. 0	150	200
20	30	10	20	2. 5	5. 0	3. 0	4. 0	2. 0	3. 0	4. 0	9. 0	---	---
20	30	10	20	3. 0	5. 0	3. 0	4. 0	2. 0	3. 0	4. 0	9. 0	---	---
---	---	---	---	3. 0	5. 0	3. 0	4. 0	2. 5	3. 0	---	---	---	---
---	---	---	---	3. 0	4. 5	3. 0	4. 0	2. 0	3. 0	---	---	---	---
---	40	---	20	---	---	---	---	2. 0	3. 0	---	---	---	---
20	40	10	20	2. 5	4. 5	2. 5	4. 0	2. 0	---	---	---	---	---
---	20	---	15	---	---	2. 0	3. 5	2. 0	3. 0	---	---	---	---
---	40	---	20	---	---	---	4. 0	---	3. 0	---	---	---	---

TABLE 2.—*Management of*

Woodland suitability group [1]	Woodland suitability subgroup	Potential productivity	Seedling mortality
Group 1: Deep, well drained and moderately well drained, medium-textured to coarse-textured soils that range mainly from high to medium in content of lime in the root zone. The Elnora and Howard soils are low in content of lime.	a b	Good Good	Slight Slight
Group 2: Deep and moderately deep, mainly moderately well drained to well drained, medium-textured and moderately fine textured soils that range from high to medium in content of lime in the root zone. The Darien soil in mapping unit DdB is somewhat poorly drained.	a b	Good Good	Slight Slight
Group 3: Deep and moderately deep, moderately well drained, medium-textured soils that have a fragipan at a depth of 15 to 24 inches in uneroded soils but are as shallow as 10 inches where eroded. These soils have a low content of lime in the root zone.	a b	Good Good	Slight Slight
Group 4: Deep and moderately deep, somewhat poorly drained, medium-textured soils that are medium to high in content of lime in the root zone.		Fair	Moderate
Group 5: Deep, well-drained to excessively drained, coarse-textured soils that are low to high in content of lime in the root zone.		Fair	Moderate
Group 6: Deep and moderately deep, somewhat poorly drained, medium-textured soils that have a fragipan at a depth of 12 to 18 inches. These soils have a low content of lime in the root zone.	a b	Fair Fair	Moderate Moderate
Group 7: Deep, somewhat poorly drained, coarse-textured soils that are low to medium in content of lime in the root zone.		Fair	Moderate
Group 8: Moderately deep and shallow, well drained to moderately well drained, medium-textured soils that are mainly medium in content of lime in the root zone. Arnot channery silt loam, 15 to 25 percent slopes, is very low to low in content of lime.	a b c	Fair Fair Fair	Moderate Moderate Moderate
Group 9: Mainly deep, poorly drained to very poorly drained, mainly medium-textured and moderately fine textured soils that are medium to high in content of lime in the root zone. The Varick soil is moderately deep to shale bedrock. The Lamson soil is moderately coarse textured.		Fair	Severe
Group 10: Fresh water marsh, mucks, and made land; onsite examination needed to determine suitability for management.			

[1] See fig. 6, page 11, for soil lime level relationships noted in this column.

the soils as woodland

Plant competition	Equipment limitation	Erosion hazard	Windthrow hazard	Trees	
				Favored for planting (*22*)	Favored in existing stands (*19*)
Severe Severe	Slight Moderate	Slight Moderate	Slight. Slight.	Suitable: Austrian pine, Scotch pine, Norway spruce, white spruce, white-cedar, Japanese larch, and black locust. Limited suitability: white pine.	**Sugar maple, white ash, black cherry, red oak, white oak, basswood, black walnut, black locust.**
Severe Severe	Slight Slight	Slight Moderate	Slight. Slight.	Suitable: Austrian pine, Scotch pine, white pine, white spruce, Japanese larch, and black locust. Limited suitability: Norway spruce.	**Sugar maple, white ash, basswood, red oak, white oak, hickory.**
Severe Severe	Slight Slight	Slight Moderate	Moderate. Moderate.	Suitable: Scotch pine, white pine, and Japanese larch. Limited suitability: Austrian pine, red pine, Norway spruce, white spruce, white-cedar, and black locust.	**Sugar maple, white ash, red oak, basswood, black locust, white pine, hemlock.**
Severe	Slight	Slight	Slight.	Suitable: white spruce, and white-cedar. Limited suitability: white pine, Norway spruce, and Japanese larch.	**Red maple, elm, black ash, basswood, white ash.**
Moderate	Slight	Slight	Slight.	Suitable: Austrian pine, Scotch pine, Norway spruce, white spruce, white-cedar, and Japanese larch. Limited suitability: red pine, white pine, and black locust.	**Sugar maple, red oak, aspen, red maple.**
Severe Severe	Moderate Slight	Slight Slight	Severe. Severe.	Suitable: white spruce. Limited suitability: Scotch pine, white pine, Norway spruce, and Japanese larch.	**Sugar maple, black cherry, elm, red maple, beech.**
Severe	Moderate	Slight	Slight.	Suitable: Norway spruce, white spruce, and white-cedar. Limited suitability: Scotch pine, white pine, and Japanese larch.	**Red maple, elm, black ash, oak.**
Severe Slight Slight	Slight Slight Moderate	Slight Moderate Moderate	Slight. Moderate. Moderate.	Limited suitability: Austrian pine, Scotch, pine, red pine, white pine, and black locust.	**Sugar maple, red oak, black oak, white oak, red maple.**
Severe	Moderate	Slight	Moderate.	Suitable: white-cedar. Limited suitability: white pine, Norway spruce, white spruce, and Japanese larch.	**Red maple, elm, black ash.**

suckle, crab apple, multiflora rose, highbush cranberry, and silky dogwood. In addition, highbush cranberry, silky dogwood, and other shrubs with similar site requirements can be planted on soils that have a rating of suited. Hardwoods that are not available commercially commonly can be transplanted successfully.

Coniferous woody plants.—This element consists of cone-bearing evergreen trees and shrubs that are used by wildlife primarily as cover, though some provide browse and seeds. Among these are Norway spruce, white pine, white-cedar, 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 form a dense canopy that shuts out the light.

Soils rated well suited are those on which conifers grow slowly. These soils either have an effective root depth of less than 10 inches or are very poorly drained or excessively drained. It may be difficult to establish a stand of conifers on these soils because seedling mortality is high. Once established, however, a pure conifer habitat is fairly easy to maintain as there is little competition from hardwoods.

Soils rated as poorly suited are these on which conifers grow at a faster rate. These are the deeper soils that are either well drained, moderately well drained, or somewhat poorly drained. If seedlings are planted, the spacing should be 14 feet or more. Maintaining a pure stand of conifers is difficult on these soils because hardwoods readily invade the site.

Wetland food and cover plants.—These are wild, herbaceous, annual and perennial plants that grow on moist to wet sites. Among them are smartweed, wild millet, rush, spikerush, sedges, rice cutgrass, mannagrass, and cattails.

Soils that have a rating of well suited are nearly level and are very poorly drained. Soils that have a rating of suited are nearly level and are poorly drained. Depth, stoniness, and texture of the surface layer are of little concern.

Shallow diked impoundments.—This habitat element is rated on the basis of suitability of the soils for the construction of a low dike to impound a shallow body of water. Included here are marshes, which receive surface runoff; flooded duck fields or dry shallow impoundments, on which domestic grains are grown and then flooded in fall with up to 18 inches of water from adjacent ponds or streams; and shallow ponds that have been developed as watering facilities for wildlife. Fishponds are not included in this habitat element.

A detailed field investigation is needed to determine the feasibility of water developments. Table 6 in the section "Engineering Uses of Soils" shows some limitations of the soils for use in reservoir areas and embankments for ponds.

Soils that are rated well suited are level or nearly level, more than 6 feet deep to bedrock, and poorly drained or very poorly drained. The subsoil must be slowly or very slowly permeable and deep enough that 2 feet of material can be left in place over limestone, sandstone, and other hard bedrock to prevent seepage through cracks in the rock.

Shallow excavated impoundments.—These are level ditches and potholes constructed to create open-water areas, primarily for waterfowl. Fishponds are not included. A detailed field investigation is needed to determine the feasibility of excavated impoundments. Table 6 in the section "Engineering Uses of Soils" shows some limitations of the soils for use in reservoir areas and embankments for ponds.

Well-suited soils are those that are nearly level, more than 6 feet deep to bedrock, and poorly drained or very poorly drained. A seasonal water table occurs within 6 inches of the surface. The subsoil must be slowly or very slowly permeable and deep enough that at least 2 feet of material can be left in place over limestone, sandstone, or other hard bedrock to prevent seepage through cracks in the rock.

Classes of wildlife

Table 3 rates the soils according to their suitability for the three classes of wildlife in the county—open-land, woodland, and wetland wildlife. 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 development.

Each rating under "Classes of Wildlife" in table 3 is based on the ratings listed for selected essential habitat elements in the first part of the table.

The ratings for open-land wildlife are based on the ratings shown for grain and seed crops, grasses and legumes, wild herbaceous upland plants, hardwood plants, and coniferous wildlife habitat. The ratings for woodland wildlife are based on the ratings listed for all the above elements except grain and seed crops. Those for wetland wildlife are based on the ratings shown for wetland food and cover plants, shallow diked impoundments, and shallow excavated impoundments.

Open-land wildlife.—Examples of open-land wildlife are pheasants, meadowlarks, field sparrows, doves, 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 wildlife.—Among the birds and mammals that prefer woodland are ruffed grouse, woodcocks, thrushes, vireos, scarlet tanagers, gray squirrels, red squirrels, gray foxes, white-tailed deer, and raccoons.

Wetland wildlife.—Ducks, geese, rails, herons, shore birds, redwing blackbirds, minks, muskrats, and beavers are familiar examples of birds and mammals that normally make their home in ponds, marshes, and swamps or in other wet areas.

Engineering Uses of the Soils [9]

This soil survey of Seneca County, New York, although made primarily for farm use, has considerable value for other uses. Some soil properties are of special interest to engineers because they affect the design, construction, and

[9] By JOHN B. FLECKENSTEIN, senior agronomist, New York State Department of Transportation, Bureau of Soil Mechanics, and WALTER S. ATKINSON, State conservation engineer, Soil Conservation Service.

TABLE 3.—*Rating of Seneca County soils for wildlife habitat elements and classes of wildlife*

[Rating 1, 2, 3, and 4 are explained in the text. Not rated are Alluvial land (Al), Fresh water marsh (Fw), and Made land, tillable (Md)]

Soil	Wildlife habitat elements								Classes of wildlife		
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood plants	Coniferous woody plants	Wetland food and cover plants	Shallow diked impoundments	Shallow excavated impoundments	Openland	Woodland	Wetland
Alden mucky silt loam	4	3	3	2	1	1	2	1	3	2	1
Alden mucky silt loam, till substratum	4	3	3	2	1	1	2	1	3	2	1
Angola silt loam, 0 to 3 percent slopes	2	2	1	1	2	3	3	3	2	1	3
Angola silt loam, 3 to 8 percent slopes	2	2	1	1	2	3	4	4	2	1	4
Appleton gravelly silt loam, 0 to 3 percent slopes	2	2	1	1	2	3	2	2	2	1	2
Appleton gravelly silt loam, 3 to 8 percent slopes	2	2	1	1	2	3	4	4	2	1	4
Appleton silt loam, 0 to 3 percent slopes	2	2	1	1	2	3	2	2	2	1	2
Appleton silt loam, 3 to 8 percent slopes	2	2	1	1	2	3	4	4	2	1	4
Arkport loamy fine sand, 1 to 6 percent slopes	2	1	1	2	2	4	4	4	1	2	4
Arkport loamy fine sand, 6 to 12 percent slopes	2	1	1	2	2	4	4	4	1	2	4
Arkport loamy fine sand, 12 to 20 percent slopes	3	2	1	2	2	4	4	4	2	2	4
Arnot channery silt loam, 15 to 25 percent slopes	3	2	2	2	4	4	4	4	2	2	4
Aurora silt loam, 3 to 8 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Aurora silt loam, 8 to 15 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Aurora silt loam, 15 to 25 percent slopes	4	3	1	1	3	4	4	4	3	2	4
Aurora and Farmington soils, 25 to 75 percent slopes	4	4	1	1	3	4	4	4	4	3	4
Canandaigua silt loam	4	3	3	2	2	2	2	2	3	2	2
Cazenovia silt loam, 3 to 8 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Cazenovia silt loam, 3 to 8 percent slopes, eroded	3	1	1	1	3	4	4	4	2	2	4
Cazenovia silt loam, 8 to 15 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Cazenovia silt loam, 8 to 15 percent slopes, eroded	3	1	1	1	3	4	4	4	2	2	4
Cazenovia soils, 15 to 25 percent slopes	3	2	1	1	3	4	4	4	2	2	4
Cazenovia soils, 25 to 40 percent slopes	4	3	1	1	3	4	4	4	3	2	4
Claverack loamy fine sand, 0 to 2 percent slopes	3	2	2	2	1	4	4	4	2	2	4
Claverack loamy fine sand, 2 to 6 percent slopes	3	2	2	2	1	4	4	4	2	2	4
Collamer silt loam, 0 to 2 percent slopes	2	1	1	1	3	4	3	3	1	1	3
Collamer silt loam, 2 to 6 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Collamer silt loam, 6 to 12 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Collamer silt loam, moderately shallow variant, 0 to 2 percent slopes	2	1	1	1	3	4	3	3	1	1	3
Collamer silt loam, moderately shallow variant, 2 to 6 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Conesus gravelly silt loam, 0 to 3 percent slopes	2	1	1	1	3	4	3	3	1	1	3
Conesus gravelly silt loam, 3 to 8 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Cosad loamy fine sand	3	2	2	2	1	3	3	3	2	2	3
Darien silt loam, 0 to 3 percent slopes	2	2	1	1	2	3	2	2	2	1	2
Darien-Danley-Cazenovia silt loams, 3 to 8 percent slopes	2	1	1	1	3	4	4	4	2	2	4
Dunkirk silt loam, 1 to 6 percent slopes	2	1	1	1	3	4	4	4	1	1	4

TABLE 3.—*Rating of Seneca County soils for wildlife habitat elements and classes of wildlife*—Continued

Soil	Wildlife habitat elements								Classes of wildlife		
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood plants	Coniferous woody plants	Wetland food and cover plants	Shallow diked impoundments	Shallow excavated impoundments	Openland	Woodland	Wetland
Dunkirk silt loam, 6 to 12 percent slopes, eroded	3	1	1	1	3	4	4	4	2	1	4
Dunkirk silt loam, 12 to 20 percent slopes	3	2	1	1	3	4	4	4	2	2	4
Dunkirk silt loam, limestone substratum, 1 to 6 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Edwards muck	4	3	3	2	2	1	3	2	3	3	2
Eel silt loam	2	2	2	1	3	4	3	3	2	2	3
Elnora loamy fine sand, 0 to 2 percent slopes	3	2	2	2	1	4	4	4	2	2	4
Elnora loamy fine sand, 2 to 6 percent slopes	3	2	2	1	1	4	4	4	2	2	4
Erie channery silt loam, 0 to 3 percent slopes	3	2	2	2	2	3	2	2	2	2	2
Erie channery silt loam, 3 to 8 percent slopes	3	2	2	2	2	3	4	4	2	2	4
Erie channery silt loam, moderately shallow variant, 0 to 3 percent slopes	3	2	2	2	2	3	4	4	2	2	4
Erie channery silt loam, moderately shallow variant, 3 to 8 percent slopes	3	2	2	2	2	3	4	4	2	2	4
Fonda mucky silty clay loam	4	3	3	2	1	1	2	1	3	2	1
Honeoye silt loam, 2 to 8 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Honeoye silt loam, 8 to 15 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Honeoye silt loam, 15 to 25 percent slopes	3	2	1	1	3	4	4	4	2	2	4
Honeoye, Ontario, and Lansing soils, 25 to 40 percent slopes	4	3	1	1	3	4	4	4	3	2	4
Howard gravelly loam, 0 to 5 percent slopes	2	1	1	2	2	4	4	4	1	2	4
Howard gravelly loam, 5 to 15 percent slopes	2	1	1	2	2	4	4	4	1	2	4
Ilion silt clay loam	4	3	3	2	2	2	3	3	3	2	3
Lakemont silty clay loam, 0 to 2 cent slopes	4	3	3	2	2	2	2	1	3	2	2
Lakemont silty clay loam, 2 to 6 percent slopes	4	3	3	2	2	2	2	4	3	2	3
Lamson fine sandy loam and mucky fine sandy loam	4	3	3	2	2	1	4	4	3	2	4
Langford channery silt loam, 2 to 8 percent slopes	2	1	1	2	2	4	4	4	1	2	4
Langford channery silt loam, 8 to 15 percent slopes	2	1	1	2	2	4	4	4	1	2	4
Langford channery silt loam, 8 to 15 percent slopes, eroded	3	1	1	2	2	4	4	4	2	2	4
Langford channery silt loam, 15 to 25 percent slopes	3	2	1	2	2	4	4	4	2	2	4
Langford channery silt loam, moderately shallow variant, 2 to 8 percent slopes	2	1	1	2	2	4	4	4	1	2	4
Langford channery silt loam, moderately shallow variant, 8 to 15 percent slopes	2	1	1	2	2	4	4	4	1	2	4
Lansing gravelly silt loam, 2 to 8 percent slopes	2	1	1	1	3	4	4	4	1	1	4

TABLE 3.—*Rating of Seneca County soils for wildlife habitat elements and classes of wildlife*—Continued

Soil	Wildlife habitat elements								Classes of wildlife		
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood plants	Coniferous woody plants	Wetland food and cover plants	Shallow diked impoundments	Shallow excavated impoundments	Openland	Woodland	Wetland
Lansing gravelly silt loam, 8 to 15 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Lansing gravelly silt loam, 8 to 15 percent slopes, eroded	3	1	1	1	3	4	4	4	2	1	4
Lansing gravelly silt loam, 15 to 25 percent slopes	3	2	1	1	3	4	4	4	2	2	4
Lima silt loam, 0 to 3 percent slopes	2	1	1	1	3	4	3	3	1	1	3
Lima silt loam, 3 to 8 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Lyons silt loam	4	3	3	2	2	2	2	2	3	2	2
Madalin and Odessa silty clay loams	4	3	3	2	2	2	2	2	3	2	2
Muck, deep	4	3	3	2	2	1	4	2	3	3	2
Muck, shallow	4	3	3	2	2	1	3	2	3	3	2
Niagara silt loam	2	2	1	1	2	3	2	2	2	1	2
Odessa silt loam, 0 to 2 percent slopes	2	2	1	1	2	3	2	2	2	1	2
Odessa silt loam, 2 to 6 percent slopes	2	2	1	1	2	3	4	4	2	1	4
Ontario fine sandy loam, 2 to 8 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Ontario fine sandy loam, 8 to 15 percent slopes, eroded	3	1	1	1	3	4	4	4	2	1	4
Ontario loam, 2 to 8 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Ontario loam, 8 to 15 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Ontario loam, 8 to 15 percent slopes, eroded	3	1	1	1	3	4	4	4	2	1	4
Ontario loam, 15 to 25 percent slopes, eroded	4	2	1	1	3	4	4	4	2	2	4
Ontario silt loam, moderately shallow variant, and Farmington soils, 2 to 8 percent slopes	2	2	2	2	2	4	4	4	2	2	2 4
Ovid silt loam, 0 to 3 percent slopes	2	2	1	1	2	3	2	2	2	1	2
Ovid silt loam, 3 to 8 percent slopes	2	2	1	1	2	3	4	4	2	1	4
Palmyra gravelly loam, 0 to 5 percent slopes	2	1	1	2	2	4	4	4	1	2	4
Palmyra gravelly loam, 5 to 15 percent slopes	2	1	1	2	2	4	4	4	1	2	4
Palmyra and Howard soils, 15 to 25 percent slopes	3	2	1	2	2	4	4	4	2	2	4
Palmyra and Howard soils, 25 to 35 percent slopes	4	3	1	2	2	4	4	4	3	2	4
Romulus silty clay loam	4	3	3	2	2	2	3	3	3	2	3
Schoharie silt loam, 2 to 6 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Schoharie silty clay loam, 0 to 2 percent slopes	2	1	1	1	3	4	3	3	1	1	3
Schoharie silty clay loam, 2 to 6 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Schoharie silty clay loam, 6 to 12 percent slopes, eroded	3	1	1	1	3	4	4	4	2	1	4
Schoharie silty clay loam, 12 to 20 percent slopes, eroded	4	2	1	1	3	4	4	4	2	2	4
Sloan silt loam	4	3	3	2	2	1	3	3	3	2	3
Stafford loamy fine sand	3	2	2	2	2	3	4	4	2	2	4
Varick silty clay loam	4	3	3	2	2	2	3	3	3	3	3
Wallkill soils	4	3	3	2	1	1	4	4	3	2	3

maintenance of roads, airports, pipelines, building foundations, and sewage disposal systems. Among the properties important to the engineer are permeability to water, shear strength, grain size, compaction characteristics, soil drainage, plasticity, and pH. Topography, depth to water table, and depth to and kind of bedrock are also important.

Information in this survey can be used to—

1. Make soil and land use studies that will aid in selecting and developing industrial, commercial, residential, and recreational sites.
2. Make preliminary estimates of the engineering properties of soils in the planning of agricultural drainage systems, farm ponds, irrigation systems, and diversion terraces.
3. Make preliminary evaluations of soil and ground conditions that will aid in selecting highway locations and in planning detailed investigations of the selected locations.
4. Locate probable sources of gravel and other construction material.
5. Correlate performance of engineering structures with soil mapping units, and thus develop information that is useful in designing and maintaining similar structures on like soils.
6. Determine the suitability of soil units for cross-country movement of vehicles and construction equipment.
7. Supplement information obtained from other published maps and reports and aerial photographs

TABLE 4.—*Engi-*

[Tests performed by the New York State Department of Transportation, Bureau of Soil Mechanics, in cooperation with the U.S. Depart-

Soil name and location	Parent material	SCS report No. S65NY50	Depth	In-place moisture content	In-place dry density	Moisture-density relationship [1]		Percolation rate [2]
						Optimum moisture content	Maximum dry density	
			In.	*Pct.*	*Lb. per cu. ft.*	*Pct.*	*Lb. per cu. ft.*	*Min. per in.*
Angola silt loam:								
Town of Lodi, 1,400 feet south of South Town Line Road and 500 feet east of Neeley Road. (More acid and coarser textured than modal profile.)	Acid, shaly glacial till, moderately deep over Genesee Shale.	13–1	0–9	25.6	87.6	26.0	94.5	--------
		13–2	9–12	--------	--------	16.5	109.8	--------
		13–3	12–20	20.2	102.3	16.6	110.0	>120
		13–4	20–22	--------	--------	13.4	116.8	--------
		13–5	22–29	18.5	109.3	14.3	115.0	--------
		--------	29–36	(7)	--------	--------	--------	--------
Town of Romulus, 300 feet south of Yerkes Road and 2,260 feet east of State Route 414. (Coarser textured than modal profile.)	Semiresidual and moderately deep over fine-grained, calcareous, gray to dark-gray sandstone and shale of the Moscow Formation.	8–1	0–10	28.1	79.6	28.2	91.5	--------
		8–2	10–15	22.8	97.2	19.5	105.0	>120
		8–3	15–24	--------	--------	15.5	114.5	--------
		--------	24–36	(7)	--------	--------	--------	--------
Town of Fayette, 100 feet west of Woodworth Road and 1,200 feet north of State Route 96A, southeast of Geneva. (Modal profile.)	Moderately deep over soft, gray, calcareous Skaneateles Shale bedrock.	4–1	0–10	26.7	85.3	22.7	95.0	--------
		--------	10–12	--------	--------	--------	--------	--------
		4–3	12–18	--------	--------	17.7	107.0	--------
		4–4	18–32	(9)	--------	--------	--------	>120
		4–5	32–44	18.0	109.3	18.2	107.0	--------
Appleton silt loam:								
Town of Ovid, 100 feet southeast of junction of County Road 131 and Combs Road.[8] (Modal profile.)	Calcareous glacial till, moderately high shale content.	10–1	0–7	27.3	88.5	28.2	91.5	--------
		10–2	7–16	18.3	103.8	16.6	110.0	--------
		10–3	16–28	12.3	118.0	11.2	123.5	29.75
		10–4	28–56	--------	--------	8.5	131.5	--------
Town of Romulus, 20 feet east of Wells Hollow Road and 400 feet south of West Blaine Road.[8] (Finer textured than modal profile.)	Calcareous glacial till dominated by dark-gray shale and limestone.	9–1	0–12	37.6	74.6	34.2	81.0	--------
		9–2	12–28	21.2	101.7	18.5	106.5	>120
		9–3	28–37	--------	--------	15.5	114.1	>120
		9–4	37–50	(7)	--------	--------	--------	--------
		9–5	50–60	10.5	122.6	11.3	123.6	--------

See footnotes at end of table.

for the purpose of making maps and reports that can be used readily by engineers.

8. Develop other preliminary estimates for construction purposes pertinent to the particular area.

With the use of the soil map for identification, the engineering interpretations in this subsection can be useful for many purposes. It should be strongly emphasized, however, that the interpretations generally will not eliminate the need for subsurface investigation, subsequent testing, and engineering analysis at the site of the proposed engineering works. In most places the intensity of investigation needed is proportional to the weight of the loads to be applied, to the depth and amount of earthwork involved, and to the cost of the contemplated works. Engineers and others should not apply specific values to the estimates given for bearing capacity of soils. Nevertheless, this engineering subsection, with the soil map and the soil descriptions, is useful for planning more detailed field investigations and for suggesting the kinds of problems that may be expected.

Much of the information in this subsection is in tables 4, 5, and 6. Table 4 lists engineering test data that were obtained when selected soils in the county were tested. Table 5 lists the soils and gives an estimate of their engineering properties. In table 6 are interpretations of the engineering properties of the soils for highway location, embankments, and structures for controlling water and erosion.

Additional information about the soils in the county can be obtained by referring to other parts of this survey,

neering test data

ment of Commerce, Bureau of Public Roads, in accordance with standard procedures of the American Association of State Highway Officials (AASHO)]

Mechanical analysis [3]												Liquid limit	Plasticity index [4]	Classification	
Percentage passing sieve—								Percentage smaller than—						AASHO [5]	Unified [6]
3 in.	2 in.	1 in.	3/8 in.	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.				
												Pct.			
-------	100.0	99.5	94.8	92.2	89.4	83.0	67.1	59.9	41.4	19.2	11.0	35.6	11.1	A-6(7)	ML-CL
-------	100.0	97.9	92.3	90.4	88.6	85.2	72.5	64.5	45.0	26.0	16.8	29.2	12.5	A-6(8)	CL
93.9	89.7	82.4	74.2	69.9	66.0	61.1	49.8	44.3	31.5	19.1	13.8	29.5	12.5	A-6(4)	SC
-------	100.0	90.1	85.0	81.5	78.7	71.8	49.1	42.0	26.6	16.3	13.8	29.5	10.7	A-6(3)	SC
-------	100.0	98.6	93.5	89.9	84.5	76.0	60.9	55.0	40.1	26.8	20.2	28.4	11.3	A-6(6)	CL
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	
-------	100.0	100.0	98.2	95.5	92.0	86.7	71.8	66.0	52.2	26.9	16.1	37.8	10.4	A-4(7)	ML
-------	100.0	99.9	99.6	98.4	96.9	94.3	83.2	75.0	56.1	36.4	25.0	29.8	11.7	A-6(9)	CL
-------	-------	96.4	95.0	93.1	91.0	86.1	68.0	59.5	40.6	26.9	20.5	26.0	11.0	A-6(7)	CL
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	
-------	100.0	96.7	95.9	94.8	93.0	89.4	79.1	71.8	53.8	35.1	23.1	42.8	14.6	A-7-6(11)	ML, OL
-------	-------	100.0	93.4	82.6	72.9	66.4	62.9	59.6	51.9	37.6	25.3	47.0	20.2	A-7-6(10)	ML, CL
-------	100.0	85.8	40.2	29.1	23.9	21.5	20.9	19.5	15.7	9.9	6.3	32.3	10.8	A-2-6(0)	GC
-------	100.0	99.9	98.6	97.1	94.4	89.2	69.2	60.4	39.9	16.9	10.5	37.1	12.1	A-6(8)	ML-CL
-------	100.0	99.7	98.6	96.2	91.9	86.1	69.3	60.9	42.4	30.0	21.3	26.8	9.9	A-4(7)	CL
-------	100.0	98.4	87.1	81.7	77.2	69.2	55.5	51.0	39.7	21.9	15.2	24.4	8.4	A-4(4)	CL
100.0	87.5	80.1	64.8	56.3	47.2	36.1	26.0	22.9	15.8	7.5	5.8	20.0	6.4	A-2-4(0)	GM-GC
-------	100.0	98.9	97.1	95.4	93.9	89.6	75.4	(10)	-------	-------	-------	52.2	13.7	A-7-5(12)	MH
100.0	97.0	91.1	85.7	81.9	78.0	73.8	61.3	56.2	43.6	29.9	20.8	35.7	16.8	A-6(8)	CL
100.0	98.1	97.2	94.5	91.2	87.3	82.8	69.6	63.0	47.6	32.2	23.0	26.9	10.3	A-4(7)	CL
95.6	89.6	87.2	79.1	72.8	67.9	61.7	51.4	47.0	35.6	20.9	13.7	25.0	10.4	A-4(3)	CL
96.5	91.5	84.3	76.2	71.8	66.1	58.8	47.5	42.8	31.7	17.5	12.3	21.4	8.7	A-4(3)	GC

TABLE 4.—*Engineering*

Soil name and location	Parent material	SCS report No. S65NY50	Depth	In-place moisture content	In-place dry density	Moisture-density relationship [1]		Percolation rate [2]
						Optimum moisture content	Maximum dry density	
			In.	*Pct.*	*Lb. per cu. ft.*	*Pct.*	*Lb. per cu. ft.*	*Min. per in.*
Arkport very fine sandy loam:								
Town of Waterloo, 200 feet north of Dunham Road and 1,500 feet west of County Road 108. (Modal profile.)	Lake-laid neutral to slightly acid sand; 54 inches thick over varved sand, silt, and clay.	1–1	0–10	19. 1	86. 9	16. 8	95. 5	----------
		1–2	10–18	11. 1	87. 9	14. 7	103. 6	----------
		1–3	18–42	14. 1	83. 4	19. 8	104. 5	----------
		1–4	42–54	25. 0	94. 3	15. 6	100. 0	2. 16
		1–5	54–66	--------	--------	18. 0	109. 9	----------
		1–6	66–84	--------	--------	14. 8	113. 7	----------
Conesus gravelly silt loam:								
Town of Lodi, 100 feet south of South Town Line Road and 500 feet east of Neeley Road.[8] (Modal profile.)	Calcareous, shaly glacial till.	14–1	0–8	21. 0	82. 5	21. 7	101. 2	----------
		----------	8–10	(7)	--------	----------	----------	----------
		14–3	10–16	16. 1	105. 9	14. 1	115. 5	63. 70
		14–4	16–25	14. 2	112. 5	14. 4	114. 5	>120
		14–5	25–60	13. 6	117. 6	11. 5	122. 5	----------
Town of Lodi, 300 feet south of corporate limits of village of Lodi and 100 feet west of County Road 137. (Intergrade toward Lima.)	Calcareous glacial till, high shale content.	12–1	0–7	15. 5	88. 7	19. 0	105. 2	----------
		12–2	7–11	--------	--------	----------	----------	----------
		12–3	11–18	--------	--------	12. 6	118. 7	----------
		12–4	18–34	14. 7	108. 4	8. 0	118. 5	7. 90
		12–5	34–68	12. 1	120. 0	9. 3	130. 0	----------
Lansing gravelly silt loam:								
Town of Ovid, 400 feet south of West Wycoff Road and 2,200 feet west of State Route 414.[8] (Moraine variety.)	Calcareous glacial till over gravelly loamy sand, water-worked material over more glacial till at a depth of 72 inches.	11–1	0–7	16. 6	92. 5	19. 2	105. 5	----------
		----------	7–10	(7)	--------	----------	----------	----------
		11–3	10–15	--------	--------	16. 5	111. 0	----------
		11–4	15–30	15. 3	100. 8	4. 4	115. 0	2. 46
		11–5	30–44	10. 2	117. 9	8. 4	133. 5	----------
		11–6	44–72	7. 7	114. 3	8. 8	131. 8	1. 10
		----------	72	(7)	--------	----------	----------	----------

[1] Based on Moisture-Density Relations of Soils Using a 5.5-Pound Rammer and a 12-in. Drop: AASHO Designation T 99–57, Method C.

[2] Based on "Standard Percolation Test," N.Y. State Dept. of Health Bul. No. 1.

[3] Mechanical analyses according to the AASHO Designation T 88. Results by this procedure frequently may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method, and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in the table are not suitable for use in naming textural classes for soils.

[4] NP=Nonplastic.

[5] Based on Standard Specifications for Highway Materials and Methods of Sampling and Testing (Pt. 1, Ed. 8): Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes, AASHO Designation M 145–49.

[6] SCS and BPR have agreed to consider that all soils having plasticity indexes within two points from A-line are to be given a border-

test data—Continued

Mechanical analysis [3]															
Percentage passing sieve—								Percentage smaller than—				Liquid limit	Plasticity index [4]	Classification	
3 in.	2 in.	1 in.	⅜ in.	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.			AASHO [5]	Unified [6]
												Pct.			
-------	-------	-------	100. 0	99. 9	99. 7	99. 2	47. 8	25. 0	6. 0	3. 2	3. 2	------	NP	A-4(3)	SM
-------	-------	-------	-------	-------	100. 0	99. 9	44. 5	34. 5	12. 9	8. 3	5. 0	------	NP	A-4(2)	SM
-------	-------	-------	-------	-------	100. 0	99. 9	54. 0	40. 0	10. 5	5. 5	3. 5	------	NP	A-4(4)	ML
-------	-------	-------	-------	-------	100. 0	99. 9	41. 6	32. 0	10. 1	3. 7	2. 7	------	NP	A-4(1)	SM
-------	-------	-------	100. 0	99. 9	99. 7	99. 6	93. 3	76. 3	67. 0	43. 9	34. 2	33. 3	16. 1	A-6(10)	CL
-------	-------	100. 0	99. 5	99. 1	98. 5	97. 8	95. 5	85. 8	33. 7	11. 5	8. 5	20. 4	5. 1	A-4(8)	ML-CL
-------	100. 0	95. 5	90. 3	86. 3	82. 6	77. 3	62. 7	56. 1	39. 1	19. 7	9. 1	30. 7	9. 1	A-4(5)	ML-CL
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	
-------	100. 0	96. 6	86. 8	81. 8	76. 8	69. 9	56. 6	49. 5	33. 8	18. 2	10. 8	25. 0	8. 1	A-4(4)	CL
-------	100. 0	91. 6	84. 3	79. 0	73. 1	65. 3	53. 1	47. 0	32. 4	20. 2	15. 6	27. 5	10. 1	A-4(4)	CL
-------	100. 0	95. 7	85. 1	78. 2	71. 5	63. 2	49. 7	39. 0	24. 6	11. 7	8. 5	18. 9	5. 3	A-4(3)	SM-SC
-------	100. 0	99. 4	94. 7	91. 8	88. 0	82. 3	62. 0	53. 5	33. 2	16. 0	7. 2	30. 2	8. 6	A-4(5)	ML-CL
-------	100. 0	98. 0	92. 8	90. 0	86. 7	81. 0	61. 1	53. 0	34. 8	19. 1	11. 8	26. 8	7. 8	A-4(5)	CL
100. 0	98. 3	97. 7	93. 3	91. 0	88. 3	82. 5	61. 9	54. 0	35. 1	21. 5	14. 5	22. 2	6. 8	A-4(5)	ML-CL
-------	100. 0	96. 1	90. 1	84. 8	79. 6	72. 7	56. 0	49. 0	32. 6	22. 5	17. 0	30. 9	13. 3	A-6(5)	CL
100. 0	98. 3	92. 2	83. 8	79. 3	73. 2	64. 5	47. 6	40. 8	25. 7	13. 3	8. 7	18. 6	6. 5	A-4(3)	SM-SC
100. 0	98. 1	96. 4	92. 4	89. 4	85. 9	80. 4	58. 1	50. 5	32. 2	18. 6	10. 0	28. 2	8. 4	A-4(5)	CL
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	
100. 0	96. 3	92. 5	86. 6	82. 8	78. 5	70. 4	57. 4	51. 0	36. 5	25. 7	18. 9	34. 1	17. 0	A-6(7)	CL
100. 0	99. 1	91. 8	82. 3	76. 6	71. 6	62. 8	47. 1	41. 0	26. 9	14. 8	10. 7	24. 8	8. 7	A-4(2)	SC
91. 5	90. 9	87. 2	76. 8	70. 5	61. 6	51. 9	37. 9	32. 1	18. 9	10. 7	7. 0	19. 4	4. 9	A-4(1)	SM-SC
96. 6	95. 5	87. 0	63. 7	53. 1	44. 4	24. 5	9. 2	(11)	------	------	------	16. 6	2. 0	A-1-a(0)	GW-GC
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	

line classification. Examples of borderline classification obtained by this use are SM-SC, GM-GC, and ML-CL.

[7] Lack of data indicates that tests were not made because the horizon was not sampled, the horizon was too thin, the material exposed was bedrock, or other adverse conditions prevented making the tests.

[8] Percentage of sample that was discarded because it did not pass a 3-inch sieve: Appleton silt loam (Modal), 5 percent at a depth of 28 to 56 inches; Appleton silt loam (Finer textured than modal), less than 1 percent at a depth of 12 to 37 inches, and 1 percent at a depth of 37 to 60 inches; Conesus silt loam (Modal), 1 to 2 percent throughout profile; Conesus silt loam (Intergrade toward Lima soils), 1 percent throughout profile; Lansing silt loam (Moraine variety), 2 percent throughout profile.

[9] Composite field tests were taken on two horizons where tests on the individual horizons were prevented by thinness of the horizons. Field tests affected are in-place moisture content, in-place dry density, and percolation rate. Other laboratory data are for the separate horizons.

[10] No hydrometer analysis was performed on soils containing a considerable amount of organic material, because the dispersing agent has a flocculating effect on organic portions of the sample and results are unreliable.

[11] No hydrometer analysis was performed on sands where less than 10 percent of the particles passed the No. 200 sieve.

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TABLE 5.—*Estimated properties*

[Alluvial land (Al); Edwards muck (Ed); Fresh water marsh (Fw); Made land, tillable (Md);

Soil series and map symbols	Depth to bedrock	Depth to seasonal high water table	Depth from surface	Classification: USDA texture
	Feet	*Feet*	*Inches*	
Alden:				
Ac	6–20	0	0–9	Mucky silt loam
			9–21	Silt loam or loam
			21–40	Stratified silt loam, loam, and very fine sandy loam.
Ad	4+	0	0–9	Mucky silt loam
			9–26	Silt loam
			26–48	Firm gritty silt loam or loam till, few stones.
Angola: AnA, AnB	2–3½	½–1½	0–9	Silt loam
			9–34	Silty clay loam and clay loam
			34	Soft shale bedrock; fractured
Appleton: AoA, AoB, ApA, ApB. Estimated properties of AoA and AoB differ from those of ApA and ApB in that they contain 15 to 50 percent stones by volume.	3½–20	½–1½	0–12	Silt loam
			12–27	Heavy silt loam or heavy loam
			27–48	Loam to silt loam glacial till; few stones
Arkport: ArB, ArC, ArD	4–80	3+	0–59	Fine sandy loam and loamy fine sand
			59–100	(2)
Arnot: AuD	1–2	1–1½	0–17	Channery silt loam
			17	Sandstone bedrock.
Aurora: AwB, AwC, AwD, AzF. For Farmington part of AzF, see Farmington series.	2–3	1½–2	0–13	Silt loam
			13–32	Silty clay loam and shaly silty clay loam
			32–48	Bedrock: soft shale.
Canandaigua: Ca	6–20	0–½	0–27	Silt loam
			27–43	Very fine sandy loam and silt loam; stratified.
Cazenovia: CeB, CeB3, CeC, CeC3, ChD, ChE	3–25	1½–3	0–13	Silt loam to heavy loam
			13–31	Light silty clay loam
			31–40	Gravelly heavy silt loam glacial till
Claverack: CkA, CkB,	5+	1½–2	0–32	Loamy fine sand
			32–40	Silty clay
Collamer:				
ClA, ClB, ClC	5–40	1–2	0–42	Silt loam to light silty clay loam
CoA, CoB	5–40	1–2	0–27	Silt loam to coarse silty clay loam
			27–48	Silty clay to clay
Conesus: CsA, CsB	3½–20	1–2	0–19	Gravelly silt loam
			19–36	Gravelly silt loam
			36–42	Gravelly loam till
Cosad: Cu	5+	½–1½	0–30	Loamy fine sand
			30–40	Silty clay
Danley	3½–7	1½–3	0–11	Silt loam
			11–24	Light silty clay loam
			24–48	Gravelly heavy silt loam or gravelly heavy loam till; many shale chips.
Darien: DaA, DdB. For Danley and Cazenovia parts of DdB, see their respective series.	3½–6	½–1½	0–10	Silt loam
			10–24	Light silty clay loam
			24–50	Gravelly light silty clay loam till

See footnotes at end of table.

of the soils

Muck, deep (Mr); and Muck, shallow (Ms) are so variable that their properties are not estimated]

Classification—Continued		Percentage passing sieve—			Permeability	Reaction	Available moisture capacity
Unified	ASSHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)			
					Inches per hour	*pH*	*Inches per inch of soil*
ML or OL	A–6	95–100	95–100	60–95	0. 63–2. 0	6. 1–7. 5	0. 16–0. 21
ML or CL	A–4	95–100	95–100	60–95	0. 63–2. 0	[1] 6. 1–8. 4	0. 20–0. 23
ML, CL or SM	A–4	95–100	95–100	45–95	0. 2–0. 63	[1] 7. 0–8. 4	0. 19–0. 22
ML, CL or OL	A–6	95–100	90–100	85–95	0. 63–2. 0	5. 6–7. 3	0. 17–0. 21
CL or ML	A–4	95–100	90–100	60–95	0. 2–0. 63	6. 1–7. 8	0. 17–0. 19
GM or GC	A–4	55–75	45–70	40–60	<0. 63	(1)	
ML or CL	A–6, A–7	90–95	90–95	65–80	0. 20–0. 63	5. 6–7. 3	0. 15–0. 19
ML or CL	A–6, A–7	70–85	70–75	50–70	<0. 2	[1] 5. 6–8. 4	0. 15–0. 17
CL or GC	A–2 to A–6	20–85	30–80	30–70	<0. 2	(1)	
ML, CL or MH	A–6, A–7	75–100	70–95	60–80	0. 63–2. 0	6. 1–7. 5	0. 13–0. 20
CL	A–4, A–6	75–100	60–95	50–75	0. 63–2. 0	6. 6–7. 8	0. 13–0. 20
GM or GC	A–2 or A–4	50–80	40–70	25–50	<0. 63	[1] 7. 0–8. 4	
SM or SP-SM	A–1 to A–4	95–100	95–100	10–50	>6. 3	[1] 5. 1–8. 4	0. 06–0. 10
(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
ML	A–4	65–80	60–70	50–65	0. 63–2. 0	4. 5–5. 5	0. 13–0. 16
ML	A–4	80–100	75–95	60–80	0. 2–0. 63	5. 1–7. 3	0. 15–0. 20
CL	A–6	80–85	70–75	60–65	<0. 2	[1] 5. 6–8. 4	0. 13–0. 17
ML or CL	A–6 or A–4	95–100	95–100	60–95	0. 63–2. 0	[1] 6. 1–8. 4	0. 15–0. 20
(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
ML or CL	A–4	90–100	80–95	55–70	0. 2–0. 63	5. 6–7. 3	0. 16–0. 19
CL	A–6	90–100	85–95	60–90	0. 2–0. 63	5. 6–7. 8	0. 16–0. 17
CL, SM or ML–CL	A–4	75–100	70–100	40–90	<0. 2	(1)	
SM	A–2	95–100	95–100	15–30	2. 0–6. 3	5. 6–7. 5	0. 08–0. 11
CL	A–7	95–100	95–100	90–100	<0. 2	[1] 7. 0–8. 4	
ML or CL	A–4	95–100	90–100	60–85	(2)	5. 1–7. 8	0. 15–0. 19
ML or CL	A–4	95–100	90–100	60–85	(2)	5. 6–7. 8	0. 15–0. 19
CL or CH	A–7	95–100	80–100	80–100	<0. 2	7. 0–8. 4	0. 10–0. 16
ML or CL	A–4	85–90	80–90	50–65	0. 63–2. 0	5. 1–7. 0	0. 13–0. 17
CL	A–4	80–85	75–80	50–55	0. 2–0. 63	5. 1–7. 0	0. 12–0. 16
SM or SC	A–4	75–80	70–75	45–50	<0. 63	[1] 6. 6–8. 4	
SM	A–2	95–100	95–100	15–30	2. 0–6. 3	5. 1–7. 0	0. 08–0. 11
ML or CL	A–4	95–100	95–100	90–100	<0. 2	[1] 6. 6–8. 4	
ML or CL	A–4	90–100	85–95	55–75	0. 2–0. 63	5. 1–7. 0	0. 16–0. 19
CL	A–4 or A–6	85–95	80–90	60–70	<0. 2	6. 1–7. 5	0. 16–0. 19
CL	A–4 or A–6	80–95	70–90	50–70	<0. 2	[1] 6. 6–8. 4	
ML or CL	A–4	90–100	85–95	55–75	0. 2–0. 63	5. 1–7. 0	0. 16–0. 19
CL	A–4 or A–6	85–95	80–90	60–70	<0. 2	6. 1–7. 5	0. 16–0. 17
CL	A–4 or A–6	80–95	70–90	50–70	<0. 2	[1] 7. 0–8. 4	

TABLE 5.—*Estimated properties*

Soil series and map symbols	Depth to bedrock	Depth to seasonal high water table	Depth from surface	Classification: USDA texture
	Feet	*Feet*	*Inches*	
Dunkirk:				
DuB, DuC3, DuD	5–50	2+	0–48	Silt loam to light silty clay loam
DwB	3½–5	2+	0–42	Silt loam to light silty clay loam
			42	Limestone bedrock.
Eel: Ee	4–20	1–1½	0–40	Silt loam to very fine sandy loam
Elnora: ElA, ElB	5+	1½–2	0–48	Loamy fine sand
Erie:				
ErA, ErB	4+	½–1	0–13	Channery silt loam
			13–48	Channery silt loam or channery loam fragipan.
EsA, EsB	1½–3½	½–1	0–13	Channery silt loam
			13–28	Channery loam to silt loam fragipan
			28	Gray sandstone and shale bedrock; fractured in upper 6 inches.
Farmington	0–1½	2+	0–15	Silt loam
			15	Limestone bedrock.
Fonda: Fn	4–20	0–½	0–5	Mucky light silty clay loam
			5–60	Silty clay loam to silty clay
Honeoye: HnB, HnC, HnD, HoE	4–20	2–3½	0–11	Silt loam
For Ontario and Lansing parts of HoE, see their respective series.			11–26	Heavy silt loam
			26–48	Loam to silt loam till
Howard: HwA, HwC	5+	3	0–25	Gravelly loam
			25–36	Very gravelly light clay loam and heavy loam.
			36–60	Stratified sand and gravel
Ilion: Is	4–20	0–½	0–12	Light silty clay loam
			12–34	Silty clay loam
			34–48	Light silty clay loam to shaly silty clay loam till.
Lakemont: LcA, LcB	6–30	0–½	0–9	Silty clay loam
			9–48	Silty clay
Lamson: Lf	6–30	0–½	0–33	Fine sandy loam to loamy fine sand
			33–48	Layers of loamy fine sand and fine sand with thin lenses of silty clay.
Langford:				
LgB, LgC, LgC3, LgD	3½+	1–2	0–19	Channery silt loam
			19–48	Channery loam fragipan
LnB, LnC	2–3½	1–2	0–17	Channery silt loam
			17–29	Channery silt loam fragipan
			29–40	Gray sandstone and hard shale bedrock.
Lansing: LsB, LsC, LsC3, LsD	4+	2½–4	0–12	Gravelly silt loam
			12–37	Gravelly heavy silt loam
			37–45	Gravelly loam glacial till
Lima: LtA, LtB	4+	1–2	0–11	Silt loam
			11–21	Heavy silt loam
			21–40	Loam till

See footnotes at end of table.

of the soils—Continued

Classification—Continued		Percentage passing sieve—			Permeability	Reaction	Available moisture capacity
Unified	ASSHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)			
					Inches per hour	*pH*	*Inches per inch of soil*
ML or CL	A-4	95–100	90–100	60–85	(2)	[1] 5.1–8.4	0.16–0.19
ML or CL	A-4	95–100	90–100	60–85	(2)	5.1–8.4	0.16–0.19
ML	A-4	95–100	90–100	60–90	0.63–2.0	6.1–7.8	0.16–0.20
SM	A-2 or A-4	95–100	85–95	15–40	2.0–6.3	4.5–7.8	0.07–0.13
ML or CL	A-4, A-6	80–95	75–95	55–80	0.63–2.0	5.1–6.0	0.13–0.17
GM, GC, or CL	A-4	60–85	50–80	35–65	<0.2	[1] 5.6–8.4	0.02–0.07
ML or CL	A-4, A-6	80–95	75–95	55–80	0.63–2.0	5.1–6.0	0.18–0.22
GM or GC	A-4	60–85	50–80	35–65	<0.2	5.6–7.3	
ML or CL							
ML	A-4	75–90	60–80	50–60	0.63–2.0	5.1–7.3	0.15–0.19
ML or OL	A-7	100	95–100	80–95	0.20–0.63	6.1–7.5	0.15–0.21
CL	A-6	100	95–100	80–95	<0.2	[1] 6.6–8.4	0.13–0.17
ML or CL	A-4 or A-6	80–95	75–95	55–75	0.63–2.0	5.6–7.3	0.13–0.18
GM or GC, ML or CL	A-4	70–95	65–85	45–70	0.2–2.0	6.1–7.8	0.13–0.18
GM, GC, SM or SC	A-2 or A-4	55–90	45–80	25–50	<0.63	[1] 7.5–8.4	0.04–0.13
GM, GC, ML, or CL	A-2, A-4, A-2	60–90	45–85	25–65	>6.3	4.5–6.5	0.10–0.14
GM or GC		40–60	20–50	15–25	>6.3	5.1–7.0	0.06–0.08
GW–GM, or GW, SM or SC	A-1, A-2	50–80	35–55	5–20	>6.3	[1] 6.1–8.4	
ML or OL	A-7-5	90–100	85–100	65–85	0.20–0.63	5.6–7.5	0.15–0.20
CL	A-6	80–95	75–90	60–75	<0.2	6.1–7.8	0.15–0.17
CL	A-6	85–95	75–85	55–70	<0.2	[1] 7.0–8.4	
ML, CL or OL	A-7-6	100	95–100	80–100	0.2–0.63	6.1–7.3	0.15–0.19
CL	A-6	100	95–100	80–100	<0.2	[1] 6.6–8.4	0.11–0.18
ML, SM, or OL	A-4	95–100	90–100	35–65	>6.3	6.1–7.5	0.07–0.15
SM or SC	A-2 or A-4	95–100	90–100	25–50	2.0–6.3	[1] 6.1–8.4	0.11–0.14
GM or GC	A-2 or A-4	50–70	40–65	25–50	0.63–2.0	5.1–6.5	0.13–0.17
GM or GC	A-2 or A-4	60–70	55–65	30–50	<0.2	5.6–7.8	0.02–0.07
GM or GC	A-2 or A-4	50–70	40–65	25–50	0.63–2.0	5.1–6.0	0.13–0.17
GM or GC	A-2 or A-4	60–70	55–65	30–50	<0.2	5.6–7.5	0.02–0.07
ML or CL	A-4	80–95	75–90	55–65	0.63–2.0	5.1–6.5	0.13–0.16
CL or SC	A-4, A-6	75–85	60–80	40–60	0.63–2.0	6.1–7.5	0.13–0.16
GW-GC, SM or SC	A-1 to A-4	50–75	40–65	10–40	<0.63	[1] 7.0–8.4	
ML or CL	A-4, A-7	80–95	75–95	55–75	0.63–2.0	6.1–7.5	0.14–0.18
CL	A-4, A-6	75–90	65–80	50–70	0.63–2.0	6.6–7.5	0.14–0.16
GM or GC, SM or SC	A-2 or A-4	55–85	45–70	30–50	<0.63	[1] 7.0–8.4	0.04–0.13

TABLE 5.—*Estimated properties*

Soil series and map symbols	Depth to bedrock	Depth to seasonal high water table	Depth from surface	Classification: USDA texture
	Feet	*Feet*	*Inches*	
Lyons: Ly	4+	0–½	0–30	Silt loam to loam
			30–40	Gravelly silt loam to loam till
Madalin: Ma	5+	0–½	0–8	Light silty clay loam
For Odessa part, see Odessa series.			8–28	Heavy silty clay loam to silty clay
			28–54	Varved silty clay and silty clay loam with lenses of silt.
Niagara: Ng	4–15	½–1	0–15	Light silt loam or very fine sandy loam
			15–35	Silt loam
			35–48	Layers of silt, very fine sandy loam, and loamy fine sand.
Odessa: OdA, OdB	5+	½–1	0–8	Silt loam
			8–40	Silty clay loam to silty clay
Ontario:				
OfB, OfC3, OnB, OnC, OnC3, OnD3	5+	2½	0–15	Loam or fine sandy loam
			15–32	Heavy fine sandy loam to light clay loam
			32–72	Loam glacial till
OpB	1½–3	3+	0–22	Silt loam
For Farmington part, see Farmington series.			22–31	Heavy silt loam
			31–40	Limestone bedrock.
Ovid: OvA, OvB	4+	½–1½	0–12	Heavy silt loam
			12–24	Silty clay loam
			24–40	Silty clay loam to heavy loam glacial till
Palmyra: PgA, PgC, PhD, PhE	5+	3+	0–12	Gravelly loam
For Howard part of PhD and PhE, see Howard series.			12–42	Gravelly loam
			42–60	Stratified sand and gravel
Romulus: Ro	3+	0–1	0–15	Light silty clay loam
			15–48	Silty clay loam
Schoharie: SeB, ShA, ShB, ShC3, ShD3	5+	1½–3	0–9	Light silty clay loam and silt loam
			9–40	Silty clay to clay
Sloan: Sn	3–20	0–½	0–36	Silt loam, silty clay loam and mucky silt loam.
			36–48	Layers of light silty clay loam and heavy silt loam.
Stafford: Sr	5+	½–1½	0–34	Loamy fine sand
			34–48	Fine sand
Varick: Vc	1½–3½	0–½	0–24	Light silty clay loam
			24	Soft shale bedrock.
Wallkill: Wk	6+	0	0–14	Fine sandy loam to very fine sandy loam
			14–40	Muck or peat

[1] Calcareous.

of the soils—Continued

Classification—Continued		Percentage passing sieve—			Permeability	Reaction	Available moisture capacity
Unified	ASSHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)			
					Inches per hour	*pH*	*Inches per inch of soil*
ML or CL	A-4, A-6	95-100	90-100	65-90	0.63-2.0	6.1-7.8	0.13-0.20
SM or SC, GM or GC	A-2 or A-4	60-80	55-70	35-50	<0.63	[1] 7.0-8.4	
ML or CL	A-4 or A-6	100	95-100	80-100	0.20-0.63	6.1-7.5	0.13-0.19
CL	A-7-6	100	95-100	80-100	<0.2	[1] 6.1-8.4	0.13-0.17
CL	A-6	100	95-100	80-100	<0.2	([1])	
ML or CL	A-4	95-100	95-100	60-95	0.63-2.0	6.1-7.5	0.16-0.21
ML or CL	A-4, A-6	95-100	95-100	60-95	([2])	[1] 6.1-8.4	0.15-0.17
----------------	----------------	([2])	([2])	([2])	([2])	([1])	
ML or CL	A-7	100	85-100	70-90	0.20-0.63	5.1-7.5	0.15-0.20
CH or CL	A-7	100	90-100	80-95	<0.2	[1] 6.1-8.4	0.14-0.16
SM, ML or CL	A-4	80-95	75-90	40-55	0.63-2.0	4.5-7.3	0.16-0.20
ML or CL	A-4	80-95	75-90	50-60	0.63-2.0	6.1-7.5	0.14-0.18
SM or SC	A-4	75-90	70-85	35-50	<0.63	[1] 7.0-8.4	
SM, ML or CL	A-4	75-95	65-90	40-55	0.63-2.0	5.1-7.3	0.16-0.20
ML or CL	A-4	65-95	55-90	50-60	0.63-2.0	6.1-7.8	0.14-0.18
ML or CL	A-4	85-100	80-100	60-75	0.63-2.0	5.1-7.5	0.16-0.19
CL	A-6	85-100	80-100	60-80	0.2-0.63	6.1-7.8	0.16-0.17
CL, ML	A-4	70-100	70-100	55-85	<0.2	[1] 6.6-8.4	0.04-0.10
ML or CL	A-4	75-95	70-90	50-70	>6.3	5.1-7.5	0.10-0.14
GM or GC	A-2 or A-4	50-75	40-70	30-50	>6.3	5.6-7.5	0.11-0.15
GM-GW, SW-SM	A-1 to A-4	35-60	20-40	5-15	>6.3	[1] 7.5-8.4	
ML or OL	A-7	90-100	85-100	65-85	0.2-0.63	6.1-7.5	0.15-0.20
CL	A-6	70-100	65-100	50-100	<0.2	[1] 6.6-8.4	0.13-0.17
ML or CL	A-7	95-100	85-100	55-100	<0.2	5.1-7.5	0.13-0.20
CL or CH	A-7	95-100	80-100	80-100	<0.2	[1] 6.1-8.4	0.10-0.16
OL or ML	A-4	90-100	90-100	80-100	0.2-0.63	6.1-7.8	0.16-0.20
CL	A-6	95-100	95-100	80-100	<0.2	[1] 7.0-8.4	
SM	A-2-4	95-100	95-100	15-35	>6.3	4.5-6.5	0.08-0.10
SP-SM or SM	A-2	95-100	95-100	12-20	>6.3	5.1-7.3	0.08-0.10
ML or CL	A-7-6	90-100	90-95	60-85	>0.63	[1] 5.1-8.4	0.15-0.20
ML or OL	A-4	90-100	90-100	80-100	0.63-2.0	6.1-7.8	0.13-0.20
OL or Pt	([2])	([2])	([2])	([2])	([2])	([2])	

[2] Variable.

TABLE 6.—*Interpretations of engineering*

Soil series and map symbols	Suitability as source of—			Soil features that affect engineering practices for—		
	Topsoil	Sand and gravel	Fill material	Highway location	Highway cut slopes	Embankment foundations
Alden: Ac, Ad	Fair to good: wet in natural state. Ad: stony in places.	Unsuitable	Ac: poor. Ad: surface layer unsuitable. Material at depth of more than 2 to 2½ feet; good where dry.	Organic surface layer; prolonged high water table; depressional relief; subgrade unstable.	Cut slopes unstable.	Ac: variable strength and stability. Ad: unstable soil material over till. Material at depth of more than 2 to 2½ feet: adequate strength for moderately high embankments.
Alluvial land: Al	Variable: wet in places.	Generally unsuitable.	Very variable	Seasonally high water table; subject to flooding.	Cut slopes unstable.	Variable strength; underlain by wet, compressible soils in places.
Angola: AnA, AnB	Fair to poor	Unsuitable	Good: low yield of material per acre.	Fractured shale bedrock at depth of 2 to 3½ feet; seepage problems.	Fractured shale bedrock at depth of 2 to 3½ feet; seepage problems.	Adequate strength for high embankments.
Appleton: AoA, AoB, ApA, ApB.	AoA, AoB: poor. ApA, ApB: fair to good.	Unsuitable	Good	Seasonally high water table; seepage problem.	Subject to seepage; slope unstable; seasonally high water table.	Adequate strength for high embankments.
Arkport: ArB, ArC, ArD	May be used as amendment to fine-textured soils.	Generally unsuitable.	Good to fair: highly erodible.	Fine sands hinder hauling operations; subgrade subject to differential frost heaving.	Cut slopes highly erodible.	Generally adequate strength for low embankments; underlain in places by wet, compressible soils.
Arnot: AuD	Unsuitable	Unsuitable	Good: low soil yield per acre.	Sandstone bedrock at depth of 1 to 2 feet; seepage problems.	Cut slopes in bedrock; seepage problems.	Adequate strength for high embankments.
Aurora: AwB, AwC, AwD	Fair to poor	Unsuitable	Good: low soil yield per acre.	Shale bedrock at depth of 2 to 3 feet; seepage problems.	Cut slopes in bedrock; seepage problems.	Adequate strength for high embankments.
AzF (For Farmington part, see Farmington series.)	Unsuitable	Unsuitable	Unsuitable	Steep to very steep gorges.	Cut slopes in bedrock.	(2)

See footnotes at end of table.

properties of the soils

Soil features that affect engineering practices for—Continued						
Foundations for low buildings [1]	Farm ponds		Agricultural drainage	Irrigation	Diversions	Waterways
	Reservoir areas	Embankment [3]				
Ac: variable bearing capacity; prolonged high water table. Ad: generally stable. Material at depth of more than 2 to 2½ feet: low compressibility.	Prolonged high water table; moderately slow to slow permeability.	Surface layer: high organic-matter content. Material at depth of more than 26 inches: good stability; slow permeability.	Moderately slow to slow permeability; prolonged high water table; depressional areas; fine sands; subject to sloughing and piping.	(2)	(2)	(4).
(2)	Subject to frequent flooding; variable permeability.	(2)	Cut slopes unstable; natural outlets inadequate.	(2)	(2)	(2).
High bearing capacity; bedrock at a depth of 2 to 3½ feet.	Shale bedrock at depth of 2 to 3½ feet; slow permeability.	Limited soil material per acre.	Slow permeability; shale bedrock at depth of 2 to 3½ feet.	Limited root depth; high available moisture capacity; bedrock at depth of 2 to 3½ feet.	Shale bedrock at depth of 2 to 3½ feet.	Subject to prolonged flow.
Moderately high bearing capacity; low compressibility.	Seasonally high water table; moderately slow to slow permeability.	Generally no adverse conditions.	Slowly permeable layer at depth of 1½ to 2½ feet; seasonally high water table.	Limited root depth; high available moisture capacity.	Generally no adverse conditions.	Subject to prolonged flow.
Variable bearing capacity and compressibility; susceptible to settling under vibratory loads.	Rapid permeability.	Poor stability; poorly graded fine sands; subject to piping; highly erodible.	(2)	High water intake rate; low available moisture capacity; droughty.	Rapid permeability.	Highly erodible.
High bearing capacity; bedrock at depth of 1 to 2 feet.	Sandstone bedrock at depth of 1 to 2 feet.	(2)	Sandstone bedrock at depth of 1 to 2 feet.	(2)	(2)	(2).
High bearing capacity; bedrock at depth of 2 to 3 feet in most places; seepage problems.	Soft shale bedrock at depth of 2 to 3 feet. AwD: steep slopes.	Limited soil material per acre; soft shale fragments very unstable.	Shale bedrock at depth of 2 to 3 feet; subject to runoff from adjacent areas.	High water intake rate; high available moisture capacity. AwD: steep slopes.	Shale bedrock at depth of 2 to 3 feet.	Highly erodible. AwD: steep slopes.
(2)	(2)	(2)	(2)	(2)	(2)	(2).

TABLE 6.—*Interpretations of engineering*

Soil series and map symbols	Suitability as source of—			Soil features that affect engineering practices for—		
	Topsoil	Sand and gravel	Fill material	Highway location	Highway cut slopes	Embankment foundations
Canandaigua: Ca	Good in places in natural state.	Unsuitalbe	Fair to poor	Prolonged high water table; subgrade unstable.	Cut slopes subject to seepage and instability.	Generally adequate strength for low embankments; underlain in places by wet, compressible soils.
Cazenovia: CeB, CeB3, CeC, CeC3, ChD, ChE.	Fair: high clay content in places.	Unsuitable	Surface layer: good; high clay content in places. Material at depth of more than 2 to 2½ feet: good.	Seasonally high water table; nonuniform soils over till; subgrade subject to differential frost heaving. ChE: steep slopes.	Cut slopes unstable in places; subject to seepage and sloughing.	Surface layer: strength and stability variable. Material at depth of more than 2 to 2½ feet: adequate strength for moderately high embankments.
Claverack: CkA, CkB	Fair to poor: sandy.	Unsuitable	Sandy material: good; highly erodible. Silty clay material: fair to poor when dry.	Seasonally high water table; clayey material hinders hauling operations when wet; unstable subgrade.	Cut slopes subject to seepage and instability.	Generally adequate strength for low embankments.
Collamer: ClA, ClB, ClC	Good	Unsuitable	Fair	Seasonally high water table; unstable subgrade.	Cut slopes subject to seepage and instability.	Generally adequate strength for low embankments; underlain in places by wet, compressible materials.
CoA, CoB	Good	Unsuitable	Surface layer: fair; clay material fair to poor when dry.	Seasonally high water table; clayey material hinders hauling operations when wet; unstable subgrade.	Cut slopes subject to seepage and instability.	Generally adequate strength for low embankments; underlain in places by soils subject to volume change.
Conesus: CsA, CsB	Poor	Unsuitable	Good	Generally no adverse conditions.	Deep cuts may encounter seepage and bedrock.	Adequate strength for high embankments.

See footnotes at end of table.

properties of the soils—Continued

Soil features that affect engineering practices for—Continued						
Foundations for low buildings [1]	Farm ponds		Agricultural drainage	Irrigation	Diversions	Waterways
	Reservoir areas	Embankment [3]				
Low bearing capacity; prolonged high water table; variable compressibility.	Prolonged high water table; stratified sands subject to excess seepage.	Fair to poor stability; fine sands subject to piping; surface layer high in organic matter.	Natural outlets may be inadequate; cut slopes unstable; fine sands subject to piping; prolonged high water table.	(2)	(2)	(2).
Material at depth of more than 2 to 2½ feet: good stability; generally low compressibility. ChD and ChE: steep slopes.	Seasonally high water table; slow permeability. ChD and ChE: steep slopes.	Good stability; poor workability when wet.	ChD and ChE: steep slopes; seasonally high water table.	Moderately low water intake rate; high available moisture capacity; highly erodible on steep slopes.	ChD and ChE: steep slopes.	Highly erodible. ChD and ChE: steep slopes.
Low bearing capacity; variable compressibility; seasonally high water table.	Material at depth of more than 32 to 40 inches: slow permeability.	Fair stability. Clayey material at depth of more than 40 inches: subject to volume change. Sandy surface material: permeable; highly erodible.	Material flows when wet; ditchbanks unstable; fine sands subject to piping.	High water intake rate; low to moderate available moisture capacity; highly erodible on steep slopes.	Susceptible to soil blowing and silting of channel.	Highly erodible.
Low bearing capcity; variable compressibility; susceptible to settling under heavy or vibratory loads; seasonally high water table.	Variable permeability; in places contains sand layers subject to excess seepage; seasonally high water table.	Fair to good stability; slow permeability; highly erodible.	Cut slopes subject to seepage and sloughing; fine sands subject to piping.	Moderate water intake rate; high available moisture capacity; highly erodible on steep slopes.	Subject to prolonged flow.	Highly erodible.
Low bearing capacity; variable compressibility; seasonally high water table. Subsoil: high shrink-swell potential.	Seasonally high water table. Material at depth of more than 1½ to 3½ feet: slow permeability.	Material at a depth of more than 1½ to 3½ feet: subject to shrink-swell potential; low shear strength; poor workability when wet.	Slowly permeable layer at depth of 1½ to 3½ feet; seepage and slope stability problems.	Moderate water intake rate; high available moisture capacity; erodible on steep slopes.	Undulating relief; slowly permeable layer at depth of 1½ to 3½ feet, seepage along this layer.	Subject to prolonged flow; erodible on steep slopes.
Moderately high bearing capacity; low compressibility; seasonally high water table.	Seasonally high water table; moderate to slow permeability.	High shear strength; good stability; slow permeability.	Drainage generally not needed except in small, wet areas.	High water intake rate; high available moisture capacity; erodible on steep slopes.	Generally no adverse conditions.	Erodible on steep slopes; subject to seepage.

TABLE 6.—*Interpretations of engineering*

Soil series and map symbols	Suitability as source of— Topsoil	Sand and gravel	Fill material	Soil features that affect engineering practices for— Highway location	Highway cut slopes	Embankment foundations
Cosad: Cu	Fair: wet in places.	Unsuitable	Sandy surface layer: good; highly erodible. Clayey subsoil: poor.	Seasonally high water table; level relief; clayey material hinders hauling operations when wet; subgrade unstable.	Cut slopes; subject to seepage and instability.	Variable strength; underlain in places by wet, compressible materials.
Danley	Fair	Unsuitable	Good	Seasonally high water table; shale bedrock at depth of 3½ to 7 feet.	Seepage and slope stability problems; bedrock at depth of 3½ to 7 feet.	Adequate strength for high embankments.
Darien: DaA, DdB (For Danley and Cazenovia parts of DdB, see their respective series.)	Poor	Unsuitable	Good	Seasonally high water table; shale bedrock at depth of 3½ to 6 feet.	Seepage and slope stability problems; bedrock at depth of 3½ to 6 feet.	Adequate strength for high embankments.
Dunkirk: DuB, DuC3, DuD, DwB.	Good	Unsuitable	DwB: fair to good; low yield of material per acre.	Seasonally high water table; clayey material hinders hauling operations when wet; subgrade unstable.	Cut slopes subject to seepage and instability; DwB: bedrock in deep cuts.	Generally adequate strength for low embankments; underlain in places by wet, compressible material. DwB: bedrock at depth of 3½ to 5 feet; some rock outcrops.
Edwards muck: Ed	Possible use as amendment to mineral soils.	Unsuitable	Unsuitable	Highly organic soils; prolonged high water table; subgrade unstable.	Cut slopes unstable.	(2)
Eel: Ee	Generally good.	Unsuitable	Generally unsuitable.	Subject to flooding; seasonally high water table.	Cut slopes subject to seepage and sloughing.	Variable strength and compressibility.
Elnora: ElA, ElB	Good	Unsuitable	Fair: highly erodible.	Seasonally high water table; fine sands hinder hauling operations; subgrade subject to differential frost heaving.	Cut slopes highly erodible; subject to seepage.	Variable strength; underlain in places by wet, compressible materials.

See footnotes at end of table.

properties of the soils—Continued

Soil features that affect engineering practices for—Continued						
Foundations for low buildings [1]	Farm ponds		Agricultural drainage	Irrigation	Diversions	Waterways
	Reservoir areas	Embankment [3]				
Low bearing capacity; variable compressibility; seasonally high water table	Seasonally high water table. Material below 30 inches: slow permeability.	Fair stability; clayey at depth of more than 30 inches; subject to volume change; permeable sandy surface material; highly erodible.	Sandy material flows when wet; ditchbanks unstable; fine sands subject to piping; seasonally high water table.	High water intake rate; moderate to low available moisture capacity.	Susceptible to soil blowing and silting of channel.	Highly erodible.
High bearing capacity; compressibility generally low; bedrock at depth of 3½ to 7 feet; seasonally high water table.	Seasonally high water table; low permeability; bedrock at 3½ to 7 feet.	Good stability; silty clay loam and clay loam material; poor workability when wet.	Seasonally high water table; slow permeability; cut slopes subject to seepage and sloughing.	Moderately low water intake rate; high available moisture capacity; erodible on steep slopes.	Silty clay loam and clay loam subsoil; low workability when wet.	Prolonged flow; difficult to establish vegetation; erodible on steep slopes.
High bearing capacity; compressibility generally low; bedrock at depth of 3½ to 6 feet; seasonally high water table.	Seasonally high water table; slow permeability; bedrock at depth of 3½ to 6 feet.	Good stability; silty clay loam and clay loam material; poor workability when wet.	Seasonally high water table; slow permeability; cut slopes subject to seepage and sloughing	Limited root depth; moderately low water intake rate; high available moisture capacity; erodible on steep slopes.	Silty clay loam and clay loam subsoil; low workability when wet.	Prolonged flow; difficult to establish vegetation; erodible on steep slopes.
Generally low bearing capacity; variable compressibility. DwB: bedrock at depth of 3½ to 5 feet.	Permeability variable; sandy layers subject to excess seepage. DwB: bedrock at depth of 3½ to 5 feet.	Moderate to low shear strength; fair to poor stability; slow permeability when compacted.	Cut slopes unstable; stratified sand and silt layers subject to piping.	High water intake rate; high available moisture capacity; highly erodible on steep slopes.	Irregular topography.	Highly erodible on steep slopes.
(2)	(2)	(2)	Very high shrinkage when first drained; marl at depth of 12 to 40 inches.	High water intake rate; high available moisture capacity.	(2)	(2).
(2)	Prolonged high water table; subject to excess seepage.	Fair to poor stability; fine silts and sands subject to piping.	Subject to annual flooding; cut slopes unstable; natural outlets inadequate.	(2)	(2)	(2).
Variable bearing capacity; susceptible to large settlement when under heavy or vibratory loads.	Moderately rapid permeability.	Fair stability; fine sands subject to piping; moderately rapid permeability; erodible.	Unstable ditchbanks; fine sand subject to piping.	High water intake rate; moderate to low available moisture capacity.	Susceptible to soil blowing and silting of channel.	Highly erodible.

TABLE 6.—*Interpretations of engineering*

Soil series and map symbols	Suitability as source of—			Soil features that affect engineering practices for—		
	Topsoil	Sand and gravel	Fill material	Highway location	Highway cut slopes	Embankment foundations
Erie: ErA, ErB, EsA, EsB	Poor	Unsuitable	Good. EsA and EsB: low yield of material per acre.	EsA and EsB: sandstone bedrock at 1½ to 3½ feet.	Cut slopes subject to seepage and sloughing. EsA and EsB: bedrock at depth of 1½ to 3½ feet.	Adequate strength for high embankments.
Farmington	Unsuitable	Unsuitable	Fair: low yield per acre.	Limestone bedrock at depth of 0 to 1½ feet. AzF: steep and very steep gorges.	Limestone bedrock at depth of 0 to 1½ feet. AzF: steep to very steep gorges.	Adequate strength for high embankment; AzF: [2]
Fonda: Fn	Fair: seasonally wet.	Unsuitable	Fair to poor when dry; surface layer has high organic-matter content.	Prolonged high water table; clayey material hinders operations when wet; unstable subgrade.	Cut slopes unstable.	Variable strength and compressibility.
Fresh water marsh: Fw	([2])	([2])	([2])	([2])	([2])	([2])
Honeoye: HnB, HnC, HnD, HoE.	Fair: stony in places.	Unsuitable	Good	Generally no adverse conditions. HoE: very steep slopes.	Cut slopes subject to seepage and sloughing.	Adequate strength for high embankments.
Howard: HwA, HwC	Unsuitable	Generally good.	Good: highly erodible where sandy.	Subgrade subject to differential frost heaving.	Cut slopes subject to seepage and sloughing; subgrade subject to differential frost heaving.	Adequate strength for moderately high embankments.
Ilion: Is	Fair to poor: seasonally wet.	Unsuitable	Good when dry	Prolonged high water table; surface layer has high organic-matter content.	Cut slopes subject to seepage and sloughing; bedrock at depth of 4 to 20 feet.	Generally adequate strength for moderately high embankments.
Lakemont: LcA, LcB	Fair to poor: seasonally wet.	Unsuitable	Poor to fair when dry.	Prolonged high water table; level or depressional positions; clayey material hinders hauling operations when wet; subgrade unstable.	Cut slopes subject to seepage and instability.	Very low strength; moderately high to high compressibility.

See footnotes at end of table.

properties of the soils—Continued

Soil features that affect engineering practices for—Continued						
Foundations for low buildings [1]	Farm ponds		Agricultural drainage	Irrigation	Diversions	Waterways
	Reservoir areas	Embankment [3]				
High bearing capacity; low compressibility. EsA and EsB: bedrock at depth of 1½ to 3½ feet.	Seasonally high water table; slow permeability. EsA and EsB: sandstone and shale bedrock at depth of 1½ to 3½ feet.	High shear strength; good stability; slow permeability. EsA and EsB: limited soil yield per acre.	Slowly permeable layer at depth of 13 inches; cut slopes subject to seepage and sloughing.	Limited root depth; not generally irrigated.	Slowly permeable layer at depth of 13 inches; prolonged seepage	Prolonged flow; difficult to establish vegetation; erodible on steep slopes.
High bearing capacity; bedrock at depth of 0 to 1½ feet. AzF: [2]	Limestone bedrock at depth of 0 to 1½ feet. AzF: [2]	(2)	Limestone bedrock at depth of 0 to 1½ feet. AzF: [2]	(2)	(2)	(2).
Variable bearing capacity; prolonged high water table.	Prolonged high water table; slow permeability; poor workability when wet.	Poor stability; surface layer has high organic-matter content; clayey material; poor workability when wet.	Ditchbanks unstable; slow permeability; natural outlets inadequate.	(2)	(2)	(2).
(2)	(2)	(2)	(2)	(2)	(2)	(2).
High bearing capacity; low compressibility; seasonally high water table at depth of 2 to 3½ feet. HoE; very slopes.	Seasonally high water table at depth of 2 to 3½ feet moderately slow to slow permeability.	Generally no adverse conditions.	Spot drainage of wet areas.	Moderate water intake rate; high availagle moisture capacity; erodible on steep slopes.	Generally no adverse conditions. HoE: very steep slopes.	Subject to prolonged flow; erodible on steep slopes.
Variable bearing capacity depending on character of underlying material; susceptible to large settlement under heavy or vibratory loads.	Rapid permeability.	High shear strength and good stability for outside shell; rapid permeability.	(2)	High water intake rate; moderate to low moisture holding capacity.	Rapid permeability.	Rapid permeability; erodible on steep slopes.
Moderately high bearing capacity; prolonged high water table; bedrock at depth of 4 to 20 feet.	Prolonged high water table; slow permeability.	Fair to good stability; slow permeability; poor workability when wet.	Cut slopes unstable; prolonged high water table; slow permeability.	Generally not irrigated.	Level or depressional position.	Level or depressional position.
(2)	Prolonged high water table; slow permeability.	Poor stability; subject to shrink-swell problems; poor workability when wet.	Cut slopes unstable; seasonally high water table; natural outlets inadequate.	(2)	(2)	(2).

TABLE 6.—*Interpretations of engineering*

Soil series and map symbols	Suitability as source of—			Soil features that affect engineering practices for—		
	Topsoil	Sand and gravel	Fill material	Highway location	Highway cut slopes	Embankment foundations
Lamson: Lf	Fair to good: seasonally wet.	Unsuitable	Fair: highly erodible.	Prolonged high water table; surface layer has high organic-matter content; natural outlets inadequate; fine sand hinders hauling operations; subgrade unstable.	Cut slopes subject to seepage and instability.	Very low strength; moderately high compressibility.
Langford: LgB, LgC, LgC3, LgD, LnB, LnC.	Poor	Unsuitable	Good. LnB and LnC: low yield of soil material per acre.	LnB and LnC: sandstone bedrock at depth of 2 to 3½ feet.	Cut slopes subject to seepage and sloughing. LnB and LnC: bedrock at depth of 2 to 3½ feet.	Adequate strength for high embankments
Lansing: LsB, LsC, LsC3, LsD.	Poor	Unsuitable	Good	Generally no adverse conditions.	Cut slopes subject to seepage and sloughing.	Adequate strength for high embankments.
Lima: LtA, LtB	Poor	Unsuitable	Good	Seasonally high water table.	Cut slopes subject to seepage and sloughing.	Adequate strength for high embankments.
Lyons: Ly	Fair: seasonally wet.	Unsuitable	Good when dry	Prolonged high water table.	Cut slopes subject to seepage and sloughing.	Adequate strength for high embankments.
Madalin: Ma (For the Odessa part, see the Odessa series.)	Poor	Unsuitable	Poor	Prolonged high water table; clayey material hinders hauling operations when wet; subgrade unstable.	Cut slopes subject to seepage and instability.	Very low strength; subject to volume change.
Made land, tillable: Md. This land type is so variable that no interpretations have been made for it.						

See footnotes at end of table.

properties of the soils—Continued

Soil features that affect engineering practices for—Continued						
Foundations for low buildings [1]	Farm ponds		Agricultural drainage	Irrigation	Diversions	Waterways
	Reservoir areas	Embankment [3]				
(2)	Prolonged high water table; rapid permeability.	Fair to poor stability; fine sands subject to piping; highly erodible.	Cut slopes highly unstable; fine sands subject to piping; natural outlets inadequate.	(2)	(2)	(2).
High bearing capacity; very low compressibility. LnB and LnC: bedrock at depth of 2 to 3½ feet.	Seasonally high water table; slow permeability. LnB and LnC: sandstone bedrock at depth of 2 to 3½ feet.	High shear strength; good stability; slow permeability. LnB and LnC: low soil yield per acre.	Generally no adverse conditions. LnB and LnC: sandstone bedrock at depth of 2 to 3½ feet.	Limited root depth.	Generally no adverse conditions. LnB and LnC: bedrock at depth of 2 to 3½ feet.	Subject to prolonged flow
Moderately high bearing capacity; low compressibility; seasonally high water table at depth of 2½ to 4 feet. LsD: moderately steep to steep slopes.	Moderately slow permeability. LsD: moderately steep to steep slopes.	High shear strength; good stability; slow permeability.	Except for small wet areas, drainage generally not needed.	High water intake rate; high available moisture capacity.	LsD: steep slopes.	LsD: moderately steep to steep slopes; bedrock at surface on steep slopes.
Moderately high bearing capacity; low compressibility; seasonally high water table.	Moderately slow or slow permeability.	High shear strength; good stability; slow permeability.	Except for small wet areas, drainage generally not needed.	High water intake rate; high available moisture capacity.	Generally no adverse conditions.	Erodible on steep slopes.
Moderately high bearing capacity; low compressibility; severe seepage problems.	Prolonged high water table; moderately slow and slow permeability.	High shear strength; good stability; slow permeability.	Level or depressional relief; natural outlets inadequate in places; slow permeability.	Prolonged high water table; generally not irrigated.	(2)	(2).
(2)	Prolonged high water table; slow permeability.	Poor stability; poor workability; subject to volume change.	Cut slopes unstable; slow permeability; natural outlets inadequate in places.	(2)	(2)	(2).

TABLE 6.—*Interpretations of engineering*

Soil series and map symbols	Suitability as source of—			Soil features that affect engineering practices for—		
	Topsoil	Sand and gravel	Fill material	Highway location	Highway cut slopes	Embankment foundations
Muck, deep: Mr Muck, shallow: Ms	Possible use as amendment to mineral soils.	Unsuitable	Unsuitable	Prolonged high water table; high organic-matter content; subgrade unstable.	Cuts slopes subject to seepage and instability.	[2]
Niagara: Ng	Good	Unsuitable	Fair	Seasonally high water table; subgrade unstable.	Cut slopes subject to seepage and instability.	Generally adeadequate strength for low embankments; underlain in places by wet, compressible soils.
Odessa: OdA, OdB	Fair to good	Unsuitable	Fair when dry	Seasonally high water table; clayey soils hinder hauling operations when wet; subgrade unstable.	Cut slopes subject to seepage and instability.	Variable strength and compressibility; clayey soils subject to shrink-swell problems.
Ontario: OfB, OfC3, OnB, OnC, OnC3, OnD3.	Good	Unsuitable	Good	Generally no adverse conditions.	Cut slopes subject to seepage and sloughing.	Adequate strength for high embankments.
OpB (For Farmington part, see Farmington series.)	Fair: stony in places.	Unsuitable	Good: low yield of soil material per acre.	Limestone bedrock at depth of 1½ to 3 feet.	Limestone bedrock at depth of 1½ to 3 feet.	Adequate strength for high embankments.
Ovid: OvA, OvB	Fair	Unsuitable	Fair	Seasonally high water table; clayey material hinders hauling operations when wet; subgrade subject to differential frost heaving.	Cut slopes subject to seepage and instability.	Generally adequate strength for high embankments.
Palmyra: PgA, PgC, PhD, PhE. (For Howard part of PhD and PhE, see Howard series).	Generally unstable.	Generally good.	Good: erodible where sandy.	Subgrade subject to differential frost heaving. PhE: steep slopes.	Cut slopes subject to seepage and sloughing.	Generally adequate strength for moderately high embankments.

See footnotes at end of table.

properties of the soils—Continued

Soil features that affect engineering practices for—Continued						
Foundations for low buildings [1]	Farm ponds		Agricultural drainage	Irrigation	Diversions	Waterways
	Reservoir areas	Embankment [3]				
(2)	(2)	(2)	Very high shrinkage when first drained; depth to underlying material variable.	High water intake rate; high available moisture capacity.	(2)	(2).
Variable bearing capacity depending on character of underlying soils susceptible to large settlement under heavy or vibratory loads; severe seepage problems.	Sand layers subject to excess seepage.	Fair to poor stability; fine sands subject to piping; highly erodible.	Seasonally high water table; cut slopes very unstable; fine sands subject to piping.	Moderate to high water intake rate; high available moisture capacity.	(2)	(2).
Variable bearing capacity; clayey soils subject to shrink-swell problems; severe seepage problems.	Seasonally high water table; slow permeability.	Low shear strength; subject to shrink-swell problems; poor workability.	Cut slopes unstable; seasonally high water table; slow permeability.	(2)	(2)	(2).
High bearing capacity; low compressibility	Sand layers subject to excess seepage. OnD3: steep slopes.	High shear strength; good stability; slow permeability.	Except for small, wet areas, drainage generally not needed.	High water intake rate; high available moisture capacity. OnD3: erodible on steep slopes.	Generally no adverse conditions.	OnD3: erodible on steep slopes.
High bearing capacity; low compressibility.	Limestone bedrock at depth of 1½ to 3 feet.	High shear strength; good stability; low yield of soil material per acre.	Limestone bedrock at depth of 1½ to 3 feet.	Generally not irrigated.	Stony; numerous rock outcrops.	Stony; numerous rock outcrops.
Moderately high bearing capacity; clayey material may be subject to shrink-swell problems; severe seepage problems.	Seasonally high water table; slow permeability.	Good stability; slow permeability; clayey material hinders hauling operations when wet.	Cut slopes unstable; slow permeability; slowly permeable layer at depth of 24 inches.	Moderate water intake rate; moderate to high available moisture capacity.	Slowly permeable layer at depth of 24 inches.	Subject to prolonged flow; erodible on some steep slopes.
Moderately high bearing capacity; settlement possible under vibratory loads. PhD and PhE: steep slopes.	Rapid permeability. PhD and PhE: steep slopes.	High shear strength and good stability for outside shell; rapid permeability.	Except for small, wet areas, drainage generally not needed. PhD and PhE: steep slopes.	High water intake rate; moderate available moisture capacity. PhD and PhE: erodible on steep slopes.	Rapid permeability.	PhD and PhE: erodible on steep slopes.

TABLE 6.—*Interpretations of engineering*

Soil series and map symbols	Suitability as source of—			Soil features that affect engineering practices for—		
	Topsoil	Sand and gravel	Fill material	Highway location	Highway cut slopes	Embankment foundations
Romulus: Ro	Fair	Unsuitable	Fair: seasonally wet.	Prolonged high water table; clayey material hinders hauling operations when wet; subgrade unstable.	Cut slopes subject to seepage and instability.	Adequate strength for moderately high embankments.
Schoharie: SeB, ShA, ShB, ShC3, ShD3.	Fair: high clay content.	Unsuitable	Good when dry	Seasonally high water table; clayey material hinders hauling operations when wet; subgrade unstable.	Cut slopes subject to seepage and instability.	Variable strength; clayey material subject to shrink-swell problems.
Sloan: Sn	Good: seasonally wet.	Unsuitable	Generally unsuitable.	Subject to flooding; surface layer has high organic-matter content; natural outlets inadequate.	Subject to flooding; cut slopes unstable.	Variable strength and compressibility.
Stafford: Sr	Fair	Unsuitable	Fair: highly erodible.	Prolonged high water table; fine sands hinder hauling operations; subgrade unstable.	Cut slopes subject to seepage and instability.	Underlain in places by wet, soft, compressible soils.
Varick: Vc	Poor	Unsuitable	Good: low yield of soil material per acre.	Shale bedrock at depth of 1½ to 3½ feet; seasonally high water table.	Shale bedrock at depth of 1½ to 3½ feet; subject to seepage.	Adequate strength for high embankments.
Wallkill: Wk	Possible use as amendment to mineral soils.	Unsuitable	Unsuitable	Subject to flooding; high organic-matter content; prolonged high water table; subgrade unstable.	Cut slopes subject to seepage and instability.	([2])

[1] Engineers and others should not apply specific values to the estimates of bearing capacity.
[2] Not applicable or not needed on this soil.

properties of the soils—Continued

Soil features that affect engineering practices for—Continued						
Foundations for low buildings [1]	Farm ponds		Agricultural drainage	Irrigation	Diversions	Waterways
	Reservoir areas	Embankment [3]				
Moderately high high bearing capacity; clayey material may be subject to shrink-swell problems; prolonged high water table.	Prolonged high water table; slow permeability.	Low shear strength; slow permeability; poor workability when wet.	Cut slopes unstable; slow permeability.	Prolonged high water table; generally not irrigated.	(2)------------	(2).
Low bearing capacity; variable compressibility; severe seepage problems.	Seasonally high water table; slow permeability.	Low shear strength; slow permeability; poor workability when wet; subject to shrink-swell problems.	Cut slopes unstable; slow permeability.	Seasonally high water table; generally not irrigated; erodible on steep slopes.	Poor workability when wet.	Erodible on steep slopes.
(2)--------------	Sand lenses subject to excess seepage.	Poor stability; low shear strength.	Subject to flooding; fine sands subject to piping; natural outlets inadequate.	(2)------------	(2)------------	(2).
Variable bearing capacity; susceptible to large settlement under vibratory loads; severe seepage problems.	Rapid permeability.	Fair to poor stability; fine sands subject to piping; highly erodible.	Prolonged high water table; fine sands subject to piping; cut slopes unstable; natural outlets inadequate in places.	High water intake rate; moderate to low available moisture capacity.	(2)------------	(2).
High bearing capacity; shale bedrock at depth of 1½ to 3½ feet.	Shale bedrock at depth of 1½ to 3½ feet.	Good stability; low yield of soil material per acre.	Shale bedrock at depth of 1½ to 3½ feet.	(2)------------	(2)------------	(2).
(2)--------------	(2)-------------	(2)-------------	Subject to flooding; very high shrinkage when first drained.	Moderate to high water intake rate; high available moisture capacity.	(2)------------	(2).

[3] Unless otherwise noted, features shown pertain to compacted materials.

particularly the sections "Descriptions of the Soils," and "Formation, Morphology, and Classification of the Soils."

Some of the terms used by soil scientists may be unfamiliar to engineers, and some common words have special meanings in soil science. Many of these terms are defined in the Glossary at the back of this publication.

Engineering classification systems

The U.S. Department of Agriculture (USDA) system of classifying soil texture is used by agricultural scientists (*25*). The USDA texture terms used to describe soil material are defined in the Glossary. In some ways this system of classifying soils is comparable to the two systems generally used by engineers; that is, the AASHO and Unified systems.

AASHO Classification System.—This system of classifying soils is one approved by the American Association of State Highway Officials (*2*). It is based on the field performance of highways in relation to the gradation of particle sizes, liquid limit, and plasticity index of soil materials. The soils having about the same general load-carrying capacity are placed in seven basic groups, though the range in load-carrying capacity within each group is wide and there is an overlapping of load-carrying capacity from one group to another. The groups range from A–1 (gravelly soils of high bearing capacity, the best soils for subgrade) to A–7 (clayey soils having low bearing capacity when wet, the poorest soils for subgrade). Within each group, the relative engineering value of the soil material is indicated by a group index number. Group index numbers range from 0 for the best material to 20 for the poorest. The group index number is given only for soils tested (as in table 4).

A detailed discussion of the AASHO system can be found in the Highway Research Board *Proceedings of the Twenty-Fifth Annual Meeting*, 1945, pages 375 to 392.

Unified Classification System.—This system (*27*) is based on the identification of soils according to their texture and plasticity and their performance as engineering construction materials. In this system, two letters are used to designate each of 15 possible classes. The letters G, S, C, M, and O stand for gravel, sand, clay, silt, and organic soils, respectively; and W, P, L, and H refer to well graded, poorly graded, low liquid limit, and high liquid limit, respectively. In this system, SM and GM are sands and gravels that include fines of silt; ML and CL are silts and clays that have a liquid limit below 50; and MH and CH are silts and clays that have a liquid limit above 50.

Engineering test data

Samples were taken at nine different locations from five extensive soil series and tested according to standard procedures. The results of these tests are given in table 4. The test results recorded in table 4 are representative. Nevertheless, the soils of this county formed in highly variable glacial till or in water-deposited material, and consequently, the range in texture, or grain size, of some of this material is fairly wide. The classification given in table 4 therefore does not apply in every place where the soil was mapped. Also, for the classification in table 4, particles larger than 3 inches across were discarded. Most of the soils were tested to a depth of less than 6 feet; consequently, the data cannot be used for estimated soil characteristics below that depth.

Most of the headings in table 4 are self-explanatory. The few that are not are further explained as follows.

Moisture-density data are obtained by compacting soil material at a successively higher moisture content. Assuming that the compactive effort remains constant, the density of the compacted material increases until the optimum moisture content is reached. After that, the density decreases with increase in moisture content. The highest dry density obtained in the compaction test is termed "maximum dry density." Moisture-density data are important in earthwork because, as a rule, optimum stability is obtained if the soil is compacted to about the maximum dry density when it is at approximately the optimum moisture content.

The tests for plastic limit and liquid limit measure the effect of water on the consistence of soil material. As the moisture content of a soil increases from a very dry state, the material changes from a semisolid to a plastic; the moisture content at which this change occurs is the liquid limit. 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.

Estimated properties of the soils

Table 5 shows some estimated soil properties that are important in engineering and gives estimated Unified and AASHO classifications for the soils. The textural terms used to describe the soil material in the main horizons are those used by the Department of Agriculture.

Depth to bedrock, as used in table 5, refers to the depth to noncompressible material. Depth to a seasonal high water table refers to the highest level at which the ground water stands for a significant period of time. Depth from surface indicates the thickness of the significant layers in a typical profile.

Permeability refers to the rate at which water moves through the undisturbed soil; it depends largely upon the texture and structure of the soil.

Reaction refers to the acidity or alkalinity of the soil, expressed in terms of pH. A pH of 7.0 is neutral; a value of less than 7.0 indicates acidity; and a value of more than 7.0 indicates alkalinity.

Available moisture capacity is the difference between the amount of water in the soil at field capacity and the amount in the soil at the wilting point; it represents the maximum amount of water that plants can obtain from the given soil.

Engineering interpretations

Table 6 gives suitability ratings for soils as a source of topsoil, sand, gravel, and fill material and gives the features of soils that affect stated engineering practices. The interpretations in table 6 provide guidelines for the use of soils in engineering. They also indicate potential hazards that require unusual procedures or special precautions in planning.

In the following paragraphs are discussed the effects of soil features on highway location, on embankments, and on structures for control of water and erosion.

Highway location.—Highway location, both as to location on the landscape and selection of the gradeline, is influenced by many soil features. Construction of highways on sloping till soils of uplands and on hilly outwash deposits on steep slopes generally requires cuts and fills. More earthwork is needed than on nearly level soils on well-drained, flood-free terraces.

Construction of highways on undulating and gullied soils that formed in silty and clayey lacustrine sediment also requires cuts and fills. Cuts in these materials may be complicated by the necessity to handle wet materials and by the instability of embankment foundations. Thus, although the volume of earthwork on till uplands and on hilly outwash may be greater, the total construction costs may be less. In wet seasons, construction is generally easier on till soils than on lacustrine soils. Sandy lacustrine sediment generally presents few difficulties, but cuts may be troublesome because of ground water.

On well-drained, sandy or gravelly terraces, highway construction generally is easy and involves relatively small cuts and fills. Good drainage permits uninterrupted grading operations. These areas may be occupied without delay even after rainstorms.

Soil conditions vary on alluvial flats. Such soils are subject to overflow and often have a relatively high water table. A moderately high gradeline is necessary on these soils to avoid roadway flooding and wet subgrades. For this reason borrow material should be obtained from a source other than adjacent alluvium, which may be unsuitable for use as embankment material because of wetness. Unless the alluvial deposits are sandy, it is difficult to compact subgrade. Unless subgrade is adequately compacted, it eventually yields enough to cause unevenness in pavements.

The gradeline selected for any highway location is influenced by drainage, soil texture, topography, and sometimes by other properties of the soils. Areas that are poorly drained and subject to flooding require a moderately high gradeline. In granular materials, strata of variable permeability are encountered in some cuts. The subgrade in such cuts consequently is not uniform.

Some soils are underlain by a dense fragipan. Where possible, the grade should be planned so that cutting in and out of the pan is not necessary.

In level areas where the soils are shallow over bedrock, such as the Arnot soils, the gradeline should be high enough, wherever possible, that it is not necessary to blast rock for ditches.

Embankments.—The main soil features that affect the placement of most embankments for roads and dams are compressibility, shear strength, and shrink-swell potential. Topography is also an important feature.

Most of the glacial till soils in the county, such as the Ontario soils, contain little clay, which affects shear strength and shrink-swell potential. These soils provide foundations for embankments that consist of fill material 10 feet or more in height. Some till soils, such as the Cazenovia, are generally suitable only for embankments that are about 5 to 10 feet high. This also applies to glacial outwash soils, which in places contain substrata consisting of wet, compressible soil materials. Most lacustrine soils, such as those of the Odessa, Lakemont, Arkport, and Claverack series, are underlain by wet, compressible materials that have low shear strength and are generally suitable only for supporting embankments less than 5 feet high.

Alluvial soils vary in their ability to support embankments, and organic soils must be completely removed before embankments can be constructed.

Soil slope, although not shown in table 6, generally is a factor where it is more than 15 percent.

Structures for controlling water and erosion.—Some of the soils derived from glacial till are underlain by a compact fragipan, or platy substratum, that retards the movement of water. Seepage along the top of this layer causes wet spots, and interception drains of both surface and subsurface types are required in places. The installation of irrigation in these soils, or in soils that are shallow to bedrock, calls for careful investigation because the depth of tillable soil is limited.

Most of the glacial till soils in the county have impeded permeability and are suitable for farm ponds. Seepage has occurred from ponds constructed in some high-lime glacial till soils, such as those of the Honeoye, Ilion, and Lima series. For these soils use of sealing agents has been necessary. Also, glacial till soils contain sandy lenses that can cause excessive seepage from the reservoir. These sandy lenses may also cause piping and instability in drainage structures. Excessive settlement and consolidation can be critical for larger structures.

Soils that formed in lacustrine sediment have highly variable engineering properties and require careful investigation for most uses. The clayey lacustrine soils are generally suitable for farm ponds, but in places they contain lenses of sand that can cause piping.

Engineering properties of geologic deposits and bedrock

The following geologic deposits occur in Seneca County: glacial till, glacial outwash, lacustrine sediment, alluvium, and muck and peat. Each geologic unit has engineering significance that differs from that of other geologic units. The broad engineering significance of each geologic unit is given in the following paragraphs.

DEEP GLACIAL TILL

Deep glacial till occurs in the uplands, mostly on sloping or hilly topography. The deposits are ordinarily 3½ feet deep or more, over bedrock. Compactness of the material depends on whether it was overridden by the ice or deposited when the ice melted. Glacial till is generally unstratified, but in places some local sorting has resulted in the formation of pockets of sand, gravel, silt, or clay within the soil mass.

Soils formed from deep glacial till are in the Alden, till substratum, Appleton, Cazenovia, Conesus, Darien, Danley, Erie, Honeoye, Ilion, Langford, Lansing, Lima, Lyons, Ontario, Ovid, and Romulus series.

Deep glacial till generally provides stable subgrades, good embankment foundations, and, with proper treatment, stable highway slopes. It also provides good foundation support for buildings. If properly compacted, material excavated from till deposits, either from highway cuts or from outside borrow areas, may be used to form stable embankments. Some till deposits, however, contain many boulders and coarse fragments, and these present a problem of excavation and placement in embankments.

THIN GLACIAL TILL

This material is similar to deep glacial till, but in most places the depth to bedrock is less than 3½ feet. Consequently, even in light grading operations, bedrock generally is encountered in cuts. The content of channery and flaggy fragments is higher in places.

Soils that formed in thin glacial till are the Angola, Arnot, Aurora, Dunkirk, limestone substratum, Erie, moderately shallow variant, Farmington, Langford, moderately shallow variant, Ontario, moderately shallow variant, and Varick soils. The bedrock underlying these soils is soft shale that disintegrates and becomes unstable under the effects of frost and alternate wetting and drying.

Soils that formed in thin glacial till provide satisfactory embankment foundations because they are so shallow that little soil settlement can occur and the underlying rock is relatively unyielding. Some of the soils, however, are in gorges and other steeply sloping areas, and in some places shear keys are needed to prevent fills from sliding. Although thin glacial till is suitable for use as highway fill, the supply above bedrock is limited.

GLACIAL OUTWASH

These deposits include outwash terraces, deltas, valley trains, kames, and lake beaches. The material consists of sand and gravel deposited by glacial melt water from a glacier. Many deposits include localized silt strata that impede drainage.

The soils that formed in deposits of glacial outwash are those of the Howard and Palmyra series.

Sand and gravel derived from outwash may be suitable for many uses. Depending on gradation, soundness, and plasticity, outwash can be used for such purposes as (1) fill material for underwater placement; (2) ordinary fill; (3) material to strengthen unstable subgrade soils; (4) subbase for pavements; (5) wearing surfaces for driveways, parking lots, and some low-class roads; (6) material for highway shoulders; (7) free-draining granular backfill for structures and pipes; (8) outside shells of impounding dams; and (9) abrasives for control of ice on highways.

These granular materials may be too permeable for the construction of a homogeneous embankment intended to hold water. Cut slopes in the more sandy material are subject to severe erosion.

Soils that formed in glacial outwash and alluvium generally are composed of larger particles and are more permeable than soils that formed in glacial till. If farm ponds for storing water above ground are built in these soils, a sealing agent should be used to prevent seepage of water from the reservoir. Ponds that are dug out to store water below the surface have been successful in places where the water table is close to the surface. Layers of poorly graded silt, fine sand, or sand present problems if open ditches or subsurface drains are installed, because these materials are subject to erosion, sloughing, and slumping. Subsurface drainage systems installed in such layers must be protected against plugging with silt and fine sand. The fact that gravelly and sandy outwash soils commonly are droughty and have a low available-moisture capacity should be considered when planning an irrigation system.

LACUSTRINE SEDIMENT

Lacustrine sediment consists of the finer textured materials that were washed into glacial lakes and eventually settled to the bottom. In places they are stratified fine sand and silt, and in other places, they are varved silt and clay. Occasional sand and silt lenses in places are interbedded with the varved materials and, since the lake elevations fluctuated, lacustrine sediment consisting of silt and clay underlie many areas of outwash deposits.

Many deposits of lacustrine sediment are subject to a high water table, and loose wet silt and clay underlie the surface materials in places. Lacustrine sediment in places becomes increasingly wetter as depth increases. Infiltration is restricted, and where topography is level, runoff is slow.

Soils that formed in sandy, silty, and clayey lacustrine sediment are those of the Alden, Arkport, Canandaigua, Claverack, Collamer, Cosad, Dunkirk, Elnora, Fonda, Lakemont, Lamson, Madalin, Niagara, Odessa, Schoharie, and Stafford series.

Soils that formed in lacustrine sediment present more engineering problems than any other soils in the county, except muck and peat. These problems result from the location of the soils, their low strength, and their low stability. In addition, some of the deposits are difficult to drain. They are highly susceptible to frost heaving and they lose strength seasonally when thawing increases the moisture content. A considerable amount of settlement in places occurs under heavy fills and structures. Cut slopes in these deposits are generally very unstable.

ALLUVIAL SEDIMENT

Alluvial material is deposited wherever streams carrying sediment drop their load. These deposits, which form the flood plain adjacent to streams, vary in texture within short distances. In places the texture of contiguous strata differs appreciably, and there may be little resemblance between material at the surface and material deep in the profile.

In Seneca County Alluvial land and soils of the Eel, Sloan, and Wallkill series formed in alluvial sediment. Alluvial sediment generally provides a poor base for foundations, and recent alluvial soils should not be used as building sites. Sewage disposal by leaching is always troublesome in alluvial sediment because the water table is seasonally or permanently high. Most alluvial soils are a good source of topsoil.

ORGANIC DEPOSITS

Organic deposits consist of accumulations of plant and animal remains and generally occur in swamps and at the surface of other poorly drained areas. They are mostly organic matter but in places contain a varying amount of inorganic material. Organic soils in Seneca County are mapped as Edwards muck, Fresh water marsh, Muck, deep, and Muck, shallow.

Organic soils ordinarily are entirely unsuited as highway and other embankment sites because they are highly compressible and unstable. They generally are underlain by soft, wet alluvium, marl, or lacustrine sediment.

BEDROCK

All bedrock in the county furnishes excellent foundations for highway embankments. Bedrock encountered in constructing foundations for dams that store water must be properly sealed to prevent excess seepage.

The subsection "Geology" in this survey describes the extent and geographical occurrence of the different kinds of bedrock in Seneca County. In addition to some exposed rock, bedrock is at a shallow depth in many areas in cuts in the thin glacial till areas and in some deeper cuts in the thick glacial till areas.

Nonfarm Uses of the Soils

This subsection was prepared to aid planners, developers, and others in selecting soils as sites for homes, streets and parking lots in subdivisions, sanitary landfills, and other nonfarm uses. The estimated limitations of the soils for such purposes are given in table 7. The limitations are rated *slight*, *moderate*, or *severe*. A rating of slight indicates the soil has few or no limitations and is considered desirable for the use named. A rating of moderate shows that a moderate limitation is recognized but can be overcome or corrected. A rating of severe indicates that use of the soil is severely limited by a hazard or restriction that is difficult to overcome. A rating of severe does not imply that a soil so rated cannot be put to the use specified. It does indicate, however, that such use may be expensive.

In interpreting the ratings, it should be recognized that large-scale cuts or fills in any area may alter the natural soil so much that the ratings shown in table 7 would no longer apply. It is helpful to refer to other sections in this survey for clarification of some of the ratings. The sections on engineering, woodland, and wildlife are among these, as is also the section describing the soil series and mapping units in the county.

Following are explanations of the ratings in table 7.

Depth to bedrock affects many nonfarm uses of soils, especially where excavating or land leveling is needed. Excavating and leveling are particularly needed for septic tanks, basements, streets and parking lots, landscaping, and campsites. It is also generally difficult to establish vegetation on soils that are shallow to bedrock.

Flooding severely limits soils for use as sites for septic tanks, homes, streets and parking lots, and sanitary landfill. If soils subject to flooding are not protected by dikes, levees, or other flood-prevention structures, they should not be used for these purposes. Other uses that may be slightly or moderately affected by infrequent flooding during periods of use or during installation are pipelines, landscaped lawns and golf courses, campsites without permanent buildings, paths and trails, and intensive play and picnic areas. Flooding is a severe limitation on the Eel soils, which are the better drained bottom-land soils along the larger streams.

Permeability refers to the rate at which water passes through the soil or soil layers and is expressed in inches per hour. It is most important in rating soils for septic tank disposal fields, for example, and is closely associated with the depth to the fragipan, clay, or dense till that is encountered in most of the deeper upland soils and in the clayey soils in the valleys and on the lake plain. Soils that have rapid permeability are rated as having slight limitations. Those that have moderately slow to slow permeability are rated as severe.

Prolonged and seasonal wetness severely limits soils for most uses. Alden, Canandaigua, Fonda, Lakemont, Lyons, Madalin, and muck soils are wet most of the year. These soils generally occur in depressions and are scattered widely throughout the county. Some soils that are wet part of the year have a seasonally perched water table above a restricting layer, or a water table that rises and falls without reaching the surface. These wet soils are not readily recognized. They include the somewhat poorly drained, loamy Appleton and the clayey Odessa soils. These soils are moderately or severely limited for many uses and are extensive throughout the county.

Slope affects the use of the soils for most community and recreational purposes. Slope is included in the name of the mapping unit where it is significant, or it is not given at all. Nearly level and gently sloping soils that have no other physical shortcomings have slight limitations for most uses, but steeply sloping soils have severe limitations for most uses. Moderately sloping soils that have no other limitation have a rating of moderate.

Although erosion is not given in table 7 as a critical soil property, it is an ever-present hazard on sloping soils. It is especially important to consider erosion when developing paths and trails, in landscaping, and in developing picnic areas for intensive use. The Schoharie, Dunkirk, and Odessa soils are among those where the erosion hazard is an important consideration.

Stability is an inferred soil property that indicates the presumptive bearing value and the ability to stand in cuts, particularly under conditions of wetness. Most of the soils in the county are stable. The main exceptions are soils that formed in glaciolacustrine deposits and on flood plains, which include the Alden, Canandaigua, Collamer, Cosad, Dunkirk, Eel, Fonda, Lakemont, Madalin, Niagara, Odessa, Schoharie, Sloan, and Wallkill soils. Other soils that may be unstable to a lesser degree are those of the Cazenovia, Ilion, Ovid, and Romulus series. These soils formed in clayey glacial till that contains some reworked, clayey, lacustrine sediment. This property is very important to consider in planning any use that requires support of heavy loads. It is strongly advised that engineering investigations be made for any large structures. This applies particularly to soils that formed in water-laid sediment, such as those of the Schoharie, Howard, Palmyra, and Arkport series. Such soils have unstable subsurface layers in places.

In Seneca County the shallow soils are 10 to 20 inches deep over bedrock, and the moderately deep soils are 20 to 40 inches deep. These soils are extensive and are widely scattered throughout the county.

Surface layer texture affects trafficability, water infiltration rate, drying time after rain, and ease of establishing and maintaining a grass cover. The presence of gravel and fragments in the surface layer mainly affects use for athletic fields. If the volume of fragments less than 10 inches in diameter is 15 percent or more, it is indicated in the soil name and is given a rating of severe. Except for the Eel soils on flood plains and lacustrine soils, such as the Dunkirk and Schoharie, along with their close associates, few soils have a surface layer that is completely free of these coarse fragments.

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Rapidly permeable soils generally are only slightly limited for septic tanks, but a contamination hazard exists if shallow wells, streams, ponds, lakes, or watercourses are nearby.

Most of the deeper soils on uplands and the clayey lacustrine soils in the county have a dense fragipan, clay, or till at a depth of 1½ to 4 feet. The main exceptions are the soils on glacial outwash and on the flood plain. Water percolates through these layers slowly, roots do not penetrate them readily, and they are difficult to dig, particularly when dry. Presence of these layers within 3 feet of the surface is one of the main reasons why septic tank effluent disposal is severely limited for most of the soils.

House basements are also affected, and waterproofing and footing drains are required to overcome the limitations. To reduce the effects of freezing and thawing on pavements, these layers should receive special attention, especially if they contain a large amount of clay.

In the following paragraphs are discussed the nonfarm uses specified in table 7 and soil features considered in rating limitations to these soils.

Septic tank disposal fields.—The ratings in table 7 are for limitations of soils used as drainage fields for the disposal of effluent from septic tanks that are adequately designed and installed (*16*.) The source or supply of water is not considered in the ratings, although possible pollution of lakes, springs, or shallow wells is indicated where the information is pertinent. Specific location of drainage fields for disposal of effluent requires careful investigation at the site of the proposed field.

Homesites.—In table 7 the limitations of soils are rated on the basis of year-round or seasonal use for homesites or sites for recreation service buildings. The sites are for buildings of three stories or less that have basements averaging at least 5 feet below the normal ground level. Where these buildings are constructed without a basement, the depth and seasonal wetness are less restrictive. Not considered in the ratings are limitations for septic effluent disposal, providing a water supply, stabilizing or maintaining plants, or building access roads.

Streets and parking lots.—The suitability of a soil for streets and parking lots is about the same as that for highways. The ratings in table 7 are for soils in subdivisions where slopes generally are more restrictive than they are for highways. Specific engineering investigations and layout are required. More detailed information on the suitability of soils for highways is given in the

TABLE 7.—*Estimated degree and kind of limitation*

Soil and map symbols	Soil features affecting—			
	Septic tank disposal fields	Homesites	Streets and parking lots	Sanitary landfill
Alden:				
Ac	Severe: prolonged wetness; moderately slow permeability.	Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness.
Ad	Severe: prolonged wetness; moderately slow and slow permeability.	Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness; moderately slow and slow permeability.
Alluvial land: Al	Severe: flooding; prolonged wetness.	Severe: flooding; prolonged wetness.	Severe: flooding; prolonged wetness.	Severe: flooding; prolonged wetness.
Angola:				
AnA	Severe: slow permeability; moderately deep to bedrock; seasonal wetness.	Severe: seasonal wetness; moderately deep to bedrock.	Moderate: seasonal wetness; moderately deep to bedrock.	Severe: seasonal wetness; slow permeability.
AnB	Severe: slow permeability; moderately deep to bedrock; seasonal wetness.	Severe: seasonal wetness; moderately deep to bedrock.	Moderate: seasonal wetness; moderately deep to bedrock.	Severe: seasonal wetness; slow permeability.
Appleton:				
AoA	Severe: seasonal wetness; moderately slow and slow permeability.	Severe: seasonal wetness.	Moderate: seasonal wetness.	Severe: seasonal wetness; moderately slow and slow permeability.
AoB	Severe: seasonal wetness; moderately slow and slow permeability.	Severe: seasonal wetness.	Moderate: seasonal wetness; slope.	Severe: seasonal wetness; moderately slow and slow permeability.
ApA	Severe: seasonal wetness; moderately slow and slow permeability.	Severe: seasonal wetness.	Moderate: seasonal wetness.	Severe: seasonal wetness; moderatley slow and slow permeability.
ApB	Severe: seasonal wetness; moderately slow and slow permeability.	Severe: seasonal wetness.	Moderate: seasonal wetness; slope.	Severe: seasonal wetness; moderately slow and slow permeability.

section "Engineering Uses of the Soils" elsewhere in this survey.

Sanitary landfill.—The ratings in table 7 are for limitations of soils used as disposal areas for trash and garbage by landfill operations. In these operations a trench is dug, trash and garbage are placed in the trench, and the material is covered with soil. Use of fill or borrow material from other soils is not considered in the rating.

Lawns and fairways.—The ratings for the suitability of the soils for lawns and fairways assume that the area will be subject to moderate traffic and that frequent mowing will be used to keep the height of the grass cover at 1 to 3 inches. Use of imported fill or topsoil is not considered in the rating, and it is assumed that the soil material at the site will be used. Traps or roughs are not considered to be part of the golf fairway.

Athletic fields.—Limitations of the soils are rated in table 7 for intensive use for baseball, football, soccer, or other organized sports, but the ratings also apply to playgrounds. Areas selected for these uses generally require a nearly level surface, good drainage, a soil texture and consistence that gives a firm surface, and soil conditions that support a good vegetative cover. The most desirable soils are naturally free of stone fragments and bedrock outcrops.

Trails and paths.—In table 7 the limitations are rated for soils used for trails, cross-country hiking, bridle paths, and for nonintensive use areas that allow for random movement of people. Ratings are made with the assumption that these areas are to be used as they occur and that little grading will be needed.

Campsites.—The limitations in table 7 are rated for soils used as sites for tents and for trailers. Frequent use during the camping season involves both heavy foot and vehicular traffic. Campsites generally provide accommodations for large groups of people, and they have a picnic table, a fireplace, and an unsurfaced parking area. Platforms for tents may be beside individual parking areas or farther away, but trailer sites and parking areas are contiguous. Sewage disposal systems, water supply, and access roads are not considered in the ratings.

Picnic and play areas.—The soils in intensive play areas are used for walking or running, mainly by children. The picnic areas have tables and fireplaces for use by groups, in contrast with small picnic sites along highways, trails, or streams. The water supply and sewage disposal systems are not considered in the ratings in table 7.

for selected nonfarm uses of the soils

Soil features affecting—Continued				
Lawns and fairways	Athletic fields	Paths and trails	Campsites	Picnic and play areas
Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness.
Severe: prolonged wetness.	Severe: prolonged wetness; moderately slow and slow permeability.	Severe: prolonged wetness.	Severe: prolonged wetness; moderately slow and slow permeability.	Severe: prolonged wetness.
Severe: flooding; prolonged wetness.	Severe: flooding; prolonged wetness; cobbles.	Severe: flooding; prolonged wetness.	Severe: flooding; prolonged wetness.	Severe: flooding; prolonged wetness.
Moderate: seasonal wetness.	Severe: seasonal wetness; slow permeability.	Moderate: seasonal wetness.	Severe: seasonal wetness; slow permeability.	Moderate: seasonal wetness.
Moderate: seasonal wetness.	Severe: seasonal wetness; slow permeability.	Moderate: seasonal wetness.	Severe: seasonal wetness; slow permeability.	Moderate: seasonal wetness.
Moderate: seasonal wetness; sandstone fragments.	Severe: seasonal wetness; sandstone fragments.	Moderate: seasonal wetness.	Severe: seasonal wetness; moderately slow and slow permeability.	Moderate: seasonal wetness.
Moderate: seasonal wetness; sandstone fragments.	Severe: seasonal wetness; sandstone fragments.	Moderate: seasonal wetness.	Severe: seasonal wetness; moderately slow and slow permeability.	Moderate: seasonal wetness.
Moderate: seasonal wetness.	Severe: seasonal wetness.	Moderate: seasonal ness.	Severe: seasonal wetness; moderately slow and slow permeability.	Moderate: seasonal wetness.
Moderate: seasonal wetness.	Severe: seasonal wetness.	Moderate: seasonal wetness.	Severe: seasonal wetness; moderately slow and slow permeability.	Moderate: seasonal wetness.

TABLE 7.—*Estimated degree and kind of limitations*

Soil and map symbols	Soil features affecting— Septic tank disposal fields	Homesites	Streets and parking lots	Sanitary landfill
Arkport:				
ArB	Slight	Slight	Moderate: slope	Slight
ArC	Moderate: slope	Moderate: slope	Moderate: slope	Moderate: slope
ArD	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Arnot: AuD	Severe: shallow to bedrock; slope.	Severe: shallow to bedrock; slope.	Severe: shallow to bedrock; slope.	Severe: shallow to bedrock; slope.
Aurora:				
AwB	Severe: slow permeability; moderately deep to bedrock; seasonal wetness.	Severe: moderately deep to bedrock.	Moderate: moderately deep to bedrock.	Severe: slow permeability; moderately deep to bedrock.
AwC	Severe: slow permeability; moderately deep to bedrock; seasonal wetness.	Severe: moderately deep to bedrock.	Severe: slope	Severe: slow permeability; moderately deep to bedrock.
AwD	Severe: slow permeability; moderately deep to bedrock; slope.	Severe: slope; moderately deep to bedrock.	Severe: slope	Severe: slope; slow permeability; moderately deep to bedrock.
AzF	Severe: slope; variable permeability; shallow to moderately deep to bedrock.	Severe: slope; shallow to moderately deep to bedrock.	Severe: slope; shallow to moderately deep to bedrock.	Severe: slope; variable permeability; shallow to moderately deep to bedrock.
Canandaigua: Ca	Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness.
Cazenovia:				
CeB	Severe: slow permeability; seasonal wetness.	Moderate: seasonal wetness.	Moderate: slope	Severe: slow permeability; high clay content in subsoil.
CeB3	Severe: slow permeability; seasonal wetness.	Moderate: seasonal wetness.	Moderate: slope	Severe: slow permeability; high clay content in subsoil.
CeC	Severe: slow permeability.	Moderate: seasonal wetness; slope.	Severe: slope	Severe: slow permeability; high clay content in subsoil.
CeC3	Severe: slow permeability.	Moderate: seasonal wetness; slope.	Severe: slope	Severe: slow permeability; high clay content in subsoil.
ChD	Severe: slow permeability; slope.	Severe: slope	Severe: slope	Severe: slow permeability; slope; high clay content in subsoil.
ChE	Severe: slope; slow permeability.	Severe: slope	Severe: slope	Severe: slope; slow permeability; high clay content in subsoil.
Claverack:				
CkA	Severe: slow permeability; seasonal wetness.	Moderate: seasonal wetness.	Moderate: seasonal wetness.	Severe: slow permeability.
CkB	Severe: slow permeability; seasonal wetness.	Moderate: seasonal wetness.	Moderate: seasonal wetness; slope.	Severe: slow permeability.

for selected nonfarm uses of the soils—Continued

Soil features affecting—Continued				
Lawns and fairways	Athletic fields	Paths and trails	Campsites	Picnic and play areas
Severe: sandy texture	Moderate: sandy texture; slope.	Slight	Slight	Slight.
Severe: sandy texture	Severe: slope	Slight	Moderate: slope	Moderate: slope.
Severe: sandy texture; slope.	Severe: slope	Moderate: slope	Severe: slope	Severe: slope.
Severe: shallow to bedrock; slope.	Severe: shallow to bedrock; slope.	Moderate: slope	Severe: shallow to bedrock; slope.	Severe: shallow to bedrock; slope.
Moderate: moderately deep to bedrock.	Severe: slow permeability.	Slight	Severe: slow permeability.	Slight.
Moderate: moderately deep to bedrock; slope.	Severe: slope; slow permeability.	Slight	Severe: slow permeability.	Moderate: slope.
Severe: slope	Severe: slope; slow permeability.	Moderate: slope	Severe: slow permeability; slope.	Severe: slope.
Severe: slope; shallow to moderately deep to bedrock.	Severe: slope; shallow to moderately deep to bedrock.	Severe: slope	Severe: slope; shallow to moderately deep to bedrock.	Severe: slope.
Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness; variable permeability.	Severe: prolonged wetness.
Slight	Severe: slow permeability.	Slight	Severe: slow permeability.	Slight.
Slight	Severe: slow permeability.	Slight	Severe: slow permeability.	Slight.
Moderate: slope	Severe: slope; slow permeability.	Slight	Severe: slow permeability.	Moderate: slope.
Moderate: slope	Severe: slope; slow permeability.	Slight	Severe: slow permeability.	Moderate: slope.
Severe: slope	Severe: slope; slow permeability.	Moderate: slope	Severe: slope; slow permeability.	Severe: slope.
Severe: slope	Severe: slope; slow permeability.	Severe: slope	Severe: slope; slow permeability.	Severe: slope.
Severe: sandy material over clayey material.	Moderate: sandy material over clayey material; seasonal wetness.	Slight	Moderate: seasonal wetness.	Slight.
Severe: sandy material over clayey material.	Moderate: sandy material over clayey material; seasonal wetness; slope.	Slight	Moderate: seasonal wetness.	Slight.

TABLE 7.—*Estimated degree and kind of limitations*

Soil and map symbols	Soil features affecting—			
	Septic tank disposal fields	Homesites	Streets and parking lots	Sanitary landfill
Collamer:				
ClA	Severe: seasonal wetness.	Moderate: seasonal wetness.	Moderate: seasonal wetness.	Moderate: seasonal wetness; high clay content in subsoil.
ClB	Severe: seasonal wetness.	Moderate: seasonal wetness.	Moderate: slope; seasonal wetness.	Moderate: seasonal wetness; high clay content in subsoil.
ClC	Severe: seasonal wetness.	Moderate: seasonal wetness; slope.	Severe: slope	Moderate: seasonal wetness; variable permeability; slope.
CoA	Severe: slow permeability; seasonal wetness.	Moderate: seasonal wetness.	Moderate: seasonal wetness.	Severe: slow permeability.
CoB	Severe: slow permeability; seasonal wetness.	Moderate: seasonal wetness.	Moderate: seasonal wetness; slope.	Severe: slow permeability.
Conesus:				
CsA	Severe: moderately slow and slow permeability; seasonal wetness.	Moderate: seasonal wetness.	Moderate: seasonal wetness.	Moderate: moderately slow and slow permeability; firm; seasonal wetness.
CsB	Severe: moderately slow and slow permeability; seasonal wetness.	Moderate: seasonal wetness.	Moderate: slope; seasonal wetness.	Moderate: moderately slow and slow permeability; firm; seasonal wetness.
Cosad: Cu	Severe: seasonal wetness; slow permeability.	Severe: seasonal wetness.	Severe: seasonal wetness.	Severe: slow permeability; seasonal wetness.
Darien:				
DaA	Severe: slow permeability; seasonal wetness.	Severe: seasonal wetness.	Severe: seasonal wetness.	Severe: slow permeability; seasonal wetness.
DdB	Severe: slow permeability; seasonal wetness.	Severe: seasonal wetness.	Severe: seasonal wetness.	Severe: slow permeability; seasonal wetness.
Dunkirk:				
DuB	Moderate: variable permeability.	Slight	Moderate: slope	Moderate: high clay content in subsoil.
DuC3	Moderate: slope; variable permeability.	Moderate: slope	Severe: slope	Moderate: slope; high clay content in subsoil.
DuD	Severe: slope	Severe: slope	Severe: slope	Severe: slope
DwB	Severe: 3½ to 5 feet to bedrock.	Severe: 3½ to 5 feet to bedrock.	Severe: 3½ to 5 feet to bedrock.	Severe: 3½ to 5 feet to bedrock.
Edwards muck: Ed	Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness; muck or marl.
Eel: Ee	Severe: flooding; seasonal wetness.	Severe: flooding	Severe: flooding	Severe: flooding
Elnora:				
ElA	Severe: seasonal wetness.	Moderate: seasonal wetness.	Moderate: seasonal wetness.	Moderate: seasonal wetness.
ElB	Severe: seasonal wetness.	Moderate: seasonal wetness.	Moderate: seasonal wetness; slope.	Moderate: seasonal wetness.

for selected nonfarm uses of the soils—Continued

Soil features affecting—Continued				
Lawns and fairways	Athletic fields	Paths and trails	Campsites	Picnic and play areas
Slight	Moderate: seasonal wetness.	Slight	Moderate: seasonal wetness.	Slight.
Slight	Moderate: slope; seasonal wetness.	Slight	Moderate: seasonal wetness.	Slight.
Moderate: slope	Severe: slope	Slight	Moderate: seasonal wetness; variable permeability; slope.	Moderate: slope.
Slight	Severe: slow permeability.	Slight	Severe: slow permeability.	Slight.
Slight	Severe: slow permeability.	Slight	Severe: slow permeability.	Slight.
Moderate: gravel	Severe: slow permeability; gravel.	Slight	Moderate: seasonal wetness; moderately slow and slow permeability; gravel.	Slight.
Moderate: gravel	Severe: slope; moderately slow and slow permeability; gravel.	Slight	Moderate: seasonal wetness; moderately slow and slow permeability; gravel.	Slight.
Severe: sandy over clayey material.	Severe: seasonal wetness; slow permeability.	Moderate: seasonal wetness.	Severe: seasonal wetness; slow permeability.	Moderate: seasonal wetness.
Moderate: seasonal wetness.	Severe: slow permeability; seasonal wetness.	Moderate: seasonal wetness.	Severe: slow permeability; seasonal wetness.	Moderate: seasonal wetness.
Moderate: seasonal wetness.	Severe: slow permeability; seasonal wetness.	Moderate: seasonal wetness.	Severe: slow permeability; seasonal wetness.	Moderate: seasonal wetness.
Slight	Moderate: slope	Slight	Slight	Slight.
Moderate: slope	Severe: slope	Slight	Moderate: slope	Moderate: slope.
Severe: slope	Severe: slope	Moderate: slope	Severe: slope	Severe: slope.
Moderate: 3½ to 5 feet to bedrock.	Severe: 3½ to 5 feet to bedrock.	Slight	Slight	Slight.
Severe: prolonged wetness; mucky material.	Severe: prolonged wetness; mucky material.	Severe: prolonged wetness; mucky material.	Severe: prolonged wetness; mucky material.	Severe: prolonged wetness; mucky material.
Moderate: flooding	Moderate: flooding	Slight	Moderate: flooding; seasonal wetness.	Slight.
Severe: sandy	Moderate: seasonal wetness; sandy.	Slight	Moderate: seasonal wetness.	Slight.
Severe: sandy	Moderate: seasonal wetness; sandy; slope.	Slight	Moderate: seasonal wetness.	Slight.

TABLE 7.—*Estimated degree and kind of limitations*

Soil and map symbols	Soil features affecting—			
	Septic tank disposal fields	Homesites	Streets and parking lots	Sanitary landfill
Erie:				
ErA	Severe: seasonal wetness; slow permeability.	Severe: seasonal wetness.	Severe: seasonal wetness.	Severe: seasonal wetness; slow permeability.
ErB	Severe: seasonal wetness; slow permeability.	Severe: seasonal wetness.	Severe: seasonal wetness.	Severe: seasonal wetness; slow permeability.
EsA	Severe: seasonal wetness; slow permeability; moderately shallow to bedrock.	Severe: seasonal wetness; moderately shallow to bedrock.	Severe: seasonal wetness; moderately shallow to bedrock.	Severe: seasonal wetness; slow permeability; moderately shallow to bedrock.
EsB	Severe: seasonal wetness; slow permeability; moderately shallow to bedrock.	Severe: seasonal wetness; moderately shallow to bedrock.	Severe: seasonal wetness; moderately shallow to bedrock.	Severe: seasonal wetness; slow permeability; moderately shallow to bedrock.
Fonda: Fn	Severe: prolonged wetness; slow permeability.	Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness; slow permeability.
Fresh water marsh: Fw	Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness.
Honeoye:				
HnB	Severe: moderately slow and slow permeability at depth of more than 30 inches; slope.	Slight	Moderate: slope	Moderate: firm; moderately slow and slow permeability.
HnC	Severe: moderately slow and slow permeability at depth of more than 30 inches.	Moderate: slope	Severe: slope	Moderate: firm; moderately slow and slow permeability; slope.
HnD	Severe: moderately slow and slow permeability; slope.	Severe: slope	Severe: slope	Severe: slope
HoE	Severe: slope; moderately slow and slow permeability.	Severe: slope	Severe: slope	Severe: slope
Howard:				
HwA	Slight	Slight	Slight	Slight
HwC	Moderate to severe: slope.	Moderate: slope	Severe: slope	Moderate: slope
Ilion: Is	Severe: prolonged wetness; slow permeability.	Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness; slow permeability; high clay content.
Lakemont:				
LcA	Severe: prolonged wetness; slow permeability.	Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness; slow permeability; clayey subsoil.
LcB	Severe: prolonged wetness; slow permeability.	Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness; slow permeability; clayey subsoil.

for selected nonfarm uses of the soils—Continued

Soil features affecting—Continued				
Lawns and fairways	Athletic fields	Paths and trails	Campsites	Picnic and play areas
Moderate: seasonal wetness; sandstone fragments.	Severe: seasonal wetness; slow permeability; sandstone fragments.	Moderate: seasonal wetness.	Severe: seasonal wetness; slow permeability.	Moderate: seasonal wetness.
Moderate: seasonal wetness; sandstone fragments.	Severe: seasonal wetness; slow permeability; sandstone fragments.	Moderate: seasonal wetness.	Severe: seasonal wetness; slow permeability.	Moderate: seasonal wetness.
Moderate: seasonal wetness; sandstone fragments; slow permeability; moderately shallow to bedrock.	Severe: seasonal wetness; slow permeability; moderately shallow to bedrock; sandstone fragments.	Moderate: seasonal wetness.	Severe: seasonal wetness; slow permeability.	Moderate: seasonal wetness.
Moderate: seasonal wetness; sandstone fragments; moderately shallow to bedrock.	Severe: seasonal wetness; slow permeability; moderately shallow to bedrock; sandstone fragments.	Moderate: seasonal wetness.	Severe: seasonal wetness; slow permeability.	Moderate: seasonal wetness.
Severe: prolonged wetness.	Severe: prolonged wetness; slow permeability.	Severe: prolonged wetness; high clay content.	Severe: prolonged wetness; slow permeability; high clay content.	Severe: prolonged wetness; high clay content.
Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness.
Slight	Moderate: moderately slow and slow permeability; slope.	Slight	Moderate: moderately slow and slow permeability.	Slight.
Moderate: slope	Severe: slope	Slight	Moderate: slope; moderately slow and slow permeability.	Moderate: slope.
Severe: slope	Severe: slope	Moderate: slope	Severe: slope	Severe: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Moderate: gravel	Severe: gravel	Slight	Moderate: gravel	Slight.
Moderate: gravel; slope	Severe: gravel; slope	Slight	Moderate: slope; gravel	Moderate: slope.
Severe: prolonged wetness.	Severe: prolonged wetness; slow premeability.	Severe: prolonged wetness.	Severe: prolonged wetness; slow permeability.	Severe: prolonged wetness.
Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness; slow permeability.	Severe: prolonged wetness.
Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness; slow permeability.	Severe: prolonged wetness.

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TABLE 7.—*Estimated degree and kind of limitations*

Soil and map symbols	Soil features affecting—			
	Septic tank disposal fields	Homesites	Streets and parking lots	Sanitary landfill
Lamson: Lf	Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness.
Langford:				
LgB	Severe: slow permeability; seasonal wetness.	Moderate: seasonal wetness.	Moderate: seasonal wetness; slope.	Severe: slow permeability.
LgC	Severe: slow permeability; seasonal wetness.	Moderate: slope; seasonal wetness.	Severe: slope	Severe: slow permeability.
LgC3	Severe: slow permeability; seasonal wetness.	Moderate: slope; seasonal wetness.	Severe: slope	Severe: slow permeability.
LgD	Severe: slow permeability; slope; seasonal wetness.	Severe: slope	Severe: slope	Severe: slope; slow permeability.
LnB	Severe: slow permeability; 2 to 3½ feet to bedrock; seasonal wetness.	Severe: 2 to 3½ feet to bedrock.	Severe: 2 to 3½ feet to bedrock.	Severe: slow permeability; 2 to 3½ feet to bedrock.
LnC	Severe: slow permeability; moderately shallow to bedrock; seasonal wetness.	Severe: moderately shallow to bedrock.	Severe: slope; moderately shallow to bedrock.	Severe: slow permeability; moderately shallow to bedrock.
Lansing:				
LsB	Severe: moderately slow and slow permeability at a depth of more than 30 inches.	Slight	Moderate: slope	Moderate: firm; moderately slow and slow permeability.
LsC	Severe: moderately slow and slow permeability at a depth of more than 30 inches; slope.	Moderate: slope	Severe: slope	Moderate: firm; moderately slow and slow permeability; slope.
LsC3	Severe: moderately slow and slow permeability.	Moderate: slope	Severe: slope	Moderate: firm; moderately slow and slow permeability; slope.
LsD	Severe: moderately slow and slow permeability; slope.	Severe: slope	Severe: slope	Severe: slope
Lima:				
LtA	Severe: moderately slow and slow permeability; seasonal wetness.	Moderate: seasonal wetness.	Moderate: seasonal wetness.	Moderate: firm; seasonal wetness; moderately slow and slow permeability.
LtB	Severe: moderately slow and slow permeability; seasonal wetness.	Moderate: seasonal wetness.	Moderate: seasonal wetness; slope.	Moderate: firm; seasonal wetness; moderately slow and slow permeability.
Lyons: Ly	Severe: prolonged wetness; moderately slow and slow permeability.	Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness; moderately slow and slow permeability.

for selected nonfarm uses of the soils—Continued

Soil features affecting—Continued				
Lawns and fairways	Athletic fields	Paths and trails	Campsites	Picnic and play areas
Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness.
Moderate: sandstone fragments.	Severe: sandstone fragments.	Slight	Severe: slow permeability.	Slight.
Moderate: sandstone fragments; slope.	Severe: sandstone fragments; slope.	Slight	Severe: slow permeability.	Moderate: slope.
Moderate: sandstone fragments; slope.	Severe: sandstone fragments; slope.	Slight	Severe: slow permeability.	Moderate: slope.
Severe: slope	Severe: slope; sandstone fragments.	Moderate: slope	Severe: slope; slow permeability.	Severe: slope.
Moderate: sandstone fragments; 2 to 3½ feet to bedrock.	Severe: sandstone fragments; 2 to 3½ feet to bedrock.	Slight	Severe: slow permeability.	Slight.
Moderate: slope; sandstone fragments.	Severe: slope; slow permeability; sandstone fragments.	Slight	Severe: slow permeability.	Moderate: slope.
Moderate: gravel and sandstone fragments.	Severe: gravel and sandstone fragments.	Slight	Moderate: moderately slow and slow permeability; gravel and sandstone fragments.	Slight.
Moderate: gravel and sandstone fragments; slope.	Severe: gravel and sandstone fragments; slope.	Slight	Moderate: slope; moderately slow and slow permeability; gravel and sandstone fragments.	Moderate: slope.
Moderate: gravel and sandstone fragments; slope.	Severe: gravel and sandstone fragments; slope.	Slight	Moderate: slope; moderately slow and slow permeability; gravel and sandstone fragments.	Moderate: slope.
Severe: slope	Severe: slope	Moderate: slope	Severe: slope	Severe: slope.
Slight	Moderate: gravel and stones.	Slight	Moderate: seasonal wetness; moderately slow and slow permeability.	Slight.
Slight	Moderate: slope; gravel and sandstone fragments.	Slight	Moderate: seasonal wetness; moderately slow and slow permeability.	Slight.
Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness; moderately slow and slow permeability.	Severe: prolonged wetness.

TABLE 7.—*Estimated degree and kind of limitation*

Soil and map symbols	Soil features affecting—			
	Septic tank disposal fields	Homesites	Streets and parking lots	Sanitary landfill
Madalin and Odessa: Ma.	Severe: prolonged wetness; slow permeability.	Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness; slow permeability; high clay content.
Made land, tillable: Md. This land type is so variable that limitations were not estimated.				
Muck, deep: Mr	Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness.
Muck, shallow: Ms.				
Niagara: Ng	Severe: seasonal wetness.	Severe: seasonal wetness.	Moderate: seasonal wetness.	Severe: seasonal wetness.
Odessa:				
OdA	Severe: seasonal wetness; slow permeability.	Severe: seasonal wetness.	Moderate: seasonal wetness.	Severe: seasonal wetness; slow permeability; clayey subsoil.
OdB	Severe: seasonal wetness; slow permeability.	Severe: seasonal wetness.	Moderate: seasonal wetness; slope.	Severe: seasonal wetness; slow permeability; clayey subsoil.
Ontario:				
OfB	Severe: moderately slow and slow permeability at a depth of more than 30 inches.	Slight	Moderate: slope	Moderate: moderately slow and slow permeability; firm.
OfC3	Severe: moderately slow and slow permeability at a depth of more than 30 inches; slope.	Moderate: slope	Severe: slope	Moderate: moderately slow and slow permeability; firm; slope.
OnB	Severe: moderately slow and slow permeability at a depth of more than 30 inches.	Slight	Moderate: slope	Moderate: firm; moderately slow and slow permeability.
OnC	Severe: moderately slow and slow permeability at a depth of more than 30 inches; slope.	Moderate: slope	Severe: slope	Moderate: slope; firm; moderately slow and slow permeability.
OnC3	Severe: moderately slow and slow permeability.	Moderate: slope	Severe: slope	Moderate: slope; firm; moderately slow and slow permeability.
OnD3	Severe: slope; moderately slow and slow permeability.	Severe: slope	Severe: slope	Severe: slope
OpB	Severe: moderately shallow to shallow to bedrock.	Severe: moderately shallow to shallow to bedrock.	Severe: moderately shallow to shallow to bedrock.	Severe: moderately shallow to shallow to bedrock.

for selected nonfarm uses of the soils—Continued

Soil features affecting—Continued				
Lawns and fairways	Athletic fields	Paths and trails	Campsites	Picnic and play areas
Severe: prolonged wetness.	Severe: prolonged wetness; slow permeability.	Severe: prolonged wetness; high clay content.	Severe: prolonged wetness; slow permeability.	Severe: prolonged wetness; high clay content.
Severe: prolonged wetness; mucky material.	Severe: prolonged wetness; mucky material.	Severe: prolonged wetness; mucky material.	Severe: prolonged wetness; mucky material.	Severe: prolonged wetness; mucky material.
Moderate: seasonal wetness.	Severe: seasonal wetness.	Moderate: seasonal wetness.	Severe: seasonal wetness.	Moderate: seasonal wetness.
Moderate: seasonal wetness.	Severe: seasonal wetness; slow permeability.	Moderate: seasonal wetness.	Severe: seasonal wetness; slow permeability; high clay content.	Moderate: seasonal wetness.
Moderate: seasonal wetness.	Severe: seasonal wetness; slow permeability; slope.	Moderate: seasonal wetness.	Severe: seasonal wetness; slow permeability; high clay content.	Moderate: seasonal wetness.
Slight	Moderate: slope; moderately slow and slow permeability; gravel and stones.	Slight	Moderate: moderately slow and slow permeability.	Slight.
Moderate: slope	Severe: slope	Slight	Moderate: slope; moderately slow and slow permeability.	Moderate: slope.
Slight	Moderate: slope; moderately slow and slow permeability; gravel and stones.	Slight	Moderate: moderately slow and slow permeability.	Slight.
Moderate: slope	Severe: slope	Slight	Moderate: slope; modderately slow and slow permeability.	Moderate: slope.
Moderate: slope	Severe: slope	Slight	Moderate: slope; moderately slow and slow permeability.	Moderate: slope.
Severe: slope	Severe: slope	Moderate: slope	Severe: slope	Severe: slope.
Moderate: moderately shallow to shallow to bedrock.	Severe: moderately shallow to shallow to bedrock.	Slight	Slight	Slight.

TABLE 7.—*Estimated degree and kind of limitations*

Soil and map symbols	Soil features affecting—			
	Septic tank disposal fields	Homesites	Streets and parking lots	Sanitary landfill
Ovid:				
OvA	Severe: seasonal wetness; slow permeability.	Severe: seasonal wetness.	Severe: seasonal wetness.	Severe: seasonal wetness; slow permeability; high clay content in subsoil.
OvB	Severe: seasonal wetness; slow permeability.	Severe: seasonal wetness.	Severe: seasonal wetness.	Severe: seasonal wetness; slow permeability; high clay content in subsoil.
Palmyra:				
PgA	Slight	Slight	Slight	Slight
PgC	Moderate to severe: slope.	Moderate: slope	Severe: slope	Moderate: slope
PhD	Severe: slope	Severe: slope	Severe: slope	Severe: slope
PhE	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Romulus: Ro	Severe: slow permeability; prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness.	Severe: prolonged wetness; slow permeability; high clay content.
Schoharie:				
SeB	Severe: slow permeability; seasonal wetness.	Moderate: seasonal wetness.	Moderate: seasonal wetness; slope.	Severe: slow permeability; high clay content in subsoil.
ShA	Severe: slow permeability; seasonal wetness.	Moderate: seasonal wetness.	Moderate: seasonal wetness.	Severe: slow permeability; high clay content.
ShB	Severe: slow permeability; seasonal wetness.	Moderate: seasonal wetness.	Moderate: seasonal wetness; slope.	Severe: slow permeability; high clay content.
ShC3	Severe: slow permeability.	Moderate: seasonal wetness; slope.	Severe: slope	Severe: slow permeability; high clay content.
ShD3	Severe: slow permeability; slope.	Severe: slope	Severe: slope	Severe: slope; slow permeability; high clay content.
Sloan: Sn	Severe: flooding; prolonged wetness.	Severe: flooding; prolonged wetness.	Severe: flooding; prolonged wetness.	Severe: flooding; prolonged wetness.
Stafford: Sr	Severe: seasonal wetness.	Severe: seasonal wetness.	Moderate: seasonal wetness.	Severe: seasonal wetness.
Varick: Vc	Severe: prolonged wetness; slow permeability; moderately deep to bedrock.	Severe: prolonged wetness; moderately deep to bedrock.	Severe: prolonged wetness; moderately deep to bedrock.	Severe: prolonged wetness; moderately deep to bedrock.
Wallkill: Wk	Severe: prolonged wetness; flooding.	Severe: prolonged wetness; flooding.	Severe: prolonged wetness; flooding.	Severe: prolonged wetness; flooding; sandy material over mucky material.

for selected nonfarm uses of the soils—Continued

Soil features affecting—Continued				
Lawns and fairways	Athletic fields	Paths and trails	Campsites	Picnic and play areas
Moderate: seasonal wetness.	Severe: seasonal wetness; slow permeability.	Moderate: seasonal wetness.	Severe: seasonal wetness; slow permeability.	Moderate: seasonal wetness.
Moderate: seasonal wetness.	Severe: seasonal wetness; slow permeability.	Moderate: seasonal wetness.	Severe: seasonal wetness; slow permeability.	Moderate: seasonal wetness.
Moderate: gravel	Severe: gravel	Slight	Moderate: gravel	Slight.
Moderate: slope, gravel.	Severe: gravel; slope	Slight	Moderate: slope; gravel.	Moderate: slope.
Severe: slope	Severe: slope; gravel	Moderate: slope	Severe: slope	Severe: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: prolonged wetness.	Severe: prolonged wetness; slow permeability.	Severe: prolonged wetness.	Severe: prolonged wetness; slow permeability.	Severe: prolonged wetness.
Moderate: slope; high clay content in subsoil.	Severe: slow permeability; high clay content in subsoil.	Slight	Severe: slow permeability.	Slight.
Moderate: high clay content.	Severe: slow permeability; high clay content.	Moderate: high clay content.	Severe: slow permeability.	Moderate: high clay content.
Moderate: high clay content.	Severe: slow permeability; high clay content.	Moderate: high clay content.	Severe: slow permeability; high clay content.	Moderate: high clay content.
Moderate: slope; high clay content.	Severe: slow permeability; slope; high clay content.	Moderate: high clay content.	Severe: slow permeability.	Moderate: slope; high clay content.
Severe: slope	Severe: slope; slow permeability; high clay content.	Moderate: slope; high clay content.	Severe: slope; slow permeability.	Severe: slope.
Severe: flooding; prolonged wetness.	Severe: flooding; prolonged wetness.	Severe: prolonged wetness.	Severe: flooding; prolonged wetness.	Severe: flooding; prolonged wetness.
Moderate: seasonal wetness.	Severe: seasonal wetness.	Moderate: seasonal wetness.	Severe: seasonal wetness.	Moderate: seasonal wetness.
Severe: prolonged wetness.	Severe: prolonged wetness; moderately deep to bedrock.	Severe: prolonged wetness.	Severe: prolonged wetness; slow permeability.	Severe: prolonged wetness; moderately deep to bedrock.
Severe: prolonged wetness; sandy.	Severe: prolonged wetness; sandy.	Severe: prolonged wetness; sandy.	Severe: prolonged wetness; sandy.	Severe: prolonged wetness; sandy.

Descriptions of the Soils

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

In the pages that follow, a general description of each soil series is given. Each series description has a detailed description of a profile typical of the series and a brief statement of the range in characteristics of the soils in the series, as mapped in this county. Following the series description, each mapping unit in the series is described individually. For full information on any one mapping unit, it is necessary to read the description of the soil series as well as the description of the mapping unit. Miscellaneous land types, such as Alluvial land, are described in alphabetic order along with the soil series.

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

For more general information about the soils, the reader can refer to the section "General Soil Map," in which the broad patterns of soils are described. Many of the terms used in the soil descriptions and other parts of the survey are defined in the Glossary.

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

Soil	Acres	Percent
Alden mucky silt loam	766	0. 4
Alden mucky silt loam, till substratum	322	. 2
Alluvial land	952	. 5
Angola silt loam, 0 to 3 percent slopes	3, 769	1. 8
Angola silt loam, 3 to 8 percent slopes	5, 496	2. 6
Appleton gravelly silt loam, 0 to 3 percent slopes	1, 077	. 5
Appleton gravelly silt loam, 3 to 8 percent slopes	258	. 1
Appleton silt loam, 0 to 3 percent slopes	2, 817	1. 3
Appleton silt loam, 3 to 8 percent slopes	806	. 4
Arkport loamy fine sand, 1 to 6 percent slopes	3, 806	1. 8
Arkport loamy fine sand, 6 to 12 percent slopes	1, 109	. 5
Arkport loamy fine sand, 12 to 20 percent slopes	121	. 1
Arnot channery silt loam, 15 to 25 percent slopes	127	. 1
Aurora silt loam, 3 to 8 percent slopes	731	. 3
Aurora silt loam, 8 to 15 percent slopes	1, 054	. 5
Aurora silt loam, 15 to 25 percent slopes	600	. 3
Aurora and Farmington soils, 25 to 75 percent slopes	3, 348	1. 6
Canandaigua silt loam	493	. 2
Cazenovia silt loam, 3 to 8 percent slopes	10, 173	4. 8
Cazenovia silt loam, 3 to 8 percent slopes, eroded	241	. 1
Cazenovia silt loam, 8 to 15 percent slopes	949	. 5
Cazenovia silt loam, 8 to 15 percent slopes, eroded	952	. 5
Cazenovia soils, 15 to 25 percent slopes	426	. 2
Cazenovia soils, 25 to 40 percent slopes	95	[1]
Claverack loamy fine sand, 0 to 2 percent slopes	1, 038	. 5
Claverack loamy fine sand, 2 to 6 percent slopes	1, 391	. 7
Collamer silt loam, 0 to 2 percent slopes	2, 465	1. 2
Collamer silt loam, 2 to 6 percent slopes	2, 567	1. 2
Collamer silt loam, 6 to 12 percent slopes	188	. 1
Collamer silt loam, moderately shallow variant, 0 to 2 percent slopes	284	. 1
Collamer silt loam, moderately shallow variant, 2 to 6 percent slopes	272	. 1
Conesus gravelly silt loam, 0 to 3 percent slopes	1, 388	. 7
Conesus gravelly silt loam, 3 to 8 percent slopes	5, 994	2. 8
Cosad loamy fine sand	1, 550	. 7
Darien silt loam, 0 to 3 percent slopes	15, 520	7. 4
Darien-Danley-Cazenovia silt loams, 3 to 8 percent slopes	12, 059	5. 7
Dunkirk silt loam, 1 to 6 percent slopes	3, 848	1. 8
Dunkirk silt loam, 6 to 12 percent slopes, eroded	614	. 3
Dunkirk silt loam, 12 to 20 percent slopes	345	. 2
Dunkirk silt loam, limestone substratum, 1 to 6 percent slopes	795	. 4
Edwards muck	1, 053	. 5
Eel silt loam	691	. 3
Elnora loamy fine sand, 0 to 2 percent slopes	283	. 1
Elnora loamy fine sand, 2 to 6 percent slopes	252	. 1
Erie channery silt loam, 0 to 3 percent slopes	2, 148	1. 0
Erie channery silt loam, 3 to 8 percent slopes	1, 955	. 9
Eire channery silt loam, moderately shallow variant, 0 to 3 percent slopes	234	. 1
Erie channery silt loam, moderately shallow variant, 3 to 8 percent slopes	288	. 1
Fonda mucky silty clay loam	1, 461	. 7
Fresh water marsh	3, 392	1. 6
Honeoye silt loam, 2 to 8 percent slopes	10, 361	4. 9
Honeoye silt loam, 8 to 15 percent slopes	1, 398	. 7
Honeoye silt loam, 15 to 25 percent slopes	193	. 1
Honeoye, Ontario, and Lansing soils, 25 to 40 percent slopes	1, 090	. 5
Howard gravelly loam, 0 to 5 percent slopes	151	. 1
Howard gravelly loam, 5 to 15 percent slopes	405	. 2
Ilion silty clay loam	4, 849	2. 3
Lakemont silty clay loam, 0 to 2 percent slopes	4, 095	1. 9
Lakemont silty clay loam, 2 to 6 percent slopes	191	. 1
Lamson fine sandy loam and mucky fine sandy loam	821	. 4
Langford channery silt loam, 2 to 8 percent slopes	5, 528	2. 6
Langford channery silt loam, 8 to 15 percent slopes	512	. 2
Langford channery silt loam, 8 to 15 percent slopes, eroded	329	. 2
Langford channery silt loam, 15 to 25 percent slopes	168	. 1
Langford channery silt loam, moderately shallow variant, 2 to 8 percent slopes	767	. 4
Langford channery silt loam, moderately shallow variant, 8 to 15 percent slopes	142	. 1
Lansing gravelly silt loam, 2 to 8 percent slopes	4, 628	2. 2
Lansing gravelly silt loam, 8 to 15 percent slopes	496	. 2
Lansing gravelly silt loam, 8 to 15 percent slopes, eroded	517	. 2
Lansing gravelly silt loam, 15 to 25 percent slopes	138	. 1
Lima silt loam, 0 to 3 percent slopes	2, 984	1. 4
Lima silt loam, 3 to 8 percent slopes	10, 254	4. 9
Lyons silt loam	693	. 3
Madalin and Odessa silty clay loams	2, 121	1. 0
Made land, tillable	1, 874	. 9
Muck, deep	3, 112	1. 5
Muck, shallow	1, 295	. 6

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

Soil	Acres	Percent
Niagara silt loam	1, 566	. 7
Odessa silt loam, 0 to 2 percent slopes	6, 725	3. 2
Odessa silt loam, 2 to 6 percent slopes	2, 153	1. 0
Ontario fine sandy loam, 2 to 8 percent slopes	1, 007	. 5
Ontario fine sandy loam, 8 to 15 percent slopes, eroded	490	. 2
Ontario loam, 2 to 8 percent slopes	5, 718	2. 7
Ontario loam, 8 to 15 percent slopes	394	. 2
Ontario loam, 8 to 15 percent slopes, eroded	1, 090	. 5
Ontario loam, 15 to 25 percent slopes, eroded	904	. 4
Ontario silt loam, moderately shallow variant, and Farmington soils, 2 to 8 percent slopes	201	. 1
Ovid silt loam, 0 to 3 percent slopes	2, 186	1. 0
Ovid silt loam, 3 to 8 percent slopes	5, 534	2. 6
Palmyra gravelly loam, 0 to 5 percent slopes	120	. 1
Palmyra gravelly loam, 5 to 15 percent slopes	396	. 2
Palmyra and Howard soils, 15 to 25 percent slopes	229	. 1
Palmyra and Howard soils, 25 to 35 percent slopes	124	. 1
Romulus silty clay loam	1, 981	. 9
Schoharie silt loam, 2 to 6 percent slopes	5, 275	2. 5
Schoharie silty clay loam, 0 to 2 percent slopes	2, 355	1. 1
Schoharie silty clay loam, 2 to 6 percent slopes	5, 094	2. 4
Schoharie silty clay loam, 6 to 12 percent slopes, eroded	732	. 3
Schoharie silty clay loam, 12 to 20 percent slopes, eroded	120	. 1
Sloan silt loam	2, 043	. 9
Stafford loamy fine sand	470	. 2
Varick silty clay loam	1, 806	. 9
Wallkill soils	469	. 2
Water areas less than 40 acres in size	188	. 1
Gravel pits and quarries	155	. 1
Total	211, 200	100. 0

[1] Less than 0.05 percent.

Alden Series

The Alden series consists of very poorly drained soils that formed in deep, silty deposits. These level or depressional soils are on the lake plain and in ponded areas of uplands.

In a cultivated area, a typical profile has a very dark brown mucky silt loam surface layer about 9 inches thick. The subsoil, which extends to a depth of 21 inches, is mottled, gray to dark-gray, friable silt loam and friable to firm loam. Reaction of the surface layer and subsoil is neutral. The substratum consists of brown to dark-brown, calcareous, mottled, friable to firm loam and silt loam.

Typical profile of Alden mucky silt loam (formerly cultivated):

Ap—0 to 9 inches, very dark brown (10YR 2/2) mucky silt loam; many, fine, dark reddish-brown (5YR 3/2 to 3/4) root mottles; strong, fine and medium, granular structure; very friable; slightly sticky; abundant, fine roots; neutral; clear, wavy boundary.

B21g—9 to 12 inches, gray (N 5/0) to dark-gray (N 4/0) silt loam; few, fine, distinct, yellowish-brown (10YR 5/6) and strong-brown (7.5YR 5/6) mottles; moderate, fine and medium, subangular blocky structure; friable; slightly sticky; common, fine roots; neutral; abrupt, wavy boundary.

IIB22g—12 to 14 inches, gray (10YR 5/1) loam; high content of coarse silt, very fine sand, and fine sand; common, fine, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium and coarse, subangular blocky structure; slightly firm; slightly sticky; few, fine roots; few, fine pores; no clay film on ped faces or in pores; neutral; clear, wavy boundary.

IIB23g—14 to 21 inches, gray (5YR 5/1) loam; high content of coarse silt, very fine sand, and fine sand; many, coarse, distinct, strong-brown (7.5YR 5/6) and yellowish-brown (10YR 5/6) mottles, and common, coarse, faint, light-gray (5YR 6/1 and 7/1) mottles; weak to moderate, coarse, angular blocky structure within moderate, coarse prisms; friable to firm; slightly sticky; few, fine roots; few, fine pores; few pockets of very fine sand, 1 to 2 inches in diameter; gray (5YR 5/1) prism faces without mottles or clay films; neutral; clear, wavy boundary.

IIC1g—21 to 32 inches, brown (7.5YR 5/2) loam; high content of coarse silt and very fine sand; many, coarse, distinct, strong-brown (7.5YR 5/6) mottles, and few, fine, faint, light-gray (7.5YR 7/1 and 6/1) mottles; moderate, coarse, angular blocky structure within moderate, coarse prisms; friable to firm; slightly sticky; very few, fine roots; very few, fine pores; brown (7.5YR 5/2) prism faces without mottles or clay films; calcareous; abrupt, wavy boundary. 10 to 12 inches thick.

IIIC2g—32 to 40 inches +, dark-brown (7.5YR 4/4) heavy silt loam; many, medium, distinct, gray (N 5/0) mottles, and common, medium and coarse, distinct, strong-brown (7.5YR 5/6) mottles; moderate to weak, thick, platy structure with plates separated by very thin seams of coarse silt; firm; sticky; very few, fine roots; calcareous.

Thickness of the solum ranges from 20 to 40 inches. Depth to carbonates ranges from 18 to more than 40 inches.

The A1 and Ap horizons range in color from black to very dark gray and from black to very dark brown. Texture ranges from very fine sandy loam to silt loam, and organic-matter content ranges from 10 to 20 percent. Structure is granular to fine blocky. Reaction ranges from slightly acid to mildly alkaline.

The Bg horizon, to a depth of 20 inches or more, ranges in color from gray or dark gray to reddish gray or olive gray. Mottles range from few to common and are distinct to prominent. Texture ranges from very fine sandy loam to light silty clay loam. Clay content ranges from 18 to 35 percent. The horizon is massive (structureless) or has moderate, blocky structure within weak to strong prisms; structure is most prominent where the clay content is higher. The Bg horizon is slightly acid to moderately alkaline and may be calcareous.

The C horizon consists mainly of varved silt and very fine sand and contains thin clay lenses to a depth of more than 40 inches.

Alden soils are the very poorly drained member of a drainage sequence that includes the well drained Dunkirk soils, the moderately well drained Collamer soils, the somewhat poorly drained Niagara soils, and the poorly drained Canandaigua soils. Alden soils have more gray hues in the B horizon than do the slightly better drained Canandaigua soils and are coarser textured than the very poorly drained Fonda soils. They are finer textured than the sandy, poorly drained and very poorly drained Lamson soils. Alden soils are closely associated in the uplands with the similar soils of the Alden series, till substratum, which are underlain at a depth of 20 to 40 inches by firm glacial till.

Alden mucky silt loam (Ac).—This is a low, level or depressional soil with slopes that are mainly less than 2 percent. In adjacent higher positions, the most common associates are areas of Collamer and Niagara soils, from which this soil receives runoff. Included in mapping are small areas of poorly drained Canandaigua soils, on slight rises and knolls, which make up as much as 15 percent of some areas. Also included are spots of shallow muck in small pockets and depressions.

If undrained, this Alden soil is not suited to crops but can be used for low-quality pasture, wildlife marshes, and ponds. The forested areas are termed "swamp woods" in which the dominant trees are soft maple and elm.

Control of water is an important problem in management. Drainage can be a difficult problem, since the silty and sandy layers of this soil tend to flow and plug tile lines and ditches.

Although total nitrogen content is high, it is slowly available in spring; therefore, plants respond to nitrogen fertilization. The supply of potassium and phosphorus is moderate. Need for lime is variable. (Capability unit IIIw-7; woodland suitability group 9)

Alden Series, Till Substratum

The Alden series, till substratum, consists of deep, very poorly drained soils. These soils formed on the till plain in silty deposits over mildly alkaline and moderately alkaline loamy glacial till and, to a more limited extent, in upland till areas from medium-textured glacial till containing varying amounts of limestone.

In a typical profile, the surface layer has a mucky silt loam surface layer about 9 inches thick. The upper two inches of the surface layer is black; the rest is very dark gray and is distinctly mottled. The subsoil, which extends to a depth of about 26 inches, is distinctly mottled, friable, dark-gray silt loam to loam that contains a few pebbles and small stone fragments in the lower part. Reaction ranges from neutral in the surface layer to mildly alkaline in the subsoil. The calcareous till substratum is distinctly mottled, dark-gray, firm loam to gritty silt that contains a few pebbles and stone fragments.

Typical profile of Alden mucky silt loam, till substratum (pasture):

A11—0 to 2 inches, black (5YR 2/1) mucky silt loam; dark reddish brown (5YR 2/2) when rubbed; moderate, fine, granular structure; very friable; many, fine roots; neutral; abrupt, wavy boundary.

A12g—2 to 9 inches, very dark gray (10YR 3/1) mucky silt loam; very dark grayish brown (10YR 3/2) when rubbed; common, fine, distinct, dark-brown (7.5YR 4/4), reddish-brown (5YR 4/4), and dark reddish-brown (5YR 3/4) root mottles or stains; moderate, fine, granular structure, and very fine and fine, subangular blocky structure; very friable; many, fine roots; neutral; abrupt, wavy boundary.

B2g—9 to 26 inches, dark-gray (5Y 4/1) silt loam to loam; estimated 20 to 25 percent clay; common, medium, distinct, olive-brown (2.5Y 4/4), light olive-brown (2.5Y 5/4 and 5/6), and yellowish-brown (10YR 5/6) mottles; weak to moderate, coarse, angular blocky structure within weak, coarse prisms; few, very thin patches of clay films on ped faces and in pores; friable; slightly sticky; few, fine roots; 2 to 5 percent gravel and small stone fragments in lower part; mildly alkaline; gradual, wavy boundary.

IICg—26 to 48 inches +, dark-gray (5Y 4/1) loam to silt loam; common, coarse, distinct, light olive-brown (2.5Y 5/4) and olive-brown (2.5Y 4/4) mottles that decrease in size and number with depth; weak, very thick, platy structure; no clay films on plate faces or in pores; firm in place; friable where crushed; no roots; 5 to 10 percent gravel and stone fragments; calcareous.

The A horizon ranges in texture from mucky silt loam to fine sandy loam but contains 0 to 10 percent by volume of pebbles, small rock fragments, or stones. Color ranges from black to dark gray in cultivated areas. Reaction is medium acid to neutral.

Texture of the B horizon is mostly silt loam but ranges from silt loam to fine sandy loam. Clay content is 18 to 35 percent. Color is mainly dark gray to gray but ranges to grayish brown or olive brown. Mottles are medium in size and range in number from none to common and in color from light olive brown to strong brown. Reaction in this horizon is slightly acid to mildly alkaline.

Texture of the C horizon is light silty clay loam to very fine sandy loam. Stone content is 5 to 40 percent by volume.

Depth to calcareous material generally ranges from 12 to 48 inches, but the upper part of the profile is neutral in areas where depth to lime is greatest.

Alden soils, till substratum, are the very poorly drained associates of a group of upland soils that formed in medium-textured glacial till containing varying amounts of limestone. These include the well drained Ontario, Honeoye, and Lansing soils and associates; the moderately well drained to well drained Danley soils and associates; and the moderately well drained Langford and Cazenovia soils and associates. Alden soils, till substratum, are siltier in the surface layer and in the upper part of the subsoil than similar Lyons soils. They are lighter textured than Fonda soils. Alden soils, till substratum, are similar to other Alden soils in the uplands but developed in silty deposits more than 40 inches thick over till.

Alden mucky silt loam, till substratum (Ad).—This soil is the very poorly drained associate of all the medium-textured soils on uplands in the county. The only areas large enough to map are at the higher elevations in the southern part of the county. In these places this soil is associated with the better drained Erie and Langford soils. A slightly better drained soil with a fragipan is a common inclusion and occupies as much as 20 percent of some areas, but it has little effect on use and management. Elsewhere in the county, this Alden soil occurs as small inclusions with the poorly drained Lyons soils.

This depressional soil is subject to ponding, and water is at or near the surface most of the year. Unless drained, this soil is too wet for cultivation. Systematic drainage is rarely applied, but its use would allow water-tolerant hay and pasture species to be grown. Water-tolerant trees are dominant in wooded areas. Some areas are used for pasture, and while not highly productive, they provide some feed during dry periods when other pasture is inadequate. (Capability unit IVw-3; woodland suitability group 9)

Alluvial Land

Alluvial land (Al) consists of several different kinds of soil material deposited in long, narrow strips along secondary streams in the uplands. It also occurs along some of the wider streams and commonly adjoins the Eel or Sloan soils. This land type shows little or no profile development. Some areas of this land type are stony or gravelly, while other areas are free of coarse fragments.

Within short distances drainage can range from well drained to very poorly drained.

Alluvial land has very low potential for farming. Some areas are in pasture, but most of the cleared areas are reverting to brush and weeds. Many areas are wooded and support water-tolerant trees such as willow, swamp elm, soft maple, and sycamore.

Hazard of flooding and variability of texture and drainage within short distances seriously affect any use made of the land. (Capability unit Vw–1; woodland suitability group 9)

Angola Series

The Angola series consists of somewhat poorly drained, moderately deep soils that formed in glacial till derived from dark-gray to black silty shale or in semiresidual material derived from the underlying shale. Angola soils occur in the uplands, mainly from the area south of the Seneca River to the vicinity of Ovid, and farther south along the lakes at an elevation of less than 1,400 feet.

In a typical profile, the surface layer is dark-gray heavy silt loam about 9 inches thick. The subsoil is firm, distinctly mottled, dark grayish-brown light silty clay loam that grades to light clay loam at a depth of about 13 inches. A few shale fragments are present and become more common as depth increases. The underlying calcareous till substratum is at a depth of about 22 inches. It is firm, dark grayish-brown and olive-brown shaly clay loam to shaly silty clay loam. Depth to dark-gray, brittle, soft shale bedrock is about 34 inches.

Typical profile of Angola silt loam, 3 to 8 percent slopes (formerly cultivated):

Ap—0 to 9 inches, dark-gray (10YR 4/1) heavy silt loam; dark grayish-brown (10YR 4/2) when crushed; strong, fine and very fine, subangular blocky structure; slightly firm to friable; slightly sticky; many, fine and medium roots; few, fine shale chips; slightly acid; clear, wavy boundary.

B21tg—9 to 13 inches, dark grayish-brown (10YR 4/2) light silty clay loam; many, fine, distinct, dark yellowish-brown (10YR 4/4), yellowish-brown (10YR 5/4), light olive-brown (2.5Y 5/4), and olive-brown (2.5Y 4/4) mottles, and a few, fine, distinct, light brownish-gray (10YR 6/2) mottles; strong, medium and coarse, blocky structure; firm; slightly sticky; common, fine roots along ped faces; few, fine and medium pores; thin, dark grayish-brown (10YR 4/2) clay coats in pores and on ped faces; few, partially weathered shale chips; slightly acid; clear, wavy boundary.

B22tg—13 to 22 inches, dark grayish-brown (2.5Y 4/2) light clay loam; many, fine and medium, distinct, olive-brown (2.5Y 4/4) and light olive-brown (2.5Y 5/4 and 5/6) mottles, and common, fine and medium, faint, grayish-brown (2.5Y 5/2) and light brownish-gray (2.5Y 6/2) mottles; strong, coarse, angular blocky structure within strong, medium and coarse prisms; firm; slightly sticky; common, fine roots along prism and ped faces; few, fine and medium pores; distinct, moderate, grayish-brown (2.5Y 5/2) clay coats on vertical prism faces, thinner clay coats on horizontal faces; common, fine, weathered shale chips; neutral to mildly alkaline; clear, wavy boundary.

C—22 to 34 inches, dark grayish-brown (2.5Y 4/2) shaly light clay loam to shaly light silty clay loam, grading to olive brown (2.5Y 4/4) in center of peds; moderate, thin and medium, platy structure; firm; slightly sticky; common, fine roots in upper part decreasing to few in lower part along ped faces; gray (5Y 5/1) silty or limy films on ped faces; calcareous; clear, wavy boundary.

R—34 to 40 inches +, dark-gray (2.5Y 4/1), brittle, soft shale bedrock; freshly broken interiors are dark grayish brown (2.5Y 4/2) to very dark grayish brown (2.5Y 3/2); very fissile horizontal cleavage ⅛ to ½ inch thick; few, fine roots along shale faces; strongly calcareous.

The thickness of the solum and the depth to bedrock ranges from 20 to 40 inches. Coarse fragments in the profile are dominantly soft shale, but some areas contain a few channery sandstone fragments.

The A horizon is commonly silt loam but ranges to silty clay loam, and in places it is shaly or channery. Reaction is mainly slightly acid but ranges from medium acid to neutral.

The B horizon ranges in texture from heavy silt loam to light silty clay loam and has a clay content of 18 to 35 percent. In places the B horizon is very shaly or channery just above bedrock. Reaction is medium acid to mildly alkaline.

The C horizon is generally absent where shale bedrock is at a depth of less than 30 inches. The C horizon has a texture similar to that of the B horizon. Reaction is neutral, and in places this horizon is calcareous. The underlying shale is slightly acid to moderately alkaline and is calcareous in places.

Angola soils are the somewhat poorly drained associates of the moderately well drained to well drained Aurora soils and the poorly drained Varick soils. They are also associated with the Darien and Appleton soils, which are similar in drainage and reaction but are deeper.

Angola silt loam, 0 to 3 percent slopes (AnA).—This soil has a profile that resembles the one described as typical for the series but has a darker colored surface layer and slightly grayer subsoil. It occurs on broad, nearly level uplands and in very gently sloping areas where runoff is slow.

Included in mapping are small areas of poorly drained Varick soils in shallow depressions and drainageways, which occupy as much as 10 percent of some areas. Although limited in acreage, these Varick soils delay field operations in spring. Commonly included, where the depth to shale bedrock is more than 40 inches, is Varick silt loam, which occupies as much as 15 percent of some areas. This deeper although more extensive soil has little effect on use and management. In a few places, where thin smears of reddish lacustrine clays were deposited, small areas of Ovid soils are also included. Other common inclusions are the sloping Angola, Aurora, Darien, and Danley soils.

Unless this soil is drained, planting is commonly delayed in spring, and harvesting of crops is very difficult in wet falls. Undrained areas can be used only for short-season crops or for water-tolerant forage crops.

Where adequate drainage is established, this soil is well suited to a variety of crops. Erosion is not a hazard. This soil has a moderate supply of potassium and a moderate to high supply of phosphorus. Supply of nitrogen is commonly deficient in spring but may be adequate for good plant growth by midsummer. Some areas need lime. (Capability unit IIIw–5; woodland suitability group 4)

Angola silt loam, 3 to 8 percent slopes (AnB).—This soil has the profile described as typical for the series. It is in upland areas that are generally fairly broad. Slopes range mainly from 3 to 5 percent. This soil receives sufficient water from adjacent higher lying areas to account for its somewhat poor drainage.

Included with this soil in mapping are spots of the deeper Darien soils, where bedrock is more than 40 inches below the surface. These Darien soils occupy as much as 15 percent of some areas. These deeper soils, though fairly extensive, have little influence on use and management. Other common inclusions are small areas of Aurora soils on knolls or rises, and of Varick soils in occasional depressions or in drainageways.

Unless this soil is drained, spring planting can be delayed and harvesting made difficult during wet falls. Undrained areas can be used for short-season crops or for forage crops that can tolerate wetness. Providing adequate drainage and controlling erosion are the main needs in management, and the diversion of runoff from adjacent areas is commonly beneficial.

The supply of phosphorus is moderate, and the supply of potassium is moderate to high. Some areas require lime. Nitrogen generally is deficient in spring but may be adequate for good growth of many crops by midsummer. (Capability unit IIIw-6; woodland suitability group 4)

Appleton Series

The Appleton series consists of somewhat poorly drained soils that formed in deep, calcareous, firm, medium-textured glacial till derived mainly from limestone, calcareous shale, and calcareous sandstone.

In a cultivated area, a typical profile has a dark-gray to very dark grayish-brown silt loam surface layer about 9 inches thick. The thin subsurface layer consists of leached, mottled, brown, friable silt loam to very fine sandy loam that extends to a depth of about 12 inches. The subsoil is distinctly mottled, firm heavy loam to silt loam that is grayish brown to light olive brown to a depth of about 21 inches and then becomes light reddish brown. Depth to the calcareous till substratum is about 27 inches. The till consists of firm loam to silt loam that contains some gravel and stones. Reaction of the surface layer is neutral. The subsoil becomes calcareous with depth.

Typical profile of Appleton silt loam, 3 to 8 percent slopes (cultivated):

Ap—0 to 9 inches, dark-gray (10YR 4/1) to very dark grayish-brown (10YR 3/2) silt loam; moderate, medium, subangular blocky structure; friable; many, fine roots; neutral; abrupt, wavy boundary.

A2—9 to 12 inches, brown (10YR 5/3) silt loam to very fine sandy loam; few, fine, distinct, yellowish-brown (10YR 5/6) mottles; weak, platy structure breaking to weak, medium, blocky structure; friable; common, fine roots; neutral; clear, wavy boundary.

B2t—12 to 21 inches, grayish-brown (10YR 5/2) to light olive-brown (2.5Y 5/4) heavy loam to heavy silt loam; common, fine, distinct, yellowish-brown (10YR 5/6) and light-gray (10YR 6/1) mottles; moderate, medium and coarse, blocky and subangular blocky structure; gray (10YR 5/1) to grayish-brown (10YR 5/2) clay films on ped faces; slightly firm; few, fine roots, mainly along ped faces; alkaline, becoming weakly calcareous in lower part; clear, wavy boundary.

B3—21 to 27 inches, light reddish-brown (5YR 6/3) heavy loam to silt loam; common, medium, distinct, light-gray (10YR 7/1) and brownish-yellow (10YR 6/8) mottles; weak to moderate, medium and coarse, blocky structure; light reddish-brown (5YR 6/3) ped faces with discontinuous clay films; friable; firm in place; few, fine roots; calcareous; clear, wavy boundary.

C—27 to 48 inches +, light brownish-gray (10YR 6/2) loam to silt loam; massive; firm in place, friable when removed; calcareous glacial till; gravel and stone content 5 to 15 percent.

Depth to carbonates ranges from 18 inches near the Onondaga limestone escarpment to 36 inches where these soils are associated with Lansing soils. The A2 horizon is commonly part of the plow layer. Texture of the A horizon is silt loam to very fine sandy loam but in places is gravelly silt loam or gravelly loam. Reaction of the A horizon ranges from slightly acid to mildly alkaline.

The B horizon is heavy silt loam to heavy fine sandy loam in texture but is gravelly silt loam or gravelly loam in places. It contains 18 to 28 percent clay. The B horizon ranges in hue from 5YR where these soils are associated with Ontario soils to 2.5Y where they are associated with Lansing soils. The B horizon ranges in reaction from slightly acid to mildly alkaline. It becomes weakly calcareous in places.

Appleton soils are the somewhat poorly drained member of a drainage sequence that includes the well drained Honeoye, Ontario, and Lansing soils, the moderately well drained Lima and Conesus soils, and the poorly drained Lyons soil. Alden, till substratum, is the very poorly drained associate. Appleton soils have a higher content of lime than Erie soils and lack a fragipan. They have a coarser textured B horizon and lower content of clay than Darien soils, which contain 28 to 35 percent clay.

Appleton gravelly silt loam, 0 to 3 percent slopes (AoA).—This soil has a profile that resembles the one described as typical for the series, but it commonly has a darker colored surface layer and a higher content of gravel. It is associated with the Lansing and Conesus soils at elevations of less than 1,400 feet in the southern third of the county, where it occurs in level, narrow drainageways and in broad, nearly level areas. This soil receives runoff from adjacent higher lying areas.

Included in mapping are spots of poorly drained Lyons soils in shallow depressions and drainageways that make up as much as 10 percent of some areas. Also included are small areas of moderately well drained Conesus soils on slight rises or knolls, which do not materially affect use.

This soil is suited to crops, pasture, and forests. If it is not drained, spring planting is delayed and its use is limited to short-season annual crops or to water-tolerant forage crops. If this soil is adequately drained, it is well suited to a variety of crops, including vegetables.

This soil is commonly deficient in nitrogen in spring, but the supply may be adequate for most crops by midsummer. Only a few areas need lime. (Capability unit IIIw-2; woodland suitability group 4)

Appleton gravelly silt loam, 3 to 8 percent slopes (AoB).—This soil has a profile that resembles the one described as typical for the series, but it has a higher content of gravel. The slopes are generally less than 5 percent. This soil is associated with Lansing and Conesus soils at elevations below 1,400 feet in the southern third of the county. It receives runoff from adjacent higher lying soils.

Included in mapping are moderately well drained Conesus soils that occur on small knolls and make up as much as 15 percent of some areas. The smallest areas of Conesus soils are along drainageways passing through fields dominated by better drained soils; along some drainageways are areas of these soils that commonly consist of nearly stone-free deposits of silt loam or fine sandy loam eroded from higher areas. Conesus soils have little effect on use and management.

This soil is suited to crops, pasture, and forest. If it is not drained, spring planting is delayed and its use is limited to short-season annual crops or to water-tolerant forage crops. If this soil is adequately drained, it is highly productive for a variety of crops.

The removal of excess water is the main need in management. Erosion is a moderate hazard. Potassium-supplying power is high, and phosphorus-supplying power is moderate. Application of nitrogen is important early in spring. Only a few areas need lime. (Capability unit IIIw–9; woodland suitability group 4)

Appleton silt loam, 0 to 3 percent slopes (ApA).—This soil is associated with Honeoye and Lima soils in broad areas in the central part of the county, and with Ontario soils in long, narrow, slightly concave areas between the drumlins in the area north of the Seneca River. In a few places, mostly north of the Seneca River, this soil is underlain at a depth of 3 to 5 feet by water-deposited materials. It receives runoff from adjacent higher lying areas.

Included in mapping are small areas of poorly drained Lyons soils in shallow depressions and drainageways. These are wetter soils that make up as much as 10 percent of some areas and commonly delay tillage in spring and field operations during wet periods. Also included are spots of better drained Lima soils on slight rises, which do not materially affect use.

This soil is suited to crops, pasture, and forest. If it is not drained, planting is commonly delayed in spring and it is limited to short-season annual crops or to water-tolerant forage crops. If this soil is adequately drained, it is suited to a wide variety of crops, including vegetables.

The removal of excess water is the main need in management. In some areas wetness can be reduced by diverting runoff from adjacent slopes. The supply of nitrogen is commonly deficient in spring but may be adequate for most crops by midsummer. The supply of phosphorus is moderate, and the supply of potassium is high. Only a few areas need lime. (Capability unit IIIw–2; woodland suitability group 4)

Appleton silt loam, 3 to 8 percent slopes (ApB).—This soil has the profile described as typical for the series. It occurs in large, broad areas or in long, narrow areas along drainageways passing through fields dominated by better drained soils.

Included in mapping are areas of Lima soils on small knolls. Lima soils make up as much as 15 percent of some areas but have little or no effect on use. Also included are small areas that have a surface layer of fine sandy loam.

This soil is suited to crops, pasture, and forest. Unless the soil is drained, spring planting is delayed and use is limited to short-season annual crops or to water-tolerant forage crops. Use of simple practices to remove excess water improves this soil significantly and makes it well suited to many crops, including vegetables.

The removal of excess water is the main need in management. Many of the larger areas can be improved by diversion of runoff from adjacent, higher areas. Because of the slope, erosion is a moderate hazard The supply of phosphorus is medium. The supply of potassium is high. Application of nitrogen is necessary early in spring. Only a few areas need lime. (Capability unit IIIw–9; woodland suitability group 4)

Arkport Series

The Arkport series consists of well-drained to excessively drained sandy soils that have thin bands with a distinct increase in content of clay in the upper 4 to 5 feet. These soils occur mainly in the northwestern part of Seneca County.

In a cultivated area, a typical profile has a dark-brown to brown loamy fine sand plow layer about 9 inches thick. The subsurface layer consists of leached, yellowish-red loamy fine sand that extends to a depth of about 18 inches. The subsoil consists of layers of reddish-brown to light-brown loamy fine sand separated by thin, reddish-brown bands of friable or very friable fine sandy loam. Reaction of the subsoil ranges from slightly acid to neutral. Depth to the calcareous substratum is about 59 inches. The substratum consists of loose, white and brown sand that has a salt-and-pepper appearance and extends to a depth of about 73 inches. This is underlain by gravelly strata that are cemented with lime at a depth of more than 84 inches.

Typical profile of Arkport loamy fine sand, 1 to 6 percent slopes (cultivated):

Ap—0 to 9 inches, dark-brown (7.5YR 4/2) to brown (7.5YR 4/4) loamy fine sand; weak, medium to coarse, granular structure in upper half, changing to weak, medium and coarse, subangular blocky structure in lower half; loose; numerous, fine and medium roots; neutral; abrupt, wavy boundary.

A2—9 to 18 inches, yellowish-red (5YR 5/6) loamy fine sand; single grain to very weak, medium and coarse, subangular blocky structure; loose; numerous, fine and medium roots; slightly acid; abrupt, wavy boundary.

B21t—18 to 19 inches, reddish-brown (2.5YR to 5YR 4/4) fine sandy loam; common, fine clay bridges between sand grains; weak, medium, subangular blocky structure; very friable; numerous, fine and medium roots; slightly acid; abrupt, wavy boundary.

B22—19 to 28 inches, reddish-brown (5YR 5/4) to light reddish-brown (5YR 6/4) loamy fine sand; single grain to very weak, medium and coarse, blocky structure; loose; common, fine and medium roots; slightly acid; abrupt, wavy boundary.

B23t—28 to 33 inches, reddish-brown (2.5YR 4/4 to 5YR 4/4) fine sandy loam; common, fine clay bridges between sand grains; weak, medium and coarse, blocky structure; friable to very friable; common, fine and medium roots; medium acid; clear, wavy boundary.

B24—33 to 45 inches, light-brown (7.5YR 6/4) to brown (7.5YR 5/4) loamy fine sand; weak, medium and coarse, subangular blocky structure; loose to very friable; few, fine and medium roots; slightly acid; abrupt, wavy boundary.

B25t—45 to 46 inches, reddish-brown (5YR 4/4 to 5/4) fine sandy loam; common clay bridges between sand grains; weak, medium, subangular blocky structure; very friable; few, fine and medium roots; medium acid; abrupt, wavy boundary.

B26—46 to 59 inches, brown (7.5YR 5/4) loamy fine sand; single grain to weak, medium and coarse, subangular blocky structure; loose to very friable; few, fine roots; neutral; clear, wavy boundary.

C—59 to 100 inches, white (N 8/0) and dark-brown (7.5YR 3/2) sand with a salt-and-pepper appearance; very few, fine roots; calcareous; loose; sand stratified with gravel at depth of 73 inches; gravel becomes lime cemented at depth of about 84 inches.

Hue in the solum ranges from 10YR to 2.5YR. Texture of the A horizon ranges from fine sandy loam to loamy fine sand. The loamy fine sand commonly includes as much as 50 percent very fine sand.

The silt and clay content of the B horizon is very low, and the clay content of the included bands is as low as 5 percent in the coarsest extreme of the range. Clay content of the bands is as much as 10 percent in places, and there are a few, thin, sandy clay bands. The very fine sandy loam in the bands in places includes as much as 50 percent by volume of very fine sand. Individual bands range in thickness from ½ to 6 inches, and all the bands in the banded zone are a total of 6 to 15 inches in thickness.

Reaction of the Ap horizon ranges from strongly acid to neutral; at a depth of 40 inches, reaction is strongly acid in some places, and in the other places the soil is moderately alkaline and calcareous. These soils are calcareous everywhere at a depth of 8 feet.

Arkport soils are the well-drained or excessively drained member of a drainage sequence that includes the poorly drained and very poorly drained Lamson soils. Arkport soils commonly occur on landscapes with the moderately well drained Elnora and Claverack soils and the somewhat poorly drained Stafford and Cosad soils. Arkport soils are also associated with Dunkirk soils, but Dunkirk soils have thicker B horizons instead of bands, and a higher silt and clay content.

Arkport loamy fine sand, 1 to 6 percent slopes (ArB).—This gently sloping and undulating soil has the profile described as typical for the series. It shows little erosion by water, but soil blowing is common, as is indicated by many small blowout spots.

Included in mapping are the moderately well drained Claverack or Elnora soils in depressions. These are wetter soils that make up as much as 10 percent of some areas, and they are important because they delay field operations in spring. Cosad or Stafford soils occur in occasional wet spots. Also included are loamy fine sands that resemble Arkport soils but lack the bands of fine sandy loam that are typical of the subsoil of Arkport soils; these are more droughty soils, and they make up as much as 15 percent of some areas. Other inclusions are Dunkirk and Collamer soils in small, silty spots and Palmyra soils in gravelly areas.

This soil is well suited to crops or forest. It is not well suited to use as pasture because forage production is low as a result of low available moisture capacity and droughtiness. This soil can be plowed early, and with adequate liming, fertilization, and irrigation, it is well adapted to early truck and market garden crops. This soil is also well suited to the land smoothing required to develop the uniform slopes needed for intensively managed garden crops grown for market.

Soil blowing is a hazard on this soil. The supply of nitrogen is inadequate. The supply of phosphorus and potassium is low. (Capability unit IIe–2; woodland suitability group 5)

Arkport loamy fine sand, 6 to 12 percent slopes (ArC).—This is mainly a rolling soil, and only a few small areas are sloping. Included in mapping are loamy fine sands that lack the fine sandy loam bands in the subsoil that are typical for this Arkport soil; these are more droughty soils that make up as much as 25 percent of some areas. Also included are a few small areas of Arkport soils that have a fine sandy loam surface layer. Common inclusions are small spots of the siltier Dunkirk soils or the gravelly Palmyra soils.

This soil is suited to crops and forest but is considered too droughty for high production of forage crops. It can be plowed early and is therefore best suited to market garden crops; because of its slope, however, this soil is somewhat difficult to work.

Fertilization and liming are the main needs in management. The supply of nitrogen is inadequate, and the supply of phosphorus and potassium is low. This soil is subject to both soil blowing and erosion. (Capability unit IVe–10; woodland suitability group 5)

Arkport loamy fine sand, 12 to 20 percent slopes (ArD).—This is a strongly sloping or rolling soil that generally occurs in small areas in association with the more nearly level Arkport soils. Included in mapping are loamy fine sands that lack the fine sandy loam bands in the subsoil that are typical for this soil. These are more droughty soils that make up as much as 30 percent of some areas. Also included in some areas are small spots of gravelly Palmyra soils and of Arkport soils having slopes of 20 to 30 percent.

This soil is best suited to woodland. It is too droughty for high production of forage crops, and without extensive land smoothing, the slopes are too steep and irregular for market garden crops.

The hazards of soil blowing and water erosion are severe. The supply of nitrogen is inadequate, and the supply of phosphorus and potassium is low. (Capability unit IVe–10; woodland suitability group 5)

Arnot Series

The Arnot series consists of shallow, acid, moderately well drained and well drained soils that formed in semiresidual material or in glacial till derived from local underlying sandstone or brittle shale bedrock. These soils occur on the highest hilltops and crests and are not extensive in the county.

In a formerly cultivated area, a typical profile has a dark grayish-brown channery silt loam surface layer about 7 inches thick. The subsoil is friable, yellowish-brown to light-olive brown channery silt loam. Depth to gray sandstone bedrock is about 17 inches. A few mottles are in the subsoil, just above the bedrock. The surface layer and subsoil are strongly acid.

Typical profile of Arnot channery silt loam, 15 to 25 percent slopes (formerly cultivated):

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) channery silt loam; brown (10YR 4/3) when rubbed; weak to moderate, fine and medium, granular structure; friable; many, fine and medium roots; strongly acid; abrupt, smooth boundary.

B2—7 to 17 inches, yellowish-brown (10YR 5/4) to light olive-brown (2.5Y 5/4) channery silt loam; few, fine and medium, distinct, yellowish-brown (10YR 5/6) and strong-brown (7.5YR 5/6) mottles in the lower 2 inches; weak, very fine, fine and medium, subangular blocky structure; friable; nonsticky; strongly acid; many, fine and medium roots; abrupt, wavy boundary.

R—17 to 40 inches +, gray to very dark gray, acid, fine-grained sandstone bedrock; strata ¼ to ½ inch thick in upper part, gradually increasing to 1 to 2 inches in the lower part. Surfaces of strata in upper part are slightly weathered and coated with thin smears of silt from the overlying horizon.

Thickness of the solum ranges from 10 to 20 inches, which corresponds with depth to bedrock. The A1 or Ap horizon ranges in color from dark grayish brown to dark brown. Texture ranges from silt loam to loam with a content of flat angular fragments of 10 to 50 percent.

The B2 horizon ranges in hue from 7.5YR to 5Y, value from 4 to 6, and chroma from 3 to 6. High-chroma mottles occur in places in a 2- to 3-inch zone above the bedrock. Reaction is strongly acid to very strongly acid. Content of angular, flat, stone fragments ranges from 10 to 50 percent. Underlying bedrock is acid, gray, fine-grained sandstone or brittle shale.

Arnot soils are most commonly associated with the deeper Langford and Erie soils. Arnot soils are more acid than Farmington soils, which are shallow to limestone bedrock.

Arnot channery silt loam, 15 to 25 percent slopes (AuD).—This soil is on the highest hills in the southern part of the county. Slopes are mainly moderately steep, but small more gently sloping as well as more steeply sloping areas are included. Depth to sandstone bedrock is mainly 10 to 20 inches, but there are deeper pockets that commonly contain Langford and Erie soils, and shallower areas where rock outcrops are common.

This soil is limited by depth to bedrock and by slope. Runoff is rapid, and the erosion hazard is severe, especially in cleared areas. Cleared areas are generally idle, and many areas are slowly reverting to woodland. Very little of this soil is used for hay or pasture. Pasture growth is very sparse by midsummer.

A moderate to large amount of lime is needed if legumes are grown. The supply of phosphorus and potassium is moderate. (Capability unit VIe-2; woodland suitability group 8b)

Aurora Series

The Aurora series consists of moderately well drained and well drained, loamy soils that developed in glacial till. These soils are underlain at a depth of 20 to 40 inches by dark-gray to black, neutral to moderately alkaline and calcareous, silty shale interbedded with occasional layers of fine-grained sandstone.

In a cultivated area, a typical profile has a dark grayish-brown silt loam surface layer about 8 inches thick. The thin subsurface layer is leached, brown, friable silt loam that extends to a depth of about 13 inches. The subsoil is dark-brown to very dark grayish-brown, firm silty clay loam in the upper part; it has a few mottles and contains a noticeable amount of shale chips. At a depth of more than about 25 inches, the subsoil is firm, mottled, shaly silty clay loam or shaly silt loam that has variegated dark grayish-brown, brown, light olive-brown and olive-brown colors. Reaction of the subsoil is neutral. Depth to thinly bedded, black to very dark gray silty shale bedrock is 32 inches. The bedrock is mildly alkaline and may be weakly calcareous.

Typical profile of Aurora silt loam, 3 to 8 percent slopes (cultivated):

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; dark gray (10YR 4/1) when rubbed; moderate, medium and coarse, granular structure; friable; nonsticky; many, fine roots; common worm channels; few partially weathered shale fragments, very few fragments larger than 3 inches in diameter; neutral; abrupt, smooth boundary.

A2—8 to 13 inches, brown (10YR 5/3) silt loam with slightly darker brown (10YR 4/3) faces; moderate, fine and medium, subangular blocky structure; friable; nonsticky; common, fine roots; common worm channels; few partially weathered shale fragments; very few, coarse fragments larger than 3 inches in diameter; slightly acid; clear, irregular boundary.

B2—13 to 25 inches, dark-brown (10YR 3/3) to very dark grayish-brown (10YR 3/2) light silty clay loam; dark brown (10YR 3/3) when rubbed; brown (10YR 5/3) silt coats on peds in the upper 2 to 3 inches; few, medium, distinct, yellowish-brown (10YR 5/4 and 5/6) and grayish-brown (10YR 5/2) mottles; moderate, medium and coarse, blocky and subangular blocky structure; firm; slightly sticky; common, fine roots along ped faces; few roots in ped interiors; few root channels; thin, continuous clay coats on ped faces and in pores in lower part; 10 to 15 percent shale fragments; neutral; clear, wavy boundary.

B3—25 to 32 inches, variegated, dark grayish-brown (2.5Y 4/2 and 10YR 4/2), brown (10YR 4/3), light olive-brown (2.5Y 5/4), and olive-brown (2.5Y 4/4), shaly light silty clay loam to heavy silt loam; few, medium, distinct, yellowish-brown (10YR 5/6) and light grayish-brown (10YR 5/2) mottles; moderate, fine and medium, angular and subangular blocky structure; firm; slightly sticky; few, fine roots; patchy, thin clay coats on ped faces; neutral; clear, wavy boundary.

R—32 to 40 inches +, black (10YR 2/1) to dark-gray (10YR 4/1) silty shale bedrock; thin bedded; upper 12 to 18 inches partially weathered; mildly alkaline and weakly calcareous.

The solum ranges in thickness from 20 to 40 inches, which generally corresponds with depth to bedrock. Content of coarse fragments that are dominantly soft shale, but include sandstone and limestone, ranges from about 5 to 30 percent in the solum and generally increases with depth. Hue of the solum is mainly 10YR but ranges from 5YR to 5Y.

The Ap horizon is dominantly dark grayish brown (10YR 4/2) but ranges in value from 3 to 4 and in chroma from 1 to 3; the darkest colors are associated with a high content of black shale. Texture of this horizon is commonly silt loam but ranges from loam to light silty clay loam. Content of shale fragments is generally minor but may be high in local, very shaly areas. Color of the A2 horizon is typically brown (10YR 5/3) or grayish brown (10YR 5/2) but ranges in value from 5 to 6 and in chroma from 2 to 3. The A2 horizon is generally unmottled, but a few faint mottles are present in places. Reaction of the A horizon ranges from strongly acid to neutral where unlimed.

The B horizon is mainly dark brown (10YR 4/3 and 3/3) and olive brown (2.5Y 4/4). Hue ranges from 5YR, for soils that are influenced by red sandstone and shale, to 5Y, for soils that are influenced by olive or black shale. Value ranges from 3 to 5 and chroma from 2 to 4. There may be faint or no mottling in the upper part of the B horizon, but at a depth of more than 15 inches, distinct grayish-brown and yellowish-brown mottles are present. Texture of the B horizon ranges from heavy silt loam to light silty clay loam. Clay content ranges from 18 to 35 percent. Thin, discontinuous clay coats are present on both vertical and horizontal ped faces and are commonly dark grayish brown (10YR 4/2). Reaction ranges from medium acid to neutral.

The C horizon, where present, is similar to the B3 horizon but differs in having a weak platy structure and a higher percentage of coarse fragments. It is neutral to mildly alkaline and is calcareous in places. Bedrock ranges from soft, slightly acid to moderately alkaline and calcareous shale to hard limestone. The shale bedrock is commonly interbedded with thin strata of neutral to mildly alkaline, fine-grained sandstone. A neutral to mildly alkaline and weakly calcareous C horizon is present in places at a depth of more than 23 inches.

Aurora soils are the moderately well drained and well drained member of a drainage sequence that includes the somewhat poorly drained Angola soils and the poorly drained Varick soils. Aurora soils are deeper to bedrock than Farmington soils, are derived mainly from shale instead of limestone, and have a darker gray and generally finer textured B horizon. Aurora soils are shallower to bedrock than the similar Danley soils.

Aurora silt loam, 3 to 8 percent slopes (AwB).—This soil has the profile described as typical for the series. It occurs on convex slopes that receive little or no runoff from higher areas. Included in mapping are spots of somewhat poorly drained Angola soils in depressions and along drainageway bottoms, which make up as much as 15 percent of some areas. Also included where the soil is more than 40 inches deep to bedrock are spots of Cazenovia, Danley, and Lima soils.

This Aurora soil is suited to crops, pasture, and forest. It is used mostly for corn, small grains, hay, and vegetables. Removal of excess water and control of erosion are the main needs in management. This soil is capable of moderate to high production if adequately limed and fertilized. Lime requirements range from none to moderate. The supply of nitrogen is inadequate in spring. The supply of phosphorus is moderate, and the supply of potassium is moderate to high. (Capability unit IIe–7; woodland suitability group 2a)

Aurora silt loam, 8 to 15 percent slopes (AwC).—This soil has a profile that resembles the one described as typical for the series, but it generally lacks mottles in the upper part of the subsoil. It has convex slopes that in places receive a moderate amount of runoff from higher adjacent areas. The smaller areas of this soil are commonly long and narrow and have short slopes.

Included in mapping, where the soil is more than 40 inches deep to bedrock, are small areas of Cazenovia, Danley, and Lima soils. Small areas of shallow soils, where depth to bedrock is less than 20 inches, are also included. Rock outcrops commonly mark these shallow areas.

This soil is suited to crops, pasture, and forest. Much of it is used for corn, small grains, hay, and vegetable crops.

Control of erosion and runoff are the main needs in management. Runoff is moderate to rapid. Cleared and farmed areas are moderately to severely eroded. Occasional gullies are eroded into the bedrock. Spots of shallow soil can hinder the use of machinery.

Need for lime ranges from none to moderate. The supply of nitrogen and phosphorus is moderate. The supply of potassium is moderate to high. (Capability unit IIIe–5; woodland suitability group 2a)

Aurora silt loam, 15 to 25 percent slopes (AwD).—This soil has a profile that resembles the one described as typical for the series, but it lacks mottles in the upper part of the subsoil. More than half of the acreage mapped has been cleared and cultivated. Most of these cleared areas are severely eroded and have lost 6 to 12 inches of soil over 75 percent or more of individual areas. In the most severely eroded areas, gullies commonly extend into the underlying shale bedrock.

Included in mapping are small areas of shallow soils where depth to bedrock is less than 20 inches. Small spots of the deeper Cazenovia, Danley, or Honeoye soils are included where this Aurora soil is more than 40 inches deep to bedrock.

Most areas of this soil are best suited to hay crops, pasture, or forest. Both hay and pasture require fertilization for even moderate production of crops. Lime requirements range from none to moderate. The supply of phosphorus is moderate, and the supply of potassium is moderate to high.

This soil is more droughty than the less sloping Aurora soils. Runoff is high during heavy rains. Although it is possible to cultivate this soil, tillage operations are difficult and hazardous on the moderately steep slopes. (Capability unit IVe–8; woodland suitability group 2b)

Aurora and Farmington soils, 25 to 75 percent slopes (AzF).—This undifferentiated unit is made up of steep and commonly very rocky Aurora and Farmington soils. They are similar to the soils described as typical for their respective series, but they are very steep and very rocky. Either or both of these soils can occur in any given area. These soils commonly occur in deep gorges that have been cut back by small streams emptying into Cayuga and Seneca Lakes and on rocky bluffs along the lakes.

Exposures of bedrock are common inclusions in this mapping unit. These exposures consist primarily of soft, lime-bearing shale with interbedded layers of limestone that occur in gorges. Also included are small pockets of the deeper Cazenovia, Lansing, Danley, and Honeoye soils.

The soils of this unit have limited suitability for forest, for wildlife habitat, and for recreational uses. Forests are extensive and tree growth is good where these soils are deep, but they are inextensive and growth is poor where there is little or no soil. (Capability unit VIIs–1; woodland suitability group 8c)

Canandaigua Series

The Canandaigua series consists of poorly drained, medium-textured soils that formed in lacustrine deposits of calcareous silt and very fine sand. These are level or depressional soils on the lake plains.

In a cultivated area, a typical profile has a very dark-gray to black silt loam plow layer about 9 inches thick. The subsurface layer is light-gray, mottled silt loam that extends to a depth of about 12 inches. The upper part of the subsoil consists of friable, light brownish-gray, mottled silt loam. The lower part of the subsoil, at a depth of 19 inches, is a layer of light-brown, mottled, friable light silt loam. Depth to the calcareous substratum of stratified silt loam and very fine sandy loam is about 27 inches. The subsoil is neutral in the upper part and weakly calcareous in the lower part.

Typical profile of Canandaigua silt loam (cultivated):

Ap—0 to 9 inches, very dark gray (10YR 3/1) to black (10YR 2/1) silt loam; moderate, fine and medium, subangular blocky structure; many, fine roots; neutral; abrupt, smooth boundary.

A2g—9 to 12 inches, light-gray (10YR 7/2) light silt loam; many, medium, distinct, yellowish-brown (10YR 5/6) and strong-brown (7.5YR 5/6) mottles; moderate, fine, subangular blocky structure within weak, very coarse prisms; light-gray (2.5Y 7/2) silt coats on ped surfaces; very friable; many, fine roots; neutral; clear, irregular boundary.

B2g—12 to 19 inches, light brownish-gray (10YR 6/2) silt loam; many, medium, faint, light-gray (10YR 7/2) mottles, and distinct, strong-brown (7.5YR 5/6) mottles; moderate, fine and medium, subangular blocky structure within weak, very coarse prisms; prisms have light-gray (10YR 7/2) silty coats; friable; few, fine and medium roots; neutral; clear, wavy boundary.

B3—19 to 27 inches, light-brown (7.5YR 6/4) light silt loam; common, medium, distinct, light-gray (10YR 7/2) and strong-brown (7.5YR 5/6) mottles; moderate, medium and thick, platy structure within weak, very coarse prisms; prisms have light-gray (10YR 7/2) silty coats; friable; few, fine and medium roots; weakly calcareous; gradual, irregular boundary.

C—27 to 43 inches +, light-brown (7.5YR 6/4) strata of silt loam and very fine sandy loam; common, medium, distinct, strong-brown (7.5YR 5/8), reddish-yellow (7.5YR 6/6), and light-gray (10YR 7/1) mottles; matrix color fades to pinkish gray (7.5YR 6/2) with depth; moderate, thin, medium and thick, platy structure varies with the thickness of the strata; few, fine roots; strongly calcareous.

Thickness of the solum ranges from 20 to 24 inches. Depth to carbonates ranges from 18 to 48 inches. Texture of the A horizon is dominantly silt loam but includes very fine sandy loam or, in a few places, loam. Some undisturbed areas have a black to dark-gray A1 horizon that is very high in organic-matter content and is as much as 6 inches thick. Reaction ranges from slightly acid to neutral.

The B horizon ranges in texture from silt loam or very fine sandy loam to light silty clay loam; it has a clay content of 18 to 35 percent. The B horizon has a weak, prismatic structure. In the B2g horizon, the structure within the prisms ranges from moderate, angular blocky, where the clay content is higher, to weak, subangular blocky, where the clay content is lower. In the B3 horizon, the structure is platy ranging from thin to moderate. Reaction ranges from slightly acid to moderately alkaline. The B3 horizon is weakly calcareous in places.

The strata of the C horizon are extremely variable in texture; they include very fine sand, silt, and occasional thinner layers of clay.

Canandaigua soils are poorly drained members of a drainage sequence that includes the well drained Dunkirk soils, the moderately well drained Collamer soils, the somewhat poorly drained Niagara soils, and the very poorly drained Alden soils. Canandaigua soils are similar in drainage to Lamson, Lakemont, and Madalin soils, all of which also developed in lacustrine deposits. Canandaigua soils have a higher clay content than the more sandy Lamson soils, but they contain less clay than the Lakemont and Madalin soils.

Canandaigua silt loam (Ca).—This soil is generally level or nearly level and occurs in low areas where only a few slopes are more than 2 percent. Included in mapping are small areas of somewhat poorly drained Niagara soils on slight rises or on knolls, which make up as much as 15 percent of some areas. Although better drained than the Canandaigua soil, these Niagara soils have little effect on use and management. Also included are small areas of very poorly drained Alden soils in small depressions and drainageways. This Canandaigua soil receives runoff from the associated better drained Collamer and Dunkirk soils that are in adjacent higher lying areas.

This soil is suited to most crops commonly grown in the county if it is adequately drained and fertilized. If undrained, this soil cannot be used for crops other than hay. It can be used for pasture, which produces well during the drier months in summer.

Wetness is the main limitation to farming this soil. Drainage of this soil may be difficult because the sandy layers tend to flow into ditches and lines. The content of nitrogen in this soil is high, but it is only slowly available in spring. The supply of phosphorus and potassium is moderate. Only a few areas need lime. (Capability unit IIIw-7; woodland suitability group 9)

Cazenovia Series

The Cazenovia series consists of moderately well drained and well drained, medium-textured and moderately fine textured soils that formed in glacial till having a high content of clayey shale and in calcareous glacial till in which a deposit of lacustrine clay has been incorporated. The thickness of the lacustrine clay is about 12 inches. The clay and the underlying till subsequently have been mixed and reworked to a depth of 24 to 30 inches by frost action, by the uprooting of trees, and by the burrowing of animals.

Cazenovia soils occur mainly along Cayuga and Seneca Lakes, where they overlie till similar to that which underlies Honeoye soils. As distance from the lakes increases, and with the gradual increase in elevation, these soils intergrade to the lighter textured Honeoye soils. North of the Seneca River, scattered areas of Cazenovia soils occur with lighter textured Ontario soils and overlie till similar to that which underlies Ontario soils. In this area the Cazenovia are gently sloping to rolling soils between the long, narrow, drumloidal hills occupied by Ontario soils.

In a cultivated area, a typical profile has a brown to dark-brown silt loam plow layer about 8 inches thick. The upper part of the subsoil consists of firm, reddish-brown heavy loam that extends to a depth of about 13 inches, where it is underlain by firm layers of reddish-brown and light reddish-brown silty clay loam. The lower part of the subsoil, beginning at a depth of about 25 inches, is reddish-brown to brown and dark-brown, firm gravelly silty clay loam that has a few, faint mottles. The reaction of the subsoil ranges from medium acid to neutral. The calcareous till substratum, beginning at a depth of about 31 inches, is distinctly mottled, grayish-brown to dark grayish-brown, very firm gravelly heavy silt loam.

Typical profile of Cazenovia silt loam, 3 to 8 percent slopes (cultivated):

Ap—0 to 8 inches, brown to dark-brown (7.5YR 4/2) silt loam; moderate, fine and medium, subangular blocky structure; slightly firm; slightly sticky; many, fine and medium roots; neutral; abrupt, smooth boundary.

IIB&A2—8 to 13 inches, reddish-brown (5YR 5/3 to 4/3) heavy loam; moderate, medium, subangular blocky structure parting to very weak, medium and thin plates; brown (10YR 5/3) silt coats up to one-fourth inch thick on peds decrease in thickness with depth; slightly firm; slightly sticky; many, fine and some medium roots; slightly acid; clear, wavy boundary.

IIB21t—13 to 20 inches, reddish-brown (5YR 4/3) light silty clay loam; strong, fine and medium, blocky structure; thin clay films on ped surfaces; firm; common, fine roots along ped faces; common, medium pores lined with clay; medium acid; gradual, wavy boundary.

IIB22t—20 to 25 inches, light reddish-brown (5YR 6/3) light silty clay loam; moderate, coarse and medium, blocky structure; reddish-brown (5YR 4/3 to 5/3) clay films on ped faces; firm to very firm; common, fine roots along ped faces; common, medium pores lined with clay; medium acid; clear, wavy boundary.

IIB23t—25 to 31 inches, reddish-brown (5YR 4/3) to brown and dark-brown (7.5YR 4/4) gravelly silty clay loam; few, fine, faint, light brownish-gray and brown mottles; moderate, medium and coarse, blocky structure; thin clay films on ped surfaces; firm; few, fine roots along ped faces; few, fine and medium pores lined with clay; neutral; abrupt, wavy boundary.

IIIC—31 to 40 inches +, grayish-brown (10YR 5/2) to dark grayish-brown (10YR 4/2) gravelly heavy silt loam; common, medium, distinct, light brownish-gray (10YR 6/2), yellowish-brown (10YR 5/6), and light yellowish-brown (2.5Y 6/4) mottles; moderate, medium, platy structure; very firm; strongly calcareous.

The texture of the A horizon in uneroded areas ranges from fine sandy loam to light silty clay loam or light clay loam. In most areas of Cazenovia soils, however, the A horizon is dominantly silt loam. Scattered gravel commonly occurs but seldom in such quantity that the A horizon should be designated gravelly silt loam. Reaction ranges from medium acid to neutral where unlimed.

The B horizon ranges in hue from 2.5YR to 10YR but is mainly 5YR and 7.5YR. Texture of this horizon ranges from light silty clay loam to light clay loam or sandy clay loam; clay content ranges from 28 to 35 percent. Reaction ranges from medium acid to mildly alkaline.

Texture of the C horizon in most places ranges from gravelly loam to gravelly clay loam. In a few places it is shaly to very shaly. Reaction of the C horizon is moderately alkaline to mildly alkaline. It is strongly calcareous to weakly calcareous.

Cazenovia soils are the well drained and moderately well drained members of a drainage sequence that includes the somewhat poorly drained Ovid soils, the poorly drained Romulus soils, and soils of the very poorly drained Alden series, till substratum. Cazenovia soils are redder and have a heavier textured B horizon than the Honeoye soils. They also have a heavier textured B horizon than the Lima and Ontario soils and are redder in most places. Cazenovia soils have a lighter textured B horizon than the Schoharie soils that formed in red lacustrine clay, and they are redder than the Danley soils.

Cazenovia silt loam, 3 to 8 percent slopes (CeB).—This soil has the profile described as typical for the series. This is a gently sloping to undulating soil that receives little or no runoff from adjacent higher areas. Included in mapping are small areas of somewhat poorly drained Ovid soils and poorly drained Romulus soils in depressions and drainageways. These small areas make up less than 10 percent of any given area, but they interfere with tillage of entire fields.

This soil is suited to crops, pasture, and forest. Most of it is used for corn, small grains, and forage crops grown in support of dairying. It can be used for some vegetable crops. Most of this soil is at elevations of less than 800 feet, which favors crops requiring a longer growing season.

This soil is susceptible to erosion. Maintenance of organic-matter content is important because the structure of the plow layer is easily destroyed. Many areas can be substantially improved by draining the included wet spots.

Need for lime ranges from none to moderate. The supply of nitrogen and phosphorus is moderate, and the supply of potassium is high. (Capability unit IIe–7; woodland suitability group 2a)

Cazenovia silt loam, 3 to 8 percent slopes, eroded (CeB3).—This soil has a profile that resembles the one described as typical for the series, but erosion has removed so much of the original surface layer that some subsoil material has been mixed into the plow layer. The surface layer of this soil is mainly heavy silt loam. In the more severely eroded spots, however, the surface layer is silty clay loam.

Included in mapping are a few small areas where there has been little or no erosion. Also included are small, wet areas of the somewhat poorly drained Ovid soils and the poorly drained Romulus soils in depressions and along drainageways, as well as small areas of Honeoye, Schoharie, Odessa, Ontario, Danley, and Aurora soils.

This soil is suited to crops, pasture, and forest. It is better suited to hay and forage crops than to row crops because the plow layer is in poor tilth; also, this soil is subject to moderate runoff and to the continued hazard of erosion. If this soil is used for row crops, intensive management is needed to control runoff, reduce erosion, maintain fertility, and keep good soil structure. In places the shallow drainageways need improvement to eliminate wet spots. Among the available plant nutrients, the supply of nitrogen, particularly, is deficient. (Capability unit IIIe—6; woodland suitability group 2a)

Cazenovia silt loam, 8 to 15 percent slopes (CeC).—This soil is near the crest of hills or on distinctly convex slopes where water does not accumulate. Included in mapping are small areas of somewhat poorly drained Ovid soils and poorly drained Romulus soils on the more gentle slopes or in seepy spots. Also included are small areas of associated Honeoye, Schoharie, Ontario, Danley, and Aurora soils.

This soil is suited to crops, pasture, and forest. Most of it is forested or in pasture. Runoff is moderately rapid, and erosion is a severe hazard if this soil is used intensively for row crops without taking measures to control runoff.

The supply of phosphorus is moderate, and the supply of potassium is high. The supply of nitrogen commonly is deficient in spring but may be adequate for moderate productivity later in the season. Need for lime ranges from none to moderate. (Capability unit IIIe-5; woodland suitability group 2a)

Cazenovia silt loam, 8 to 15 percent slopes, eroded (CeC3).—This soil has a profile that resembles the one described as typical for the series, but erosion has removed so much of the original surface layer that some of the more clayey subsoil has been mixed into the plow layer during tillage. The surface layer of this soil is heavy silt loam, but where erosion has been severe, it is silty clay loam.

Included in mapping are a few small areas that have undergone little or no erosion. Also included, in occasional small depressions and along small drainageways, are deposits of eroded soil material that overlie Ovid and Romulus soils, both of which are wet. Other inclusions are spots of Honeoye, Schoharie, Ontario, Danley, and Aurora soils.

This soil can be used for crops, pasture, and forest. It is better suited to hay and pasture than to row crops because the plow layer is in poor tilth. This soil is subject to moderately rapid runoff and to a continuing hazard of erosion. The moderately rapid runoff also results in the loss of water needed for crops.

This soil needs intensive management to control runoff, reduce erosion, and improve fertility and tilth. If this soil is used frequently for row crops, special measures to control water are needed. The shallow drainageways that cross some areas need application of practices to eliminate wet spots. A complete fertilizer is necessary for even moderate productivity. The supply of nitrogen, in particular, is inadequate. (Capability unit IVe–9; woodland suitability group 2a)

Cazenovia soils, 15 to 25 percent slopes (ChD).—These soils have a profile that resembles the one described as typical for the series, but they lack mottling in the lower part of the subsoil. They generally are well drained. These soils occur mainly on valley sides that are dissected by closely spaced drainageways. Only a few areas are on fairly large, smooth slopes. Areas that have been cropped are severely eroded, but those still in forest have had little or no erosion.

Included in mapping are small areas of Aurora soils that occur where shale bedrock is close to the surface. These shallow soils make up as much as 15 percent of some areas bordering Seneca and Cayuga Lakes. Also included are small areas of Honeoye, Danley, Ontario, and Ovid soils that are too small to be mapped separately.

The soils of this unit are poorly suited to most crops, but they can be used for pasture, hay, or forest. A complete fertilizer is necessary to obtain even moderate production of hay or pasture. Little or no lime is needed. (Capability unit IVe–8; woodland suitability group 2b)

Cazenovia soils, 25 to 40 percent slopes (ChE).—These soils have a profile that resembles the one described as typical for the series, but they lack mottling in the lower part of the subsoil and have only faint mottling in the substratum. These are well-drained soils on the steep sides of valleys and on dissected landforms. Degree of erosion ranges from none to severe. Included in mapping are small areas of the steep Danley, Aurora, and Honeoye soils.

The soils of this unit are limited mainly by slope, which precludes their use other than for forests, as recreational areas, and for wildlife habitat. Rapid runoff results in a lack of moisture, which limits plant growth. Fertility is moderate. Little or no lime is needed. (Capability unit VIe–1; woodland suitability group 2b)

Claverack Series

The Claverack series consists of moderately deep, moderately well drained soils made up of loamy fine sand, generally deposited by water and wind. This is underlain by highly calcareous, heavy lacustrine clay or silty clay that restricts internal drainage.

In a cultivated area, a typical profile has a very dark grayish-brown loamy fine sand plow layer about 8 inches thick. The upper part of the subsoil is yellowish-brown to strong-brown loamy fine sand that is loose to very friable. Between depths of about 13 inches and 22 inches, the subsoil is yellowish-brown, loose to very friable loamy fine sand that has a few mottles. The lower part of the subsoil is pale-brown loamy fine sand that has common mottles. Reaction of the surface layer and subsoil is neutral. Depth to the very firm, calcareous, reddish-brown silty clay substratum is about 32 inches. The substratum has common, strong-brown and gray mottles and light-gray, calcareous, silt coats on platy structural faces.

Typical profile of Claverack loamy fine sand, 0 to 2 percent slopes (cultivated):

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) loamy fine sand; dark brown (10YR 3/3) when rubbed and dark grayish brown (10YR 4/2) when dry; single grain to very weak, fine, granular structure; loose to very friable; neutral; many, fine roots; abrupt, wavy boundary.

B21—8 to 13 inches, yellowish-brown (10YR 5/6) to strong-brown (7.5YR 5/6) loamy fine sand; yellow (10YR 7/6) to reddish yellow (7.5YR 7/6) when dry; few, fine, yellowish-red to red iron concretions with dark reddish-brown centers; single grain to very weak, fine, subangular blocky structure; loose to very friable; neutral; many, fine roots; clear, wavy boundary.

B22—13 to 22 inches, yellowish-brown (10YR 5/4) loamy fine sand; very pale brown (10YR 7/4) when dry; few, fine and medium, distinct, strong-brown (7.5YR 5/6) mottles; common, medium and coarse, yellowish-red and red iron concretions with reddish-brown centers; some black manganese concretions in centers of hardest cores; single grain to very weak, fine and medium, subangular blocky structure; loose to very friable; neutral; common, fine roots; gradual, wavy boundary.

B3—22 to 32 inches, pale-brown (10YR 6/3) loamy fine sand; common, medium, distinct, strong-brown (7.5YR 5/6), yellowish-brown (10YR 5/6), and light-gray (10YR 7/2) mottles; few, fine and medium, yellowish-red to red iron concretions, decreasing in size and number with depth; single grain to weak, medium, blocky structure within weak, platy structure; loose to very friable; neutral; few, fine roots; abrupt, wavy boundary.

IIC—32 to 40 inches +, reddish-brown (5YR 5/3 to 4/3) silty clay; common, medium, distinct, strong-brown (7.5YR 5/6) and gray (5YR 5/1) mottles; moderate, thick, platy structure; plate faces coated with light-gray (5YR 7/1) calcareous silt with few, medium, distinct, strong-brown (7.5YR 5/6) mottles; common, fine and medium, white lime nodules; few, fine and medium pores with thin, discontinuous clay films; very firm; sticky; few, fine roots in upper part; calcareous.

The solum ranges in thickness from 20 to 40 inches. Color of the A horizon ranges from very dark grayish brown to dark brown. Texture is loamy fine sand that commonly contains up to 50 percent very fine sand by volume. Reaction is medium acid to neutral.

The B horizon ranges in thickness from 10 to 30 inches. Color of the B21 horizon ranges from yellowish brown to strong brown, and occasionally to yellowish red. Color of the B3 horizon ranges from pale brown to brown or grayish brown. The B3 horizon is loamy fine sand in texture and commonly contains up to 50 percent very fine sand. The content of silt and clay is low. Reaction ranges from medium acid to neutral.

The IIC horizon ranges in texture from heavy silty clay loam to clay. Hue ranges from 2.5YR to 7.5YR with a chroma of 2 to 4 and a value of 3 to 5. At a depth of more than 40 inches, the texture is silty clay that is stratified with thin layers of silt and very fine sand. The IIC horizon is neutral to moderately alkaline in reaction, and in places it is calcareous.

Claverack soils are moderately well drained members of a drainage sequence that includes the somewhat poorly drained Cosad soils. Claverack soils commonly occur in association with the well drained to excessively drained Arkport soils and the moderately well drained Elnora soils. Claverack soils resemble Elnora soils but have an unconforming clay substratum at a depth of less than 40 inches.

Claverack loamy fine sand, 0 to 2 percent slopes (CkA).—This soil has the profile described as typical for the series. It occurs in areas that receive little or no runoff from adjacent areas. The underlying silty clay or clay causes the water table to be perched for long periods in spring.

Included in mapping are the somewhat poorly drained Cosad soils in slight depressions and in shallow drainageways, and of the poorly drained, more clayey Lakemont soils in areas where the sand is thin. The Lakemont and Cosad soils make up as much as 15 percent of some areas, and although of limited extent, they commonly delay work in spring or during wet periods. Also included are small areas of Arkport soils on slight rises or knolls, and of Elnora soils where the underlying clay is more than 40 inches deep. The Arkport and Elnora soils make up as much as 10 percent of some areas but have little or no effect on use or management.

This soil is well suited to crops, pasture, or forest. It is adapted to a variety of crops, particularly to vegetables. This soil responds well to heavy fertilization and supplemental irrigation where used for intensively managed vegetable crops.

Liming and fertilization are the main needs in management. The supply of nitrogen is inadequate, and the supply of phosphorus and potassium is low. This soil has a moderate hazard of soil blowing. Drainage is desirable for early crop production. The rounded fine sand flows readily when saturated with water and requires special measures to prevent plugging of ditches and tile drains. (Capability unit IIw–1; woodland suitability group 1a)

Claverack loamy fine sand, 2 to 6 percent slopes (CkB).—This soil occurs in smooth or very gently undulating areas, mainly where slopes are 2 to 4 percent. It receives some seepage or runoff from adjacent higher lying areas, which causes wetness for long periods in spring.

Included in mapping are spots of the somewhat poorly drained Cosad soils in slight depressions or along drainageways, and of poorly drained Lakemont soils where the sand is thin. Cosad and Lakemont soils make up as much as 10 percent of some areas, and although of limited extent, they commonly interfere with fieldwork early in spring. Also included are small areas of Arkport soils on slight rises and knolls, and of Elnora soils where depth to the underlying clay is more than 40 inches. Schoharie and Odessa soils are minor inclusions that occur in occasional deeper and more sloping drainageways where the underlying clay stratum is exposed.

This soil is well suited to crops, pasture, or forest. It is adapted to a wide variety of crops, particularly to vegetables. This soil responds well to use of heavy fertilization and supplemental irrigation for intensively managed vegetable crops.

Liming and fertilization are the main needs in management. The supply of nitrogen is inadequate, and the supply of phosphorus and potassium is low. The hazards of soil blowing and water erosion are moderate. Drainage of wet spots and interception of seepage are desirable for early crop production. The rounded fine sand flows readily when saturated and requires use of special measures to prevent plugging of ditches and tile drains. (Capability unit IIw–5; woodland suitability group 1a)

Collamer Series

The Collamer series consists of moderately well drained, medium-textured soils that formed in lacustrine deposits of alkaline or calcareous silt or very fine sand that is high in content of silt. These are nearly level to moderately sloping soils on the lake plain in the northern part of the county. The largest acreage is south of the Seneca River and extends from Seneca Lake to the vicinity of Waterloo.

In a cultivated area, a typical profile has a very dark grayish-brown to dark-brown silt loam surface layer about 9 inches thick. The subsurface layer is leached, mottled, light-brown, friable silt loam that extends to a depth of about 14 inches. The subsoil to a depth of about 22 inches is reddish-brown, firm to friable, distinctly mottled sandy clay loam to light silty clay loam. Below this, the subsoil is distinctly mottled, brown to dark-brown light silt loam that is firm in place and friable when removed. Reaction of the subsoil is medium acid in the upper part, becoming neutral as depth increases.

Typical profile of Collamer silt loam, 0 to 2 percent slopes (cultivated):

Ap1—0 to 3 inches, very dark grayish-brown (10YR 3/2) to dark-brown (10YR 3/3) silt loam; dark brown (10YR 3/3) when crushed and rubbed; moderate, very fine and fine, granular structure; friable; neutral; many, fine roots; clear, wavy boundary.

Ap2—3 to 9 inches, dark-brown (10YR 3/3) silt loam; slightly less brown (10YR 4/3 to 3/3) when crushed and rubbed; moderate, very fine, fine, and medium, granular structure; friable; slightly acid; many, fine roots; clear, wavy boundary.

A2—9 to 14 inches, light-brown (7.5YR 6/3) silt loam; few, fine, distinct, strong-brown (7.5YR 5/6) mottles; moderate, very thin and thin, platy structure, parting to weak, very fine, granular structure; friable; medium acid; many, fine roots; abrupt, wavy boundary.

B&A—14 to 16 inches, light reddish-brown (5YR 6/3) light silty clay loam; common, medium and coarse, distinct, yellowish-red (5YR 5/6) and strong-brown (7.5YR 5/6) mottles; moderate, platy structure parting to weak, fine and medium, subangular blocky structure; thin, pinkish-gray (7.5YR 6/2 to 5YR 6/2) silt coats on ped faces; friable to firm; medium acid; common, fine roots; clear, wavy boundary.

B2t—16 to 22 inches, reddish-brown (5YR 5/3) light sandy clay loam to light silty clay loam; common, medium and large, distinct, yellowish-red (5YR 5/6) and strong-brown (7.5YR 5/6 to 5/8) mottles, and a few, fine, distinct, light-gray (5YR 7/1) mottles; moderately thick and very thick, platy structure, parting to weak to moderate, fine to medium, angular blocky structure; slightly firm to friable; slightly sticky; distinct, light reddish-brown (5YR 6/3) to reddish-brown (5YR 5/3) clay films on ped faces and in pores; few, fine roots; medium acid; clear, wavy boundary.

B3—22 to 42 inches, brown (7.5YR 5/4) to dark-brown (7.5YR 4/4) light silt loam; common, medium, distinct, light-gray (7.5YR 7/1), strong-brown (7.5YR 5/6 and 5/8), and yellowish-red (5YR 5/6 and 5/8) mottles; massive to weak, coarse, blocky structure; friable; firm in place; neutral; few, fine roots.

Texture of the A horizon is dominantly silt loam but ranges to very fine sandy loam. Texture of the B horizon ranges from heavy very fine sandy loam to light silty clay loam, and clay content ranges from 18 to 35 percent.

Reaction of the A horizon ranges from strongly acid to mildly alkaline. At a depth of about 36 inches, the soil is slightly acid to mildly alkaline in places.

Collamer soils are the moderately well drained member of a drainage sequence that includes the well drained Dunkirk soils, the somewhat poorly drained Niagara soils, the poorly drained Canandaigua soils, and very poorly drained Alden soils. Collamer soils are coarser textured than Schoharie soils and finer textured than Elnora and Claverack soils of similar drainage. Collamer soils resemble Collamer silt loam, moderately shallow variant, in the upper part, but Collamer silt loam, moderately shallow variant, is underlain by silty clay or clay at a depth of 20 to 40 inches.

Collamer silt loam, 0 to 2 percent slopes (ClA).—This soil has the profile described as typical for the series. It receives little or no runoff from adjacent higher lying areas.

Included in mapping are small areas of somewhat poorly drained Niagara soils and spots of poorly drained Canandaigua soils in shallow depressions and along narrow drainageways. These wetter soils occupy as much as 15 percent of some areas, and although of limited extent, they commonly delay tillage in spring. Also included are small areas of well-drained Dunkirk soils on small knolls.

Collamer silt loam, 0 to 2 percent slopes, is well suited to crops, pasture, or forest. Many areas are used intensively for row crops, and nearly all crops common to the county can be grown on this soil.

Maintenance of fertility and structure of the surface layer are important needs in management. Drainage of the included wetter soils is desirable to improve some areas. Need for lime ranges from none to moderate. The supply of nitrogen is deficient in spring, and the supply of phosphorus and potassium is moderate. Erosion generally is not a hazard on this nearly level soil. (Capability unit IIw–1; woodland suitability group 1a)

Collamer silt loam, 2 to 6 percent slopes (ClB).—This is a gently undulating soil that receives little or no runoff from higher, adjacent areas. Shallow drainageways commonly occur on it at close intervals.

Included in mapping are small areas of somewhat poorly drained Niagara soils and poorly drained Canandaigua soils in shallow depressions and narrow drainageways. These are wetter soils that make up as much as 15 percent of some areas, and although limited in size, they commonly delay tillage in spring. Also included are the well-drained Dunkirk soils on small knolls, which comprise 10 percent of some areas.

This soil is well suited to crops, pasture, and forest. Nearly all crops commonly grown in the county can be grown on it, and many areas are used intensively for row crops.

Maintenance of fertility and structure of the surface layer are important needs in management. Erosion is a hazard, even on the more gentle slopes. Drainage of the included wetter soils may be needed to improve some areas.

Need for lime ranges from none to moderate. The supply of nitrogen is inadequate. The supply of available phosphorus and potassium is moderate. (Capability unit IIe–4; woodland suitability group 1a)

Collamer silt loam, 6 to 12 percent slopes (ClC).—This soil is slightly better drained than other Collamer soils. It occurs mainly on short, irregular side slopes below areas of less sloping Collamer soils. Degree of erosion ranges from none to severe.

Included with this soil in mapping are spots of the well-drained Dunkirk soils on small knolls and of the somewhat poorly drained Niagara soils and the poorly drained Canandaigua soils in narrow, interfingering drainageways.

This soil is suited to crops, pasture, or forest. It is best suited to long-term hay and forage crops. This soil is highly erodible, and erosion control is very difficult. Special practices to control erosion are necessary if row crops are grown.

Need for lime ranges from none to moderate. The supply of nitrogen is inadequate. The supply of available phosphorus and potassium is moderate. Adequate fertilization is needed for good growth of hay and forage crops. (Capability unit IIIe–4; woodland suitability group 1a)

Collamer Series, Moderately Shallow Variant

The Collamer series, moderately shallow variant, consists of moderately well drained, medium-textured soils that formed in deposits of alkaline or calcareous silt or very fine sand 20 to 40 inches thick over calcareous lacustrine silty clay and clay. These are nearly level or gently sloping soils on the lake plain in the northern part of the county. They are closely associated with the normal Collamer soils where the silty deposits are deeper.

In a cultivated area, a typical profile has a very dark grayish-brown to dark-brown silt loam surface layer about 9 inches thick. The subsurface layer is leached, mottled, light yellowish-brown to light-brown, friable silt loam to very fine sandy loam that extends to a depth of about 14 inches. The subsoil is firm, mottled, reddish-brown heavy silt loam to light silty clay loam that is medium acid. At a depth of more than about 24 inches, the subsoil is friable to firm, mottled heavy silt loam that is slightly acid. Depth to the reddish-brown, firm to very firm silty clay substratum is about 27 inches. In the upper part, the substratum has a few mottles and is neutral in reaction. At a depth of more than about 31 inches, it is calcareous and contains thin layers of brown silt.

Typical profile of Collamer silt loam, moderately shallow variant, 2 to 6 percent slopes (cultivated):

Ap—0 to 9 inches, very dark grayish-brown (10YR 3/2) to dark-brown (10YR 3/3) silt loam; dark brown (10YR 3/3) when crushed and rubbed; moderate, very fine, fine and medium, granular structure; friable; many, fine and medium roots; neutral; abrupt, smooth boundary.

A2—9 to 14 inches, light-brown (7.5YR 6/4) to light yellowish-brown (10YR 6/4) silt loam to very fine sandy loam; few, fine, distinct, yellowish-brown (10YR 5/6) and strong-brown (7.5YR 5/6) mottles; weak, fine and medium, subangular blocky structure within very weak, platy structure; friable; many, fine and medium roots; medium acid; clear, wavy boundary.

B&A—14 to 16 inches, light reddish-brown (5YR 6/3) heavy silt loam to light silty clay loam; common, medium, distinct, yellowish-red (5YR 5/6) and strong-brown (7.5YR 5/6) mottles; few, fine, distinct, light-gray (5YR 7/1) mottles; moderate, coarse, subangular blocky structure; slightly firm; slightly sticky; peds surrounded by light yellowish-brown (10YR 6/4) to light-brown (7.5YR 6/4), friable light silt loam coats up to one-fourth inch thick; many, fine and medium roots; medium acid; clear, wavy boundary.

B2t—16 to 24 inches, reddish-brown (5YR 4/3) heavy silt loam to light silty clay loam; common, medium, distinct, yellowish-red (5YR 5/6) and strong-brown (7.5YR 5/6) mottles, and few, fine, distinct, light gray (5YR 7/1) mottles; moderate to strong, medium, angular blocky structure within moderate, platy structure; slightly firm; slightly sticky; distinct, continuous clay coats on ped faces; prominent clay films in common, medium pores and in a few, large pores; common, fine roots; medium acid; clear, wavy boundary.

B3t—24 to 27 inches, brown (7.5YR 4/4 to 5/4) heavy silt loam; common, medium, distinct, strong-brown (7.5YR 5/6 and 5/8), yellowish-red (5YR 5/6 and

5/8), and light-gray (7.5YR 7/1) mottles; weak, medium to coarse, angular blocky structure within moderate, platy structure; friable to slightly firm; slightly sticky; distinct clay coats on plate faces and in pores; common, fine roots; slightly acid; abrupt, smooth boundary.

IIC1—27 to 31 inches, reddish-brown (5YR 4/3 and 4/4) silty clay; few, fine, distinct, strong-brown (7.5YR 5/6) and light-gray (5YR 6/1) mottles; strong, medium and coarse, blocky structure within moderate, platy structure within strong, coarse prisms; firm to very firm; sticky and plastic; silt coats on vertical ped faces; clay films in pores; few, fine roots along ped faces; neutral; clear, wavy boundary.

IIC2—31 to 48 inches +, reddish-brown (5YR 4/3) silty clay strata separated by thin, brown (7.5YR 5/4) silt varves; clay has moderate, medium and coarse, angular blocky structure within coarse prisms; firm to very firm; sticky and plastic; lime coats on vertical ped faces; common, white lime nodules; few, fine roots along ped faces; calcareous.

Depth of the solum ranges from 24 to 36 inches. Depth to the unconforming silty clay and clay substratum ranges from 20 to 40 inches. The Ap horizon ranges in hue from 7.5YR to 10YR, in value from 3 to 5, and in chroma from 2 to 4. Reaction is medium acid to neutral.

The B horizon is heavy silt loam to heavy sandy clay loam in texture and has a clay content of 18 to 35 percent. The color ranges in hue from 5YR to 10YR, in value from 4 to 6 and in chroma from 3 to 4. Depth to mottling ranges from 12 to 18 inches. Reaction is medium acid to mildly alkaline.

The IIC horizon ranges in texture from silty clay to clay. Color ranges in hue from 2.5YR to 7.5YR, value from 3 to 5, and chroma from 3 to 4. The horizon is neutral to moderately alkaline and may be calcareous.

Collamer soils, moderately shallow variant, are associated on the lake plain with the finer textured Schoharie soils and the more sandy Elnora and Claverack soils, all of which are similarly drained. They resemble the normal Collamer soils but are underlain by silty clay or clay at a depth of 20 to 40 inches.

Collamer silt loam, moderately shallow variant, 0 to 2 percent slopes (CoA).—This soil occurs on the flat tops of undulating areas and is closely associated with the more sloping Collamer soils. Included in mapping are spots of the wetter, finer textured Odessa and Lakemont soils in drainageways and small depressions. Also included are a few small spots of Collamer soils with a very fine sandy loam surface layer and of the better drained Dunkirk soils on knolls where silty deposits are more than 40 inches deep over clay.

This soil is well suited to crops, pasture, and forest. Many areas are used intensively for row crops. This soil has high production potential.

Keeping the soil in good tilth is an important need in management. Drainage of wet spots is commonly desirable. This soil crusts easily if mismanaged. Need for lime ranges from none to moderate. The supply of nitrogen, phosphorus, and potassium is moderate. (Capability unit IIw–1; woodland suitability group 1a)

Collamer silt loam, moderately shallow variant, 2 to 6 percent slopes (CoB).—This soil has the profile described as typical for the series. It is gently undulating, but includes some small, nearly level spots. Erosion has exposed the underlying clay in places on a few steep slopes.

Included in mapping are spots of the wetter, heavier textured Odessa and Lakemont soils in narrow drainageways and in depressions. Although of limited extent, these soils commonly delay tillage in spring. Also included are a few small spots of Dunkirk soils and, more commonly, the normal Collamer soils on knolls where deeper silty deposits occur. Schoharie soils also occur in a few spots where silt is less than 20 inches deep.

This soil is well suited to crops, pasture, and forest. It is suited to nearly all crops commonly grown in the county. Many areas are used intensively for intertilled crops. This soil has high production potential.

Maintenance of good soil structure is an important need in management. This soil crusts easily if mismanaged. Erosion is a hazard even on the more gentle slopes. Seepage along the top of the underlying clay is a problem in spring. Interception of seepage and drainage of wet spots are needed in most areas.

The amount of lime needed ranges from none to moderate. The supply of nitrogen, phosphorus, and potassium is moderate. (Capability unit IIe–4; woodland suitability group 1a)

Conesus Series

The Conesus series consists of moderately well drained, medium-textured soils that formed in moderately calcareous glacial till. The till is derived mainly from calcareous gray shale, fine-grained gray sandstone, and a small amount of limestone. These soils are in the uplands south of Ovid in the southern part of the county, generally at an elevation of 900 to 1,400 feet.

In a cultivated area, a typical profile has a dark grayish-brown gravelly silt loam surface layer about 9 inches thick. The next layer consists of partly leached, pale-brown and brown, firm gravelly silt loam that has common to many mottles. The subsoil, at a depth of about 19 inches, is firm gravelly silt loam. The upper part of the subsoil is brown to olive brown and has yellowish-brown mottles. The lower part is olive brown and has light olive-brown and grayish-brown mottles. The reaction of the subsoil is medium acid to slightly acid. The substratum, at a depth of 36 inches, is grayish-brown, very firm gravelly loam that has yellowish-brown mottles and is calcareous.

Typical profile of Conesus gravelly silt loam, 3 to 8 percent slopes (cultivated):

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) gravelly silt loam; weak, medium and fine, granular structure; friable; slightly plastic; many, fine roots; 20 percent gravel and small angular stones; slightly acid where limed; abrupt, smooth boundary.

A&B—9 to 14 inches, pale-brown (10YR 6/3) gravelly silt loam; common, fine, faint, light yellowish-brown (10YR 6/4) mottles, and distinct, yellowish-brown (10YR 5/4) mottles; weak, thin, platy structure within weak, medium, blocky structure; slightly firm; slightly plastic; common, fine roots; many fine pores; ped interiors constituting 5 to 40 percent of the mass are brown (10YR 5/3), are slightly more plastic, and have common, fine, yellowish-brown (10YR 5/4) mottles; 15 percent gravel and rock fragments; medium acid; gradual, wavy boundary.

B&A—14 to 19 inches, brown (10YR 5/3) gravelly silt loam; many, medium and fine, faint, yellowish-brown (10YR 5/4 to 5/6) mottles; moderate, medium, subangular blocky structure; firm; slightly plastic; few, fine roots; many, fine pores; 20 percent coarse fragments; ped exteriors have 1/8 inch thick coatings of pale-brown (10YR 6/3) silt and very fine sand, which grade to thin films at bottom; few pores with clay films; strongly acid; gradual, wavy boundary.

B21t—19 to 25 inches, brown (10YR 5/3) to olive-brown (2.5YR 4/4) gravelly silt loam; many, fine and medium, distinct, yellowish-brown (10YR 5/4 to 5/6) mottles; strong, medium, subangular blocky structure; firm; plastic; few, fine roots; common, fine pores; 5 to 20 percent of ped faces and all pores have thin clay films; 20 percent coarse fragments; medium acid; diffuse boundary.

B22t—25 to 36 inches, olive-brown (2.5Y 4/4) gravelly silt loam; common, medium and fine, faint, light olive-brown (2.5Y 5/4 to 5/6) mottles, and common, fine, faint, grayish-brown (2.5Y 5/2) mottles; strong, coarse, subangular blocky structure; firm; plastic; no roots; common, fine pores; dark grayish-brown (2.5Y 4/2) to grayish-brown (2.5Y 5/3) clay films on 15 to 30 percent of ped faces and in all pores; 25 percent coarse fragments; slightly acid; clear, wavy boundary.

C—36 to 42 inches +, grayish-brown (2.5Y 5/2) gravelly loam; many, medium, distinct, yellowish-brown (10YR 5/4) mottles; moderate, thick, lenslike, overlapping plates; very firm; slightly plastic; few pores; 25 to 35 percent gravel, fragments, and stones; calcareous.

The solum ranges in thickness from 30 to 45 inches. Depth to carbonates ranges from 30 to 50 inches. The A horizon is commonly gravelly or channery silt loam, but in places it is free of coarse fragments. The content of coarse fragments increases with depth, and in the C horizon it is 20 to 35 percent by volume. The Ap horizon ranges in color from grayish brown to dark grayish brown. Reaction ranges from strongly acid to neutral, depending on the extent of liming.

The A&B and the B&A horizons collectively extend to a depth of 16 to 24 inches, and the proportion of A horizon material relative to B horizon material decreases with depth. Within this zone the colors are mainly yellowish brown, pale brown, and brown. These horizons are faintly mottled in places. Texture is gravelly loam or gravelly silt loam, and structure is weak to moderate, fine to medium, blocky.

The B horizon ranges in color from yellowish brown to olive and contains faint to distinct mottles. Texture ranges from gravelly heavy loam to gravelly silt loam. Reaction ranges from strongly acid to slightly acid in the upper part to slightly acid or neutral in the lower part.

The C horizon is mottled, olive-gray to grayish-brown gravelly loam to gravelly silt loam. It has platy structure but may be massive. Consistence is firm to very firm. The C horizon is weakly to strongly calcareous.

Conesus soils are the moderately well drained member of a drainage sequence that includes the well drained Lansing soils, the somewhat poorly drained Appleton soils, the poorly drained Lyons soils, and the very poorly drained Alden soils, till substratum. Conesus soils lack the yellowish-brown color of the B horizon and the distinct fragipan characteristic of similarly drained Langford soils. They have a higher proportion of coarse fragments of fine-grained sandstone in the solum and contain less clay and a lower proportion of shale fragments than similar Danley soils.

Conesus gravelly silt loam, 0 to 3 percent slopes (CsA).—This soil has a profile that resembles the one described as typical for the series, but it generally has a darker surface layer and a more strongly mottled subsoil. It receives little or no runoff from adjacent areas.

Included in mapping are small areas of somewhat poorly drained Appleton soils in shallow depressions and in drainageways. These wetter soils make up as much as 15 percent of some areas and may interfere with fieldwork early in spring. Also included are small areas of well-drained Lansing soils on slight knolls.

This soil is well suited to crops, pasture, and forest. It can be used for most crops commonly grown in the county, including vegetables. Many areas are used intensively for row crops. This is potentially one of the most productive soils in the county.

Maintenance of fertility and soil structure and correction of acidity are important needs in management. Erosion is not a serious hazard. Drainage of the included Appleton soils will improve most areas. The supply of phosphorus is moderate, and the supply of potassium is moderate to high. (Capability unit IIw-4; woodland suitability group 1a)

Conesus gravelly silt loam, 3 to 8 percent slopes (CsB).—This soil has the profile described as typical for the series. It occurs mainly on short, slightly convex to long, smooth slopes of 3 to 5 percent. The larger areas of this soil are commonly on broad hilltops. The smaller areas generally are adjacent to the higher lying, more strongly sloping Lansing soils. Runoff is slight to moderate. Some runoff is received from adjacent areas.

Included in mapping are small areas of well-drained Lansing soils on knolls. Lansing soils make up as much as 10 percent of some areas but have little effect on use and management of entire fields. Many areas of this soil are crossed by long, narrow depressions or drainageways. Narrow strips of somewhat poorly drained Appleton soils occur in these depressions and make up as much as 5 percent of some areas. Although of minor extent, these wetter soils delay tillage in spring. Other inclusions are the poorly drained Lyons and Alden soils in occasional wet spots or depressions.

This soil is well suited to crops, pasture, or forest. Much of it is used for row crops. It is well suited to most crops commonly grown in the county, including vegetables.

Seasonal wetness, moderately slow and slow permeability, and gravel are the main limitations to farming this soil. Maintenance of fertility and control of acidity are important needs in management. Erosion is a moderate hazard. Drainage of wet spots will improve many areas. This is one of the more productive soils in the county, and response to management is high. (Capability unit IIe-3; woodland suitability group 1a)

Cosad Series

The Cosad series consists of medium acid to neutral loamy fine sand that is 18 to 40 inches deep over calcareous silty clay. These are somewhat poorly drained soils that occur on the lake plain in the northern part of the county.

In a cultivated area, a typical profile has a plow layer of very dark brown loamy fine sand about 9 inches thick. The subsoil is mottled, very friable, pale-brown and brown loamy fine sand. Reaction of the subsoil is slightly acid to neutral. Depth to the calcareous silty clay substratum is about 30 inches. The substratum is reddish brown, has distinct mottles, and has thin, gray, calcareous silt coats on plate faces.

Typical profile of Cosad loamy fine sand (cultivated):

Ap—0 to 9 inches, very dark brown (10YR 2/2) loamy fine sand; grayish brown (10YR 5/2) when dry; weak to moderate, medium and coarse, granular structure; very friable; many roots; medium acid; abrupt, wavy boundary.

B21—9 to 12 inches, pale-brown (10YR 6/3) loamy fine sand; common, coarse, distinct, yellowish-brown (10YR 5/6) mottles, and common, fine and medium, light-gray (10YR 7/2) and very pale brown (10YR 7/3) mottles; very weak, medium and thick, platy structure, parting to single grain; very friable; few roots; slightly acid; clear, wavy boundary.

B22—12 to 30 inches, brown (7.5YR 5/4 to 5/2) loamy fine sand; common, fine and medium, distinct, strong-brown (7.5YR 5/6) mottles; common, fine and medium, light-gray (10YR 7/2) and very pale brown (10YR 7/3), uncoated sand grains; very weak, very thick, platy structure, parting to single grain; very friable; few roots; neutral; abrupt, wavy boundary.

IIC—30 to 40 inches, reddish-brown (5YR 4/3) silty clay; common, medium, distinct, strong-brown (7.5YR 5/6) and gray (5YR 5/1) mottles; moderate, very thick, platy structure; plate faces coated with light-gray (5YR 7/1) calcareous silt with few, medium, distinct, strong-brown (7.5YR 5/6) mottles; few, fine and medium pores with thin, discontinuous clay films; very firm; sticky; few roots in upper part; calcareous.

The solum ranges in thickness from 18 to 34 inches, which closely corresponds with the depth of the sandy deposit. The Ap and A1 horizons are very dark gray to very dark brown where moist and range in texture from fine sandy loam to loamy fine sand. Reaction ranges from strongly acid to neutral.

The B horizon ranges in color from reddish brown to pale brown. Texture is commonly loamy fine sand, but layers of fine sand, very fine sand, and very fine sandy loam are present in places. Reaction ranges from strongly acid to neutral.

The IIC horizon ranges from heavy silty clay loam to clay. It is dominantly calcareous and has common lime nodules. In some places the upper 12 inches is noncalcareous and is neutral in reaction. The IIC horizon has platy structure but may be massive. At a depth of more than 40 inches, lamina of silt and very fine sand are common.

Cosad soils are the poorly drained member of a drainage sequence that includes the moderately well drained Claverack soils. The Cosad soils are associated with the deeper, sandy soils such as those of the Arkport and Stafford series. They are also associated with the soils that formed in the silty clay and clay that underlie the Cosad soils, such as those of the Lamson, Odessa, and Lakemont series.

Cosad loamy fine sand (Cu).—This soil has a surface layer that is very sandy in most places, but there are a few scattered spots of fine sandy loam. Included in mapping are small areas of the moderately well drained Claverack soils on slight rises. These better drained soils may occupy as much as 10 percent of some areas. Small areas of the poorly drained Lamson or Lakemont soils in depressions comprise as much as 5 percent of some areas. Small areas of somewhat poorly drained Stafford soils, which are deeper to the underlying silty clay, are also included.

This soil is suited to pasture or forest. It is too wet for most crops. When adequately drained, however, it is well suited to annual crops such as corn, dry beans, and many vegetables. When saturated, the rounded fine sand flows readily, and special measures are needed to prevent plugging of ditches and drains.

Need for lime ranges from none to moderate. The supply of phosphorus and potassium is low. Adequate and timely fertilization is needed. (Capability unit IIIw-2; woodland suitability group 7)

Danley Series

The Danley series consists of moderately well drained and well drained soils that formed in glacial till derived from local, alkaline and calcareous, dark-gray and black silty shale and a small quantity of limestone. These soils occur mainly in the central part of the county on the upper parts and crests of gentle, concave slopes, where runoff is medium. They are mapped only in a complex with the Darien and Cazenovia soils. This complex is described under the Darien series.

In a cultivated area, a typical profile has a very dark grayish-brown heavy silt loam surface layer about 8 inches thick. The thin subsurface layer consists of leached, brown to light olive-brown, friable to firm heavy silt loam about 3 inches thick. The subsoil is firm, faintly mottled, dark-brown to olive-brown silty clay loam that contains a noticeable amount of weathered, dark-gray shale fragments. Reaction of the surface layer and subsoil is neutral. Depth to the calcareous till substratum is about 24 inches. The substratum consists of firm, distinctly mottled, dark grayish-brown gravelly heavy loam or silt loam that contains many shale fragments.

Typical profile of a Danley silt loam having slopes of 3 to 8 percent (cultivated):

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) heavy silt loam; dark brown (10YR 3/3) when rubbed and grayish brown (10YR 5/2) when dry; brown (10YR 5/3) when rubbed and dry; moderate, fine and medium, granular structure; hard when dry; friable when moist; nonsticky when wet; many, fine and medium roots; neutral; abrupt, smooth boundary.

A2—8 to 11 inches, brown (10YR 5/3) to light olive-brown (2.5Y 5/4) heavy silt loam; moderate, medium and coarse, subangular blocky structure; friable to firm; slightly sticky; many, fine and medium roots; neutral; clear, irregular boundary, with fingers ¼ to ½ inch across extending 1 to 2 inches into the underlying horizon.

B2t—11 to 24 inches, dark-brown (10YR 4/3) to olive-brown (2.5Y 4/4) light silty clay loam; few, fine, faint, dark yellowish-brown (10YR 4/4), light olive-brown (2.5Y 5/4), light yellowish-brown (2.5Y 6/4), and light brownish-gray (2.5Y 6/2) mottles; moderate to strong, medium and coarse, angular and subangular blocky structure, parting to moderate, fine, angular and subangular blocky structure; prominent, dark-brown (10YR 4/3) clay films on faces of medium and coarse peds; thin clay films on faces of fine peds; prominent clay films in pores; firm; slightly sticky; common, fine and medium roots; common, partially weathered, dark-gray shale fragments; neutral; gradual, wavy boundary.

IIC—24 to 48 inches +, dark grayish-brown (2.5Y 4/2) gravelly heavy loam or gravelly heavy silt loam; many shale fragments; common, fine, distinct, yellowish-brown (10YR 5/4 and 5/6) mottles; weak, thick and very thick, platy structure within weak, coarse prisms; discontinuous clay films in large pores in upper part; firm; slightly sticky; common, fine roots to depth of 40 inches; few roots at depth of more than 40 inches; calcareous.

Depth to shale bedrock is commonly 4 to 7 feet but in places is much greater or is as little as 40 inches. Depth to carbonates is 24 to 40 inches. The A1 and Ap horizons range from very dark gray to brown in color. Texture is silt loam to light silty clay loam, which is shaly or channery in a few places. The A2 horizon has been mixed into the Ap horizon by plowing in places. Reaction ranges from strongly acid to neutral.

The B horizon ranges in color from yellowish brown to olive. Mottles range from few to common and fine to medium. Texture is light silty clay loam to light clay loam, and the clay content is 28 to 35 percent. Content of coarse fragments is mainly less than 5 percent but ranges up to 20 percent. Reaction ranges from slightly acid to mildly alkaline.

Danley soils are the moderately well drained and well drained member of a drainage sequence that includes the somewhat poorly drained Darien soils and the poorly drained

Ilion soils and the very poorly drained Alden soils, till substratum. They resemble the moderately deep Aurora soils. Danley soils are finer textured than Lima, Hilton, and Conesus soils of similar drainage and lime content. Danley soils have grayer hues than do the reddish Cazenovia soils.

Darien Series

The Darien series consists of somewhat poorly drained soils that formed in glacial till derived mainly from local alkaline and calcareous, dark-gray and black silty shale and a small quantity of limestone. These are nearly level to gently sloping soils on uplands in the central part of the county.

In a typical profile, the plow layer is very dark grayish-brown silt loam about 9 inches thick. The thin subsurface layer is mottled, grayish-brown to brown silt loam. The subsoil is mottled, yellowish-brown silty clay loam that is dark grayish brown at a depth of more than about 18 inches. Reaction is neutral. At a depth of more than about 24 inches, the subsoil is calcareous, firm, mottled, dark grayish-brown gravelly silty clay loam. Depth to the calcareous till substratum is about 29 inches. The substratum consists of firm, dark grayish-brown gravelly and shaly silty clay loam or clay loam. It has a few mottles in the upper part, but these gradually disappear with depth.

Typical profile of Darien silt loam, 0 to 3 percent slopes (cultivated):

Ap—0 to 9 inches, very dark grayish-brown (10YR 3/2) silt loam; few, faint root mottles; weak, medium, granular structure; friable to firm when moist; slightly sticky when wet; medium acid; many, fine roots; abrupt, wavy boundary.

A2—9 to 10 inches, grayish-brown (10YR 5/2) to brown (10YR 5/3) silt loam; few, fine, distinct, yellowish-brown (10YR 5/6) and light olive-brown (2.5Y 5/4) mottles; moderate, thin and medium, platy structure, parting to moderate, fine, subangular blocky structure; friable to firm; medium acid; many, fine roots; broken, wavy boundary.

B21tg—10 to 18 inches, yellowish-brown (10YR 5/4 to 5/6) light silty clay loam; many, medium and coarse, prominent, grayish-brown (2.5Y 5/2) mottles, and faint, dark yellowish-brown (10YR 4/4) mottles; moderate, medium and coarse, angular and subangular blocky structure within moderate, coarse and very coarse prisms; faces of prisms and blocky peds have light, brownish-gray (2.5Y 6/2) to light-gray (2.5Y 7/2) silt coats and clay films; firm when moist; slightly sticky when wet; neutral; common, fine roots along ped faces; clear, wavy boundary.

B22tg—18 to 24 inches, dark grayish-brown (2.5Y 4/2) light silty clay loam; many, fine and medium, prominent, yellowish-brown (10YR 5/4 and 5/6) mottles; moderate, medium and coarse, angular and subangular blocky structure within moderate, coarse and very coarse prisms; faces of prisms and blocky peds have dark-gray (5Y 4/1) clay films; firm when moist; slightly sticky when wet; neutral; common, fine roots along ped faces; 5 to 10 percent pebbles and shale fragments; gradual, wavy boundary.

B3g—24 to 29 inches, dark grayish-brown (2.5YR 4/2) gravelly light silty clay loam; common, medium, distinct, light olive-brown (2.5Y 5/6), olive-yellow (2.5Y 6/8), and gray (10YR 5/1) mottles; massive to weak, coarse, prismatic structure, parting to weak, coarse, subangular blocky structure; patchy, dark grayish-brown (2.5Y 4/2) clay films on ped faces; firm when moist; slightly sticky when wet; calcareous; few, fine roots along ped faces; gradual, wavy boundary.

Cg—29 to 50 inches +, dark grayish-brown (2.5YR 4/2), gravelly and shaly light silty clay loam or clay loam till; few, fine, distinct, olive-brown (2.5Y 4/4), light olive-brown (2.5Y 5/6), olive-yellow (2.5Y 6/8), and gray (10YR 5/1) mottles, which become less numerous with depth; massive to weak, thick and very thick, platy structure; very few roots in upper part; 20 to 30 percent pebbles and shale fragments; calcareous.

Depth to shale bedrock ranges from 40 to 72 inches. Depth to carbonates ranges from 20 to 40 inches; at a depth of 36 inches, reaction is neutral to mildly alkaline.

The A horizon is commonly heavy silt loam in texture but ranges from silt loam to silty clay loam. Reaction ranges from strongly acid to neutral.

The B horizon is commonly silty clay loam in texture but ranges from light silty clay loam to silty clay containing 28 to 35 percent clay. Reaction ranges from slightly acid to mildly alkaline.

Darien soils are the somewhat poorly drained member of a drainage sequence that includes the moderately well drained to well drained Danley soils, the poorly drained Ilion soils, and the very poorly drained Alden soils, till substratum. They are closely associated with the moderately well drained to well drained Danley soils, the poorly drained Ilion soils, and the Angola soils; the Angola soils are a moderately deep analog of the Darien soils. Other similarly drained soils are the Ovid and Appleton soils. The Ovid soils have a reddish hue in contrast to the yellowish-brown to olive-brown hue of the Darien soils. The Appleton soils are lighter textured than the Darien soils.

Darien silt loam, 0 to 3 percent slopes (DaA).—This soil has the profile described as typical for the series. It is extensive on the broad uplands in the central part of the county.

Included in mapping are small areas of Ovid soils that occur where thin remnants of lake-deposited reddish clay overlie the shaly glacial till in which the Darien soil formed. Ovid soils make up as much as 20 percent of some mapped areas, and although extensive, they have little or no effect on use and management. Also included are spots of Ilion soils in slight depressions and along narrow, shallow drainageways. These soils make up as much as 10 percent of some areas. Although of limited extent, this wetter soil commonly delays tillage operations in spring. Angola soils make up as much as 5 percent of some areas where the underlying shale bedrock is less than 40 inches deep. Other inclusions in mapping are the Danley, Cazenovia, Appleton, Lima, and Alden soils.

This soil is suited to crops, pasture, or forest. Unless this soil is drained, planting is commonly delayed in spring, and harvesting of crops is very difficult when it is wet in fall. If adequately drained, this soil is suited to a variety of crops. Undrained areas can be used only for short-season crops or for moisture-tolerant forage crops. Some areas can be improved by draining the wettest spots.

This soil tends to be cloddy if plowed when wet. Drainage and maintenance of good structure and high organic-matter content are the main needs in management. There is little or no hazard of erosion. Need for lime ranges from none to moderate. The supply of nitrogen is deficient in spring but may be adequate later in the season. The supply of phosphorus is moderate, and the supply of potassium is moderate to high. (Capability unit IIIw-5; woodland suitability group 4)

Darien-Danley-Cazenovia silt loams, 3 to 8 percent slopes (DdB).—This complex consists of areas in which Darien, Danley, and Cazenovia soils are closely intermingled. The gently sloping Darien soil in this complex

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is generally a little better drained than the nearly level Darien soil described as having the profile typical for the series. The Danley soil and the Cazenovia soil have the profiles described as typical for their respective series.

The soils in this mapping unit are extensive on gently undulating and undulating uplands throughout the central part of the county. The somewhat poorly drained Darien soil typically is on concave slopes that have gradients of 3 to 5 percent and makes up about 35 percent of most areas. The moderately well drained Danley soil generally occurs on convex slopes and on the steeper parts of concave slopes, both of which have gradients of 4 to 8 percent. It makes up about 35 percent of most areas. The moderately well drained and well drained Cazenovia soil occurs mainly on knolls in small spots or areas 10 to 40 feet wide. This soil makes up about 20 percent of most areas.

Included in mapping are poorly drained Ilion soils in narrow, shallow drainageways and in depressions among the undulating slopes. Ilion soils make up as much as 10 percent of some areas.

The soils in this complex are suited to crops, pasture, and forest. Unless the Darien soil is drained, planting is commonly delayed in spring and harvesting of crops is very difficult. If adequately drained, areas of the soils in this unit are suited to most crops commonly grown in the county. Undrained areas are best suited to short-season crops or to moisture-tolerant forage crops. Most fields can be greatly improved by draining the wettest spots, but a complete drainage system is desirable.

These soils tend to be cloddy if plowed when wet. They must be carefully managed to maintain good soil structure and organic-matter content. They commonly have only a moderate hazard of erosion because the slope is gentle.

The need for lime ranges from none to moderate. The supply of nitrogen is deficient in spring but may be adequate later in the season. The supply of phosphorus is moderate, and the supply of potassium is moderate to high. (Capability unit IIIw-6; woodland suitability group 2a)

Dunkirk Series

The Dunkirk series consists of well-drained, medium-textured soils that formed in lacustrine deposits of calcareous silt and very fine sand in rolling or dissected areas on the lake plain. The largest area of these soils is south of the Seneca River, extending from Seneca Lake to the vicinity of Waterloo. Other areas occur on the lake plain in the northern part of the county.

In a cultivated area, a typical profile has a dark-brown to brown silt loam surface layer about 9 inches thick. The subsurface layer consists of leached, friable, light yellowish-brown to light-brown silt loam that extends to a depth of about 16 inches. The upper part of the subsoil is friable, reddish-brown heavy silt loam. At a depth of about 24 inches, the lower part of the subsoil consists of layers of reddish-brown silty clay loam separated by thinner layers of brown very fine sandy loam and silt loam. The subsoil is medium acid. Depth to the substratum is about 30 inches. It consists mainly of layers of brown silt loam and very fine sandy loam separated by thinner layers of reddish-brown silty clay loam. The substratum is medium acid in the upper part and is calcareous at a depth of 42 inches.

Typical profile of Dunkirk silt loam, 1 to 6 percent slopes (cultivated):

Ap—0 to 9 inches, dark-brown (10YR 3/3) to brown (10YR 4/3) silt loam; moderate, fine and very fine, subangular blocky structure, parting to weak, fine, granular structure; friable; slightly acid; many, fine roots; abrupt, smooth boundary.

A2—9 to 16 inches, light yellowish-brown (10YR 6/4) to light-brown (7.5YR 6/4) light silt loam; weak to moderate, medium, subangular blocky structure; friable; medium acid; many, fine roots; abrupt, irregular boundary.

B2t—16 to 24 inches, reddish-brown (5YR 4/3) heavy silt loam; moderate to strong platy structure, parting to weak, very fine to medium, angular and subangular blocky structure; friable; silt coats of A horizon material on ped faces in upper 2 to 4 inches, and below this, patchy clay films on ped faces and prominent clay films in pores; medium acid; common, fine roots; clear, wavy boundary.

B3—24 to 30 inches, reddish-brown (5YR 4/3) light silty clay loam in layers 1 to 2 inches thick and separated by ¼- to ½-inch layers of brown (7.5YR 5/4) very fine sandy loam and silt loam; moderate, thick, platy structure, parting to weak and very weak, subangular blocky structure; patchy clay films on ped surface and in pores; medium acid; common, fine roots; abrupt, wavy boundary.

C—30 to 48 inches +, brown (7.5YR 5/4) silt loam or very fine sandy loam in layers ½ inch to 3 inches thick; friable; weak, platy structure separated by layers ½ to 1½ inches thick of reddish-brown (5YR 4/3) silty clay loam with strong, thick, platy structure; firm; few, fine roots; medium acid at depth of 30 inches; calcareous at depth of 42 inches.

Thickness of the solum ranges from 20 to 40 inches. Free carbonates occur at a depth of more than 36 inches. Texture of the A horizon is dominantly silt loam but ranges to very fine sandy loam. Reaction of the A horizon is strongly acid to neutral.

The texture of the B horizon ranges from very fine sandy loam to silty clay loam. Clay content ranges from 18 to 35 percent. Reaction of the B horizon ranges from medium acid to mildly alkaline.

The Dunkirk soils are the well drained member of a drainage sequence that includes the moderately well drained Collamer soils, the somewhat poorly drained Niagara soils, the poorly drained Canandaigua soils, and the very poorly drained Alden soils. The Dunkirk soils are associated on the lake plain with the similarly drained Arkport and Schoharie soils. Dunkirk soils have a higher content of silt and clay than the Arkport soils and a lower content of clay than the Schoharie soils.

Dunkirk silt loam, 1 to 6 percent slopes (DuB).—This soil has the profile described as typical for the series. It commonly occurs in shallow drainageways or depressions, in undulating areas characterized by short, convex slopes, or in smooth areas with longer, convex slopes. This soil receives little or no runoff from adjacent areas.

Included in mapping are small spots of Collamer soils in shallow depressions and along irregular drainageways. These are moderately well drained soils that make up as much as 20 percent of some areas. Wetter Niagara and Canandaigua soils occur in occasional wet spots in the lower parts of depressions and drainageways. Occasional small spots of Schoharie and Arkport soils are also included.

This soil is well suited to pasture and forest. It is well suited to nearly all crops commonly grown in the county.

Most of the soil is cropped, and a high percentage is used intensively for row crops.

Control of erosion and maintenance of soil structure are the main needs in management. The silty surface layer flows freely when saturated, and erosion is a hazard even on short, very gentle slopes. Drainage of occasional wet spots will improve many areas. The supply of nitrogen, phosphorus, and potassium is moderate. Lime requirements range from none to moderate. (Capability unit IIe–6; woodland suitability group 1a)

Dunkirk silt loam, 6 to 12 percent slopes, eroded (DuC3).—This soil has a profile that resembles the one described as typical for the series, but because of erosion, the surface layer is browner or redder and the subsurface layer is thinner. This soil occurs mainly on side slopes of drainageways on the lake plain; most of the slopes are distinctly convex. This soil receives some runoff from adjacent, higher lying, less strongly sloping Dunkirk soils.

Included in mapping are small areas of Collamer soils in depressions and in drainageways, which comprise as much as 15 percent of some areas. Also included are spots that have little or no erosion and accumulation areas in depressions and along drainageways.

This soil is suited to crops, pasture, or forest. The complex slopes, moderate to rapid runoff, hazard of erosion, and the poor tilth in the plow layer make this soil better suited to hay and pasture than to other crops. Water control is needed if intertilled crops are grown.

The supply of phosphorus and potassium is moderate. The supply of nitrogen is inadequate. Lime requirements range from none to moderate. (Capability unit IVe–7; woodland suitability group 1a)

Dunkirk silt loam, 12 to 20 percent slopes (DuD).—Most of this soil is eroded. In most areas that have been cleared and cultivated, erosion has removed the original surface layer and some of the heavier subsoil is exposed. This soil generally occurs on short, complex slopes in strongly dissected areas.

Included in mapping are narrow areas of Collamer soils in drainageways and in depressions. Also included are a few small areas of steep Dunkirk soils.

This soil is suited to hay crops, pasture, or forest. It is highly erodible and droughty, since it loses much water by runoff. Lime requirements range from none to moderate. The supply of phosphorus and potassium is moderate. The supply of nitrogen is generally low. (Capability unit IVe–6; woodland suitability group 1b)

Dunkirk silt loam, limestone substratum, 1 to 6 percent slopes (DwB).—This is a gently sloping soil that is underlain by limestone bedrock at a depth of 3½ to 5 feet. Included in mapping are spots of Ontario silt loam, moderately shallow variant, and Farmington soils, which commonly occur adjacent to limestone outcrops that range from few to common in number. Also included are a few areas of Dunkirk silt loam, 6 to 12 percent slopes, eroded.

This soil is suited to crops, pasture, or forest. Most of it is cropped with a high percentage of low crops. This soil is suited to most crops commonly grown in the county.

Control of erosion and maintenance of soil structure are the main needs in management. The structure of this silty soil is naturally weak, and it tends to break down where farming is intensive. In this condition the soil is flourlike and is easily moved by water. Thus, erosion is a hazard even on short, gentle slopes. Rock outcrops hinder tillage in places.

Lime requirements range from none to moderate. The supply of nitrogen, phosphorus, and potassium is moderate. (Capability unit IIe–6; woodland suitability group 1a)

Edwards Series

The Edwards series consists of organic soils that formed in mixed woody, grassy, or sedgy material underlain by white to light-gray calcareous marl at a depth of 10 to 40 inches. These soils occur mainly in the northeastern part of the county, near the Seneca and Clyde Rivers.

In a cultivated area, a typical profile has a black, well-decomposed muck surface layer about 9 inches thick. The layer just below is also well-decomposed black muck that extends to a depth of about 16 inches. It is underlain by layers of very dark brown to black muck containing dark-brown wood fragments and partially disintegrated wood and sedge material. Depth to white to very pale-brown calcareous marl is about 33 inches. Reaction of the muck is neutral to slightly acid.

Typical profile of Edwards muck (drained):

Oa1—0 to 9 inches, black (10YR 2/1) muck; moderate to strong, fine and medium, granular structure; very friable; neutral; clear, wavy lower boundary.

Oa2—9 to 16 inches, black (10YR 2/1) muck; moderate to strong, coarse, blocky and subangular blocky structure; very friable; neutral; clear, wavy boundary.

Oa3—16 to 26 inches, very dark-brown (10YR 2/2) muck; partially disintegrated, brown to dark-brown wood fragments; moderate, coarse, blocky and subangular blocky structure; friable; slightly acid; clear, wavy boundary.

Oa4—26 to 33 inches, black (10YR 2/1) to very dark-brown (10YR 2/2) muck; brown to dark-brown flakes of partially disintegrated wood and sedge material; moderate, coarse, blocky structure; friable; neutral; gradual, wavy lower boundary.

IIIca—33 to 40 inches +, white (10YR 8/1) to very pale-brown (10YR 8/3) marl; fine grained (silty); extremely calcareous; some fine shell fragments.

Depth of organic material ranges from 12 to 40 inches over marl. In places peaty layers are in the deeper muck. Mineral content is higher in the shallower muck. The muck is black and well decomposed. The organic material ranges in reaction from medium acid to mildly alkaline; it is calcareous in places. When undrained, the muck has a soft, granular structure throughout the profile. Undrained muck may be browner in color.

Edwards muck (Ed).—This level or nearly level soil occurs near the Seneca and Clyde Rivers. Included in mapping are small areas of muck more than 40 inches deep over marl and other areas less than 10 inches deep over marl. These inclusions occupy as much as 15 percent of some areas. Also included are a few small areas of muck that are 10 to 20 inches deep over calcareous sand, silt, or clay and marl.

This soil is drained in some areas and undrained in others. The undrained muck is best suited to woodland or wildlife habitat. The drained muck commonly contains marl that was dug from ditches and mixed with the muck bordering the ditches. It is well suited to truck crops that are adapted to soils that are medium acid to mildly alkaline and, in places, calcareous.

Prolonged wetness and texture are the main limitations. If this soil is drained, measures are needed to control soil blowing and to regulate the water so that the rates of subsidence and oxidation will be reduced. A high rate of fertilization is needed for most truck crops. (Capability unit IVw–5; woodland suitability group 10)

Eel Series

The Eel series consists of moderately well drained, medium-textured soils that formed in alluvial sediment that is high to medium in content of lime. These are level and nearly level soils on flood plains. They are subject to annual flooding, which generally occurs where runoff is heavy early in spring but occasionally at other times of the year. Eel soils have a moderately high water table during the wetter periods of the year.

In a cultivated area, a typical profile has a very dark gray to very dark grayish-brown silt loam surface layer about 9 inches thick. The underlying layers extend to a depth of 40 inches or more and consist of dark-gray, friable silt loam to very fine sandy loam that is mottled at a depth of more than about 15 inches. All layers are neutral in reaction.

Typical profile of Eel silt loam (cultivated):

Ap—0 to 9 inches, very dark gray (10YR 3/1) to very dark grayish-brown (10YR 3/2) silt loam; very dark grayish brown (10YR 3/2) when rubbed; very weak, coarse, subangular blocky structure that readily breaks to moderate, medium and coarse, granular structure; friable; nonsticky; numerous, fine roots; neutral; clear, wavy boundary.

C1—9 to 15 inches, dark-gray (10YR 4/1) silt loam to very fine sandy loam; weak, coarse, subangular blocky structure breaking to very weak, fine, subangular blocky structure and coarse granular structure; friable; nonsticky; numerous, fine roots; neutral; gradual, wavy boundary.

C2—15 to 28 inches, dark-gray (10YR 4/1) silt loam to very fine sandy loam; common, medium, distinct, brown to dark-brown (10YR 4/3), dark yellowish-brown (10YR 4/4), or strong-brown (7.5YR 5/6) mottles, and fine, distinct, light-gray (10YR 6/1) mottles; weak, coarse, subangular blocky structure and coarse, granular structure; friable; nonsticky; numerous, fine roots; neutral; clear, wavy boundary.

C3—28 to 40 inches +, dark-gray (10YR 4/1) silt loam to very fine sandy loam; few, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak to very weak platy structure that breaks to very weak, medium and coarse, blocky structure; friable; nonsticky; many, fine roots; neutral.

The A horizon ordinarily is dark gray or dark grayish brown, but it is brown in some places where the alluvium is derived from redder material. Colors in the C horizon are similar to those in the A horizon, or they range toward brown, yellowish brown, or reddish brown. Mottling ordinarily begins at a depth of 10 to 24 inches.

Texture throughout the profile ranges from silt loam to fine sandy loam. In a few places, however, there are a few thin strata or lenses of silty clay, sand, or both, at a depth of more than 12 to 18 inches. The silt or very fine sandy loam alluvium averages less than 18 percent in clay content. It ranges in thickness from 24 to 60 inches or more and is underlain mainly by stratified sand and gravel or stream rubble. In places it is underlain by lacustrine silt, sand, or clay, or by firm basal glacial till. Eel soils range from slightly acid to moderately alkaline in reaction and in places are calcareous.

Eel soils are closely associated on flood plains with the poorly drained and very poorly drained Sloan soils that formed in similar materials. Eel soils are not so wet as the Sloan soils, and they are not mottled at a depth of less than inches.

Eel silt loam (Ee).—This is a level and nearly level soil on flood plains. Included with this soil in mapping are areas of somewhat poorly drained soils on bottom lands. These soils are wetter than Eel silt loam and are faintly mottled just below the plow layer; they make up as much as 25 percent of some areas of Eel silt loam. Also included are small areas of well-drained soils on bottom lands, ordinarily on narrow, natural levees bordering streams, and of poorly drained Sloan soils in depressions and narrow channels. Most areas of this unit are subject to annual flooding, but there are a few included areas of Eel soils on higher bottom lands that are less subject to flooding.

Eel silt loam is suited to crops, pasture, or forest. Although it is moderately wet, it is suited to vegetables as well as to field crops commonly grown in the county.

Management is simple. Drainage of the wet spots improves some areas, but most are not wet enough to require systematic drainage. Control of streambank erosion is needed in some areas. Only a few areas need lime. The level of fertility is moderate to high, and response to fertilization is good. (Capability unit IIw–3; woodland suitability group 1a)

Elnora Series

The Elnora series consists of moderately well drained, coarse-textured soils that formed in deep, sandy deposits. These are level to gently sloping soils that occur mainly on a large sand delta at the northern end of Seneca Lake; these soils extend along the north bank of the Seneca River to Waterloo. They are in moderately low positions where the water table is at a depth of 15 to 26 inches during the wettest season, and they also lie at the base of moderately well drained slopes where there is some seepage.

In a cultivated area, a typical profile has a dark-gray to very dark gray loamy fine sand plow layer about 8 inches thick. The upper part of the subsoil, to a depth of 22 inches, is very friable to loose, brown loamy fine sand. It contains a few, small, slightly hard, yellowish-red iron concretions and is mottled in the lower part. At a depth of about 22 inches, the subsoil is mottled, light brownish-gray to light-brown loamy fine sand, and the iron concretions increase in size and number with depth. At a depth of about 34 inches to 48 inches is brown loamy fine sand that is very friable to loose. Reaction of the surface layer and subsoil is neutral.

Typical profile of Elnora loamy fine sand, 0 to 2 percent slopes (cultivated):

Ap—0 to 8 inches, dark-gray (10YR 4/1) to very dark gray (10YR 3/1) loamy fine sand; weak, medium and coarse, subangular blocky structure, breaking to weak, fine and medium, granular structure without distinct cleavage planes; very friable; many, fine and medium roots; neutral; abrupt, smooth boundary.

B21—8 to 15 inches, brown (10YR 5/3) loamy fine sand; few, fine, yellowish-red (5YR 5/6), slightly hard iron concretions; very weak, medium and coarse, subangular and angular blocky structure; common, fine and medium roots; very friable to loose; neutral; gradual, wavy boundary.

B22—15 to 22 inches, brown (10YR 5/3) loamy fine sand; few, fine, distinct, yellowish-brown (10YR 5/6) mottles; few, fine, yellowish-red (5YR 5/6) iron concretions; very weak, medium and coarse, subangular and angular blocky structure; common, fine and medium roots; very friable to loose; neutral; abrupt, wavy boundary.

B23—22 to 34 inches, light brownish-gray (10YR 6/2) to light-brown (7.5YR 6/3) loamy fine sand; common, fine, faint, pinkish-gray (10YR 7/2) mottles, and few, fine, distinct, yellowish-brown (10YR 5/6) and strong-brown (7.5YR 5/6) mottles; common, medium and coarse, yellowish-red (5YR 5/8 to 4/8) and red (2.5YR 5/8 to 4/8) iron concretions, with dark reddish-brown (5YR 3/4) centers in larger concretions; single grain to very weak, blocky and subangular blocky structure; few, fine roots; very friable to loose; neutral; clear, wavy boundary.

B3—34 to 48 inches, brown (7.5YR 5/4) loamy fine sand; single grain to very weak, coarse, blocky and subangular blocky structure; very friable to loose; neutral.

The sandy material in these soils ranges in depth from 40 inches to many feet. The reaction of the Ap horizon ranges from very strongly acid to neutral where this horizon is unlimed. At a depth of 36 inches, reaction ranges from medium acid to mildly alkaline.

Texture of the Ap horizon is mainly heavy loamy fine sand but ranges from light fine sandy loam to loamy fine sand. It is as much as 50 percent very fine sand.

Texture of the B horizon is mostly loamy fine sand that has a high content of very fine sand. Weak color banding frequently is present, and in places there appears to be a slight increase in content of silt and clay. Depth to mottles is 15 to 30 inches, and contrast is faint to distinct.

Elnora soils are a member of a drainage sequence that includes the somewhat poorly drained Stafford soils and the poorly drained and very poorly drained Lamson soils. It is also associated with the sandy well-drained to excessively drained Arkport soils, the moderately well drained Claverack soils, and the somewhat poorly drained Cosad soils. The Elnora soils resemble the Claverack soils, but the Elnora soils have sandy horizons more than 40 inches deep while the Claverack soils have sandy horizons 20 to 40 inches deep over clay substrata.

Elnora loamy fine sand, 0 to 2 percent slopes (ElA).—This nearly level soil has the profile described as typical for the series. It occurs in moderately low or depressional positions on sandy deltas or lake plains. This soil is wet mainly because the water table is moderately high during the wettest period of the year.

Included in mapping are small areas of well-drained Arkport soils on slight rises and knolls, which occupy as much as 15 percent of some areas. These inclusions generally have little effect on use and management of this Elnora soil. Small spots of wetter Stafford or Cosad soils in shallow depressions or narrow drainageways make up 10 percent of some areas. Although of limited extent, these soils commonly delay field operations in spring.

This soil is well suited to crops, pasture, or forest. It is well suited to market garden crops that require intensive management. Fertilization and liming are needed. This soil is low in nitrogen and in its supply of phosphorus and potassium but responds well to fertilization. Soil blowing is a slight to moderate hazard. Supplemental irrigation may be needed during prolonged dry periods. (Capability unit IIw-1; woodland suitability group 1a)

Elnora loamy fine sand, 2 to 6 percent slopes (ElB).—This soil has slopes mainly of 2 to 4 percent and generally occurs in places that receive seepage from adjacent areas. It is commonly underlain by slowly permeable material at a depth of more than 40 inches, which accounts for a moderately high water table during the wet season.

Included in mapping are small areas of well-drained Arkport soils on slight rises and knolls. These areas occupy as much as 15 percent of this unit. Small areas of Stafford or Cosad soils occur in shallow depressions or in narrow drainways and occupy as much as 5 percent of some areas.

This soil is well suited to crops, pasture, or forest. It is well suited to market garden crops that require intensive management. In places the seasonal high water table, texture, and slope are limitations that affect use. Water erosion and soil blowing are moderate hazards. They occur mainly early in spring during periods of alternate freezing and thawing, but they can occur at other times during the year.

Fertilizer and lime are required. This soil is low in nitrogen and in its supply of available phosphorus and potassium, and it responds well to fertilization. Supplemental irrigation may be needed during prolonged dry periods, and random drainage of included wet spots is beneficial in many areas. Special measures are generally needed to prevent sand from plugging the drains. (Capability unit IIw-5; woodland suitability group 1a)

Erie Series

The Erie series consists of medium-textured, somewhat poorly drained soils that formed in neutral to weakly calcareous till derived from gray, fine-grained sandstone, silty shale, and limestone. They occur at the higher elevations, generally above 1,200 feet, south of Lodi.

In a cultivated area, a typical profile has a dark grayish-brown channery silt loam plow layer about 8 inches thick. Below this is a leached layer of friable to firm, olive, mottled channery silt loam that extends to a depth of about 13 inches. This is underlain by a very firm, dense fragipan consisting of dark grayish-brown, mottled channery silt loam. At a depth of more than 30 inches is equally firm and dense till. The till is dark-gray, mottled channery silt loam or channery loam. It is neutral in the upper part and becomes calcareous at a depth of 40 inches. Reaction of the surface layer is medium acid. Reaction of the fragipan is medium acid in the upper part and becomes neutral as depth increases.

Typical profile of Erie channery silt loam, 3 to 8 percent slopes (cultivated):

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) channery silt loam; brown (10YR 4/3 to 5/3) when rubbed; moderate, fine and medium, granular structure; friable; medium acid; many, fine and medium roots; abrupt, smooth boundary.

A2—8 to 13 inches, olive (5Y 5/4) channery silt loam; common, medium, distinct, yellowish-brown (10YR 5/6 and 5/4) mottles, and common, fine, faint, olive-gray (5Y 5/2 mottles; weak, medium and coarse, blocky structure; friable to firm; nonsticky; thin, discontinuous, olive-gray (5Y 5/2) silt coats on ped faces; medium acid; common, fine roots; abrupt, wavy boundary.

IIBx—13 to 30 inches, dark grayish-brown (2.5Y 4/2) channery silt loam to channery loam that contains more stone fragments than the A horizon; few, fine, distinct, light olive-brown (2.5Y 5/6 to 5/4) mottles; massive to very weak, platy structure, breaking to weak, medium and coarse, blocky structure, within very coarse (10- to 18-inch) prisms; very firm in place, brittle when removed; slightly sticky; very thin, discontinuous, grayish-brown (2.5Y 5/2) clay films on ped faces; few, prominent clay films in large pores; no roots in prism interiors; prisms separated by ½- to ¾-inch, grayish-brown (2.5Y 5/2), friable silt streaks with distinct yellowish-brown (10YR 5/6 to 5/4) borders; common, fine roots along prism faces, extending to a depth of 28 inches; medium acid becoming neutral at depth of 28 inches; diffuse boundary.

IICx—30 to 48 inches, dark-gray (5Y 4/1) channery silt loam or channery loam; common, fine and medium, distinct, light olive-brown (2.5Y 5/6) and yellowish-brown (10YR 5/6) mottles that decrease in size and number as depth increases; very weak, thick and very thick, platy structure; very firm in place; firm to crush; no roots; calcareous at depth of 40 inches.

Thickness of the solum ranges from 24 to 48 inches. Depth to bedrock is 4 feet or more. Depth to free carbonates ranges from 36 to 48 inches. Depth to the fragipan or Bx horizon is 12 to 18 inches.

The A horizon is channery silt loam and channery loam containing 15 to 25 percent small stone fragments. The Ap horizon ranges in color from very dark gray to grayish brown. The A2 horizon has a hue of 10YR to 5Y, a chroma of 3 or 4, a value from 4 to 6, and common or many, distinct mottles. Reaction of the A horizon is strongly acid to medium acid.

The Bx horizon is grayish brown to olive in color and has distinct or prominent mottles. Texture ranges from channery loam to channery light clay loam containing 18 to 28 percent clay. The Bx horizon commonly contains enough sand to give it a gritty feel. The gray silt streaks that separate the 10- to 18-inch prisms range in thickness from ¼ inch to 1 inch. Mottles are most common along the borders of these streaks and are mostly yellowish brown or olive brown but are strong brown in places. Reaction of the Bx horizon is medium acid to neutral in the upper part and is nearly everywhere neutral in the lower part. Stone content of the fragipan and underlying till ranges from 20 to 35 percent by volume. The stones consist mostly of small medium, flat, angular fragments.

Erie soils are the somewhat poorly drained member of a drainage sequence that includes the moderately well drained Langford soils and very poorly drained soils of the Alden series, till substratum. They have a stronger fragipan and a lower lime content than the Darien and Appleton soils. Erie soils are also coarser textured than the Darien soils.

Erie channery silt loam, 0 to 3 percent slopes (ErA).—This soil has a profile that resembles the one described as typical for the series but is generally wetter and has a more gray subsoil. It occurs in areas where runoff is slow or where much runoff comes from adjacent areas.

Included in mapping are small areas of slightly wetter soils that have a very dark-gray plow layer; in woodlands, where the surface layer has not been plowed, it is nearly black. Although too small to map separately, these flat, depressed spots comprise as much as 20 percent of some areas; these areas delay tillage. Also included are a few small knolls of moderately well drained Langford soils.

This soil is suited to crops, pasture, or forest. Without drainage it is generally better suited to water-tolerant grasses, legumes, and trees.

Water is the main problem in management. Random drainage may be effective in making wetter spots suitable for hay and forage crops. Liming and complete fertilization with nitrogen, phosphorus, and potassium are necessary. (Capability unit IIIw-3; woodland suitability group 6a)

Erie channery silt loam, 3 to 8 percent slopes (ErB).—This soil has the profile described as typical for the series. It is gently sloping and occurs in areas that are generally smooth but includes some slightly undulating areas. This soil receives runoff from higher adjacent land, but it has enough slope to remove some of the excess water.

Included in mapping are slightly wetter soils along narrow drainageways and in slight depressions, which make up as much as 15 percent of some areas; these areas commonly delay planting in spring. Moderately well drained Langford soils make up as much as 10 percent of some areas on slight rises or knolls but have little effect on their use.

This soil is used for crops, pasture, or forest. If adequately managed, it is suited to such crops as corn, but it is better suited to water-tolerant grasses and legumes. Winter wheat can be grown, but spring grains are subject to wetness, and midsummer drought contributes to wide variations in production.

Water control is the main need in management, and erosion is a moderate hazard on the longer slopes. Many areas can be improved by diverting runoff, and others by random drainage of wet spots. (Capability unit IIIw-8; woodland suitability group 6b)

Erie Series, Moderately Shallow Variant

The Erie series, moderately shallow variant, consists of somewhat poorly drained, medium-textured soils that formed in slightly acid to mildly alkaline glacial till derived mainly from sandstone and shale. These are extensive soils that occur at the higher elevations south of Lodi, and their relief is controlled by the underlying bedrock.

In a cultivated area, a typical profile has a dark grayish-brown channery silt loam plow layer about 7 inches thick. The subsurface layer is friable to firm, leached, mottled, olive to light olive-brown channery silt loam that extends to a depth of 13 inches. This is underlain by a very firm, dense, mottled, dark grayish-brown channery loam to channery silt loam fragipan. Depth to gray and dark-gray, fine-grained sandstone and hard shale bedrock is about 28 inches. Reaction of the surface and subsurface layers is medium acid. The fragipan is medium acid in the upper part, but becomes slightly acid with depth.

Typical profile of Erie channery silt loam, moderately shallow variant, 3 to 8 percent slopes (cultivated):

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) channery silt loam; brown (10YR 4/3 to 5/3) when rubbed; moderate, fine and medium, granular structure; friable; many, fine and medium roots; medium acid; abrupt, smooth boundary.

A2—7 to 13 inches, olive (5Y 5/4) to light olive-brown (2.5Y 5/4) channery silt loam; common, medium, distinct, yellowish-brown (10YR 5/6 to 5/4) and light-gray (2.5Y 7/2) mottles; weak, medium and coarse, angular and subangular blocky structure; friable to firm; nonsticky; thin, discontinuous, olive-gray (5Y 5/2) silt coats on ped faces; common, fine roots; medium acid; abrupt, wavy boundary.

Bx—13 to 28 inches, dark grayish-brown (2.5Y 4/2) channery loam to channery silt loam; few, fine, distinct, light olive-brown (2.5Y 5/6 to 5/4) and yellowish-brown (10YR 5/6 to 5/4) mottles; massive to very weak, platy structure within weak, very coarse prisms, 10 to 18 inches across, breaking to weak, medium and coarse, blocky structure; very firm in place; brittle when removed; slightly sticky; few, discontinuous clay films on blocky and platy faces; common clay linings in large pores; no roots in prism interiors; prisms separated by ½ to ¾ inch wide, grayish-brown (2.5Y 5/2) friable silt streaks with distinct border mottles of yellowish brown (10YR 5/6 to 5/4) and light olive brown (2.5Y 5/6); common, fine roots along prism faces; distinctly more stone fragments than A2 horizon; medium acid, becoming slightly acid at depth of 25 inches; abrupt, wavy boundary.

R—28 to 40 inches +, gray (10YR 5/1) and dark-gray (10YR 4/1), fine-grained sandstone and hard shale bedrock; horizontal fractures ½ to 2 inches thick; upper 6 inches has thin, grayish-brown (2.5Y 5/2) silt coats on rock faces.

Thickness of the solum ranges from 20 to 40 inches, which corresponds to the depth to hard sandstone and shale bedrock. The A horizon ranges in texture from silt loam to very fine sandy loam and contains 10 to 35 percent stones. Color of the A1 and Ap horizons ranges from very dark gray to grayish brown. The A2 horizon ranges in hue from 10YR to 5Y, in chroma from 3 to 5, and in value from 4 to 6. Mottles are common or many and distinct. Reaction of the A horizons ranges from strongly acid to medium acid where these horizons are unlimed.

Depth to the fragipan or the Bx horizon ranges from 12 to 18 inches. This horizon is thickest where the depth to bedrock is the greatest. Texture of the fragipan ranges from channery loam or very channery loam to channery light silty clay loam; the clay content is mainly 18 to 28 percent. Content of coarse fragments ranges from 20 to 50 percent. Color ranges from dark grayish brown to olive gray, and mottles inside prisms are few to common. The material is firm to extremely firm in place and brittle when removed. Reaction of the fragipan is medium acid to neutral.

A thin Cx horizon is commonly present where bedrock is at a depth of 30 to 40 inches. The Cx horizon, where present, ranges in texture from loam to silt loam, and its content of angular stones ranges from 20 percent to more than 50 percent. The material is firm to very firm in place and brittle when removed. Reaction ranges from medium acid to slightly alkaline. In places the Bx and Cx horizons contain enough sand to have a gritty feel.

The Erie series, moderately shallow variant, is a somewhat poorly drained member of a drainage sequence that includes the moderately well drained Langford series, moderately shallow variant. It is closely associated with the normal Erie soils that are similar but is less than 40 inches deep over bedrock. Soils of the Erie series, moderately shallow variant, have a fragipan and have a lower lime content than the Angola soils. Also, the Angola soils are generally finer textured in the B horizon and are underlain by soft, rippable shale instead of by hard sandstone and shale bedrock.

Erie channery silt loam, moderately shallow variant, 0 to 3 percent slopes (EsA).—This soil has a profile that resembles the one described as typical of the series, but it is slightly wetter, has a slightly darker surface layer, and has a more highly mottled subsoil. It has mainly smooth, gentle slopes of 2 to 3 percent.

Included in mapping are slightly wetter soils that occur mainly in small, shallow depressions or in long, narrow strips along shallow drainageways. These wetter soils make up as much as 20 percent of some areas and have a very dark-gray plow layer; where unplowed in woods, the surface layer is nearly black. Though of limited extent, they commonly delay fieldwork in spring or following heavy rains and thus restrict the choice of crops.

The soil in this unit is similar in use and management for crops, pasture, or forest to the deeper Erie channery silt loam, 0 to 3 percent slopes. Depth to the fragipan, which controls root depth and the supply of water available to plants, is similar. The difference in the depth to bedrock, however, results in differences in the limitations of these two soils for engineering structures. Seasonal wetness, slow permeability, and depth to bedrock are the main limitations to management. (Capability unit IIIw-3; woodland suitability group 6a)

Erie channery silt loam, moderately shallow variant, 3 to 8 percent slopes (EsB).—This soil has the profile described as typical for the series. It is mainly smooth and gently sloping but is slightly undulating in some areas. This soil typically receives runoff from adjacent, higher land but has enough slope that some of the excess water drains away.

Included in mapping are small areas of Erie soils where bedrock is at a depth of more than 40 inches. These soils make up more than 20 percent of some areas but have little effect on use. Wetter soils in shallow drainageways and slight depressions make up as much as 10 percent of some areas; although these soils are in areas too small to map separately, they commonly delay spring planting. Spots of moderately well drained Langford soils on slight rises and knolls are also included but have little effect on use.

This Erie soil is similar to the deep Erie channery silt loam, 3 to 8 percent slopes, in its use for crops, pasture, or forest. The depth to the fragipan, which controls the depth of plant roots and the supply of water available to plants, is also similar. Depth to bedrock, seasonal wetness, and slow permeability limit use in places. (Capability unit IIIw-8; woodland suitability group 6b)

Farmington Series

The Farmington series consists of shallow, well-drained, medium-textured soils that formed in glacial till derived mainly from sandstone, shale, and some limestone. These soils are in small, scattered areas south of the Seneca River, where the Onondaga and Tully Limestone Formations crop out.

A typical profile has a very dark-gray silt loam surface layer about 3 inches thick. The subsoil is friable to very friable, strong-brown silt loam to a depth of about 9 inches. It is underlain by very friable, brown silt loam that occurs in irregular, 3- to 5-inch bodies surrounded by thin, light-brown, ¼- to ½-inch silt loam coatings. Depth to hard, gray limestone bedrock is about 15 inches. Solution cracks 2 to 6 inches wide occur at 2- to 5-foot intervals and are filled with dark-brown silt loam that is neutral in reaction. The soil above bedrock is strongly acid to medium acid.

Typical profile of a Farmington silt loam on slopes of 2 to 8 percent:

A1—0 to 3 inches, very dark gray (5YR 3/1) silt loam; dark brown (7.5YR 3/2) when rubbed; moderate, fine, granular structure; very friable; many, fine and medium roots; slightly acid; abrupt, wavy boundary.

B2—3 to 9 inches, strong-brown (7.5YR 5/6) silt loam; weak to moderate, fine, subangular blocky structure; very friable to friable; many, fine and medium roots; numerous, fine and medium pores; strongly acid; clear, wavy boundary.

A′2-B′1—9 to 15 inches, brown (7.5YR 4/4) silt loam; weak, fine and medium, subangular blocky structure; friable; many, fine and medium pores; few, very thin, discontinuous clay films in pores and on ped faces; material arranged in irregularly shaped bodies 3 to 5 inches across and surrounded by ¼ to ½ inch thick, light-brown (7.5YR 6/4) silt loam that has very weak, fine, subangular blocky structure and is very friable; numerous, fine and medium roots; medium acid; abrupt, wavy boundary.

R—15 inches +, hard, gray limestone bedrock; fractures 2 to 6 inches wide at 2- to 5-foot intervals; fractures are 2 to 4 feet deep and filled with dark-brown (7.5YR 4/4) fine silt loam that has distinct, thin clay films on ped faces and in pores; moderate, medium, blocky structure; neutral; many, fine roots.

Thickness of the solum ranges from 10 to 20 inches, which corresponds with depth to hard limestone bedrock. The A horizon ranges in color from dark gray to dark brown, in texture from silt loam to fine sandy loam, and in stone content from few to many fragments. It commonly contains enough sand to have a gritty feel.

The B horizon ranges in texture from silt loam to fine sandy loam and contains few to many rock fragments. Color ranges from dark brown to yellowish brown.

Reaction ranges from strongly acid to neutral in the A and B horizons. Clay films are thin and discontinuous except for the soil in the deeper cracks.

Farmington soils are mapped only in undifferentiated units with the moderately shallow variants of the Ontario and Aurora soils. They also are commonly associated with the deeper Ontario, Honeoye, Danley, Dunkirk, and Schoharie soils or with their less well drained associates. Farmington soils have a higher lime content than Arnot soils.

Fonda Series

The Fonda series consists of very poorly drained, moderately fine textured soils that developed in lacustrine deposits of gray, brown, or reddish, calcareous clay containing occasional bands of silt and very fine sand. These are level or depressional soils that occur mainly on the lake plain in the northern third of the county.

In an idle area, a typical profile has a very dark brown to a very dark gray light silty clay loam surface layer about 5 inches thick. The subsurface layer extends to a depth of about 13 inches. It is mainly silty clay loam or heavy sandy clay loam that is light gray to gray and is distinctly mottled. Just below is a firm subsoil that is brown, mottled silty clay loam in the upper part. In the lower part, it is dark, reddish-gray silty clay or silty clay loam that is distinctly mottled. The substratum, at a depth of more than about 25 inches, is very firm, reddish-gray, mottled heavy silty clay loam with thin silt layers. Reaction is neutral in the surface and subsurface layers. The subsoil and substratum are calcareous.

Typical profile of Fonda mucky silty clay loam (idle):

A1—0 to 5 inches, very dark brown (10YR 2/2) to very dark gray (10YR 3/1) mucky light silty clay loam; moderate, fine and medium, granular structure; friable; slightly sticky; many, fine roots; neutral; clear, wavy boundary.

A21g—5 to 6 inches, variegated, very dark gray (N 3/0) to light-gray (N 6/0) silty clay loam; strong, coarse, subangular blocky and blocky structure; firm; slightly plastic; very dark gray (10YR 3/1) to black (10YR 2/1) organic silt coats on ped faces; many, fine roots; neutral; clear, wavy boundary.

A22g—6 to 9 inches, light-gray (10YR 7/1 to 6/1) silty clay loam; common, large, distinct, yellowish-brown (10YR 5/4 to 5/6) mottles; strong, coarse, subangular blocky and blocky structure; firm; slightly plastic; very dark gray (10YR 3/1) to black (10YR 2/1) organic silt coats on ped faces; many, fine roots along ped faces; neutral; clear, wavy boundary.

A23—9 to 13 inches, light-gray to gray (10YR 6/1) silty clay loam or heavy sandy clay loam; common, large, distinct, light-gray (10YR 7/1), yellowish-brown (10YR 5/4 to 5/6), and brownish-yellow (10YR 6/6) mottles; moderate, coarse, blocky structure; firm; slightly plastic; light-gray (10YR 7/1 to 6/1) silty coats on ped faces; common, fine roots along ped faces; neutral; clear, wavy boundary.

B21g—13 to 16 inches, brown (7.5YR 4/2 to 5/2) heavy silty clay loam; common, medium, distinct, light-gray (5Y 7/1), yellowish-brown (10YR 5/6), and brownish-yellow (10YR 6/6) mottles; moderate, coarse, prismatic structure, breaking to moderate, coarse, blocky structure; firm; plastic; pinkish-gray (7.5YR 7/2 to 6/2), prominent silty lime coats on prism and ped faces; few, fine roots along ped faces; slightly calcareous; clear, wavy boundary.

B22g—16 to 25 inches, dark reddish-gray (5YR 4/2) silty clay to heavy silty clay loam; common, medium, distinct, light-gray (N 7/0), brown (7.5YR 5/4), and strong-brown (7.5YR 5/6) mottles; moderate, coarse, prismatic structure, breaking to moderate, coarse, blocky structure; firm; plastic; light-gray (N 6/0 to N 7/0), thin silt coats on prisms and ped faces; very few, fine roots; strongly calcareous; abrupt, wavy boundary.

C—25 to 60 inches +, reddish-gray (5YR 5/2) heavy silty clay loam; common, coarse, distinct, yellowish-brown (10YR 5/6) and grayish-brown (10YR 5/2) mottles that decrease in size and number as depth increases; strong, thick, platy structure separated by thin, light-gray (N 6/0) to pinkish-gray (7.5YR 6/2) silty laminae; very firm; strongly calcareous.

The A1 horizon ranges from black mucky silty clay loam in the wettest spots to dark-gray silt loam in the better drained areas. Texture of the A1 horizon normally is mucky light clay loam or mucky heavy silt loam but ranges from very fine sandy loam to silty clay; it has a clay content of 35 to 55 percent. The A22g horizon is generally present, but where it it incorporated in the Ap horizon by plowing, it generally becomes a discontinuous horizon. In the wettest areas, the A2g horizon may be as much as 15 inches deep. Reaction is slightly acid to neutral.

The B horizon generally is silty clay but ranges from heavy silty clay loam to clay. Thin lenses of silt or fine sand are present at a depth of less than 24 inches in places, but they seldom total more than 6 inches in thickness. Reaction ranges from neutral to moderately alkaline. The soils are generally calcareous to a depth of 12 to 30 inches, but they are calcareous to a depth of 40 inches in places.

The Fonda soils are the very poorly drained member of a drainage sequence that includes the well drained and moderately well drained Schoharie soils, the somewhat poorly drained Odessa soils, and the poorly drained Lakemont. It is also a member of a drainage sequence that includes the poorly drained Madalin soils. Fonda soils have a finer textured B horizon than the similarly drained Alden soils.

Fonda mucky silty clay loam (Fn).—This is a level or depressional soil that occurs on the lake plains in the northern third of the county. In woodland it consists of 2 to 6 inches of muck over moderately dark mineral soil. In pastures the muck has become mixed with mineral soil, and the surface layer is nearly black mucky silty clay loam. In some cropped areas, the plow layer is dark gray and contains less organic matter. This soil occupies the lowest depressions, and if undrained, it commonly is covered with standing water most of the year.

Included in mapping are areas of Muck, shallow, in lower depressions and drains, which make up as much as 15 percent of some areas. Poorly drained Madalin and

Lakemont soils occur on slight rises or knolls and comprise as much as 10 percent of some areas.

Prolonged wetness, slow permeability, and the mucky silty clay loam to silty clay texture are the main limitations to management, but if adequately drained, this soil can be used for crops. Drained areas need little or no lime, but they need a moderate amount of phosphorus and some potassium. If undrained, this soil is suited mainly to forest or to wetland pasture. The supply of nitrogen is deficient in spring but may become adequate by midsummer. (Capability unit IVw-1; woodland suitability group 9)

Fresh Water Marsh

Fresh water marsh (Fw) consists of shallow, inundated areas around lakes and of ponded areas in the uplands. Some of the ponded areas are in their natural state, some are manmade, and some formed as a result of the construction of beaver dams. The most extensive area that is in its natural state is at the northern end of Cayuga Lake. The largest manmade areas are in the Montezuma National Wildlife Refuge. These areas are made by building dikes to impound water. Some of them are in areas of muck or mineral soils, which consist mainly of bottom land and alluvial deposits. Fresh water marsh is covered by water most of the year and commonly is too wet to support growth of trees, except along the edges of the lakes, where the water is shallow. These ponded areas do, however, support growths of marsh plants. Many of these growths consist almost entirely of cattails, and others consist of water-tolerant shrubs.

Some of the cattail flags are harvested for caulking material. The harvesting operation, properly managed, opens up the areas and benefits wildlife. These marshes are good habitat for muskrat and other aquatic animals as well as for waterfowl. (Capability unit VIIIw-1; woodland suitability group 10)

Honeoye Series

The Honeoye series consists of well-drained, medium-textured soils that formed in strongly calcareous, firm glacial till derived mainly from gray limestone and gray alkaline and calcareous shale. These gently sloping to steep soils occur a mile or more away from Seneca and Cayuga Lakes and in the central part of the county.

In a cultivated area, a typical profile has a very dark grayish-brown to very dark-gray silt loam plow layer about 5 inches thick. The subsurface layer is thin, leached pale-brown to brown, friable silt loam. This layer fingers into the top part of the subsoil, which consists of slightly heavy, brown to dark-brown, friable silt loam that extends to a depth of about 11 inches. The lower part of the subsoil is dark-brown, friable to firm heavy silt loam. It is neutral in reaction to a depth of about 18 inches and then becomes calcareous. Depth to the firm, calcareous till substratum is about 26 inches. The substratum consists of grayish-brown to brown loam to silt loam.

Typical profile of Honeoye silt loam, 2 to 8 percent slopes (cultivated):

Ap—0 to 5 inches, very dark grayish-brown (10YR 3/2) to very dark gray (10YR 3/1) silt loam; very dark grayish brown (10YR 3/2) when crushed and rubbed; moderate to strong, fine, medium, and coarse, granular structure; friable to very friable; many, fine and medium roots; neutral; clear, wavy lower boundary.

A2—5 to 8 inches, pale-brown (10YR 6/3) to brown (10YR 5/3) silt loam; weak to moderate, fine and medium, subangular blocky structure, breaking to weak, fine, granular structure; many, fine and medium roots; neutral; clear, wavy lower boundary.

B2&A2—8 to 11 inches, brown to dark-brown (10YR 4/3) silt loam; moderate, fine and medium, subangular blocky structure; friable; fingers of brown (10YR 5/3) silt loam, ¼ to ½ inch thick and 1 to 3 inches apart, extending into horizon; few, thin clay films on ped faces and in pores; neutral; clear, wavy boundary.

B21t—11 to 18 inches, dark-brown (10YR 4/3 to 3/3) heavy silt loam; moderate, fine and medium, subangular blocky structure; friable to firm; thin clay films on ped faces and in pores; common, fine roots; mildly alkaline; gradual, wavy boundary.

B22t—18 to 26 inches, dark-brown (10YR 4/3 to 3/3) heavy silt loam; moderate, fine and medium, subangular blocky and blocky structure; friable; discontinuous clay films on ped faces and in pores; common, fine roots; calcareous; clear, wavy boundary.

C—26 to 48 inches +, grayish-brown (10YR 5/2) to brown (7.5YR 5/2) loam to silt loam; moderate, platy structure breaking to moderate, fine, blocky structure; firm; strongly calcareous.

The solum is 15 to 40 inches thick. The A horizon is mainly silt loam but ranges to loam and fine sandy loam. Content of coarse fragments ranges from 2 to 25 percent or more, by volume, but is mainly from 2 to 5 percent. These fragments vary in size from fine pebbles to occasional boulders. Color of the A1, or the Ap, horizon is very dark gray to dark brown. The A2 horizon is light brown to brown and olive brown and ranges in thickness from 1 to 5 inches. Reaction is medium acid to neutral. Generally, there are free carbonates within 30 inches of the surface.

The B horizon ranges in color from olive brown to brown and dark brown and in texture from fine sandy loam to silt loam. Mainly, however, it is silt loam with a clay content of 18 to 28 percent. Reaction is slightly acid to mildly alkaline. In places the B horizon is weakly calcareous. The B horizon ranges in thickness from 5 to 20 inches. The B and C horizons contain enough sand to have a gritty feel.

The Honeoye soils are the well-drained member of a drainage sequence that includes the moderately well drained Lima soils, the somewhat poorly drained Appleton soils, the poorly drained Lyons soils, and very poorly drained soils of the Alden series, till substratum. They are associated with similar Ontario, Cazenovia, Danley, Lansing, and Palmyra soils. Honeoye soils have a thinner A horizon than the Ontario soils. They are grayer and coarser textured than Cazenovia soils. They are somewhat coarser textured and more calcareous than the Danley soils, which are derived almost entirely from dark-gray alkaline and calcareous shale till. Honeoye soils have more lime and thinner A and B horizons than the more strongly developed Lansing soils, which are derived from glacial till containing more gray sandstone and less lime.

Honeoye silt loam, 2 to 8 percent slopes (HnB).—This soil has the profile described as typical for the series. It is gently sloping or gently undulating and commonly occurs on convex hilltops and upland areas that are interspersed with shallow drainageways.

Included in mapping are areas of moderately well drained Lima soils along drainageways; these soils commonly make up 10 to 15 percent of some areas.

This is one of the more extensive soils in the county and is well suited to cropping, pasture, or forest. The main limitation to use is a moderately slowly to slowly permeable substratum. The soil is very responsive to good management, such as use of practices to control erosion, maintain good tilth, and increase fertility. Only a few areas need lime. This soil is medium in content of nitrogen, medium in supply of phosphorus, and high in supply of available potassium. (Capability unit IIe-1; woodland suitability group 1a)

Honeoye silt loam, 8 to 15 percent slopes (HnC).—This soil has a profile that resembles the one described as typical for the series, but it has a slightly thinner surface layer and subsoil and the calcareous substratum is at a shallow depth. It generally has short, convex slopes that range from smooth to rolling. The long axis of the smooth slopes is most commonly near a north-south direction. Many areas of this soil are on the sides of drainageways.

Included in mapping are narrow areas of moderately well drained Lima soils that occur on the bottom of drainageways. These areas seldom exceed 10 percent of the total area. Where cultivated, this Honeoye soil generally is slightly eroded to moderately eroded but severely eroded spots are included in places. Most woodland areas are not eroded.

This soil is suited to crops, pasture, or forest. Its use is limited mainly by slope and by the slowly permeable substratum. Erosion control measures are needed in intensively farmed areas. Response to fertilization is good, and only a few areas need lime. (Capability unit IIIe-1; woodland suitability group 1a)

Honeoye silt loam, 15 to 25 percent slopes (HnD).—This soil has a profile that resembles the one described as typical for the series, but the combined thickness of the surface layer and subsoil generally is less. Where this soil has been cleared and cultivated, it has a thinner and lighter colored surface layer, has reduced organic-matter content, and is severely eroded. Also, the surface layer contains more gravel and stone fragments.

Included in mapping are small areas of nearly level Honeoye soils. Small areas of Lima and Appleton soils occur as wet spots, but these are of limited extent.

Cropping is difficult, and most areas of this soil are better suited to hay, pasture, or forest. Slope is the main limitation, and much water runs off during heavy rains. This soil is therefore very susceptible to erosion and is considerably more droughty than most Honeoye soils. Both hay and pasture require fertilization. Only a few areas need lime. (Capability unit IVe-1; woodland suitability group 1b)

Honeoye, Ontario, and Lansing soils, 25 to 40 percent slopes (HoE).—The profile of the individual soils in this unit resemble that described as typical for their respective series. A given area of this unit generally includes only one of these soils. Honeoye and Lansing soils generally occur on narrow valley walls, and Ontario soils are on the eastern and western sides of drumlins. Many areas of these soils are long and narrow, 2 to 20 acres in size, and have never been cleared. Where cleared, they are severely eroded, particularly those areas that have been cropped. Included in mapping are spots of steep Palmyra and Danley soils.

These soils are used mainly for pasture and forest. Their steep slopes and rapid runoff are the main limitations to use. (Capability unit VIe-1; woodland suitability group 1b)

Howard Series

The Howard series consists of deep, well-drained, medium-textured soils that formed in gravelly, medium-lime to low-lime outwash materials. The gravel consists mainly of gray sandstone, hard shale, and some limestone. These soils are in small areas in the southern part of the county, south of Ovid.

In a forested area, a typical profile has a dark grayish-brown gravelly loam surface layer about 3 inches thick. The subsurface layer is leached, pale-brown to brown gravelly loam that fingers into the upper part of the subsoil at a depth of about 16 inches. The main part of the subsoil is friable to firm, yellowish-brown gravelly heavy loam that extends to a depth of about 30 inches. Below this, the subsoil is friable, brown very gravelly clay loam that gradually merges, at a depth of about 36 inches, with a stratified sand and gravel substratum. The reaction of the subsoil and upper substratum is slightly acid, but the reaction of the substratum becomes less acid as depth increases. The soil is calcareous at a depth of 60 inches.

Typical profile of Howard gravelly loam, 5 to 15 percent slopes (forested):

A1—0 to 3 inches, dark grayish-brown (10YR 4/2) gravelly loam; dark brown (10YR 4/3) when rubbed; strong, fine and medium, granular structure; friable; slightly acid; many roots; clear, wavy boundary.

A2—3 to 16 inches, pale-brown (10YR 6/3) to brown (10YR 5/3) gravelly loam; moderate, fine and medium, subangular blocky structure, breaking to moderate, fine and medium, granular structure; friable; many, fine and medium roots; medium acid; clear, wavy boundary.

A2&B1—16 to 25 inches, pale-brown (10YR 6/3) to brown (10YR 5/3) gravelly loam, 1 to 3 inches thick, surrounding irregularly shaped bodies of yellowish-brown (10YR 5/6 to 5/4) gravelly heavy loam, 1 to 3 inches across, with discontinuous, thin clay films; moderate, fine and medium, subangular blocky structure, breaking to weak, fine and medium, granular structure; friable; many, fine and medium roots; slightly acid; clear, wavy boundary.

IIB21t—25 to 30 inches, yellowish-brown (10YR 5/6) very gravelly heavy loam; weak to moderate, medium, subangular blocky structure; friable to slightly firm; brown (10YR 5/3), thin clay films on ped faces; variegated brown and yellowish-brown films on gravel; slightly sticky and plastic; slightly acid; clear, wavy boundary.

IIB22t—30 to 36 inches, brown (10YR 4/3) very gravelly light clay loam; weak to moderate, subangular blocky structure; friable; slightly sticky; prominent clay films in pores and discontinuous films on ped faces; variegated brown (10YR 5/3) and yellowish-brown (10YR 5/6) clayey films on gravel; common, fine and medium roots; slightly acid; clear, wavy boundary.

IIB3&C1—36 to 49 inches, stratified sand and gravel; pale-brown (10YR 6/3) to brown (10YR 5/3); slightly sticky; silty clay films on gravel and coarse sand; the sand is pale brown (10YR 6/3) and dark gray (10YR 4/1); very friable; slightly acid; clear, wavy boundary.

IIIC2—49 to 60 inches +, stratified sand and gravel; sand is light brownish gray and dark gray; neutral at depth of 55 inches; calcareous at depth of 60 inches.

Thickness of the solum ranges from 40 to 60 inches and corresponds with depth to carbonates. The A horizon is chiefly gravelly loam to gravelly sandy loam, but in a few small areas it is silt loam. The gravel content ranges from 15 to 35 percent, by volume. Color of the A1, or Ap, horizon ranges from very dark gray to brown, and the A2 horizon ranges from pale brown to brown and yellowish brown. Reaction is very strongly acid to slightly acid.

The B2 horizon ranges from heavy sandy loam to light clay loam and has a gravel content of 35 to 50 percent or more, by volume. It contains clay films in the form of clay bridges. The B horizon is mainly brown but ranges to yellowish brown. Reaction ranges from strongly acid to neutral.

The Howard soils have a lower lime content and a thicker solum than the Palmyra soils.

Howard gravelly loam, 0 to 5 percent slopes (HwA).—This soil occurs mainly on terraces in the valleys, on tops of gravelly deltas, and on the sides of valleys. Included in mapping are spots of moderately well drained, silty Collamer soils, but these spots seldom exceed 5 percent of a given area.

This soil is well suited to crops, pasture, or forest. It can be used for most crops commonly grown in the county, including fruits and vegetables. It is particularly well suited to deep-rooted crops.

Maintenance of fertility is a need in management, and most areas need lime, nitrogen, phosphorus, and potassium. This soil responds well to fertilization. Erosion generally is not a hazard. Some areas can be improved by draining the included wet spots of Collamer soils. (Capability unit I–1; woodland suitability group 1a)

Howard gravelly loam, 5 to 15 percent slopes (HwC).—This soil has the profile described as typical for the series. Most of the areas mapped have simple, smooth slopes; however, some rolling or undulating areas occur, and here the slopes are short and complex. Most areas have enough slope to cause tillage to be moderately difficult.

This soil is suited to crops, pasture, or forest. It is mainly used for crops and is particularly well suited to deep-rooted legumes for hay or pasture. The smooth, less sloping areas are well suited to row crops. The complex slopes are well suited to deep-rooted hay and forage.

Slope and gravel are the major limitations to use. This soil is moderately susceptible to erosion, especially early in spring when the subsoil is frozen. Management is necessary for control of runoff. Fertilizer and lime are needed. (Capability unit IIIe–2; woodland suitability group 1a)

Ilion Series

The Ilion series consists of poorly drained, moderately fine textured soils that formed in calcareous glacial till consisting mainly of dark-gray to black, alkaline and calcareous, local shale containing a small amount of limestone. Shale bedrock commonly occurs at a depth of 4 to 6 feet. These soils occur in broad, level or slightly depressional areas throughout the central part of the county, generally at an elevation of less than 1,200 feet.

In an idle area, a typical profile has a dark-gray silty clay loam surface layer that contains root mottles and is about 4 inches thick. The subsoil is slightly sticky, gray silty clay loam that is distinctly mottled to a depth of 12 inches and has many coarser, more prominent mottles in the lower part. Reaction of the subsoil is slightly acid to neutral. At a depth of about 34 inches is the firm, calcareous till substratum. It is mottled dark grayish-brown silty clay loam and contains a noticeable amount of shale fragments.

Typical profile of Ilion silty clay loam (idle):

A1—0 to 4 inches, dark-gray (5Y 4/1) light silty clay loam; yellowish-brown (10YR 5/6) and strong-brown (7.5YR 5/6) root mottles; moderate, fine, subangular blocky structure; slightly firm; slightly sticky; many, fine and medium roots; medium acid; abrupt, wavy boundary.

B21g—4 to 12 inches, gray (5Y 5/1) light silty clay loam; common, medium, distinct, olive-brown (2.5Y 4/4) and light olive-brown (2.5Y 5/4) mottles; moderate, coarse prisms, breaking to moderate, medium and coarse, blocky structure; slightly sticky; dark-gray (5Y 4/1) organic stains in upper 1 or 2 inches, grading to gray (5Y 5/1), prominent clay films on ped faces and in pores; common, fine roots along ped faces; slightly acid; clear, wavy boundary.

B22tg—12 to 34 inches, gray (10YR 5/1) silty clay loam; many, coarse, prominent, dark-brown (7.5YR 4/4) and brown (7.5YR 5/4) mottles; moderate, coarse, prismatic structure, breaking to moderate, coarse, blocky structure; slightly sticky; gray (5Y 5/1), prominent clay films on ped faces and in pores; common, fine roots along ped faces, none inside peds; neutral; gradual, wavy lower boundary.

C—34 to 48 inches +, dark grayish-brown (2.5Y 4/2) light silty clay loam; few, medium, distinct, gray (5Y 5/1) mottles; common, partially weathered, dark-gray shale fragments; massive to weak, medium to thick, platy structure; firm; few, fine roots along ped faces in upper 6 inches; calcareous; content of shale increases with depth.

Thickness of the solum ranges from 20 to 40 inches and corresponds with depth to free carbonates. The A horizons are thin. The A1 horizon ranges in thickness from 3 to 6 inches. Texture ranges from heavy loam to light clay loam and is mostly heavy silt loam or light silty clay loam. Color ranges from very dark gray to olive gray. Reaction is medium acid to neutral.

Texture of the B horizon ranges from light silty clay loam to clay loam. The clay content is 28 to 35 percent. Color is mainly mottled gray with brown to yellow threads. Reaction is slightly acid to mildly alkaline.

Ilion soils are the poorly drained members of a drainage sequence that includes the moderately well drained and well drained Danley soils, the somewhat poorly drained Darien soils, and the very poorly drained Alden soils, till substratum. Ilion soils are similar in drainage and texture to Romulus soils but have gray instead of reddish colors. Ilion soils are finer textured than Lyons soils, which are similar in drainage.

Ilion silty clay loam (Is).—This soil is in nearly level areas adjacent to the more strongly sloping Darien or Danley soils, from which it receives runoff. Included in mapping are some areas of sediment that eroded from adjacent slopes. These deposits are as much as 18 inches thick and are generally very dark colored. Also included are a few small areas where slopes are up to 4 percent.

If undrained, this soil is too wet for most crops except grass hay. When adequately drained, it is suited to many of the annual field crops common to the county. Woodland consists of water-tolerant species. Many sites are suited to ponds or wildlife marshes.

The main need in management is control of excess water. Erosion is not a hazard. Most areas need little or no lime. Supply of potassium is high or very high, and the supply of available phosphorus is moderate. Nitrogen is deficient in the early part of the growing season but is generally adequate by midsummer. (Capability unit IVw–1; woodland suitability group 9)

Lakemont Series

The Lakemont series consists of poorly drained, moderately fine textured soils that formed in calcareous, reddish, lacustrine clay and silty clay. These level or depressional soils occur in low positions on the lake plains. They are located mainly in the northern third of the county, and the most extensive areas are in the vicinity of the Seneca River.

In a cultivated area, a typical profile has a very dark gray silty clay loam plow layer about 7 inches thick. The thin upper part of the subsoil is distinctly mottled, gray to grayish-brown, firm silty clay loam about 2 inches thick. At a depth of more than about 9 inches, the subsoil consists of firm, reddish-brown silty clay that is distinctly mottled. It is neutral in the upper part and becomes calcareous in the transition zone to the substratum, at a depth of about 16 inches. Depth to the firm, reddish-brown silty clay substratum is about 24 inches. The substratum has a few distinct mottles in the upper part that decrease in size and number as depth increases. It is also calcareous.

Typical profile of Lakemont silty clay loam, 0 to 2 percent slopes (cultivated):

Ap1—0 to 4 inches, very dark gray (10YR 3/1) light silty clay loam; very dark grayish brown (10YR 3/2) when rubbed; moderate, fine, granular structure; friable; slightly sticky; many, fine and medium roots; neutral; abrupt, wavy boundary.

Ap2—4 to 7 inches, very dark gray (10YR 3/1) light silty clay loam; very dark grayish brown (10YR 3/2) when rubbed; moderate, fine and medium, subangular blocky structure; friable; slightly sticky; many, fine roots; neutral; abrupt, smooth boundary.

B21g—7 to 9 inches, gray (10YR 5/1) to grayish-brown (10YR 5/2) silty clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) that grade to yellowish red (5YR 5/6); few, fine, distinct mottles of light olive brown (2.5Y 5/6); moderate, coarse, angular and subangular blocky structure within medium, coarse, prismatic structure; firm; sticky; prominent, gray (10YR 5/1) clay films on ped and prism faces; common, medium and coarse, distinct, yellowish-brown (10YR 5/6) and light olive-brown (2.5Y 5/6) mottles in the clay films; prominent clay films in pores; few, fine roots on prism and ped faces, none in ped interiors; neutral; clear, wavy boundary.

B22g—9 to 16 inches, reddish-brown (5YR 5/3 to 4/3) light silty clay; few, medium, distinct mottles of gray (10YR 5/1) and strong brown (7.5YR 5/6); moderate to strong, coarse, angular blocky structure within strong, coarse prisms; firm; sticky and plastic; very prominent, thick, gray (5YR 5/1) clay films on prism faces; prominent reddish-gray (5YR 5/2) clay films on blocky ped faces; these clay films have common, medium and coarse, distinct mottles of strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6); prominent, clay film in pores; few, fine roots on ped and prism faces; neutral; clear, wavy boundary.

B3—16 to 24 inches, reddish-brown (5YR 5/3) light silty clay; common, coarse, distinct mottles of yellowish brown (10YR 5/6), strong brown (7.5YR 5/6), and gray (5YR 5/1 and 6/1); strong, coarse, blocky structure in strong platy structure, within strong, coarse, prismatic structure; firm; sticky and plastic; very prominent, gray (5YR 5/1) clay films on prism faces; prominent, gray (5YR 5/1) clay films on ped faces; common, fine, distinct mottles of strong brown (7.5YR 5/6) in clay films; gray, clay film streaks in pores; few, fine roots along ped faces in upper part; calcareous; clear, wavy boundary.

C—24 to 48 inches +, reddish-brown (5YR 5/3) light silty clay; few, medium, distinct mottles of yellowish brown (10YR 5/6), strong brown (7.5Y 5/6), and gray (5YR 5/1 and 6/1), which decrease in size and number with depth; no mottles at depth of more than 40 inches; common, white and light-gray lime nodules; moderate, thick and very thick, platy structure within moderate coarse prisms; gray (5YR 5/1) to light-gray (5YR 6/1) silty lime coats on prism and plate faces and in pores; no roots; strongly calcareous.

Thickness of the solum ranges from 12 to 36 inches and corresponds with depth to free carbonates. Dominant texture of the A horizon is light silty clay loam or heavy silt loam. It includes some areas that have a thin smear as coarse as fine sandy loam. Color of the Ap and A1 horizons ranges from dark gray to black. Reaction is slightly acid to neutral.

The B horizon is mainly reddish brown to brown in color and contains few to common mottles that range from fine to coarse in size. Texture ranges from silty clay loam to silty clay, and the clay content ranges from 35 to 50 percent. A few thin layers of silt and sand occur in the B and C horizons in places, but these seldom are more than a total of 6 inches in thickness in the upper 40 inches. Reaction ranges from neutral to moderately alkaline. The B and C horizons are strongly calcareous in places.

The Lakemont soils are in a drainage sequence with the moderately well drained to well drained Schoharie soils, the somewhat poorly drained Odessa soils, and the very poorly drained Fonda soils. Lakemont soils are red, whereas the similar Madalin soils are gray. Lakemont soils are finer textured than Canandaigua soils of similar drainage.

Lakemont silty clay loam, 0 to 2 percent slopes (LcA).—This poorly drained soil has the profile described as typical for the series. It generally occurs in small- to medium-sized areas on the lake plain. The larger areas are mostly low and flat and are surrounded by the gently sloping Schoharie and Odessa soils or by the Cazenovia and Ovid soils that formed in glacial till. The small areas occur mainly in depressions or as narrow strips along drainageways between areas of gently sloping or moderately sloping Schoharie and Odessa soils. Many of these small areas contain deposits of eroded material from adjacent slopes and have a surface smear as much as 24 inches thick.

If undrained, this soil is used mainly for pasture or woods. Smaller areas in cultivated fields generally have been drained to some extent, but such drainage is commonly inadequate for intensive use. Consequently, many of these areas are important mainly because their wetness controls the timing of work on the better drained soils in spring. Some areas are suitable sites for ponds or wildlife marshes.

Drainage and careful management to prevent cloddiness are important needs in management. When these needs are met, this soil is suited to annual crops such as corn and beans. It is potentially one of the better soils in the county for growing sugar beets. Drained areas need little or no lime, a moderate amount of phosphorus, and a small amount of potassium. The supply of nitrogen is noticeably deficient in spring but is generally adequate for most crops by midsummer. (Capability unit IVw-1; woodland suitability group 9)

Lakemont silty clay loam, 2 to 6 percent slopes (LcB).—This soil has a profile similar to the one described as typical for the series but is generally a little drier. It is an inextensive soil and occurs mainly in narrow areas in close association with the better drained Schoharie and Odessa soils, from which it receives considerable runoff. Slopes are short and slightly convex and range dominantly from 2 to 4 percent.

If undrained, this soil is best suited to pasture or forest. Areas in cultivated fields generally have been drained to some extent, but drainage is often inadequate for intensive use. Many of these areas are important however, because their wetness controls the timing of work on better drained associated soils. Some areas are suitable sites for ponds.

Drainage is the main need in management, but drained areas need careful management to prevent cloddiness. Drained areas require little or no lime, a moderate amount of phosphorus, and a small amount of potassium. The supply of nitrogen is noticeably deficient in spring but is generally adequate for most crops by midsummer.

Measures to control erosion and reduce runoff from adjacent areas are greatly beneficial to this soil in most fields. Interception of runoff from adjacent areas reduces wetness of many areas and reduces the hazard of erosion, which is slight to moderate. (Capability unit IVw-2; woodland suitability group 9)

Lamson Series

The Lamson series consists of moderately coarse textured, level or depressional, poorly drained and very poorly drained soils that have a medium-lime to high-lime content. These soils occur mainly in the area north of the Seneca River.

In a cultivated area, a typical profile has a black to very dark brown fine sandy loam plow layer about 9 inches thick. The thin subsurface layer consists of very friable, gray to grayish-brown fine sandy loam about 4 inches thick. The upper part of the subsoil is mottled, very friable, light-gray to white loamy fine sand. At a depth of more than 18 inches, the subsoil is friable to very friable, mottled fine sandy loam that is reddish brown in the upper part and grades to light reddish brown to pinkish gray as depth increases. Reaction of the surface layer and subsoil is neutral to mildly alkaline. Depth to the calcareous substratum is about 33 inches. The substratum consists of thin layers of brownish-yellow, light-gray, and light reddish-brown loamy fine sand, fine sand, and silty clay.

Typical profile of Lamson fine sandy loam (cultivated):

Ap—0 to 9 inches, black (10YR 2/1) to very dark-brown (10YR 2/2) fine sandy loam; moderate, medium and coarse, subangular blocky structure, breaking to weak, fine and medium, granular structure; very friable; many, fine roots; neutral; clear, wavy boundary.

A2g—9 to 13 inches, gray (10YR 6/1) to grayish-brown (10YR 6/2) light fine sandy loam; weak, medium and coarse, subangular blocky structure; very friable; common, fine roots; neutral; clear, wavy boundary.

B21g—13 to 18 inches, light-gray (10YR 7/1) to white (10YR 8/1) loamy fine sand; few, medium, distinct, yellowish-brown (10YR 5/6) and reddish-brown (5YR 4/4) mottles in lower part; weak, medium and coarse, subangular blocky structure; very friable; few, fine roots; neutral; clear, wavy boundary.

B22g—18 to 24 inches, reddish-brown (5YR 3/3) light fine sandy loam; common, medium, distinct, light-gray (10YR 7/1) and strong-brown (7.5YR 5/6) mottles; weak, platy structure breaking to weak, medium and coarse, blocky structure; very friable; neutral; clear, wavy lower boundary.

B23g—24 to 33 inches, light reddish-brown (5YR 6/3) to pinkish-gray (5YR 6/2) light fine sandy loam; many coarse, distinct, light-gray (5YR 7/1), strong-brown (7.5YR 5/6), and brownish-yellow (10YR 6/6) mottles; massive to weak, platy structure breaking to very weak, medium and coarse, blocky structure; friable; mildly alkaline; clear, wavy lower boundary.

C—33 to 48 inches +, variegated, brownish-yellow (10YR 6/6), light-gray (10YR 7/1), and light reddish-brown (5YR 6/3), thin, banded loamy fine sand, fine sand, and silty clay; weak to moderate, medium, thick and very thick, platy structure; friable; strongly calcareous; thicker bands of silty clay below depth of 40 inches.

The A horizon generally is fine sandy loam to loamy fine sand in texture and contains as much as 50 percent very fine sand by volume. It commonly is black and in places contains sufficient organic matter to be mucky. Where these soils are cultivated, and they are drained, there is a decrease in organic-matter content and in time the A horizon becomes dark gray or dark brown.

The B horizon ranges in texture from very fine sandy loam to loamy fine sand. Depth to sandy material ranges from 36 inches to many feet. At a depth of more than 20 to 40 inches, thin bands of clay up to 2 inches thick, but not more than 6 inches in total thickness, occur in places in the solum.

The reaction of the A horizon generally is medium acid to neutral but ranges from very strongly acid to mildly alkaline. At a depth or more than 36 inches, the soil is calcareous in places.

Lamson soils are commonly the poorly drained and very poorly member of a drainage sequence that includes the well-drained to excessively drained Arkport soils. It is also a member of the drainage sequence that includes the moderately well drained Elnora soils and the somewhat poorly drained Stafford soils. Lamson soils are coarser textured than Canandaigua and Alden soils.

Lamson fine sandy loam and mucky fine sandy loam (Lf).—This unit consists of the soil described as typical for the series and of another Lamson soil containing sufficient organic matter to have a mucky fine sandy loam surface layer. Some areas consist almost entirely of the poorly drained soil and some areas consist of the very poorly drained soil, but most areas are a mixture of both soils. Many of the larger areas are poorly drained around the edges and grade to very poorly drained in the center. Included in mapping are small spots of shallow muck. Also included are spots of the better drained Stafford and Elnora soils, which occur on occasional slight rises and knolls but have little effect on management and use.

The undrained areas are best suited to water-tolerant pasture, forest, or wildlife. Drained areas may be used for a variety of crops, and the soil responds readily to artificial drainage. Because the fine sand flows readily where saturated, special measures are needed to prevent drains from plugging. Areas that have been drained need nitrogen, phosphorus, and potash. Some areas need lime. (Capability unit IIIw-7; woodland suitability group 9)

Langford Series

The Langford series consists of deep, medium-textured, moderately well drained soils that have a fragipan. These soils formed in neutral or weakly calcareous glacial till derived mainly from gray, fine-grained sandstone but including some gray shale and limestone. They occur in the southern part of the county, generally at an elevation of more than 1,200 feet.

In a cultivated area, a typical profile has a dark-gray channery silt loam plow layer about 8 inches thick. The upper part of the subsoil extends to a depth of 14 inches and consists of friable, yellowish-brown to brown channery silt loam. It is separated from the lower part of the subsoil by a thin, leached layer of friable, light brownish-gray to grayish-brown channery silt loam that is distinctly mottled. The lower part of the subsoil, between depths of 19 and 38 inches, consists of a very firm and brittle fragipan of mottled, dark grayish-brown channery loam. This is underlain by a very firm, acid, brittle till substratum that is grayish-brown to light olive-brown channery loam and contains a few mottles in the upper part, which disappear as depth increases. Reaction of the upper part of the subsoil and of the leached layer is medium acid. The fragipan is medium acid in the upper part and becomes neutral as depth increases. The substratum is neutral in the upper part and weakly calcareous at a depth of more than 48 inches.

Typical profile of Langford channery silt loam, 2 to 8 percent slopes (cultivated):

Ap—0 to 8 inches, dark-gray (10YR 4/1) channery silt loam; dark grayish brown (10YR 4/2) when rubbed; moderate, medium, subangular blocky structure, breaking to medium, granular structure; friable; many, fine roots; slightly acid; clear, wavy boundary.

B2—8 to 14 inches, yellowish-brown (10YR 5/4) channery silt loam that fades to brown (10YR 5/3) in lower part; moderate, fine and medium, subangular blocky structure; friable; common, fine roots; medium acid; clear, wavy boundary.

IIA'2g—14 to 19 inches, light brownish-gray (10YR 6/2) to grayish-brown (10YR 5/2) channery silt loam; common, medium, distinct, light-gray (10YR 7/2), yellowish-brown (10YR 5/4), and brownish-yellow (10YR 6/6) mottles; weak to moderate, fine and medium, subangular blocky structure; friable; few, fine roots; medium acid; clear, irregular boundary.

IIB'x1—19 to 24 inches, dark grayish-brown (2.5Y 4/2) channery loam; common, medium, distinct mottles of light gray (2.5Y 7/2), light olive brown (2.5Y 5/6), yellowish brown (10YR 5/6), and brownish yellow (10YR 6/6); weak, coarse prisms, 12 to 14 inches across, that break to weak, medium and coarse, subangular blocky structure; firm in place, brittle when removed; prisms separated by light brownish-gray (2.5Y 6/2) to light-gray (2.5Y 7/2), friable light silt loam, or by very fine sandy loam streaks that are 1 to 2 inches wide at top and taper to ¼ inch at the bottom; common, fine and medium, light olive-brown (10Y 5/6), yellowish-brown (10YR 5/6), and brownish-yellow (10YR 6/6) mottles in the streaks; medium acid; very few roots inside prisms, and few roots in material between prisms; gradual, wavy boundary.

IIB'x2—24 to 33 inches, dark grayish-brown (2.5Y 4/2) channery loam; common, medium, distinct mottles of light yellowish brown (2.5Y 6/4), light olive brown (2.5Y 5/6), yellowish brown (10YR 5/6), and light brownish gray (2.5Y 6/2); weak, coarse prisms, 12 to 14 inches across, break to weak, coarse, subangular blocky structure; very firm in place, brittle when removed; prisms separated by thin, gray (10YR 5/1) to grayish-brown (2.5Y 5/2), friable silt coats; very few, fine roots along prism faces; neutral; gradual, wavy boundary.

IIB'x3—33 to 38 inches, dark grayish-brown (2.5Y 4/2) channery loam, grading to very dark grayish brown (2.5Y 3/2); few, medium, distinct mottles of yellowish brown (10YR 5/6), strong brown (7.5YR 5/6), and light gray (10YR 7/2); weak, coarse prisms, 12 to 14 inches across, that break to weak, coarse, subangular blocky structure; very firm in place, brittle when removed; thin, grayish-brown (2.5Y 5/2) silt coats on prism faces; no roots; few, thin, discontinuous clay films in larger pores; neutral; gradual, wavy boundary.

IICx—38 to 48 inches, grayish-brown (2.5Y 5/2) to light olive-brown (2.5Y 5/4) channery loam; few, fine, faint, yellowish-brown mottles that gradually disappear with depth; weak, medium and thick, platy structure; very firm in place, brittle when removed; thin, grayish-brown silt coats on plate faces; neutral at depth of 42 inches, weakly calcareous at depth of 48 inches.

Color of the A1, or the Ap, horizon ranges from very dark gray to grayish brown. Texture ranges from channery loam to silt loam, and content of pebbles and stone fragments ranges from 15 to 30 percent. Reaction ranges from strongly acid to medium acid where the soil is unlimed.

The B2 horizon ranges in color from strong brown to light olive brown, and its texture is silt loam or loam. This horizon commonly has high-chroma mottles in its lower part. Reaction is strongly acid to slightly acid.

The A'2g horizon ranges from light gray to pale brown. It has common to many, medium and coarse, high-chroma mottles. The texture ranges from silt loam to very fine sandy loam. Content of stone fragments is 15 to 35 percent. Reaction ranges from strongly acid to slightly acid.

Depth to the fragipan, or Bx horizon, ranges from 15 to 24 inches in uneroded soils but occurs at a depth of as little as 10 inches where eroded. The Bx horizon ranges in texture from loam to heavy silt loam. Content of stone fragments is 15 to 35 percent. Color ranges from very dark grayish brown to grayish brown, and there are few to common, fine and medium mottles. Reaction ranges from medium acid in the upper part of the horizon to mildly alkaline in the lower part.

The Cx horizon is neutral to moderately alkaline, and in places it is calcareous. Depth to carbonates is 40 to 72 inches.

The Langford soils are the moderately well drained member of a drainage sequence that includes the somewhat poorly drained Erie soils and the very poorly drained Alden soils, till substratum. Langford soils are more acid and have a prominent fragipan that is lacking in the similar Conesus soils.

Langford channery silt loam, 2 to 8 percent slopes (LgB).—This soil has the profile described as typical for the series and is the most extensive soil of this series in the county. It is on long, smooth slopes in the uplands or in undulating areas dominated by convex slopes. Included in mapping are spots of somewhat poorly drained Erie soils in shallow depressions or along narrow drainageways. These are wetter soils that make up as much as 10 percent of some areas and that delay planting in spring.

This soil is suited to crops, pasture, or forest. It is among the better soils of the uplands for crops but is slightly limited by wetness. Alfalfa and other deep-rooted perennial crops can be grown successfully, but the risk of winterkilling can be serious in the wetter areas. Runoff is moderate to moderately rapid, and erosion is a hazard. Random drainage of wet spots may be beneficial in many fields. As with all of the more acid soils, this soil must be limed adequately before the potential response to nitrogen, phosphorus, and potassium can be obtained. (Capability unit IIe-8; woodland suitability group 3a)

Langford channery silt loam, 8 to 15 percent slopes (LgC).—This soil is on uniform side slopes of valleys or in complex, rolling areas of the uplands. Cropped acreage commonly includes small areas that are moderately eroded. Areas of this soil range from small to moderate in size, and few are larger than 20 acres.

Included in mapping are spots of somewhat poorly drained Erie soils in depressions and along narrow drainageways. These soils occupy as much as 15 percent of some undulating areas where the depressions and drainageways are more numerous.

This soil is suited to crops, pasture, or forest. Runoff is rapid, and this soil is more susceptible to erosion and midsummer drought than are the less sloping Langford soils. Control of water is an important management need because of the hazard of erosion and drought. The undulating slopes are generally better suited to long-term hay than to cultivated crops. Adequate liming and complete fertilization are essential. (Capability unit IIIe–3; woodland suitability group 3a)

Langford channery silt loam, 8 to 15 percent slopes, eroded (LgC3).—Areas of this soil range from small to moderate in size, and few are larger than 20 acres. The profile of this soil resembles that described as typical for the series, but it has a fragipan at a depth of only 10 to 15 inches. The plow layer directly overlies the fragipan in places. The present plow layer consists largely of yellowish-brown subsoil material and has much lower organic-matter content than previously.

This soil has uniform slopes in some areas, a complex, and rolling topography in other areas. The degree of erosion is most nearly uniform on uniform slopes. Uneroded, eroded, and some severely eroded spots are intermingled in the rolling areas, where deposits of eroded material commonly occur in small depressions.

Included in mapping are spots of somewhat poorly drained Erie soils in depressions and along narrow drainageways. These spots occupy as much as 15 percent of some rolling areas where depressions and drainageways are more numerous.

This soil is not suited to intensive cultivation. The surface layer has a relatively low organic-matter content and absorbs water slowly. Runoff is rapid, and continued erosion is a hazard. The thin root zone above the fragipan holds only 2 to 3 inches of available water for plants, and rapid runoff contributes to the loss of water, which is needed in summer. Consequently, crops are subject to drought damage.

This soil can be used for crops if properly managed, but it is generally better suited to long-term hay, pasture, or forest. Use of measures to control erosion and conserve moisture, to increase organic-matter content, and to improve structure of the plow layer are important to management. Adequate liming and fertilization are necessary for field or forage crops. The supply of nitrogen and lime is especially deficient, and the need for them is likely to be critical. (Capability unit IVe–4; woodland suitability group 3a)

Langford channery silt loam, 15 to 25 percent slopes (LgD).—This soil has a profile that resembles the one described as typical for the series but generally is drier. It occurs in smooth areas on hillsides or on uplands that have hilly, complex topography. Wet spots occur along the intermittent streams or drainageways that cross many of the smooth areas at right angles to the contour.

This soil commonly has a yellowish-brown, well-aerated layer below the plow layer that in places extends to or almost to the fragipan. Where this soil is not eroded, depth to the fragipan is generally less than 24 inches. In many places the soil is free of mottling above the fragipan, or if mottled above the pan, the mottled layer is generally thin.

The degree of erosion was not differentiated in mapping this moderately steep soil. Cropped areas generally are moderately eroded but include severely eroded spots. Because of the shallow depth to the fragipan, even uneroded areas have a lower moisture-holding capacity than do the less sloping Langford soils.

This soil is suited to limited cropping, to pasture, or to forest. Use of farm machinery is restricted by slope. Long-term hay and pasture are among the better uses. Runoff is rapid, and erosion is a hazard in all areas. Loss of water contributes to droughtiness by midsummer. Where this soil is used for intertilled crops, use of intensive measures to control erosion and conserve water is important. Lime and complete fertilization are necessary where this soil is used for hay and pasture. (Capability unit IVe–3; woodland suitability group 3b)

Langford Series, Moderately Shallow Variant

The Langford series, moderately shallow variant, consists of medium-textured, moderately well drained soils that have a strongly expressed fragipan. These soils formed in thin, neutral to mildly alkaline glacial till derived mainly from gray sandstone but containing some shale and limestone. They generally occur in the southern part of the county at an elevation of more than 1,200 feet.

In a cultivated area, a typical profile has a dark grayish-brown channery silt loam plow layer about 8 inches thick. The upper part of the subsoil extends to a depth of 14 inches and is friable, yellowish-brown channery silt loam. Just below is a thin, leached layer of friable, light brownish-gray channery silt loam that has yellowish-brown mottles. The lower part of the subsoil, at depths between 17 and 29 inches, is a very firm, dense fragipan of dark grayish-brown channery silt loam that has a few yellowish-brown and light-gray mottles. Depth is about 29 inches to hard sandstone and shale bedrock. The bedrock is commonly fractured in the upper part. Reaction of the subsoil and of the leached layer is medium acid. Reaction of the fragipan is slightly acid.

Typical profile of Langford channery silt loam, moderately shallow variant, 2 to 8 percent slopes (cultivated):

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) channery silt loam; dark brown (10YR 4/3) when rubbed; weak, medium and coarse, granular structure; friable; numerous fine and medium roots; slightly acid; abrupt, wavy boundary.

B2—8 to 14 inches, yellowish-brown (10YR 5/4) channery silt loam; fades to brown (10YR 5/3) with depth; moderate, fine and medium, subangular blocky structure; friable; nonsticky; numerous, fine and medium roots; medium acid; clear, wavy boundary.

A'2g—14 to 17 inches, light brownish-gray (2.5Y 6/2) channery silt loam; common, medium, distinct, yellowish-brown (10YR 5/4 and 5/6) and brownish-yellow (10YR 6/6) mottles; weak to moderate, very fine, subangular blocky structure in weak, platy structure; friable; common, fine roots and few, medium roots; medium acid; clear, irregular boundary.

B'x—17 to 29 inches, dark grayish-brown (2.5Y 4/2) channery silt loam; few, fine, distinct mottles of yellowish brown (10YR 5/6) and light gray (2.5Y 7/2); moderate, very coarse prisms, 12 to 18 inches across, that break to weak, coarse and medium, angular blocky structure in upper 3 inches, changing gradually to very weak, very thick, platy structure with depth; firm to very firm in places, brittle when removed; discontinuous, thin clay films on ped faces; distinct clay linings in few larger pores; prisms separated by light brownish-gray (2.5Y 6/2), friable, very fine sandy loam or light silt loam streaks ½ to 1½ inches wide; common, medium, distinct mottles of yellowish brown (10YR 5/6 and 5/4) in the streaks; common, fine roots along prism faces; slightly acid; abrupt, wavy boundary.

R—29 to 40 inches +, gray, fine-grained sandstone and hard shale bedrock; upper 6 to 12 inches fractured into layers ½ to 2 inches thick; light-gray (2.5Y 7/2) silt coats on horizontal rock faces.

Thickness of the solum ranges from 20 to 40 inches; this corresponds with depth to hard sandstone and shale bedrock. The A1, or the Ap, horizon ranges in color from very dark gray to grayish brown, and its texture is channery silt loam or channery loam; content of coarse fragments, mainly flat and angular, is 15 to 30 percent. Reaction is strongly acid to medium acid where unlimed.

The B2 horizon ranges in color from strong brown to light olive brown and commonly has high-chroma mottles in the lower part. Texture is channery silt loam or channery loam; content of coarse fragments, which are mainly flat and angular, is 15 to 35 percent. Reaction is strongly acid to medium acid.

The A'2g horizon ranges in color from light gray to pale brown and has common to many, medium and coarse, high-chroma mottles. Texture ranges from channery silt loam to channery very fine sandy loam; content of coarse fragments, which are mainly flat and angular, is 15 to 35 percent. Reaction is strongly acid to medium acid.

The B'x horizon, or fragipan, ranges in color from very dark grayish brown to grayish brown and has few to common, fine and medium mottles. Texture is channery loam to channery heavy silt loam, and commonly there is enough sand to give it a gritty feel; content of coarse fragments is 15 to 35 percent. Reaction ranges from medium acid to mildly alkaline.

A thin Cx horizon is present in some places where depth to bedrock is between 30 and 40 inches. Color and texture are similar to those of the B'x horizon. Reaction is neutral to mildly alkaline.

The Langford series, moderately shallow variant, is a moderately well drained member of a drainage sequence that includes the somewhat poorly drained Erie series, moderately shallow variant. It is also closely associated in the uplands with normal Langford and Erie soils that are more than 40 inches deep over hard sandstone and shale bedrock.

Langford channery silt loam, moderately shallow variant, 2 to 8 percent slopes (LnB).—This soil has the profile described as typical for the series. It occupies bedrock-controlled hilltops or upper side slopes. The gentle slopes are characteristically smooth and slightly convex in shape.

Included in mapping are spots of soils of the somewhat poorly drained Erie series, moderately shallow variant, the shallow Arnot soils, and the deeper Langford soils. The moderately shallow Erie soils are in shallow depressions or along narrow drainageways. They occupy as much as 18 percent of some areas and are sufficiently wet to delay tillage in the spring. Inclusions of Arnot soils occupy as much as 10 percent of some areas, and though of minor extent, their shallow depth to bedrock affects use in some fields. The deeper Langford soils occupy as much as 25 percent of some areas. They have little effect on the use and management, since the overall depth of bedrock of 20 to 40 inches is the major factor determining many uses.

This soil is suited to crops, pasture, or forest. In its response to management for these uses, this soil resembles Langford channery silt loam, 2 to 8 percent slopes, which is deeper. The depth to fragipan determines the rooting depth and the amount of water available for plants. The 20- to 40-inch depth to bedrock affects the deep placement of random drains, which may be needed to drain wet spots in some fields.

Runoff is moderate to moderately rapid, and erosion is a hazard. This soil is suited to most crops commonly grown in the county if properly managed. It must be limed adequately before the potential response to nitrogen, phosphorus, and potassium can be obtained. Small, flat stones moderately limit cultivation. (Capability unit IIe–8; woodland suitability group 3a)

Langford channery silt loam, moderately shallow variant, 8 to 15 percent slopes (LnC).—This soil has a profile that resembles the one described as typical for the series but is generally a little drier. It is of limited extent and occurs mainly as small areas adjacent to less sloping Langford or Arnot soils, which have bedrock at a depth of less than 20 inches. Included in mapping are spots of the deep Langford soils, where bedrock is at a depth of more than 40 inches.

The degree of erosion is not differentiated in this mapping unit. Cropped areas commonly are moderately eroded, but a few spots are severely eroded. In forested and unplowed areas, there is little or no erosion. Runoff is rapid, and this soil is more susceptible to erosion and midsummer drought than are the less sloping Langford soils. Erosion and drought hazards make water control an important need.

This soil is suited to crops, pasture, or forest. Adequate liming and complete fertilization are essential to cropping. (Capability unit IIIe–3; woodland suitability group 3a)

Lansing Series

The Lansing series consists of well-drained soils that have distinct horizons and a moderate lime content. These soils formed in calcareous, medium-textured glacial till derived mainly from calcareous gray shale; calcareous, gray, fine-grained sandstone; and some limestone. They occur mostly in the area south of the village of Ovid at elevations of 1,000 to 1,400 feet.

In a cultivated area, a typical profile has a dark-gray gravelly silt loam plow layer 6 inches thick. The subsurface layer is leached, friable, pale-brown gravelly silt loam about 4 inches thick. The subsoil, which is at a depth of about 10 inches, is dark-brown to dark grayish-brown, firm gravelly silt loam. It is partially leached in the upper 2 inches and has some brownish-gray silt coatings around blocks of darker material. Depth to firm, calcareous, gray and brown gravelly loam till is about 37 inches. Reaction of the subsoil ranges from medium acid in the upper part to neutral in the lower part.

Typical profile of Lansing gravelly silt loam, 2 to 8 percent slopes (cultivated):

Ap—0 to 6 inches, dark-gray (10YR 4/1) gravelly silt loam; dark grayish brown (10YR 4/2) when rubbed; moderate, fine and medium, subangular blocky structure, breaks to weak, fine and medium granules;

friable; many, fine and medium roots; slightly acid; abrupt, wavy boundary.

A2—6 to 10 inches, pale-brown (10YR 6/3) gravelly silt loam; moderate, fine and medium, subangular blocky structure, breaking to weak, very fine and fine, granular structure; friable; many, fine and medium roots; medium acid; clear, wavy boundary.

B&A—10 to 12 inches, dark-brown (10YR 3/3) to dark grayish-brown (10YR 4/2) gravelly heavy silt loam; moderate, medium, subangular blocky structure; light brownish-gray (10YR 6/2) to grayish-brown (10YR 5/2) silt coats on ped surfaces; firm; discontinuous, thin clay films in pores; many, fine and medium roots; medium acid; clear, wavy boundary.

B21t—12 to 17 inches, dark-brown (10YR 3/3) to dark grayish-brown (10YR 4/2) gravelly heavy silt loam; moderate, medium and coarse, subangular blocky structure; firm; slightly sticky; dark grayish-brown (10YR 4/3) to grayish-brown (10YR 5/2) thin clay films on blocky faces and in larger pores; many, fine and medium roots; medium acid; gradual, wavy boundary.

B22t—17 to 25 inches, dark grayish-brown (10YR 4/2) to dark-brown (10YR 3/3) gravelly heavy silt loam; moderate, coarse and medium, angular and subangular blocky structure; firm; slightly sticky; dark grayish-brown, distinct clay films on block faces and in larger pores; many, fine and medium roots; slightly acid; gradual, wavy boundary.

B3—25 to 37 inches, dark-brown (10YR 3/3) to very dark brown (10YR 3/2) gravelly heavy silt loam; moderate to weak, coarse, subangular blocky structure; firm; slightly sticky; dark-brown (10YR 3/3) to dark grayish-brown (10YR 4/2) patchy clay films on block faces and in pores; common, fine and medium roots; neutral; clear, wavy boundary.

C—37 to 45 inches +, variegated gray (10YR 5/1) and brown (10YR 5/3) gravelly loam glacial till that becomes grayer with depth; weak, platy structure breaks to weak, fine and medium, blocky structure in upper part; very firm in place; calcareous.

Thickness of the solum ranges from 32 to 50 inches, which corresponds with depth to carbonates or calcareous material. The A1, or the Ap, horizon ranges in color from very dark gray to grayish brown, and the A2 horizon from light grayish brown to brown. Texture of the A horizon is mainly gravelly silt loam but ranges to loam and very fine sandy loam. Content of coarse fragments is 5 to 25 percent, by volume. Reaction ranges from strongly acid to slightly acid where the soil is unlimed.

The B horizon is dark grayish brown to olive brown. Texture ranges from gravelly loam to gravelly heavy silt loam, and clay content is 18 to 28 percent. Coarse fragments range in size from pebbles to boulders and make up 15 to 30 percent of the horizon, by volume. Reaction is strongly acid to slightly acid in the upper part of the horizon to neutral or mildly alkaline in the lower part.

The C horizon is a mixed or variegated gray and brown in color and changes to gray as depth increases. Texture is mainly gravelly loam but ranges from gravelly silty loam glacial till to gravelly loamy sand where this horizon consists of morainic or water-sorted material. Content of coarse fragments ranges from 15 to 35 percent. Reaction is moderately alkaline to neutral. The C horizon is mainly calcareous.

The Lansing soils are the well drained member of a drainage sequence that includes the moderately well drained Conesus soils, the somewhat poorly drained Appleton soils, the poorly drained Lyons soils, and the very poorly drained Alden soils, till substratum. Lansing soils are more acid, have a thicker solum, and have a greater depth to free lime than similar Honeoye soils. Lansing soils are grayer than Ontario soils and coarser textured than the Danley soils and the redder Cazenovia soils.

Lansing gravelly silt loam, 2 to 8 percent slopes (LsB).—This soil has the profile described as typical for the series. It occurs in uniform and undulating areas that receive little or no runoff from adjacent areas. It is the most extensive soil of the Lansing series, and in places it is the dominant soil in entire fields.

Included in mapping are spots or areas of moderately well drained Conesus soils and somewhat poorly drained Appleton soils that occur in occasional depressions and drainageways. These wet spots are not extensive, but in many fields they are troublesome early in spring.

This soil is among the best in the county for crops, pasture, or forest. It is suited to all crops commonly grown in the county, including deep-rooted legumes, corn, small grains, and vegetables. The stone content hinders tillage in some areas.

The main needs in management include keeping the surface layer in good tilth, maintaining fertility, and controlling acidity. The hazard of erosion is slight to moderate, and measures to control runoff may be needed. Random drainage of included wet spots is beneficial in some areas. (Capability unit IIe-1; woodland suitability group 1a)

Lansing gravelly silt loam, 8 to 15 percent slopes (LsC).—This soil is not extensive in Seneca County. Most areas have smooth, short, and convex slopes that limit the use of machinery. This soil is associated with the less sloping Lansing soils and it commonly occurs on side slopes below less strongly sloping soils, from which it receives some runoff.

Included in mapping are a few small spots of moderately well drained Conesus soils that occur in small, more nearly level pockets or along, shallow, narrow drainageways. These wetter soils seldom make up more than 5 percent of a given area.

This Lansing soil is suited to crops, pasture, and forest, and much of it is still forested or in unplowed pasture. Although the soil is suited to most crops, requirements for crops that need tillage are exacting. Lime and a complete fertilizer are required. If intertilled crops are grown, the hazard of erosion necessitates use of control measures. Random drains may be needed for occasional wet spots. (Capability unit IIIe-1; woodland suitability group 1a)

Lansing gravelly silt loam, 8 to 15 percent slopes, eroded (LsC3).—This soil is not extensive in Seneca County. It has a profile that resembles the one described as typical for the series, but the present plow layer is composed mainly of material from the upper part of the original subsoil. The soil is eroded over 75 percent or more of its total area.

The plow layer in eroded areas is generally lighter in color, has lower organic-matter content, and has a higher content of gravel and stone fragments than in uneroded areas. Many areas of the eroded soil lie on the moderately long side slopes of valleys that are below less strongly sloping Lansing soils. Included in mapping are narrow areas of Conesus soils in some drainageways, which seldom make up more than 5 percent of a given area. Also included are spots where the more clayey lower subsoil is mixed into the plow layer. Other inclusions are areas that have little or no erosion and small depressions or strips along the upper sides of fence rows, where eroded material has been deposited.

This soil is suited to crops, pasture, or forest. Most of it is cropped or has been cropped. This soil is commonly better suited to long-term hay and forage crops, because erosion is a continuing hazard. If intertilled crops are grown, stringent erosion control measures are needed, as well as rotations that include a high percentage of crops to improve soil structure and increase organic-matter content. This soil needs lime and a complete fertilizer. The severely eroded spots are especially deficient in nitrogen. (Capability unit IVe-2; woodland suitability group 1a)

Lansing gravelly silt loam, 15 to 25 percent slopes (LsD).—This soil is not extensive in the county and occurs mainly on short side slopes adjacent to the less strongly sloping Lansing soils. The degree of erosion ranges from none or slight in woods and unplowed fields to severe in cropped areas. Included in mapping are a few small areas of Conesus soils that occur in slightly wet spots.

This soil can be cultivated, but slopes are so steep that tillage is extremely difficult and hazardous. The hazard of erosion is severe, so most areas are better suited to hay, pasture, or forest than to other crops. Lime and a complete fertilizer are needed for hay and forage crops. (Capability unit IVe-1; woodland suitability group 1b)

Lima Series

The Lima series consists of deep, moderately well drained soils that formed in strongly calcareous, medium-textured glacial till. South of the Seneca River, the brown and olive-brown colors of the soil reflect the influence of the dark-gray and black shale in the till. North of the river, reddish colors are imparted by the red shale and sandstone of the till. These soils are in widely scattered areas north of Ovid. They are generally at an elevation of less than 1,000 feet.

In a cultivated area, a typical Lima soil has a dark grayish-brown silt loam plow layer about 8 inches thick. The subsurface layer is thin, leached, friable, brown to yellowish-brown silt loam that fingers into the upper subsoil at a depth of about 11 inches. The subsoil is friable to firm heavy silt loam that is yellowish brown to dark yellowish brown in the upper few inches. At a depth of more than about 15 inches, the subsoil is dark yellowish brown to olive brown and has common, distinct mottles. Depth to firm calcareous loam till is about 21 inches. The till is mottled grayish brown to light olive brown to a depth of about 30 inches. Below this depth it is grayish brown and unmottled.

Typical profile of Lima silt loam, 3 to 8 percent slopes (cultivated):

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; dark brown (10YR 4/3) when rubbed; moderate, medium, granular structure; friable; many, fine and medium roots; neutral; abrupt, smooth boundary.

A2—8 to 11 inches, brown (10YR 5/3) to yellowish-brown (10YR 5/4) silt loam; weak to moderate, medium, subangular blocky structure; friable; nonsticky; many, fine and medium roots; many, fine and medium pores; neutral; clear, wavy boundary; thin fingers, 1 to 3 inches apart, extend 1 to 3 inches into the underlying horizon.

B21t—11 to 15 inches, yellowish-brown (10YR 5/4) to dark yellowish-brown (10YR 4/4) heavy silt loam; moderate, medium and coarse, subangular blocky structure; friable to firm; slightly sticky; thin, grayish-brown (10YR 5/2) to brown (10YR 5/3) clay films on ped faces and in pores; many, fine and medium roots; neutral; clear, wavy boundary.

B22t—15 to 21 inches, dark yellowish-brown (10YR 4/4) to olive-brown (2.5Y 4/4) heavy silt loam; common, medium, distinct mottles of yellowish brown (10YR 5/6), light olive brown (2.5YR 5/6), and pale brown (10YR 6/3); moderate, coarse and medium, subangular and angular blocky structure; slightly firm; slightly sticky; thin, grayish-brown (2.5Y 5/2) clay films on ped faces and in pores; common, fine and medium roots; neutral; clear, wavy boundary.

C1—21 to 30 inches, grayish-brown (2.5Y 5/2) to light olive-brown (2.5Y 5/4) loam; common, medium, distinct mottles of yellowish brown (10YR 5/4), olive brown (2.5Y 4/4), brown (10YR 4/3), and light gray (10YR 7/2); weak, platy structure, breaking to moderate, medium and coarse, blocky structure; firm; thin, gray, silty coats on vertical ped faces; few, fine roots; weakly calcareous; clear, wavy boundary.

C2—30 to 40 inches +, grayish-brown (2.5Y 5/2) loam; weak to moderate, thick, platy structure; firm, calcareous glacial till.

Thickness of the solum and depth to calcareous material range from 12 to 30 inches. Reaction of the solum is neutral.

The A1, or the Ap, horizon ranges in color from very dark gray to dark brown. The A2 horizon ranges in color from pale brown to yellowish brown and contains faint high-chroma mottles in some places where the horizon is wettest. The A2 horizon is weakly to moderately expressed. Texture of the A horizon is dominantly silt loam but ranges from fine sandy loam to silt loam. Content of stone fragments is 0 to 10 percent. Reaction ranges from slightly acid to mildly alkaline.

The B horizon is olive brown to reddish brown and in places is mottled throughout or only in the lower part. Texture ranges from heavy silt loam to heavy fine sandy loam, and content of clay is 18 to 28 percent. The content of stone fragments ranges from 0 to 25 percent or more. The content of dark-gray and black shale increases where these soils are closely associated with Danley soils. Reaction ranges from slightly acid to mildly alkaline.

Lima soils are the moderately well drained members of drainage sequences that include the well drained, brown Honeoye soils and the reddish-brown Ontario soils. Other members of these drainage sequences are the somewhat poorly drained Appleton soils, the poorly drained Lyons soils, and the very poorly drained Alden soils, till substratum. Lima soils are similar in drainage to the Conesus, Cazenovia, and Danley soils. Lima soils have a higher content of lime and a thinner solum than the Conesus soils and are coarser textured than the Cazenovia or Danley soils.

Lime silt loam, 0 to 3 percent slopes (LtA).—This soil has a profile that resembles the one described as typical for the series but in most places it is faintly mottled in the upper part of the subsoil and highly mottled in the lower part. In a few places, deposits of eroded material from adjacent areas are as much as 10 to 15 inches or more in thickness.

This soil comprises about a fourth of the acreage of the Lima series in Seneca County. The largest areas are in the uplands and receive little or no runoff from adjacent areas. Slopes are generally smooth or slightly convex in shape. In places this soil is dominant in entire fields, but it is generally associated with the more strongly sloping Lima, Appleton, or Darien soils.

In the northern part of the county, areas of this soil are generally small. They occur mostly as narrow, level or slightly depressional strips with a long north-south axis. They are associated with Ontario soils that occupy drumlins or long drumloidal hills.

Included in mapping are small areas of Appleton soils in shallow depressions or along narrow drainageways, which make up as much as 10 to 15 percent of some areas and delay field operations in spring.

This soil is well suited to crops, pasture, or forest. It is suited to most crops commonly grown in the county, but planting of some crops may be delayed by wetness in spring, and some water-sensitive crops may be damaged in very wet seasons.

Removal of excess water is an important need in management. Random drainage of wet spots or included areas of Appleton soils is highly beneficial in many fields. Erosion is not a hazard on this nearly level soil. Only a few areas need lime, and response to fertilization is good. Supply of nitrogen is commonly deficient in spring. (Capability unit IIw-4; woodland suitability group 1a)

Lima silt loam, 3 to 8 percent slopes (LtB).—This soil has the profile described as typical for the series. This is one of the more extensive soils in Seneca County and covers approximately 10,000 acres. Many areas in the central part of the county are large, and in some places this is the dominant soil in entire fields. About 70 to 80 percent of the acreage is on slopes of 3 to 5 percent, which are mainly smooth and slightly convex. The areas occur in positions where they receive only low to moderate runoff from adjacent slopes.

This soil generally is associated with the less sloping Lima or Appleton soils or with the more sloping Honeoye soils, from which it receives runoff. Included in mapping are spots of somewhat poorly drained Appleton soils and of well-drained Honeoye soils. The Appleton soils occur in shallow depressions or along narrow drainageways and occupy as much as 5 to 10 percent of some areas. Although of limited extent, the Appleton soils commonly delay tillage in spring. The Honeoye soils occupy slight rises or knolls, and although they make up as much as 5 to 10 percent of some areas, they have little effect on use or management.

This soil is well suited to crops, pasture, or forest. Most of it is used for crops, and nearly all crops common to the county are grown, including vegetables.

Excess wetness and erosion are moderate limitations. Random drainage of wet spots is effective in many fields. Few areas need lime. This soil responds well to fertilization. (Capability unit IIe-3; woodland suitability group 1a)

Lyons Series

The Lyons series consists of deep, medium-textured, poorly drained soils that formed in firm, calcareous glacial till derived mainly from limestone, sandstone, and shale. These soils occupy some scattered areas at elevations below 1,200 feet throughout the county.

In a cultivated area, a typical profile has a very dark gray silt loam surface layer about 9 inches thick. The subsurface layer is friable, leached, gray loam that has yellowish-brown and light olive-brown mottles. The subsoil begins at a depth of about 14 inches and consists of firm, gray to grayish-brown, mottled silt loam to loam in the upper part. At a depth of more than 25 inches, the subsoil is light reddish-brown, mottled loam. Depth to firm, light brownish-gray gravelly silt loam to loam till is about 30 inches. The subsoil and underlying till are calcareous.

Typical profile of Lyons silt loam (cultivated):

Ap—0 to 9 inches, very dark gray (10YR 3/1) silt loam; very dark grayish brown (10YR 3/2) when rubbed; cloddy; moderate, coarse, subangular blocky structure; friable; many, fine and medium roots; neutral; abrupt, wavy boundary.

A2g—9 to 14 inches, gray (10YR 5/1) loam; common, medium, distinct, yellowish-brown (10YR 5/6), gray (10YR 7/2), and light olive-brown (2.5Y 5/6) mottles; moderate, medium and coarse, subangular blocky structure; friable; common, fine and medium roots; neutral to mildly alkaline; abrupt, wavy boundary.

B21g—14 to 17 inches, gray (10YR 5/1) to grayish-brown (10YR 5/2) silt loam to loam; common, medium, distinct, yellowish-brown (10YR 5/6), brownish-yellow (10YR 6/8), and light-gray (10YR 6/1) mottles; moderate, medium and coarse, blocky structure within moderate, medium and coarse prisms; thin, gray (10YR 5/1) silt films on prism and ped faces; firm; many, fine roots along prism and ped faces; calcareous; clear, wavy boundary.

B22g—17 to 25 inches, grayish-brown (10YR 5/2) silt loam to loam; many, coarse, distinct, yellowish-brown (10YR 5/6) and light-gray (10YR 6/1) mottles; moderate, coarse, blocky structure within moderately coarse prisms; gray (10YR 5/1) silt films on prism and ped faces; few, fine roots; firm; calcareous; clear, wavy boundary.

IIB3g—25 to 30 inches, light reddish-brown (5YR 6/3) loam; common, medium, distinct, light-gray (10YR 7/1) and brownish-yellow (10YR 6/8) mottles; discontinuous silt films on ped faces; weak to moderate, coarse, blocky structure; firm in place; friable when crushed; calcareous; clear, wavy boundary.

IIIC—30 to 40 inches +, light brownish-gray (10YR 6/2) gravelly silt loam to loam glacial till; massive; firm in place; friable when crushed; calcareous.

Depth to carbonates ranges from 12 inches, where these soils are close to the Onondaga Limestone escarpment, to 40 inches, where the soils are associated with the more acid Lansing soils. Content of coarse fragments in the solum ranges from 5 to 25 percent and commonly increases with depth. Color varies with the parent material and ranges from yellowish red in areas where these soils are associated with Ontario soils to yellow in areas where they are associated with Lansing soils. Texture of the Ap horizon generally is silt loam but ranges in places from fine sandy loam to silt loam. The B horizon ranges from fine sandy loam to silt loam. Reaction of the A horizon is slightly acid to neutral, and the B horizon is slightly acid to mildly alkaline. The B horizon commonly is weakly calcareous.

Lyons soils are the poorly drained member of a drainage sequence that includes the well drained Honeoye soils, the moderately well drained Lima soils, the somewhat poorly drained Appleton soils, and the very poorly drained Alden soils, till substratum. Lyons soils also are the poorly drained members of drainage sequences headed by the well-drained Ontario and Lansing soils. Lyons soils are coarser textured than the Romulus and Ilion soils.

Lyons silt loam (Ly).—This nearly level soil is of limited extent in the county. Most areas are in small depressions, and in only a few places do slopes exceed 2 percent. Included in mapping are a few small areas at higher elevations in the southern part of the county where the soil contains enough small, angular stone fragments to be classified as channery silt loam. These included areas are of limited extent, and there is little or no difference in their management and use from that of soils without stone fragments. In some of the areas, deposits of material eroded from adjacent areas are as much as 12 to 15 inches or more in thickness.

This soil occurs mainly in fields in which the dominant soils are the better drained Appleton, Lima, or Conesus soils. Included in mapping are Appleton soils on slight rises or knolls, and spots of the wetter Alden soils in small sags or in distinctly lower areas.

Where undrained, this soil can be used for hay, pasture, or forest; in places it is suited to ponds and wildlife marshes. Drained areas are suited to intertilled crops.

Drainage is the main need in management. Adequately drained areas respond well to fertilization. Nitrogen is commonly deficient in spring. Only a few areas need lime. Erosion generally is not a hazard, but deposits of eroded material from adjacent areas can plug drainage ditches. (Capability unit IVw-3; woodland suitability group 9)

Madalin Series

The Madalin series consists of deep, poorly drained soils that formed in calcareous, gray and brown clay and silty clay in glacial lakes. These soils occupy depressions on the lake plain, mainly in the area north of the Seneca River. They are most extensive in the Black Brook drainage area and commonly lie in low areas between drumlins.

In a cultivated area, a typical profile has a surface layer of very dark gray to very dark brown light silty clay loam about 8 inches thick. The upper part of the subsoil is mottled heavy silty clay loam and light silty clay. It is grayish brown to a depth of about 13 inches and dark grayish brown to dark brown below this depth. The lower part of the subsoil occurs at a depth of about 21 inches and is weakly calcareous. The upper 7 inches is firm, mottled, dark grayish-brown to dark-brown heavy silty clay loam or silty clay. At a depth of more than 28 inches, the subsoil is mottled, friable, grayish-brown heavy silt loam. The substratum consists of calcareous, brown and grayish-brown layers of firm silty clay and silty clay loam.

Typical profile of Madalin silty clay loam (cultivated):

Ap—0 to 8 inches, very dark gray (10YR 3/1) to very dark brown (10YR 2/2) light silty clay loam; very dark grayish brown (10YR 3/2) when rubbed; gray (10YR 5/1) when dry; moderate, fine and medium, subangular blocky structure that breaks to moderate and strong, fine and medium, granular structure; slightly hard when dry; friable when moist; slightly sticky when wet; many, fine and medium roots; neutral; abrupt, smooth boundary.

B21tg—8 to 13 inches, grayish-brown (10YR 5/2) heavy silty clay loam or light silty clay; common, fine and medium, distinct, yellowish-brown (10YR 5/6 and 5/4), dark-brown (7.5YR 4/4), and strong-brown (7.5YR 5/6) mottles; moderate to strong, coarse, angular blocky structure within strong, coarse prisms; grayish-brown (10YR 5/2), prominent clay films on prism faces; common, very dark gray (10YR 3/1) to very dark brown (10YR 2/1) organic stains in upper 2 inches; prominent, grayish-brown (10YR 5/2) clay films on ped faces; prominent clay films in pores; firm; sticky; common, fine roots along ped faces, no roots inside peds; neutral; clear, wavy boundary.

B22tg—13 to 21 inches, dark grayish-brown (10YR 4/2) to dark-brown (7.5YR 4/2) heavy silty clay loam or light silty clay; common, fine and medium, distinct, yellowish-brown (10YR 5/6) and strong-brown (7.5YR 5/6) mottles, and few, fine, distinct, light-gray (10YR 7/1) mottles and streaks; strong, coarse, angular blocky structure within strong, coarse prisms; gray (10YR 5/1), very prominent clay films on prism faces; grayish-brown (10YR 5/2), prominent clay films on ped faces with few, fine, distinct, yellowish-brown (10YR 5/6) and gray (5Y 5/1) mottles; firm; sticky; few, fine roots along prism and ped faces; mildly alkaline; clear, wavy boundary.

B31tg—21 to 28 inches, dark grayish-brown (10YR 4/2) to dark-brown (7.5YR 4/2) heavy silty clay loam or light silty clay; few, fine, distinct, strong-brown (7.5YR 5/6) and gray (5Y 5/1) mottles; moderate to strong, coarse, angular blocky structure within strong, coarse prisms; dark-gray (5Y 4/1), prominent clay films on prism faces; gray (5Y 3/1) to dark-gray (5Y 4/1), prominent clay films on ped faces; prominent clay films in pores; firm; sticky; few, fine roots along prism and ped faces; weakly calcareous; abrupt, smooth boundary.

IIB32g—28 to 31 inches, grayish-brown (10YR 5/2) heavy silt loam; common, fine, distinct, yellowish-brown (10YR 5/6) and light-gray (10YR 7/2) mottles; weak, thin and medium, platy structure within strong, coarse prisms; dark-gray (5Y 4/1) clay coats on prism faces; thin clay films in pores; friable; slightly sticky; few, fine roots along prism faces; weakly calcareous; abrupt, smooth boundary.

IIIC—31 to 54 inches +, brown (7.5YR 4/2) and grayish-brown (10YR 5/2), varved silty clay and silty clay loam; common, fine, distinct, yellowish-brown (10YR 5/4), brown (7.5YR 5/4), and gray (5Y 5/1) mottles; common, medium and coarse, light-gray (10YR 7/1) and white (10YR 8/1) lime concretions; prominent, coarse prisms extend to a depth of 48 inches in places with gray (5Y 5/1), prominent clay films; moderate, thick, platy structure; firm; sticky; strongly calcareous.

Depth to calcareous material ranges from 20 to 40 inches. Texture of the Ap horizon ranges from silt loam to silty clay loam. The Ap, or the A1, horizon ranges in color from black to dark brown. In places a thin A2 horizon is present and fingers into the underlying B horizon. Reaction ranges from slightly acid to mildly alkaline.

The B horizon ranges in color from dark brown to dark gray. A few thin bands of reddish clay occur in some places, and thin bands of silt or of silt and fine sand occur in other places. Reaction ranges from slightly acid to moderately alkaline. The B horizon is calcareous in places.

The C horizon at a depth of more than 20 inches is composed in places of clay, silt, and sand in bands of varying thickness, or it consists entirely of layered clay, silt, or sand.

Madalin soils are a member of a drainage sequence that includes the very poorly drained Fonda soils. They are finer textured than similar Canandaigua soils and have more gray and brown hues than the reddish Lakemont soils.

Madalin and Odessa silty clay loams (Ma).—This undifferentiated unit consists of a poorly drained Madalin soil and a somewhat poorly drained Odessa soil. The Madalin soil has the profile described as representative for the series. The Odessa soil has a profile that resembles the one described as representative for the series but has slightly higher clay content in the surface layer and is grayer and browner in color. These soils occur mainly in the northern third of the county and are most extensive in the Black Brook watershed. A few scattered areas are in the central part of the county.

In most areas of this unit, both soils are intermingled. Some areas are as much as 80 percent of the Odessa soil, and other areas are as much as 80 percent of the Madalin soil. However, there is always enough of the Madalin soil present that poor drainage governs use and management.

Included in mapping are spots of very poorly drained Fonda soils in shallow depressions and along drainageways. Fonda soils make up as much as 10 percent of some areas, and although of limited extent, they create drainage difficulties and limit the choice of plants.

If undrained, the soils of this unit are suited mainly to hay, pasture, or woodland. Many areas provide suitable sites for ponds and wildlife marshes.

Adequate drainage and maintenance of good structure in the surface layer are needed if these soils are cropped. They become cloddy if not managed properly. Good seedbed preparation requires proper timing of tillage operations. Nitrogen fertilization is needed in spring. The supply of available phosphorus is moderate. Though the reserve supply of potassium is very high, the amount in readily available form may be inadequate for some crops. Need for lime ranges from none to low. (Capability unit IVw-1; woodland suitability group 9)

Made Land, Tillable

Made land, tillable (Md) consists mainly of areas in which the original soil has been moved or disturbed, and the original surface layer and subsoil are not evident. Most areas of this land type consist of material that was dredged during the straightening and deepening of the barge canal. Some areas have been filled with soil material, while others consist of trash and rubbish that have been leveled and then covered with soil. A few areas consist of reclaimed gravel and borrow pits that have been filled with the original surface layer or with a crude mixture of the original surface layer and subsoil.

Included in areas mapped as Made land, tillable, are a few small areas of nontillable, unleveled spoil. The most extensive acreage of included nontillable land occurs along the Seneca Lake extension of the Barge Canal, east of Seneca Falls. It consists of unleveled, very stony spoil on which trees are slowly becoming established.

Much of the land that was formed from the dredging of the Barge Canal is well suited to a wide variety of crops. A few areas along the New York State Thruway were excavated for roadfill material for the thruway. The surface layer or surface layer-subsoil mixture has been releveled in these areas, and some areas are being cropped with varying degrees of success.

Made land, tillable, is so variable in texture and other characteristics that onsite investigation is necessary to determine potential use and management. (Capability unit not assigned; woodland suitability group 10)

Muck

Muck consists of organic soil formed in a mixture of wood, grass, or sedgy materials. This soil is strongly acid to alkaline, and the organic layer generally is more than 3 feet thick.

In a typical profile, the surface layer is black muck about 9 inches thick. The next layer is friable, very dark-brown muck in the upper part and grades to dark-brown and dark yellowish-brown, fibrous peaty material as depth increases. The peaty layer contains many partly decomposed wood fragments. The mineral substratum, at a depth of about 40 inches, consists of light-gray to white layers of clay and silty clay that are weakly calcareous. The muck layers are neutral in reaction.

Typical profile of Muck, deep (drained and cultivated):

Oa1—0 to 9 inches, black (10YR 2/1 and N 2/0) muck; moderate, fine and medium, blocky structure that parts readily to moderate, fine and medium, granular structure; very friable, soft; neutral; gradual, wavy lower boundary.

Oa2—9 to 40 inches, very dark-brown (10YR 2/2) muck; grades with depth to variegated dark-brown (10YR 3/2), dark yellowish-brown (10YR 4/4), and dark-brown (7.5YR 4/4), fibrous, peaty material containing numerous partly decomposed wood fragments; moderate, platy structure that parts to weak, medium, blocky structure; friable; soft; neutral; abrupt, wavy lower boundary.

IIC—40 to 48 inches +, light-gray to white (N 7/0 and N 8/0) layers of clay and silty clay; weak, thick and very thick, platy structure; firm; plastic; weakly calcareous.

Deep, undrained muck has a granular structure in the upper 24 to 36 inches, and the granules are soft when moist. Drained and cultivated muck commonly has a blocky structure. Many areas of muck, when first drained, have a very dark brown (10YR 2/2) surface layer that becomes black (10YR 2/1 to N 2/0) after a few years. The reaction of the organic layers normally is medium acid to neutral but ranges from very strongly acid to mildly alkaline.

Moderately deep and shallow phases that have organic layers 12 to 40 inches deep over mineral materials are recognized. Included with the more woody muck of this area is a small amount of muck that was derived mainly from reedy and sedge material.

Deep muck resembles Edwards muck but generally consists of a more acid mixture of woody and grassy or sedgy material over mineral soil material instead of being highly calcareous marl where less than 40 inches deep.

Muck, deep (Mr).—This soil has the profile described as typical for the series. It has slopes of 0 to 1 percent. The organic material ranges in thickness from 40 inches to as much as 17 feet. It is underlain by mineral soil material or by white, highly calcareous marl. The mineral soil material in places is sand, silt, or clay, or a mixture of these. It is commonly calcareous, but in a few places it is medium acid. The muck is mainly slightly acid to neutral but ranges from strongly acid to mildly alkaline. The largest areas of strongly acid muck occur near Junius Ponds.

Included in mapping are spots of moderately deep and shallow muck. The shallower areas generally occur as narrow bands around the edges of muck that grades to mineral soils.

This soil includes both drained and undrained areas. Undrained muck that ranges in depth from 40 to 60 inches compresses or subsides about a third of its original thickness within 2 or 3 years after being drained.

Undrained muck is best suited to woodland or to wildlife habitat. Some areas provide good sites for ponds or wildlife marshes. Drained muck is suited to most crops, especially to intensively managed "muck crops." If this muck soil is drained, control of soil blowing and management of water are necessary to reduce the rate of subsidence and oxidation. A large amount of fertilizer is needed for most muck crops. (Capability unit IIIw-1; woodland suitability group 10)

Muck, shallow (Ms).—This soil has slopes of 0 to 2 percent. It has a layer of organic material 10 to 40 inches deep. This layer is underlain by mineral soil material that is sand, silt, or clay, or by mixtures of these. The mineral material is mainly moderately alkaline and calcareous, but in a few places it ranges to medium acid. Muck, shallow, is generally slightly acid to neutral, but in some places it is strongly acid and in others it is mildly alkaline.

Included in mapping are small areas of Muck, deep, and areas of very poorly drained mineral soils. Muck, deep, generally occurs near the center of an area of muck. The mineral soils generally occur as narrow bands around the muck or as slight rises or low knolls within the area of muck.

Both drained and undrained areas of Muck, shallow, are in this mapping unit. The undrained muck is best suited to woodland or to wildlife habitat. Some areas provide good sites for ponds or wildlife marshes.

Drained muck is suited to most crops, especially to intensively managed "muck crops." A large amount of fertilizer is needed for most muck crops.

Drained muck compresses or subsides about a third of its thickness within 2 or 3 years after draining and commonly is less than 24 inches deep. Drained muck therefore needs control of soil blowing and management of water to reduce the rate of subsidence and oxidation. (Capability unit IVw-5; woodland suitability group 10)

Niagara Series

The Niagara series consists of deep, somewhat poorly drained silty soils that formed in lacustrine deposits high in content of silt and very fine sand. These are nearly level soils that have little runoff and commonly receive water from higher, adjacent areas. They are not extensive in Seneca County. Niagara soils occur mainly in the northern third of the county and are most extensive in the southern part of the Black Brook watershed.

In a cultivated area, a typical profile has a dark-gray to very dark gray silt loam to very fine sandy loam surface layer about 9 inches thick. The thin, leached subsurface layer consists of very friable, light brownish-gray to pale-brown, distinctly mottled very fine sandy loam. The subsoil begins at a depth of about 12 inches and consists of firm, distinctly mottled, brown silt loam. The substratum is at a depth of about 35 inches and consists of layers of distinctly mottled, brown silt, very fine sandy loam, and loamy very fine sand. The subsoil is neutral in the upper part and becomes weakly calcareous just above the substratum. The substratum is strongly calcareous.

Typical profile of Niagara silt loam (cultivated):

Ap—0 to 9 inches, dark-gray (10YR 4/1) to very dark gray (10YR 3/1) light silt loam to very fine sandy loam; dark grayish brown (10YR 4/2) when rubbed; gray (10YR 5/1) when dry; moderate, fine and medium, granular structure; friable; many, fine and medium roots; neutral; abrupt, wavy boundary.

A2g—9 to 12 inches, light brownish-gray (10YR 6/2) to pale-brown (10YR 6/3) very fine sandy loam; few, fine, distinct, yellowish-brown (10YR 5/6) mottles; weak, fine and medium, subangular blocky structure; very friable; many, fine and medium roots; neutral; clear, wavy boundary.

B1g—12 to 15 inches, brown (10YR 5/3 to 7.5YR 5/2) light silt loam; few, fine, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; slightly firm; nonsticky; common, fine roots; neutral; clear, wavy boundary.

B21g—15 to 23 inches, very dark grayish-brown (10YR 3/2) to brown (7.5YR 5/2) silt loam; common, distinct, yellowish-brown (10YR 5/6) and light-gray (10YR 7/2) mottles; weak, medium and coarse, subangular blocky structure; thin, discontinuous, grayish-brown (10YR 5/2) clay films on ped faces; prominent clay films in pores; firm; slightly sticky; few, fine roots; neutral; abrupt, wavy boundary.

B22g—23 to 35 inches, brown (7.5YR 5/2 and 10YR 5/3) heavy silt loam; common, medium, distinct, yellowish-brown (10YR 5/6) mottles, and few, fine, distinct, light-gray (10YR 7/2) mottles; weak to moderate, coarse, subangular blocky structure; thin, continuous, grayish-brown (10YR 5/2) clay films on ped faces; prominent clay films in pores; few, fine roots; mildly alkaline, becoming weakly calcareous in lower part; abrupt, wavy boundary.

C—35 to 48 inches +, layers of brown (7.5YR 5/2) silt, very fine sandy loam, and loamy very fine sand, 1 to 3 inches thick; many, coarse, distinct, yellowish-brown (10YR 5/4 and 5/6) and pinkish-gray (7.5YR 7/2) mottles, decreasing in size and number with depth; weak, thick, platy structure; silt layers are firm; loamy fine sand layers are loose; very few roots; strongly calcareous.

Depth to calcareous material ranges from 18 to 36 inches. The texture of the A horizon is fine sandy loam to silt loam. The A1, or the Ap, horizon is very dark gray to brown. The A2 horizon is grayish brown to light reddish brown and is as much as 6 inches thick where it is not disturbed by plowing. Few to common, fine to medium, high-chroma mottles are present in places. Reaction is slightly acid to neutral.

The B horizon is very fine sandy loam to heavy silt loam in texture and has a clay content of 18 to 35 percent. In places the B horizon contains a few thin clay layers that are less than a third of its total thickness; this horizon has an average clay content of less than 35 percent. It ranges in color from reddish brown to light olive brown but in places includes a few thin layers that are grayer in color. Reaction ranges from slightly acid to mildly alkaline.

Niagara soils are the somewhat poorly drained member of a drainage sequence that includes the well drained Dunkirk soils, the moderately well drained Collamer soils, the poorly drained Canandaigua soils, and the very poorly drained Alden soils. Niagara soils are associated on the lake plain with the similarly drained but coarser textured Odessa soils. It contains more silt and clay than the similarly drained, sandy Stafford and Cosad soils.

Niagara silt loam (Ng).—This is a generally level or nearly level soil with slopes of 0 to 2 percent, but in a few small areas slope is more than 3 percent. In some places the surface layer is fine sandy loam. Small areas adjacent to sloping soils have a thicker surface layer because alluvial material has been deposited from sloping soils. In a few places, reddish clay strata occur at a depth of 30 to 40 inches.

Included in mapping are spots of poorly drained Canandaigua soils that occur mainly as narrow strips along shallow drainageways or in small, shallow depressions. These wetter soils occupy as much as 15 percent of some areas, and though of limited extent, they can delay planting in spring. A few small knolls of the better drained Collamer soils are also included but have little effect on use and management.

This soil is suited to crops, pasture, or forest. Undrained areas are suited to water-tolerant hay and forage crops. With adequate drainage, this soil is well suited to most intertilled crops that are common in the county.

Use of drainage and adequate fertilization are the most important needs in management for crops. This soil commonly has rounded fine sand grains that flow readily when saturated. Special measures are required to prevent drains and ditches from becoming plugged.

This soil has a moderate supply of available phosphorus and potassium. The supply of nitrogen is commonly deficient in spring. Only a few areas need lime. Erosion is not a hazard. (Capability unit IIIw-2; woodland suitability group 4)

Odessa Series

The Odessa series consists of deep, somewhat poorly drained soils that formed in calcareous, reddish, lacustrine clay and silt. These are nearly level to gently sloping soils on the lake plain in the northern part of the county. Small areas occur in slight depressions and in very shallow drainageways within areas of Schoharie soils.

In a cultivated area, a typical profile has a dark grayish-brown silt loam surface layer about 8 inches thick. The subsoil has a thin upper layer of firm, mottled, brown silty clay loam. At a depth of more than 10 inches the subsoil consists of firm, mottled, reddish-brown silty clay that grades to dark reddish gray at a depth of about 15 inches. The calcareous substratum, at a depth of about 25 inches, consists of layers of firm, mottled, dark reddish-gray silty clay. The layers are separated by very thin lenses of silt and very fine sand. The subsoil is slightly acid in the upper part and weakly calcareous just above the till substratum.

Typical profile of Odessa silt loam, 0 to 2 percent slopes (cultivated):

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine and medium, granular structure; friable; slightly hard; slightly plastic; many, fine roots; slightly acid; abrupt, smooth boundary.

B21t—8 to 10 inches, brown (7.5YR 4/4) silty clay loam; common, fine, distinct, strong-brown (7.5YR 5/6) and pinkish-gray (7.5YR 6/2) mottles; moderate, medium, subangular blocky structure; firm; hard; moderately plastic; few, fine roots; common, fine pores; ped faces have thick, pinkish-gray (7.5YR 6/2) silt coats; horizon has a light color when broken along structural units; clay films line most pores; slightly acid; clear, wavy boundary.

B22t—10 to 15 inches, reddish-brown (5YR 4/3) silty clay; common, medium and fine, faint, reddish-brown (5YR 5/4) and reddish-gray (5YR 5/2) mottles; moderate, medium and coarse, subangular blocky structure; dark, reddish-gray (5YR 4/2) ped faces; firm; hard; moderately plastic; few, fine roots; many, fine pores; distinct clay films on horizontal and vertical ped faces and in all pores; slightly acid; diffuse boundary.

B23t—15 to 25 inches, dark reddish-gray (5YR 4/2) silty clay; common, fine, faint, reddish-gray (5YR 5/2) mottles, and distinct, reddish-brown (5YR 5/4) mottles; moderate, coarse, blocky structure; reddish-gray (5YR 4/2) ped faces; firm; hard, moderately plastic; no roots; common, fine pores; distinct, patchy clay films on ped faces and lining all pores; neutral; mildly calcareous on ped faces in the lower 4 inches; clear, wavy boundary.

C—25 to 40 inches +, dark reddish-gray (5YR 4/2) silty clay; common, coarse and medium, distinct, pinkish-gray (5YR 6/2 and 7/2) mottles of segregated lime on ped faces; common, fine, faint, reddish-brown (5YR 4/3) mottles in ped interiors; strong, thin to thick, platy structure associated with layered sediment with irregular vertical cleavage forming angular blocks; very thin silt layers and very fine sand separate some plates; firm; hard; plastic; no roots; calcareous.

The A horizon is dominantly silt loam but ranges from very fine sandy loam to light silty clay loam. The coarser textures are generally the result of thin deposits of unconforming very fine sand that is less than 20 inches thick. Where present, the A2 horizons are distinctly mottled. Reaction ranges from strongly acid to mildly alkaline.

The B horizon is dominantly silty clay but ranges from silty clay to clay loam that contains 35 to 50 percent clay. The B horizon in places has thin layers of silt or very fine sand. The B horizon is calcareous in places. Reaction ranges from slightly acid to moderately alkaline.

The C horizon generally is laminated, reddish silty clay and clay and contains a few thin layers of very fine sand and silt or of silt.

The Odessa soils are the somewhat poorly drained member of a drainage sequence that includes the moderately well drained and well drained Schoharie soils, the poorly drained Lakemont soils, and the very poorly drained Fonda soils. Small areas of Odessa soils occur in slight depressions or in very shallow drainageways within areas of better drained Schoharie soils. Odessa soils are redder in color and finer in texture than Niagara soils.

Odessa silt loam, 0 to 2 percent slopes (OdA).—This soil has the profile described as typical for the series. It is level and occupies moderately large to large, broad areas of the lake plain; generally these areas receive no runoff from adjacent areas. Small areas are mapped in drainageways that border gently sloping Schoharie soils, from which they receive some runoff. Runoff is slow. Little or no ponding occurs during wet periods.

Included in mapping are areas of Lakemont soils that occur in slight depressions along the lowest parts of drainageways. These wetter soils occupy as much as 15 percent of some areas and may delay field operations in spring.

This soil is suited to crops, pasture, or forest. It is limited for crops mainly by wetness. It also clods easily if not properly managed, which restricts its use for intertilled crops. This soil is limited to water-tolerant varieties of legumes when used for hay or forage crops.

Some fields can be improved by use of random drainage of the included wet soils. Good seedbed preparation requires the proper timing of tillage operations. Supply of nitrogen is particularly deficient in spring, and the supply of available phosphorus is moderate. While the potassium reserve is very high, the amount readily available to plants may be inadequate for some crops. Little or no lime is needed. (Capability unit IIIw-5; woodland suitability group 4)

Odessa silt loam, 2 to 6 percent slopes (OdB).—More than 75 percent of this soil has slopes of 2 to 4 percent. The slopes are generally smooth, and runoff is moderately slow. When rainfall is heavy, this soil receives so much runoff from adjacent areas that it remains wet for moderately long periods.

This Odessa soil is generally associated with the moderately well drained Schoharie soils and with the less strongly sloping Odessa soils, from which it receives runoff. Included in mapping are the poorly drained Lakemont soils. These are wetter soils that occur as small spots in depressions or along narrow drainageways. They occupy as much as 10 percent of some areas and delay tillage operations in spring.

This soil is suited to crops, pasture, or forest. Wetness and a tendency to clod readily if mismanaged limit its suitability for intensively cultivated crops. Hay is mainly limited to water-tolerant varieties.

Wetness, difficulty of maintaining good soil structure of the surface layer, and hazard of erosion are the main limitations to cropping. Some fields can be improved by random drainage of included wet spots. Preparation of a good seedbed requires proper timing of tillage operations. A high percentage of sod in the cropping system is desirable to maintain good soil structure.

This soil is erodible, even where slopes are gentle, and measures to control water are needed. Supply of nitrogen is deficient, especially in spring, and the supply of available phosphorus is moderate. The supply of potassium is very high, but the amount in a readily available form may be inadequate for some crops. Little or no lime is needed. (Capability unit IIIw-6; woodland suitability group 4)

Ontario Series

The Ontario series consists of deep, medium-textured, well-drained soils that formed in strongly calcareous, firm glacial till. The glacial till is derived mainly from sandstone, limestone, and some shale, and contains sufficient red sandstone or red shale to impart a pinkish or reddish hue.

These soils occur on drumlins, along drumloidal hills, and in rolling and undulating upland areas in the northern part of the county, mainly in the area north of the Seneca River.

In a cultivated area, a typical profile has a surface layer of dark-brown loam about 6 inches thick. The thick, subsurface layer is leached, strong-brown to brown loam, about 15 inches deep, that fingers into the upper part of the subsoil around blocks of friable, reddish-brown heavy loam. At a depth of more than 18 inches, the subsoil is firm, reddish-brown light clay loam or heavy loam with a noticeable blocky structure. Depth to the firm, calcareous reddish-gray to reddish-brown loam till substratum is about 32 inches. Reaction of the solum is neutral.

Typical profile of Ontario loam, 2 to 8 percent slopes (cultivated):

Ap—0 to 6 inches, dark-brown (7.5YR 3/2 and 4/2) loam; moderate, fine, medium and coarse, granular structure; friable; many roots; neutral; clear, wavy boundary.

A2—6 to 15 inches, strong-brown (7.5YR 5/6) to brown (7.5YR 5/4) loam grading to brown (7.5YR 5/4) in lower part; moderate, fine and medium, subangular blocky structure parting to weak, fine and medium, granular structure; friable; many roots; neutral; clear, wavy boundary.

B&A—15 to 18 inches, reddish-brown (5YR 4/3) heavy loam; moderate, medium and coarse, subangular blocks, ½ to 2 inches across, with brown (7.5YR 5/4) loam 1/16 inch to ¼ inch thick that decreases in thickness with depth; friable; discontinuous clay films in pores in block interiors; many roots; numerous worm holes and casts; neutral; clear, wavy boundary.

B2t—18 to 32 inches, reddish-brown (5YR 4/3) light clay loam to heavy loam; moderate, coarse, blocky and subangular blocky structure; reddish-brown (5YR 4/3 and 4/4), faint clay films on ped faces; firm; slightly sticky; prominent clay films in pores; common, fine roots; neutral; clear, wavy boundary.

C—32 to 72 inches +, reddish-gray (5YR 5/2) to reddish-brown (5YR 5/3) loam; moderate, medium and thick, platy structure becomes very thick with depth; firm in place; few, fine roots to depth of 72 inches; strongly calcareous.

The thickness of the uneroded solum is mainly 24 to 48 inches, but small, local areas are as thick as 60 inches. The texture of the A horizon is mainly loam or fine sandy loam, but there are small areas of gravelly loam, gravelly fine sandy loam, coarse silt loam, or very fine sandy loam. The A horizon of Ontario fine sandy loam is generally thicker. The reaction of the A horizon of Ontario loam ranges from medium acid to neutral. The reaction of the A horizon of Ontario fine sandy loam ranges from very strongly acid to slightly acid.

The B horizon of Ontario loam ranges in texture from heavy loam to light clay loam and in content of clay from 18 to 28 percent. The B horizon of Ontario fine sandy loam is less strongly expressed and generally is heavy fine sandy loam or light sandy clay loam in texture. Reaction of the B horizon ranges from medium acid to mildly alkaline.

Depth to calcareous material is 24 to 48 inches in Ontario loam. Depth to calcareous material is 30 to 60 inches in Ontario fine sandy loam.

The texture of the C horizon is loam but there is enough sand to give a gritty feel. The Ontario soils are the well drained member of a drainage sequence that includes the moderately well drained Lima soils, the somewhat poorly drained Appleton soils, and the poorly drained Lyons soils. The Ontario series is the very poorly drained associate of the Alden series, till substratum. Ontario soils are coarser textured than the associated Cazenovia soils and are redder and generally have a higher lime content than Lansing soils. They are redder and have thicker and more strongly expressed A2 and B2 horizons than Honeoye soils.

Ontario fine sandy loam, 2 to 8 percent slopes (OfB).—This soil has a profile with a horizon sequence similar to the one described as typical for the series, but it has more sand in the surface layer and subsoil and depth to calcareous glacial till is slightly greater. It is more porous, dries out and warms up earlier in spring than Ontario loams, and can commonly be planted to crops several days earlier.

Areas of this soil are generally small. They range from 2 to 20 acres in size, and only a few are larger than 30 acres. Most areas are smoothly sloping or gently undulating and are so situated that they receive little or no runoff from adjacent areas. The slopes are generally short and convex.

Included in mapping are moderately well drained Lima soils in shallow depressions and along narrow drainageways. Somewhat poorly drained Appleton soils also occur as wet spots in the lowest parts of depressions and drainageways. These wetter soils make up as much as 15 percent of some areas and commonly delay planting in spring unless they are drained.

This soil is suited to crops, pasture, or forest. It is well suited to most crops common to the county and is particularly well suited to most vegetable crops.

The main needs in management are maintenance of fertility and control of erosion and runoff. Runoff is generally slight to moderate. This sandy soil can erode when intensively farmed if it is not managed properly. Random drainage of included wet spots is beneficial in many areas. This sandy soil generally needs a larger amount of nitrogen and potassium than do Ontario loams. The supply of available phosphorus is generally moderate. Little or no lime is needed. (Capability unit IIe-1; woodland suitability group 1a)

Ontario fine sandy loam, 8 to 15 percent slopes, eroded (OfC3).—This soil has a profile that is similar to the one described as typical for the series but is more sandy and is eroded over about 75 percent of its total area. The degree of erosion varies from spot to spot. Much of the acreage has lost 10 to 15 inches of soil material, and the redder subsoil is exposed on the most severely eroded spots. The more nearly level areas are only slightly eroded in places. Sags, depressions, and areas on the uphill side of horizontal fence rows commonly contain deposits of eroded soil. There are a few, small, uneroded woodland, pasture, or idle areas.

Most areas of this soil are small and range in size from 2 to 10 acres, but a few are larger than 20 acres. Slopes are generally smooth, short, and convex, but there are a few, small, undulating areas with short, complex slopes.

Included in mapping are areas of Lima soils in depressions and along drainageways. Lima soils comprise up to 10 percent of some areas.

This soil is suited to crops, pasture, or forest. Most of the acreage has been cleared and cropped. This soil is suited to many crops common to the county, but there is a continuing hazard of erosion. Erosion control, soil building, and fertility maintenance are important needs in management. The supply of nitrogen is especially deficient. The supply of available phosphorus and potassium is moderate. Little or no lime is needed. (Capability unit IVe–2; woodland suitability group 1a)

Ontario loam, 2 to 8 percent slopes (OnB).—This soil has the profile described as typical for the series. It occurs on smooth or gently undulating, convex slopes in the uplands and receives little or no runoff from adjacent areas. Hazard of erosion is slight to moderate. This is the most extensive Ontario soil in the county, but areas generally are only 2 to 20 acres in size, although a few are larger than 50 acres.

Included in mapping are moderately well drained Lima soils in shallow depressions or along narrow drainageways. Also included are the somewhat poorly drained Appleton soils that commonly occur as wet spots in the lowest parts of depressions and drainageways. These wetter soils make up as much as 15 percent of some areas, and although of limited extent, they are important because they commonly delay planting in spring. Other minor inclusions are spots of the more strongly sloping Ontario soils, which have little effect on use and management.

This soil is well suited to crops, pasture, or forest.

Maintenance of fertility, keeping good soil structure, and control of erosion are the main needs in management. Random drainage of included wet spots can substantially improve many fields. Although this soil has a moderate supply of nitrogen, phosphorus, and potassium, it is highly responsive to application of complete fertilizer. Need for lime ranges from none to moderate. (Capability unit IIe–1; woodland suitability group 1a)

Ontario loam, 8 to 15 percent slopes (OnC).—This soil has a profile that is similar to the one described as typical for the series but is generally thinner and about 2 to 6 inches shallower to calcareous glacial till. Most areas of this soil range from 2 to 10 acres in size, but a few areas are larger than 20 acres. The areas are generally long and narrow, have a north-south axis, and occur on the tops or side slopes of drumlins or long, drumloidal hills. The slopes are generally smooth, short, and convex.

This soil is generally associated with the more gently sloping or the more strongly sloping Ontario soils. These Ontario soils are also the main inclusions and make up as much as 15 percent of some areas, but they have little or no effect on use and management. Small spots of moderately well drained Lima soils or somewhat poorly drained Appleton soils occur along narrow drainageways and on the bottom of depressions. These wetter soils seldom exceed 5 percent of a given area, but they interfere with planting in spring on some cropped land.

This soil is well suited to crops, pasture, or forest. Although well suited to most crops common to the county, much of it is woodland or unplowed pasture. Because of the hazard of erosion, management needs are exacting for crops that require tillage. A high proportion of sod-forming crops is generally desirable. Need for lime ranges from none to moderate. This soil is moderately fertile and is highly responsive to application of complete fertilizer. (Capability unit IIIe–1; woodland suitability group 1a)

Ontario loam, 8 to 15 percent slopes, eroded (OnC3).—This soil has a profile that resembles the one described as typical for the series, but about 75 percent of most areas are so eroded that the surface layer consists partly of material from the subsoil. Erosion is generally uneven from spot to spot. The surface layer is lighter, or redder, in color, lower in content of organic matter, and higher in content of clay. In some of the most severely eroded spots, the surface layer consists almost entirely of material from the subsoil. This material has a distinct red color that appears as bald spots where crops other than hay or sod are grown.

This soil commonly occurs in long, narrow strips on the sides or tops of drumlins. The slopes are generally smooth, short, and slightly convex, but there are a few small, strongly undulating or rolling areas.

The soil in this unit generally is associated with the more gently sloping or more strongly sloping Ontario soils. These Ontario soils are also the main inclusions and make up as much as 15 percent of some areas. Small spots of moderately well drained Lima soils and somewhat poorly drained Appleton soils occur along narrow drainageways or on the bottom of depressions. Although these wetter soils seldom make up more than 5 percent of a particular area, they can delay planting in spring. Also included are uneroded areas and spots that are mostly in depressions on the uphill side of fence rows, where a part of the eroded soil has accumulated.

This soil is suited to limited cropping, to pasture, or to forest. It is best suited to hay and forage crops or to farming where cropping systems that include sod-forming crops 50 percent of the time are used.

This soil absorbs water more slowly than does the uneroded Ontario loam, 8 to 15 percent slopes. Runoff is more rapid, and erosion limits use and affects management. The surface layer tends to clod if plowed when too wet or too dry. Little or no lime is needed. Because of the loss of organic matter, extra nitrogen is needed along with the application of a complete fertilizer for most crops. Random drainage of included wet spots is helpful in some fields. (Capability unit IVe–2; woodland suitability group 1a)

Ontario loam, 15 to 25 percent slopes, eroded (OnD3).—This soil has a profile similar to the one described as typical for the series but is generally thinner over calcareous till. Most areas of this soil occur on the side of drumlins, and most of the slopes are single, although a few are hilly and complex. Most areas of this soil are small, and only a few are more than 10 acres in size.

Most areas of this soil have been cleared and cropped; these areas are now so eroded that in most places the upper part of the subsoil is mixed with the present surface layer. In the more severely eroded areas, the surface layer consists almost entirely of material from the subsoil. Many of the eroded areas commonly have an increased content of gravel in the surface layer.

Included in mapping are areas that are less sloping and areas of the more strongly sloping Ontario soils. Moderately well drained Lima soils and somewhat poorly drained Appleton soils occur as small, wet spots in occasional depressions or hillside seeps. A few small areas of Palmyra soils are included, generally near the southern end of drumlins, where there are thin, shallow deposits of water-sorted gravel. Also included are relatively uneroded spots and areas in which the eroded soil material has been deposited. The few areas that are still forested are not eroded. These inclusions have little or no effect on use and management.

This soil is suited to limited cropping, to pasture, or to forest. Because the hazard of erosion is severe, this soil is generally best suited to long-term hay and forage crops. Deep-rooted legumes are especially well suited. A complete fertilizer is needed to maintain a cover adequate to help control erosion and runoff where hay and forage crops are grown. Need for lime ranges from none to moderate. (Capability unit VIe–1; woodland suitability group 1b)

Ontario Series, Moderately Shallow Variant

This series consists of well-drained, medium-textured soils that formed in thin deposits of calcareous glacial till over limestone bedrock. These soils are not extensive in Seneca County. They occur in small, scattered areas near Canoga and Fayette, where the Onondaga Limestone Formation outcrops, as well as near Ovid, where the Tully Limestone Formation outcrops.

In a cultivated area, a typical profile has a grayish-brown to very dark grayish-brown silt loam surface layer about 9 inches thick. The subsurface layers are leached and have a combined thickness of about 13 inches. The upper layer is brown to light-brown, friable silt loam to very fine sandy loam 2 inches thick. The thicker, lower layer is brown, friable silt loam that merges with the subsoil at a depth of about 22 inches. The subsoil is friable, brown to dark-brown heavy silt loam. Depth to the underlying limestone bedrock is about 31 inches. Reaction of the leached layers is slightly acid to neutral, and reaction of the subsoil is neutral.

Typical profile of an Ontario silt loam, moderately shallow variant, that has slopes of 2 to 8 percent (cultivated):

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) to very dark grayish-brown (10YR 3/2) light silt loam; dark grayish brown (10YR 4/2) when rubbed; moderate, fine and medium, granular structure; friable to very friable; many, fine and medium roots; neutral; abrupt, wavy boundary.

A21—9 to 11 inches, brown (7.5YR 5/4) to light-brown (7.5YR 6/4) silt loam to very fine sandy loam; weak to moderate, fine and medium, subangular blocky structure; friable; nonsticky; numerous medium and large pores; many, fine and medium roots; neutral; clear, wavy boundary.

A22—11 to 22 inches, brown (7.5YR 5/4) silt loam; moderate, medium and coarse, subangular blocky structure; friable; nonsticky; numerous medium and large pores; many, fine and medium roots; slightly acid; clear, wavy boundary.

B2t—22 to 31 inches, brown to dark-brown (7.5YR 4/4) heavy silt loam; moderate, medium and coarse, subangular blocky structure; friable; slightly sticky; many medium and a few large pores; thin, continuous clay films on ped faces and in pores; common, fine and medium roots; neutral; abrupt, wavy boundary.

R—31 to 40 inches, nearly horizontal, bedded limestone bedrock; fissured at top, becoming massive with depth; material from B2t horizon extends 1 to 3 feet into larger fissures and contains common, fine and medium roots and many pores lined with clay films.

Thickness of the solum is controlled largely by the 20- to 40-inch depth to bedrock. The content of limestone and chert fragments in the solum ranges from 0 to 35 percent. Color is commonly brown or dark brown but ranges from reddish brown to yellowish brown.

Texture of the A horizon is dominantly silt loam but ranges from silt loam to fine sandy loam. The reaction ranges from strongly acid to neutral. The B horizon has a texture of heavy silt loam to heavy loam and contains 18 to 28 percent clay. Reaction of the B horizon ranges from slightly acid to mildly alkaline. A C horizon that is calcareous loamy glacial till is present in some places where the depth to bedrock is 36 to 40 inches.

Soils of the Ontario series, moderately shallow variant, are closely associated with similar shallow Farmington soils in bedrock-controlled areas; Farmington soils, however, are less than 20 inches thick over bedrock.

Ontario silt loam, moderately shallow variant, and Farmington soils, 2 to 8 percent slopes (OpB).—This unit can include either or both soils, but commonly both are in a mapped area. The profile of these soils is the one described as typical for their respective series. These soils occur mainly on very gentle, bedrock-controlled slopes, but there are some inclusions that have steeper slopes. Bedrock outcrops are common, particularly in the steeper inclusions. As much as 20 percent of some areas include spots of the deeper Ontario, Honeoye, Dunkirk, or Cazenovia soils, but they have little effect on use and management.

These soils are suited to pasture and forest and are well suited to cropping in areas where the moderately shallow Ontario soils are dominant. The areas of shallow Farmington soils are droughty and generally contain enough very shallow areas and rock outcrops to interfere with the operation of farm equipment. Hazard of erosion is slight.

In areas suitable for cropping, the available moisture capacity is variable. These soils are moderate in content of nitrogen and in the supply of available phosphorus and potassium. The response to fertilization is good. Need for lime is moderate to slight. (Capability unit IIs–1; woodland suitability group 8a)

Ovid Series

The Ovid series consists of deep, somewhat poorly drained soils that have a moderately fine textured subsoil. These soils formed in reddish glacial till derived from mixed limestone and red, alkaline or calcareous clay shale or from appreciable amounts of reworked, red, lacustrine clay mixed with limestone and shale. These are gently sloping soils that occur in areas bordering Cayuga and Seneca Lakes or in local areas between drumlins of Cazenovia and Ontario soils.

In a cultivated area, a typical profile has a dark grayish-brown heavy silt loam surface layer about 9 inches thick. The thin, leached subsurface layer is firm, pinkish-gray heavy silt loam that has distinct, strong-brown mottles. The subsoil, at a depth of 12 inches, is firm, reddish-brown silty clay loam that has a few, faint and distinct mottles. Depth to firm or very firm, dense, calcareous till is about 24 inches. The till consists of reddish-brown silty clay loam to heavy loam and has pinkish-gray mottles. Reaction of the surface and subsurface layers is neutral. Reaction of the subsoil is neutral to mildly alkaline.

Typical profile of Ovid silt loam, 3 to 8 percent slopes (cultivated):

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) heavy silt loam; dark brown (10YR 4/3) when rubbed; light grayish brown (10YR 6/2) when dry; moderate, fine and medium, subangular blocky structure; friable to firm; slightly sticky; many roots; neutral; abrupt, smooth boundary.

A2g—9 to 12 inches, pinkish-gray (7.5YR 6/2) heavy silt loam; common, medium, distinct, strong-brown (7.5YR 5/6) mottles; moderate, fine and medium, angular and subangular blocky structure; slightly firm to firm; slightly sticky; common, fine and medium roots; neutral; abrupt, irregular boundary; thin, ⅛- to ¼-inch fingers, 1 to 4 inches apart, extend 1 to 3 inches into underlying horizon; thickness decreases with depth.

B21t—12 to 20 inches, reddish-brown (5YR 4/3) silty clay loam; few, fine, faint, pinkish-gray (7.5YR 6/2) mottles; moderate to strong, medium and coarse, angular blocky structure; prominent, brown (7.5YR 5/2) to pinkish-gray (7.5YR 6/2) clay films on ped faces and in pores; firm to very firm; sticky; common, fine roots along ped faces in upper part, decreasing to few in lower part; very few fine roots inside peds; neutral to mildly alkaline; clear, wavy boundary.

B22t—20 to 24 inches, light reddish-brown (5YR 6/3) to light-brown (7.5YR 6/3) silty clay loam; few, fine, faint, reddish-brown (5YR 4/3) mottles, and few, distinct, light-gray (10YR 7/2) mottles; moderate to strong, medium and coarse, angular blocky structure; prominent, brown (7.5YR 5/2) clay films on ped faces; firm; slightly sticky; few, fine roots along ped faces; mildly alkaline; clear, wavy boundary.

C—24 to 40 inches +, reddish-brown (5YR 4/3) silty clay loam to heavy loam till; common, medium, distinct, pinkish-gray (5Y 6/2) mottles; light-gray (N 7/0) lime concretions; weak, coarse, blocky structure, becoming weak, thick, platy structure with depth; very firm in place; firm when crushed; very few, fine roots along block faces in upper part; calcareous.

The texture of the A horizon is mainly heavy silt loam but ranges from very fine sandy loam to silty clay loam. The texture of the B horizon is mainly silty clay loam but ranges to sandy clay loam that has a clay content of 28 to 35 percent. Color of the B horizon ranges from reddish brown to brown. The reaction of the A horizon is strongly acid to mildly alkaline, and that of the B horizon is slightly acid to moderately alkaline. Depth to carbonates is 20 to 36 inches.

Ovid soils are the somewhat poorly drained member of a drainage sequence that includes the well drained to moderately well drained Cazenovia soils, the poorly drained Romulus soils, and the very poorly drained Alden soils, till substratum. Similarly drained soils that frequently are associated with Ovid soils are Appleton, Darien, and Odessa soils. Ovid soils are reddish in color, whereas Darien soils are yellowish brown and olive brown. Ovid soils have a coarser textured B horizon than Odessa soils and formed in glacial till instead of in deep, clayey lacustrine deposits. Ovid soils have finer textured B horizons than do Appleton soils.

Ovid silt loam, 0 to 3 percent slopes (OvA).—This soil has a profile that is similar to the one described as typical for the series but is generally a little wetter. Most of the small and medium-sized areas, and a few of the larger areas, occur in positions where they receive moderate runoff from adjacent slopes. Most of the larger areas, however, are on level or nearly level hilltops and receive little or no runoff. These areas have such low gradients that runoff is very slow, and they stay wet for long periods after heavy rains; however, there is little or no ponding.

Included in mapping are spots of poorly drained Romulus soils in shallow depressions or along narrow drainageways. Romulus soils make up as much as 15 percent of some areas, and although they are not extensive, they commonly delay tillage in spring and field operations following heavy rains. Small areas of Cazenovia soils occur on slight rises or knolls but have little or no effect on use and management.

This soil is suited to crops, pasture, or forest. Although intertilled crops can be grown, wetness and a tendency to clod limit the intensity of cultivation.

Control of water and maintenance of good structure in the surface layer are important needs in management. Structures to hasten the removal of surface water are desirable in many areas. Erosion is not a hazard.

The supply of nitrogen is deficient, especially early in spring, and the supply of available phosphorus is low to medium. The reserve of potassium is high, but the supply in readily available form is commonly inadequate for some crops. Most areas need little or no lime. (Capability unit IIIw-5; woodland suitability group 4)

Ovid silt loam, 3 to 8 percent slopes (OvB).—This soil has the profile described as typical for the series. In most areas this soil has uniform slopes of 3 to 5 percent. Individual areas range in size from small to large and are so situated that runoff is received from adjacent, higher slopes. Since runoff is slow, this soil is wet for long periods following heavy rains. Cropped areas having slopes of 3 to 5 percent generally are only slightly eroded. Areas that have slopes of 5 to 8 percent generally are moderately eroded, but severely eroded spots occur where runoff is concentrated. Depressional and less sloping areas commonly contain deposits of material eroded from adjacent areas.

This soil commonly is associated with or adjacent to the Cazenovia soils or the less strongly sloping Ovid soils, from which it receives runoff. Included in mapping are areas of Cazenovia soils on slight rises or knolls. This better drained Cazenovia soil occupies as much as 10 percent of some areas but has little effect on use and management. Also included are spots of poorly drained Romulus soils in shallow depressions and along drainageways.

These soils make up as much as 8 percent of some areas, and although they are not extensive, they commonly delay tillage operations in spring or following heavy rains.

This soil is suited to crops, pasture, or forest. Although intertilled crops can be grown, wetness and a tendency to clod limit the intensity of cultivation.

Control of water and maintenance of good structure in the surface layer are important needs in management. Erosion control measures are needed on long slopes. Drainage of included spots of Romulus soils is needed in some areas. Structures to hasten the removal of water may be highly beneficial in most areas.

Nitrogen, especially early in the growing season, and phosphorus are the main nutrient needs. Although the reserve of potassium is high, the readily available supply is commonly inadequate for some crops. Little or no lime is needed in most areas. (Capability unit IIIw-6; woodland suitability group 4)

Palmyra Series

The Palmyra series consists of deep, well-drained, medium-textured and moderately coarse textured soils that formed in gravelly outwash materials of high lime content. The gravel is dominantly limestone but includes some sandstone and shale. These are inextensive soils that occur in scattered areas throughout the county, mainly on small deltas and kame terraces. The greatest concentration of these soils is in the area north of the Seneca River, east of Seneca Falls.

In a cultivated area, a typical profile has a dark-brown to dark grayish-brown gravelly loam surface layer about 8 inches thick. The subsurface layer is leached, yellowish-brown to pale-brown, friable gravelly loam. At a depth of about 12 inches, this layer fingers into the upper part of the subsoil around blocks of friable, dark-brown gravelly loam that is slightly heavier in texture. At a depth between 17 and 29 inches, the subsoil is friable, dark-brown gravelly heavy loam. Below this is grayish-brown to dark grayish-brown, friable gravelly heavy loam. Depth to the calcareous stratified sand and gravel substratum is about 42 inches. Reaction of the surface layer and the upper part of the subsoil is neutral.

Typical profile of Palmyra gravelly loam, 5 to 15 percent slopes (cultivated):

Ap—0 to 8 inches, dark-brown (7.5YR 3/2 and 4/2) to dark grayish-brown (10YR 4/2) gravelly loam; moderate, medium and coarse, granular structure; friable; many roots; neutral; abrupt, wavy boundary.

A2—8 to 12 inches, yellowish-brown (10YR 5/4) to pale-brown (10YR 6/3) gravelly loam; moderate, fine, subangular blocky structure; friable; many roots; neutral; clear, wavy boundary.

B&A—12 to 17 inches, dark-brown (10YR 4/4) gravelly loam; slightly more clay than in A2 horizon; moderate, fine and medium, subangular blocky structure; surrounded by ⅛- to ¼-inch thick, brown (10YR 5/3), slightly coarser loam; friable; many roots; neutral; clear, wavy boundary.

B2t—17 to 29 inches, dark-brown (10YR 3/3) gravelly heavy loam to loam; discontinuous clay films on ped faces and gravel; moderate, fine and medium, subangular blocky structure; friable; many roots; neutral; clear, wavy boundary.

B3—29 to 42 inches, grayish-brown (10YR 5/2) to dark grayish-brown (10YR 4/2) gravelly heavy loam; moderate, fine and medium, subangular blocky structure; friable; common, fine roots; calcareous; clear, wavy boundary.

C—42 to 60 inches +, light brownish-gray (10YR 6/2 and pinkish-gray (7.5YR 6/2) sand and stratified sand and gravel. Gravel is dominantly limestone and red and gray sandstone; strongly calcareous.

Texture of the A horizon is mainly gravelly loam but ranges to gravelly fine sandy loam; a few spots are essentially gravel-free loam. pH is strongly acid to mildly alkaline.

The texture of the B horizon is gravelly heavy loam to gravelly sandy loam that is reddish brown to brown and has a gravel content of 15 to 35 percent. Reaction ranges from medium acid to mildly alkaline. Depth to calcareous, stratified sand and gravel is mainly 18 to 42 inches, but a few isolated pockets are as much as 48 inches deep.

Palmyra soils occur mainly on small deltas and kame terraces in association with Ontario, Honeoye, and Lansing soils, which are upland soils that formed in firm glacial till. Palmyra soils have a higher lime content and thinner A and B horizons than similar Howard soils that developed in glacial outwash.

Palmyra gravelly loam, 0 to 5 percent slopes (PgA).—This soil occurs on terraces in valleys, on the tops of some deltas, and on the sides of valleys. Included in mapping are silty Collamer and Niagara soils and sandy Elnora soils in depressions or pockets that are so low that they have a moderately high water table in the wetter seasons. These wetter soils seldom make up more than 10 percent of a given area but are important because they delay field operations in spring. Also included are a few spots of Arkport soils, mainly in the northwestern corner of Seneca County.

This soil is very well suited to many crops, as well as to pasture and forest. It is especially well suited to many vegetable and fruit crops. This soil is a good to excellent source of sand and gravel.

Maintenance of fertility is an important need in management. Lime cementation of the gravel is a problem in many areas. Most crops need a complete fertilizer, and response to intensive fertilization is generally very high. Need for lime ranges from none to moderate. Drainage is not a problem. Hazard of erosion is slight. The high gravel content of the surface layer commonly hinders use of farm machinery and can also limit use of the soil for root crops. (Capability unit I-1; woodland suitability group 1a)

Palmyra gravelly loam, 5 to 15 percent slopes (PgC).—This soil has the profile described as typical for the series. Its steepness commonly makes the use of farm machinery moderately difficult. The steeper slopes, mainly in the 10- to 15-percent range, include small areas that are slightly to moderately eroded. Erosion occurs mostly in spring when the surface layer thaws and the subsoil is still frozen.

This soil is moderately sloping and occurs mainly on the edge of terraces or on dissected terraces. Slopes are generally short and uniform, but a few small areas have complex slopes. Included in mapping were small spots of Palmyra gravelly sandy loam.

This soil is suited to crops, pasture, or forest. It is especially well suited to deep-rooted crops. Areas where slopes range mostly from 10 to 15 percent, or that have complex slopes, are not well suited to intensive farming to intertilled crops, especially to vegetables.

Control of runoff and erosion and maintenance of fertility are the main needs in management. Lime cementation of the gravel is a problem in most areas. Little lime is needed, but a complete fertilizer is required. Crops respond well to adequate fertilization. Steeper slopes have a moderate erosion hazard and should include a high percentage of sod or hay crops in the cropping system. (Capability unit IIIe–2; woodland suitability group 1a)

Palmyra and Howard soils, 15 to 25 percent slopes (PhD).—These soils have a profile described as typical of their respective series, but they have a lighter colored surface layer and are thinner over calcareous gravel. They are of limited extent in Seneca County.

Individual mapping units are comprised mainly of one soil or the other. The Howard soil is the less extensive and occurs at higher elevations in the southern part of the county, generally south of the village of Ovid. Most cleared areas of either soil are moderately eroded. Texture of the surface layer varies more within individual mapping units than in the less steeply sloping Palmyra or Howard soils. Texture is mainly gravelly loam and gravelly sandy loam.

These soils can be cropped, but the steep slopes make use of machinery extremely difficult, and erosion is a severe hazard if they are plowed. These soils are generally better suited to long-term hay, pasture, or forest. Deep-rooted legumes are the best suited of the hay crops. Intertilled crops should be grown as seldom as possible. These soils are a good source of sand and gravel, but cementation of the gravel is a problem in many areas.

This soil is especially low in content of nitrogen and the supply of available potassium. The supply of available phosphorus is moderate. Legumes need both phosphorus and potassium. The Howard soils need lime in places. (Capability unit IVe–11; woodland suitability group 1b)

Palmyra and Howard soils, 25 to 35 percent slopes (PhE).—These soils have a profile that resembles the one described as typical for their respective series but are thinner over calcareous gravel and have a thinner subsoil that is lower in content of clay. The texture of the surface layer is more variable within individual mapping units than between the less steeply sloping Palmyra or Howard soils, which are mainly gravelly loam and gravelly sandy loam.

These gravelly soils are so steep that the use of farm machinery is extremely difficult and hazardous. Any mapped area can consist of Palmyra soils or Howard soils, or both. They rarely occur together, and individual areas are mainly one soil or the other. Howard soils are less extensive and occur at the higher elevations.

These soils can be used for pasture, but most areas are best suited to woodland. They are relatively unproductive as pasture unless they are limed and fertilized. They are generally good sources of sand and gravel.

The generally short and complex slopes dominate the use and management of these soils. In cleared and plowed areas, erosion commonly ranges from slight to severe within short distances. These soils tend to be droughty. (Capability unit VIe–1; woodland suitability group 1b)

Romulus Series

The Romulus series consists of deep, poorly drained, moderately fine textured soils. These soils formed in reddish, calcareous glacial till that generally contains reworked, reddish, lacustrine clay. They are nearly level or depressional and occur on the till plain throughout the northern half of the county and extend south along Cayuga and Seneca Lakes.

In a cultivated area, a typical profile has a very dark-gray silty clay loam surface layer that is about 8 inches thick. The subsoil extends to a depth of about 24 inches and consists of firm, mottled silty clay loam. The subsoil is gray in the upper few inches and reddish-gray at a depth of more than about 15 inches. The firm, dense substratum consists of mottled, reddish-gray to dark reddish-gray silty clay loam till that extends to a depth of about 32 inches. Below this, the subsoil consists of mottled, reddish-brown silty clay loam till that is calcareous. The subsoil ranges from neutral in the upper part to moderately alkaline and calcareous above the substratum.

Typical profile of Romulus silty clay loam (cultivated):

Ap—0 to 8 inches, very dark-gray (10YR 3/1) light silty clay loam; very dark grayish brown (10YR 3/2) when rubbed; strong, medium and coarse, granular structure; friable; slightly sticky; many, fine and medium roots; neutral; abrupt, wavy boundary.

B&A—8 to 15 inches, gray (N 5/0 to 5Y 5/1) light silty clay loam; common, medium, distinct, yellowish-brown (10YR 5/6), dark yellowish-brown (10YR 4/4), and olive-brown (2.5Y 4/4) mottles; moderate, coarse, angular blocky structure within strong, coarse prisms; thick, very dark grayish-brown (10YR 3/2) silt coats on prism faces grade from ¼ to ½ inch at top to very thin with depth; dark-gray (N 4/0 to 5Y 4/1), thin silt coats on ped faces; firm; sticky; common, fine and medium roots along prism faces; common, fine roots along ped faces; neutral; abrupt, wavy boundary.

B2tg—15 to 20 inches, reddish-gray (5YR 5/2) silty clay loam; many, coarse, distinct, brown (7.5YR 5/4) and gray (10YR 5/1) mottles; moderate to strong, coarse, angular blocky structure within strong, coarse prisms; prominent, gray (10YR 5/1) silt coats on prism faces; common, organic stains; prominent, gray (10YR 5/1) clay films on ped faces and in pores; firm; sticky; few, fine roots along ped faces and in larger pores; mildly alkaline; clear, wavy boundary.

B3g—20 to 24 inches, reddish-gray (5YR 5/2) silty clay loam; common, coarse, distinct, strong-brown (7.5YR 5/4) and gray (10YR 5/1) mottles; moderate, coarse, blocky structure within moderate to strong, coarse prisms; prominent, gray (10YR 5/1) silty lime coats; very dark gray (10YR 3/1) organic stains on prism faces, and thinner, silty lime coats on ped faces; prominent clay flows in larger pores; few, fine and medium, pinkish-gray (7.5YR 7/2) lime nodules; firm; sticky; few, fine roots along prism and ped faces; calcareous; clear, wavy boundary.

C1g—24 to 32 inches, reddish-gray (5YR 5/2) to dark reddish-gray (5YR 4/2) silty clay loam; many, medium, distinct, strong-brown (7.5YR 5/4 to 5/6) mottles, and few, fine, distinct, gray (10YR 5/1) mottles; common, medium, pinkish-gray (7.5YR 7/2) lime concretions; moderate to strong, medium and coarse, angular blocky, in moderate platy structure; gray (10YR 5/1) to dark-gray (10YR 4/1) silty lime coats on ped faces; firm; slightly sticky; few, fine roots along ped faces; strongly calcareous; gradual, wavy boundary.

C2g—32 to 48 inches +, reddish-brown (5YR 4/3) silty clay loam; common, medium, distinct, strong-brown

(7.5YR 5/4) mottles, and few, fine, distinct, gray (10YR 5/1) mottles at top, which decrease in size and number with depth; moderate, thick, platy structure; discontinuous, gray (10YR 5/) silty lime coats on plate faces; firm; slightly sticky; no roots; strongly calcareous.

Depth to carbonates ranges from 12 to 30 inches. Texture of the A horizon ranges from silt loam to silty clay loam. The color of the A1 and Ap horizons ranges from black to dark brown. Reaction is slightly acid to mildly alkaline.

The B horizon is silty clay loam to clay loam in texture and contains 28 to 35 percent clay. Color ranges from gray to reddish gray, and there are common to many mottles. In the B2g and C1g horizons, from 20 to 40 percent of the surface area is mottled. In the B and C horizons, a few small stone fragments and dark-gray shale chips are present. Reaction of the B2 horizon ranges from neutral to mildly alkaline.

Romulus soils are poorly drained members of a drainage sequence that includes the well drained to moderately well drained Cazenovia soils, the somewhat poorly drained Ovid soils, the very poorly drained Fonda, and Alden soils, till substratum. The very poorly drained Fonda soils commonly are mapping associates. Romulus soils are redder than similar Ilion soils that are derived from dark-gray shale and have a finer textured B horizon than similar Lyons soils.

Romulus silty clay loam (Ro).—This is a level or gently sloping soil that occurs in areas adjacent to the Ovid and Cazenovia soils, from which it receives a considerable amount of runoff. Only a few small areas of this soil have a slope of more than 2 percent.

Included in mapping are the better drained Ovid soils on slight rises or knolls, which make up as much as 10 percent of some areas. These soils have little effect on use and management. Also included are small, wet pockets of very poorly drained Alden or Fonda soils, which make up as much as 8 percent of some areas; although they are not extensive these wetter soils delay tillage.

If undrained, this soil is used mainly for pasture or woods. Some areas provide good sites for ponds and wildlife marshes. Smaller areas in cultivated fields have some drainage, but drainage generally is inadequate for intensive use. Consequently, these areas are important because they control the timing of work on the better drained soils in spring.

When properly managed, this soil is well suited to annual crops, including corn and beans, and should be well suited to sugar beets. Drainage is the greatest single need in management when this soil is used for farming. Careful management to prevent cloddiness in the surface layer is also important.

This soil needs little lime. The supply of available phosphorus is moderate, and the supply of available potassium is low. The supply of nitrogen is deficient in spring but may be adequate for most crops by midsummer. (Capability unit IVw-1; woodland suitability group 9)

Schoharie Series

The Schoharie series consists of deep, moderately well drained and well drained soils derived from calcareous reddish clay and silt. These soils occur on the higher, nearly level to strongly dissected areas of the lake plain. They are in a large, nearly continuous area that extends east from Waterloo to Cayuga Lake and along both banks of the Seneca River; it extends south along Cayuga Lake to a point south of Canoga.

In a cultivated area, a typical profile has a very dark gray to dark reddish-brown surface layer of silty clay loam 6 inches deep. The thin, leached subsurface layer is pinkish-gray silty clay loam about 1 inch thick that fingers around blocks of reddish-brown to brown silty clay loam in the top few inches of the subsoil. At a depth of more than 9 inches, the subsoil is reddish-brown clay to silty clay that is firm to very firm. Depth to the substratum is about 29 inches. The substratum is firm, strongly calcareous, reddish-brown silty clay. Reaction of the subsoil is neutral to mildly alkaline. It becomes weakly calcareous just above the substratum.

Typical profile of Schoharie silty clay loam, 2 to 6 percent slopes (cultivated):

Ap—0 to 6 inches, very dark gray (5YR 3/1) to dark reddish-brown (5YR 3/2) light silty clay loam; dark reddish brown (5YR 3/2) when crushed and rubbed; strong, very fine to medium, granular structure; firm; slightly sticky; many, fine and medium roots; neutral; abrupt, smooth boundary.

A2—6 to 7 inches, pinkish-gray (7.5YR 6/2) light silty clay loam; strong, medium and coarse, subangular blocky structure; pinkish-gray (7.5YR 7/2) silt coats on ped faces; firm; slightly sticky; many, fine roots along ped faces; common, fine and medium pores; neutral; abrupt, broken boundary; thin, ⅛- to ¼-inch fingers, 1 to 4 inches apart, extend into underlying horizon.

B&A—7 to 9 inches, reddish-brown (5YR 5/3) silty clay loam; strong, medium and coarse, angular and subangular blocky structure; brown (7.5YR 5/2 and 5/4) to reddish-brown (5YR 5/3), thin clay films with streaks of pinkish gray (7.5YR 6/2) on ped faces; firm; sticky; many, fine roots along ped faces; common, fine and medium pores; discontinuous clay films in larger pores; neutral; discontinuous, abrupt, broken boundary.

B21t—9 to 18 inches, reddish-brown (5YR 4/4) silty clay to clay; strong, fine and medium, angular blocky structure; firm to very firm; sticky; common, fine roots along ped faces; few, fine and medium pores; distinct clay films in pores; dark reddish-gray (5YR 4/2) to reddish-brown (5YR 4/3) clay films on ped faces; mildly alkaline; gradual, wavy boundary.

B22t—18 to 29 inches, reddish-brown (5YR 4/3) silty clay to clay; strong, coarse, blocky structure parts to weak, fine and medium blocks; firm to very firm; sticky; common, fine roots along ped faces; few, fine and medium pores; gray (N 5/0) clay films along root channels and in pores; reddish-brown (5YR 4/3 and 5/3) clay films on ped faces; mildly alkaline; becomes calcareous in lower part; gradual, wavy boundary.

C—29 to 40 inches +, reddish-brown (5YR 4/3) silty clay that is gray (N 5/0) along root channels; moderate and strong, thick, platy structure, parts to weak, fine and medium, blocky structure; few, fine roots along block and plate faces; dark reddish-gray (5YR 4/2) to reddish-brown (5YR 4/3) clay flows interspersed with white (N 8/0) to light-gray (5YR 7/1), silty lime coats on ped faces; strongly calcareous.

Texture of the A horizon is mainly silty clay loam or silt loam but ranges from silty clay to very fine sandy loam. The A2 horizon is faintly mottled in places. Reaction ranges from strongly acid to mildly alkaline.

The B horizon is mostly silty clay loam to clay and has a clay content of 35 to 50 percent. Thin layers of silt or very fine sand are present in places. The color of the B horizon is generally reddish brown, but in places it is brown in the upper part, and in other places there is faint mottling. Reaction ranges from slightly acid to moderately alkaline. Depth to free carbonates is 12 to 48 inches.

The C horizon is dominantly silty clay or clay but contains thin layers of silt or very fine sand.

Schoharie soils are the moderately well drained and well drained member of a drainage sequence that includes the somewhat poorly drained Odessa soils, the poorly drained Lakemont soils, and the very poorly drained Fonda soils. Schoharie soils are finer textured than the Dunkirk and Collamer soils. Schoharie soils are similar in color and drainage to the Cazenovia soils but are finer textured and formed in deep, clayey lacustrine deposits rather than in firm glacial till.

Schoharie silt loam, 2 to 6 percent slopes (SeB).—This soil has a profile similar to the one described as typical for the series but is slightly coarser in texture. The surface layer is commonly silt loam, but there are a few small areas of very fine sandy loam. The subsoil and substratum commonly consist of thin layers of silt and very fine sand between layers of clay. This soil gradually grades toward the coarser textured Collamer and Dunkirk soils. It generally lies between large areas of Schoharie silty clay loam in the eastern part of the county and of the Dunkirk and Collamer soils in the western part.

The more smoothly sloping areas have moderately long to short, convex slopes that grade into narrow, nearly straight, concave drainageways. Undulating areas have short, convex slopes with many, narrow, irregular drainageways and shallow depressions.

Included in mapping are the somewhat poorly drained Odessa soils in drainageways and depressions, which occupy as much as 15 percent of some areas. Spots of poorly drained Lakemont soils occur where water ponds in drainageways. Though not extensive, these wetter soils delay field operations in spring and when it is wet in fall. Also included are spots of silty Dunkirk or Collamer soils and small areas of Cazenovia soils where lake-deposited clay is thin over glacial till. These inclusions have little effect on use and management.

Erosion generally is slight to moderate, but small spots of clay indicating severe erosion are common in the more steeply sloping, undulating areas. Drainageways and depressions commonly contain deposits of eroded material.

This soil is suited to crops, pasture, or forest. It is best suited to crops grown in support of dairying.

Maintenance of good structure in the surface layer and control of erosion are among the main needs in management. Careful management is needed to prevent cloddiness and severe crusting. Water is absorbed slowly and runoff is moderate, so erosion is a continuing hazard. Random drainage of the included wetter soils is beneficial in most fields.

Little or no lime is needed, but application of a complete fertilizer is desirable. The supply of nitrogen is deficient in spring. Although the supply of potassium is high, the amount in readily available form may be deficient for some crops. (Capability unit IIe–5; woodland suitability group 2a)

Schoharie silty clay loam, 0 to 2 percent slopes (ShA).—This soil has a profile that is similar to the one described as typical for the series, but it is commonly mottled directly below the surface layer and is a little wetter. Some areas have a siltier surface layer. This soil occurs in slightly convex areas of the lake plain.

Included in mapping are areas of somewhat poorly drained Odessa soils in slight depressions and in long, shallow, narrow drainageways. Small spots of the poorly drained Lakemont soils occur where water ponds. These wetter soils make up as much as 20 percent of some areas. They are important because they delay fieldwork in spring and can hamper harvesting when it is wet in fall.

This soil is suited to crops, pasture, or forest. Crops grown in support of dairying are among those to which it is best suited.

Careful management is necessary, since this soil clods readily and can crust severely. Good seedbed preparation is also required. Water is absorbed slowly, and surface water commonly is a problem. Random drainage of included wetter spots generally is needed in most fields. Cropping systems that include hay or sod about 50 percent of the time are generally desirable to maintain good soil structure.

Little or no lime is needed, but application of a complete fertilizer is desirable. The supply of nitrogen tends to be deficient in spring. Although the supply of potassium is high, the amount in readily available form may be deficient for some crops. (Capability unit IIw–2; woodland suitability group 2a)

Schoharie silty clay loam, 2 to 6 percent slopes (ShB).—This soil has the profile described as typical for the series. The more smoothly sloping areas have moderately long to short, convex slopes that grade into concave drainageways. The undulating areas have short, convex slopes that are separated by narrow, concave drainageways and depressions.

Included in mapping are somewhat poorly drained Odessa soils along narrow drainageways or in depressions and poorly drained Lakemont soils where ponding occurs in the drainageways. These wetter soils make up as much as 15 percent of some areas and may delay fieldwork in spring and when it is wet in fall. Also included are spots of silty Dunkirk or Collamer soils, areas of Cazenovia soils, and unnamed soils that formed in 20 to 40 inches of reddish clay over dense, reddish, clayey, calcareous till, mainly in the areas southwest of Seneca Falls and west of State Route 414. These inclusions have little or no effect on use and management.

Much of the farmed areas is moderately eroded, and small clay patches are common, especially on the steeper, undulating slopes. Drainageways and depressions commonly contain deposits of eroded material.

This soil is suited to crops, pasture, or forest. Maintenance of good structure in the surface layer and control of erosion are among the main needs in management.

Careful management is needed to prevent cloddiness and severe crusting. Good seedbed preparation is necessary. Water is absorbed slowly and runoff is moderately rapid, so erosion is a continuing hazard. Random drainage of the included wetter soils is beneficial in most fields.

Little or no lime is needed, but application of a complete fertilizer is desirable. The supply of nitrogen tends to be deficient in spring. Although the supply of potassium is high, the amount in readily available form may be deficient for some crops. (Capability unit IIe–5; woodland suitability group 2a)

Schoharie silty clay loam, 6 to 12 percent slopes, eroded (ShC3).—This soil generally occurs in dissected areas and has short, convex slopes that are separated by narrow drainageways, but a few small areas have smooth, single slopes. The steeper side slopes are severely eroded, and clay or bald spots are common. The gently sloping tops of knolls and the lower side slopes, however, are only slightly to moderately eroded. The center and lower parts of drainageways and sags commonly contain deposits of eroded material.

Most cropped areas of this soil are severely eroded. The present surface layer is mixed with material from the more clayey subsoil, has a higher clay content than previously, and is thinner to calcareous material.

Commonly included with this soil in mapping are narrow areas of Odessa soils along drainageways. These are wetter soils that make up as much as 15 percent of some areas and delay work in fields in spring. Also included are a few small areas of this soil that are woodland or unplowed pasture. These areas have suffered little or no erosion. They are commonly silt loam or light silty clay loam in the surface layer.

This soil can be used for limited cropping, for pasture, or for forest. Because of the complex slopes, the hazard of erosion, and the poor physical condition of the surface layer, this soil is best suited to hay and forage crops.

Intensive management to control runoff and erosion and to maintain good soil structure is needed if this soil is used for intertilled crops. Preparation of a good seedbed requires careful timing to assure the proper moisture content. Random drainage of included wet spots can benefit some fields. A complete fertilizer is needed. Little or no lime is needed. (Capability unit IVe–5; woodland suitability group 2a)

Schoharie silty clay loam, 12 to 20 percent slopes, eroded (ShD3).—This soil occurs mainly on strongly dissected and complex slopes or on the sides of the main drainageways of the lake plain.

In most cleared and cultivated areas, the present surface layer is mixed with the more clayey subsoil. Some spots have lost nearly all the original surface layer, and the present surface layer consists of silty clay or clay.

This soil is commonly associated with the less strongly sloping Schoharie soils, from which it receives a considerable amount of runoff. Included in mapping are small areas of somewhat poorly drained Odessa soils on the bottom of drainageways and a few small areas of poorly drained Lakemont soils in areas where water ponds. Also included are a few woodlands and unplowed pastures that are not eroded and a few small areas on slopes of 20 to 30 percent.

This soil is suited to crops, pasture, or forest. It is well suited to deep-rooted legumes if properly managed.

This soil is limited in use and management by slope, slow permeability, droughtiness, erosion, and, to some extent, by texture. Little or no lime is needed. Phosphorus and potassium are required for legumes, and nitrogen is needed for other crops. (Capability unit VIe–1; woodland suitability group 2b)

Sloan Series

The Sloan series consists of deep, poorly drained and very poorly drained, medium-textured and moderately fine textured soils that formed in slightly acid to mildly alkaline, recent alluvium. Except for a mucky surface layer, these soils show little genetic development and generally have little or no structure. These are level to slightly depressional soils in slack-water areas and in old, partially filled stream channels or oxbows of the flood plains. The soils are moderately extensive in the major river valleys of the county but are of little importance to farming.

In an idle area, a typical profile has a very dark gray to very dark brown silt loam surface layer, about 10 inches thick. The upper part of the subsurface layer is very dark gray to very dark brown light silty clay loam that has high organic-matter content and contains partly decomposed root, leaf, and wood fragments. The lower part of the subsurface layer is at a depth of about 17 inches. It consists of very dark gray mucky silt loam that also contains a few partly decomposed root, leaf, and wood fragments. The subsoil, at a depth between 22 inches and 36 inches, consists of mottled, friable, dark-gray heavy silt loam. The substratum is neutral, mottled, gray to dark-gray light silt clay loam that is slightly sticky when wet. The surface layer, subsurface layer, and subsoil are slightly acid in reaction.

Typical profile of Sloan silt loam (idle):

A11g—0 to 10 inches, very dark gray (10YR 3/1) to very dark brown (10YR 2/2) silt loam; very high organic-matter content; many, fine, distinct, dark reddish-brown (5YR 3/2) root mottles; moderate, medium and coarse, granular structure; friable when moist; nonsticky when wet; common, fine roots; slightly acid; abrupt, wavy boundary.

A12g—10 to 17 inches, very dark gray (10YR 3/1) to very dark brown (10YR 2/2) light silty clay loam; very high silt and organic-matter content; common, medium and coarse, distinct, partly decomposed root, leaf, and wood fragments that are dark brown (7.5YR 3/2) and dark reddish brown (5YR 3/2) in color; massive to very weak, coarse prisms that part to very weak, coarse, subangular blocky structure; friable when moist; slightly sticky when wet; few, fine roots; slightly acid; abrupt, wavy boundary.

A13g—17 to 22 inches, very dark gray (10YR 3/1) mucky silt loam; few, medium and coarse, distinct, dark reddish-brown, partly decomposed organic fragments and logs; massive; friable when moist; nonsticky when wet; few, fine roots; slightly acid; abrupt, wavy boundary.

Bg—22 to 36 inches, dark-gray (10YR 4/1) heavy silt loam; common, coarse, distinct, brown (7.5YR 4/4) to dark-brown (7.5YR 4/2), dark yellowish-brown (10YR 4/4), and strong-brown (7.5YR 5/6) mottles; weak, coarse, subangular blocky structure within weak, coarse prisms; thin, dark-gray silt coats on prisms and ped faces; slighty friable; very few, fine roots; slightly acid; abrupt, wavy boundary.

IIC—36 to 48 inches +, gray (N 5/0) to dark-gray (N 4/0) light silty clay loam; very high silt content; few, fine, distinct, olive-brown (2.5Y 4/4) and dark reddish-brown (5YR 3/4) root mottles; thin, discontinuous silt coats on vertical prism faces; weak, coarse, prismatic structure that parts to weak, thick, platy structure; slightly sticky when wet; very few, fine roots; neutral.

The texture of the A horizon ranges from very fine sandy loam to light silty clay loam. Organic-matter content is high, and in places there are thin layers that have very high organic-matter content. Color is black to dark grayish brown. Reaction is slightly acid to mildly alkaline.

The texture of the B horizon is very fine sandy loam to light silty clay loam. It has a clay content of 18 to 35 percent and a high content of silt or very fine sand. Color is dark gray to gray. The B horizon is slightly acid to neutral, and at a depth of more than 30 inches, it becomes calcareous in places.

Sloan soils are the wettest member of a drainage sequence that includes the moderately well drained Eel soils. Sloan soils are generally finer textured than better drained associated soils.

Sloan silt loam (Sn).—This soil occurs in low areas and depressions on first bottom lands and is the first soil to flood. This soil is of limited extent in Seneca County. It occurs on bottom lands mainly along the larger streams. The most extensive area is along the Clyde River in the northeastern corner of the county.

This soil is associated mainly with the Eel, Wallkill, and muck soils. Included in mapping are areas that are more grayish brown and have a thinner surface layer that has high organic-matter content.

If undrained, this soil is best suited to pasture or forest in which water-tolerant plants are predominant. Some areas provide suitable sites for ponds and wildlife marshes. This soil needs drains and dikes to be made suitable for crops and it has a high potential if these are adequately established and maintained.

Flooding and prolonged wetness are major limitations to use. (Capability unit IIIw-4; woodland suitability group 9)

Stafford Series

The Stafford series consists of deep, somewhat poorly drained, coarse-textured soils that formed in sandy lacustrine deposits. These are low or depressional soils on the lake plains, mainly on the delta north of Seneca Lake and on the north side of Seneca River and extending to the village of Waterloo.

In a cultivated area, a typical profile has a very dark-gray loamy fine sand surface layer about 8 inches thick. The subsoil, which extends to a depth of about 34 inches, is mottled, very friable to loose loamy fine sand. It is pale brown to brown in the upper part; at a depth of more than about 22 inches, it becomes grayish brown, grading to light gray as depth increases. The subsoil contains a few, firm, reddish-brown iron concretions. The substratum is light-gray fine sand that has a few prominent mottles in the upper part, which decrease in number as depth increases. Reaction of the subsoil is strongly acid to medium acid, and reaction of the substratum is medium acid.

Typical profile of Stafford loamy fine sand (cultivated):

Ap—0 to 8 inches, very dark-gray (10YR 3/1) loamy fine sand; very dark grayish brown (10YR 3/2) when rubbed; very weak, fine and medium, granular structure; very friable; many, fine and medium roots; slightly acid; abrupt, smooth boundary.

B21—8 to 22 inches, pale-brown (10YR 6/3) to brown (10YR 5/3) loamy fine sand; common, medium, distinct, yellowish-brown (10YR 5/6 and 5/4) and dark yellowish-brown (10YR 4/4) mottles, and few, fine, distinct, light-gray (10YR 7/1) mottles; massive to very weak, medium and coarse, subangular blocky structure, within very weak, thick, platy structure; very friable to loose; numerous, fine roots, and few, medium roots; medium acid; clear, wavy boundary.

B22—22 to 34 inches, grayish-brown (10YR 5/2) loamy fine sand, grading to light gray (10YR 7/2) with depth; common, coarse, prominent, strong-brown (7.5YR 5/6 and 5/8) and yellowish-red (5YR 5/6) mottles; few, reddish-brown (5YR 4/4), slightly firm iron concretions; massive; slightly firm in place; very friable to loose when crushed; few, fine roots; strongly acid; gradual, wavy boundary.

C—34 to 48 inches, light-gray (10YR 7/1) fine sand; few, medium, prominent, dark-brown (7.5YR 4/4) and strong-brown (7.5YR 5/6) mottles that decrease in number and size with depth; massive; slightly firm in place; very friable to loose when crushed; medium acid.

The solum ranges in thickness from 24 to 48 inches. Texture of the A horizon is commonly loamy fine sand but ranges from light fine sandy loam to loamy fine sand. Depending on organic-matter content, colors are very dark gray to gray. Reaction is very strongly acid to slightly acid where unlimed.

Texture of the B horizon is mainly loamy fine sand, but there are thin layers or bands of fine sandy loam to fine sand. A few, thin, finer textured bands are present. Consistency is loose to firm. Color is reddish brown to olive brown but includes various hues of gray. There are a few fine to coarse mottles, and iron concretions are common where the horizon is more acid. Reaction ranges from very strongly acid to slightly acid.

The texture of the C horizon is loamy very fine sand to sand. Color is gray to pinkish gray. Reaction ranges from strongly acid to mildly alkaline.

Stafford soils are the somewhat poorly drained member of a drainage sequence that includes the moderately well drained Elnora soils and the poorly drained and very poorly drained Lamson soils. Stafford soils commonly are associated with the well-drained or excessively drained Arkport soils. Stafford soils resemble Cosad soils but are more than 40 inches deep to clay or silty clay. They contain more sand and less silt than similarly drained Niagara soils.

Stafford loamy fine sand (Sr).—Most of this soil is level or depressional and has slopes of less than 2 percent. This soil is not extensive. Most areas are small, and only a few are larger than 20 acres.

Included in mapping are areas of poorly drained and very poorly drained Lamson soils in slight depressions and along narrow drainageways. These are wetter soils that make up as much as 15 percent of some areas, and although they are not extensive, they delay tillage operations. Also included are small areas of moderately well drained Elnora soils on occasional slight rises, but these soils have little influence on use and management.

This soil is suited to crops, pasture, or forest. If undrained, it is generally well suited to water-tolerant hay and forage crops. If adequately drained, this soil is well suited to most annual, intertilled crops and is especially well suited to many types of vegetables.

Drainage and adequate fertilization are the most important needs in management. The fine sand flows readily when saturated and requires use of special measures to prevent plugging of open ditches and tile drains. This soil needs a moderate amount of lime. It requires a complete fertilizer for most crops and is especially deficient in potassium. Response to fertilization is high where drainage is adequate. Erosion generally is not a hazard, but soil blowing can be a hazard on the sandier soils. (Capability unit IIIw-2; woodland suitability group 7)

Varick Series

The Varick series consists of poorly drained soils that formed in glacial till and semiresidual material from alkaline and calcareous, gray to black silty shale.

In a cultivated area, a typical profile has a very dark gray silty clay loam surface layer about 8 inches thick. The subsoil is distinctly mottled, light brownish-gray, firm silty clay loam. Depth to calcareous shale bedrock is

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about 24 inches. The shale bedrock is partly weathered and is fractured in the upper 12 inches. Reaction of the surface layer and subsoil is neutral.

Typical profile of Varick silty clay loam (cultivated):

Ap—0 to 8 inches, very dark-gray (10YR 3/1) light silty clay loam; very dark grayish brown (10YR 3/2) when crushed and rubbed; moderate to strong, very fine and fine, subangular blocky structure and medium, granular structure; friable; slightly sticky; many roots; neutral; clear, wavy boundary.

B2g—8 to 24 inches, light brownish-gray (2.5Y 6/2) light silty clay loam; many, medium, distinct, yellowish-brown (10YR 5/6), light olive-brown (2.5Y 5/6), and light-gray (10YR 7/1) mottles; moderate, coarse, angular blocky structure within moderate, coarse prisms; light-gray (10YR 6/1) to gray (5Y 6/1) prominent clay films on block and prism faces; few roots along block faces, but very few roots entering block interiors; neutral; clear, wavy boundary.

R—24 to 40 inches, gray; dark-gray, olive-gray, and grayish-brown calcareous shale bedrock, ¼-inch to 1-inch bedding; upper 12 inches soft and partly broken by weathering.

Texture of the A horizon is mainly light silty clay loam but ranges from silt loam to silty clay loam. Color is black or very dark brown to dark gray. The B2 horizon is dominantly silty clay loam but ranges from light silty clay loam to clay; it has a clay content of 28 to 35 percent. Color is brownish gray to olive gray. The surface layer ranges in reaction from strongly acid to mildly alkaline, and depth to carbonates is 20 to 48 inches.

Varick soils are the poorly drained member of a drainage sequence that includes the moderately well drained to well drained Aurora soils and the somewhat poorly drained Angola soils. Varick soils resemble some Ilion soils but are 20 to 40 inches deep to bedrock. Varick soils are shallower and finer textured than the associated poorly drained Lyons soils. Varick soils resemble the poorly drained Madalin soils, but the Madalin soils are deeper, finer textured, and formed in deep lacustrine deposits.

Varick silty clay loam (Vc).—This soil is level and occurs in broad areas that receive much runoff from higher, adjacent Angola soils. It also occurs in small areas along drainageways or in depressions within areas of better drained Angola and Aurora soils.

Included in mapping are spots of better drained Angola soils on slight rises and small areas of Ilion soils where depth to shale bedrock is more than 40 inches. Although these inclusions make up as much as 20 percent of some areas, they have little or no effect on use and management.

Where undrained, this soil is used mainly for pasture or forest. Small areas in cultivated fields have been drained to some degree, but large areas generally are inadequately drained for intensive use.

Prolonged wetness, shallowness to bedrock, and slow permeability are important limitations. Drainage is the main need in management and is particularly important in fields dominated by better drained soils. Drained areas can be expected to need little lime, a moderate amount of phosphorus, and a small amount of potassium. The supply of nitrogen is deficient in spring but may be abundant by midsummer. (Capability unit IVw-4; woodland suitability group 9)

Wallkill Series

The Wallkill series consists of alluvial mineral materials underlain by muck or peat. The recent mineral deposits consist of sand, silt, or clay, or of varying mixtures of two or more of these washed from uplands, terraces, and lacustrine deposits. In places, calcareous marl is included in the mineral material. These soils generally lie between uplands and areas of true muck and peat or along lakes and on stream bottoms. They are most extensive along the Clyde and Seneca Rivers in the northern part of the county.

In an idle area, a typical profile has a very dark brown to reddish-brown fine sandy loam surface layer about 6 inches deep. The subsoil consists of mineral soil that extends to a depth of about 14 inches. The upper 3 inches is very dark brown to very dark gray, friable very fine sandy loam or fine sandy loam that has a few light-gray mottles. At a depth of more than 9 inches is a layer of friable, distinctly mottled, light-gray to white fine sandy loam. This is underlain to a depth of 21 inches by a layer of very dark brown to very dark grayish-brown fibrous muck containing numerous dark reddish-brown peat fragments. At a depth of 21 inches to more than 40 inches is a layer of very dark brown silty muck that also contains a noticeable amount of peat fragments. The surface layer and subsoil are mildly alkaline to neutral in reaction, and the mucky layers are medium acid.

Typical profile of Wallkill soils (idle):

A1—0 to 6 inches, variegated, very dark brown (10YR 2/2), brown (10YR 5/3 and 7.5YR 5/3), and reddish-brown (5YR 5/3) fine sandy loam; moderate, medium and coarse, subangular blocky structure; friable; nonsticky; many, fine roots; mildly alkaline; abrupt, wavy boundary.

B21g—6 to 9 inches, very dark brown (10YR 2/2) to very dark gray (10YR 3/1) very fine sandy loam and fine sandy loam; few, coarse, distinct, light-gray mottles; weak, medium and coarse, subangular blocky structure; friable; nonsticky; common, fine roots; neutral; abrupt, wavy boundary.

B22g—9 to 14 inches, light-gray (5YR 7/1) to white (5YR 8/1) fine sandy loam; common, medium and large, distinct, strong-brown (7.5YR 5/6) and reddish-yellow (7.5YR 6/6) mottles; weak, medium and coarse, subangular and angular blocky structure; friable; nonsticky; few, fine roots; neutral; discontinuous lower boundary.

IIoa—14 to 21 inches, very dark brown (10YR 2/2) to very dark grayish-brown (10YR 3/2) fibrous muck; many dark reddish-brown (5YR 3/3 and 3/4) peat fragments; medium acid; abrupt, wavy boundary.

IIoe—21 to 40 inches +, very dark brown (10YR 2/2) silty muck; common, dark reddish-brown (5YR 3/3 and 3/4) peat fragments; medium acid.

Depth of alluvium ranges from 12 to 40 inches. In some areas, the muck or peat alternates with layers of mineral material. Texture of the surface layer is mainly fine sandy loam and silt loam. Included in mapping are a few small areas of silty clay loam. In places, white flecks of calcareous marl and shell fragments are present.

Wallkill soils (Wk).—These are mainly poorly drained to very poorly drained, level or depressional soils having slopes of 0 to 2 percent, although a few slopes are as much as 4 to 5 percent. Included in mapping are areas of somewhat poorly drained soils on slightly higher natural levees that are generally next to streams. Also included are areas of dredged material underlain by muck along the Seneca River and the Erie Canal. This dredged material is mainly calcareous fine sandy loam and silt loam containing many shell and marl fragments and is generally a little better drained than Wallkill soils in the natural state.

Prolonged wetness, flooding, and texture are the main limitations for most uses. Most areas of these soils are idle. If drained, they are well suited to many annual intertilled crops, particularly to the muck crops commonly grown in the county. These soils generally flood each year, usually early in spring. Dikes to reduce spring flooding and to aid pumping for earlier cropping may be justified for use in larger areas. (Capability unit IIIw-4; woodland suitability group 9)

Formation, Morphology, and Classification of the Soils

Soils are the products of soil-forming processes acting upon material deposited or accumulated by geologic forces. The five factors that affect the formation of soils are parent material, climate, plant and animal life, relief, and time.

Factors of Soil Formation

Climate and living organisms, particularly vegetation, are the active forces of soil formation. Their effect on parent material is modified by relief and by the length of time the parent material has been in place. The relative importance of each factor differs from place to place. In a few places, one factor dominates and fixes most of the properties of the soil, but normally the interaction of all five factors determines the kind of soil that develops in any given place.

Parent material

Parent material is the unconsolidated mass from which soils form. Its nature determines the mineralogical and chemical composition of the soil and, to a large extent, the rate at which soil-forming processes take place.

The soils in Seneca County formed in glacial till, glacial outwash, lacustrine materials, recent stream alluvium, and organic materials. Most of the soil materials were left after the glaciers melted 10,000 to 15,000 years ago. Alluvial and organic materials are of recent origin and are being deposited at the present time.

The soils in the county are relatively young, and profile development has not progressed far enough that differences in parent material are hidden; therefore, parent material and the method of its deposition have been used as one of the means of identifying the soils in the county. Table 9 provides a key to the soil series of Seneca County. For each series, the kinds of parent materials and the drainage classes are shown; also given are selected soil characteristics of the best drained member of the drainage sequence.

Soils that formed in glacial till are most extensive and have a wide range of characteristics. A firm substratum commonly is present. Honeoye, Lima, Appleton, and Lyons are examples of such soils.

Soils that formed in glacial outwash are generally loamy in texture and commonly are underlain by stratified sand and gravel. Examples of these soils are the Howard and Palmyra.

Soils that formed in lacustrine materials range in texture from loamy fine sand to silty clay loam. Examples of soils that formed in coarse-textured lacustrine material are the Arkport, Elnora, and Claverack. Examples of soils that formed in fine-textured lacustrine materials are the Schoharie, Odessa, Lakemont, and Fonda.

Soils on stream bottoms formed in water-laid materials called recent alluvium. They are medium textured and have little or no soil development. Examples of these soils are the Eel and Sloan.

Soils that formed in organic materials are called muck.

Plant and animal life

All living organisms, including vegetation, animals, bacteria, and fungi, are important to soil formation. Vegetation is generally responsible for the organic-matter content, the color of the surface layer, and the nutrient level. Earthworms, cicada, and larger burrowing animals help keep the soil open and porous. Bacteria and fungi decompose the vegetation, thus releasing nutrients for plants. In Seneca County, the native forests have had a greater influence on soil formation than have any other living organism.

Climate

Seneca County has a humid, continental climate that is marked by extreme seasonal temperature changes. Annual precipitation is about 32 inches, and mean annual air temperature is 48° F. Rainfall is rather uniform during the growing season of May through September and averages about 15 inches. The cool temperature has promoted the accumulation of organic matter in the surface layer of the soils. More information on climate is given in the section "General Nature of the County."

Time

Time, usually a long time, is required for soils to form from parent materials. The soils of Seneca County have developed since the glacial period and are therefore relatively young. Not all of the soils have reached the same stage of profile development, however, because other soil-forming factors have influenced the rate and kind of development in the various soils. Soils that formed on low bottoms, for example, are subject to varying amounts of overflow and may receive new sediment with each flooding. These soils have weak soil structure and weak color differences between horizons. An example is the Eel soils. Soils that have well-developed soil horizons, such as the Honeoye, have been developing for longer periods than have the Eel soils.

Relief

Local differences in soils are largely the result of differences in relief and parent material. The shape of the land surface, slope, and position in relation to the water table have greatly influenced the formation of soils in Seneca County. Soils that formed in sloping areas where runoff is moderate to rapid are generally well drained, bright colored, and unmottled in the subsoil, and in most places they are leached to a greater depth than are wetter soils in the same general area. Some soils are wet as a result of a high water table, their position, or the permeability of the soil.

TABLE 9.—*Key to soil series and drainage sequence*

[Absence of entry in a column means that no soil series of this drainage class has formed in the soil material named in the first column]

Parent material and selected soil characteristics of the best-drained member	Soil drainage class: Well drained or excessively drained	Moderately well drained	Somewhat poorly drained	Poorly drained	Very poorly drained
I. Soils on glacial till.					
A. Deep and moderately deep; high and medium lime; clay concentration in B horizon.					
(1) Sandstone and limestone mixed.					
a. Deep; high lime; prominent leached layer; 18 to 28 percent clay in B horizon.	Ontario	Lima	Appleton	Lyons	Alden, till substratum.
b. Moderately deep over limestone; high lime; prominent leached layer; 18 to 28 percent clay in B horizon.	Ontario, moderately shallow variant.	----------	----------	----------	
(2) Limestone and gray, calcareous shale, mixed.					
a. Deep; high lime; thin leached layer; 18 to 28 percent clay in B horizon.	Honeoye	Lima	Appleton	Lyons	Alden, till substratum.
b. Deep; medium lime; prominent leached layer; 18 to 28 percent clay in B horizon.	Lansing	Conesus	Appleton	Lyons	Alden, till substratum.
c. Deep; dominantly from and over dark-gray alkaline or calcareous shale with sandstone and limestone; medium to high lime; thin leached layer; 18 to 35 percent clay in B horizon.	Danley	Danley	Darien	Ilion	Alden, till substratum.
d. Moderately deep over dark-gray alkaline to calcareous shale; some sandstone and limestone; medium to high lime; thin leached layer; 18 to 35 percent clay in B horizon.	Aurora	Aurora	Angola	Varick	
(3) Limestone and clay shale or lacustrine clay mixed.					
a. Deep; high lime; thin leached layer; 18 to 35 percent clay in B horizon.	Cazenovia	Cazenovia	Ovid	Romulus	Alden, till substratum.
B. Deep, moderately low lime and acid; no clay concentration in B horizon.					
(1) Sandstone and shale, mixed.					
a. Deep; low lime; fragipan; 18 to 28 percent clay in B horizon.	----------	Langford	Erie	----------	Alden, till substratum.
b. Moderately deep over sandstone and shale; low lime; fragipan; 18 to 28 percent clay in B horizon.	----------	Langford, moderately shallow variant.	Erie, moderately shallow variant.	----------	
C. Shallow: less than 20 inches to bedrock.					
(1) Medium to low lime over limestone, or alkaline to calcareous over sandstone and hard shale.	Farmington	----------	----------	----------	
(2) Low lime and very low lime, over acid sandstone and hard shale.	Arnot	Arnot	----------	----------	
II. Soils on gravelly deposits of glacial outwash, beaches, and old alluvial fans.					
A. High lime and medium lime; clay concentration in B horizon.					
(1) Limestone and sandstone; high lime; thin leached layer; 18 to 28 percent clay in B horizon; loamy; skeletal C horizon.	Palmyra	----------	----------	----------	
(2) Sandstone, limestone, and shale; medium lime; prominent leached layer; loamy; skeletal B horizon.	Howard	----------	----------	----------	

TABLE 9.—*Key to soil series and drainage sequence*—Continued

Parent material and selected soil characteristics of the best-drained member	Soil drainage class				
	Well drained or excessively drained	Moderately well drained	Somewhat poorly drained	Poorly drained	Very poorly drained
III. Soils on sand of deltas and beaches.					
A. Deep, alkaline sand with clay concentration in bands or lamellae.					
(1) Loamy very fine sand to fine sandy loam.	Arkport	------	------	Lamson	Lamson.
B. Deep, alkaline sand without clay concentration in bands, or no bands or lamellae.					
(1) Loamy very fine sand to fine sandy loam.	------	Elnora	Stafford	Lamson	Lamson.
C. Moderately deep, alkaline sand over alkaline or calcareous clay or silty clay substrata; no clay concentration in bands or no bands in sand.					
(1) Loamy very fine sand to fine sandy loam.	------	Claverack	Cosad	------	
IV. Soils on fine, sorted alluvium, mainly lacustrine, but including loess and other alluvium.					
A. High lime and medium lime; clay concentration in B horizon.					
(1) Deep; alkaline to calcareous silt and very fine sand; prominent, leached layer; 18 to 35 percent clay in B horizon; 15 percent coarser than very fine sand.	Dunkirk	Collamer	Niagara	Canandaigua	Alden.
(2) Alkaline to calcareous silt and very fine sand; 3½ to 5 feet deep over limestone; prominent leached layer; 18 to 35 percent clay in B horizon; 15 percent coarser than very fine sand.	Dunkirk, limestone substratum.	------	------	------	
(3) Moderately deep, alkaline to calcareous silt and very fine sand over lacustrine clay and silty clay substrata; prominent leached layer; 18 to 35 percent clay in B horizon above substrata; 15 percent coarser than very fine sand.	------	Collamer, moderately shallow variant.	------	------	
(4) Dominantly silty clay and clay material; high to medium lime.					
a. Deep; high lime; thin leached layer; colors yellower than 7.5YR; 35 to 55 percent clay in B horizon.	------	------	------	Madalin	Fonda.
b. Deep, high lime; thin leached layer; colors redder than 7.5YR; 35 to 55 percent clay in B horizon.	Schoharie	Schoharie	Odessa	Lakemont	Fonda.
V. Soils on recent alluvium.					
A. First bottoms.					
(1) Silt loam and loam, nearly neutral gray material.	------	Eel	------	Sloan	Sloan.
(2) Silt loam and loam, neutral to alkaline material deposited on muck or organic material.	------	------	------	------	Wallkill.
VI. Organic soils.					
A. Medium acid to alkaline.					
(1) Organic material more than 40 inches deep.	------	------	------	------	Muck, deep.
(2) Organic material 12 to 40 inches deep over alkaline to calcareous sand, silt, or clay in varying combinations.	------	------	------	------	Muck, shallow.
(3) Organic material 12 to 40 inches deep over marl.	------	------	------	------	Edwards muck.

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Soils that formed in more gently sloping areas, where runoff is slower, generally exhibit some evidence of wetness, such as mottling in the subsoil, for short periods of time. In level areas or slight depressions, however, 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 characteristically have a thick, dark-colored, organic surface layer and a strongly mottled or grayish subsoil.

Morphology of Soils

If a vertical cut is dug into a soil, several layers, or horizons, are evident. This differentiation of horizons is the result of many soil-forming processes (*24*). The most important of these are the following: (1) physical weathering, such as thawing and freezing, (2) leaching of salts that are more or less soluble, (3) accumulation of organic matter, (4) chemical weathering of primary minerals or rocks into silicate clay minerals, (5) translocation of silicate clay minerals from one horizon to another by percolating water, (6) accumulation of some iron colloids, and (7) formation of dense or compact layers in the subsoil.

Some of these processes take place in all the soils, but the number of active processes and the degree of their activity vary from one soil to another.

In all of the mineral soils, some organic matter has accumulated to form an A1 horizon. In wooded areas these mineral soils have an organic horizon at the surface, and this is designated as an O1 or O2 horizon, depending on the extent to which the organic material has decomposed. If the soils are cleared and plowed, their organic and A1 horizons lose their identity as they are mixed into the plow layer, which is called an Ap horizon. This horizon is enriched in organic matter and generally is distinct from the underlying horizons because it is darker and more friable. The Darien and Ontario soils are examples of soils that have a distinctive, dark-colored Ap horizon. Only in the recent alluvial soils is there no sharp contrast between the A1, or the Ap, horizon and the next underlying horizon.

The upper horizons of a soil normally are more leached of bases and silicate clays than are the lower horizons. The leached part of the A horizon that is too far below the surface to be influenced by surface organic matter is called the A2 horizon. Normally, it is the lightest colored horizon in the soil. It is well expressed in such soils as the Lansing and Ontario.

In soils having a B horizon of clay accumulation, the clays removed from the A horizon are immobilized in what is designated as the B2t horizon. Of all the horizons in the soil, this one contains the highest concentration of clay and is the brownest. The Cazenovia, Darien, and Schoharie are among the soils that have a well-expressed B2t horizon.

The subsoil of some soils includes a distinct zone of yellowish brown that differs little or none in texture from the A horizon. This zone is called a color B horizon. The Claverack and Langford soils have a strongly expressed color B horizon.

Characteristics that indicate relative wetness, or class of drainage, are evident in soils. Excess water commonly produces mottles, or a pattern of colors, dominantly gray. The extent of mottling indicates the degree of gleying, or the process of chemical reduction and transfer of iron. A gley soil normally is gray or bluish gray. Locally, soil layers of this color are called blue clay, a name given to soil material excavated from many pond sites.

In soils that are well aerated, brown or yellowish brown is the normal color. A soil is considered well drained if it is free of mottles to a depth of at least 20 inches and shows only brown colors. Among the well-drained soils in this county are the Honeoye and Ontario. Ordinarily, moderately well drained soils are wet for short periods and are free of mottles to a depth of 16 to 20 inches. If the soils have a temporary perched water table, however, the A2 horizon contains a few mottles, though the upper part of the B horizon is essentially mottle free. The Lima and Langford soils are examples of moderately well drained soils.

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 relationships to one another and to the whole environment, and to develop principles that help us in understanding 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.

Thus in classification, soils are placed in narrow categories that are used in detailed soil surveys so that knowledge about the soils can be organized and used in managing farms, fields, and woodland; in developing rural areas; in engineering work; and in many other ways. Soils are placed in broad classes to facilitate study and comparison in large areas, such as countries and continents.

Two systems of classifying soils have been used in the United States in recent years. The older system was adopted in 1938 (*3*) and later revised (*20*). The system currently used was adopted for general use by the National Cooperative Soil Survey in 1965. The current system is under continual study. Therefore, readers interested in developments of the current system should search the latest literature available (*17*, *21*). In table 10, the soil series of Seneca County are placed in the categories of the current system and in the great soil groups and orders of the older system. Placement of some series in the current system of classification may change as more precise information becomes available.

The current system of classification has six categories. Beginning with the broadest, these categories are order, suborder, great group, subgroup, family, and series. In this system the criteria used as a basis for classification are soil properties that are observable and measurable. The properties are chosen, however, so that the soils of similar genesis, or mode or origin, are grouped together. The classes that make up the current system are briefly defined in the following paragraphs.

ORDER: Ten soil orders are recognized in the current system. They are Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The properties used to differentiate the soil orders are those that tend to give broad climatic groupings of soils. Two exceptions, Entisols and Histosols, occur in many different climates. Table 10 shows the five soil orders in Seneca County—Alfisols, Inceptisols, Entisols, Mollisols, and Histosols.

Alfisols are soils that have clay-enriched B horizons that are high in base saturation. In Seneca County this order includes all of the soils that formerly were called Gray-Brown Podzolic soils (*5*, *6*) and many of the soils that were called Low-Humic Gley soils.

Inceptisols most often are found on young but not recent land surfaces. In Seneca County this order includes soils formerly called Alluvial soils, Humic Gley soils, Sol Bruns Acides, and Low-Humic Gley soils.

Entisols are recent soils. They do not have genetic horizons or have only the beginnings of such horizons. In Seneca County this order includes some sandy soils previously classified Sol Bruns Acides (*4*).

Mollisols generally formed under grass vegetation. They have a thick, dark-colored surface layer. In Seneca County this order includes soils that formerly were called Alluvial soils integrading to Low-Humic Gley soils and Humic Gley soils.

Histosols formed in organic deposits under water. They are composed of peat or muck. In Seneca County this order includes soils formerly called Bog soils.

The above soil orders are further discussed and line drawings of their profiles are shown in the Soil Survey of Cayuga County, New York (*26*).

SUBORDER: Each order is divided into suborders, primarily on the basis of those soil characteristics that seem to produce classes having the greatest genetic similarity. The suborders narrow the broad climatic range permitted in the orders. The soil properties used to separate suborders mainly reflect either the presence or absence of waterlogging or soil differences resulting from the climate or vegetation. The suborder is not shown in table 10.

GREAT GROUP: Soil orders are separated into great groups on the basis of uniformity in the kinds and sequence of major soil horizons and features. The horizons used to make separations are those in which clay, iron, or humus have accumulated or those that have pans interfering with growth of roots or movement of water. The features used are the self-mulching properties of clays, soil temperature, major differences in chemical composition (mainly calcium, magnesium, sodium, and potassium), and the like. The great group is not shown separately in table 10, because the name of the great group is the last word in the name of the subgroup.

SUBGROUP: Great groups are divided into subgroups, one representing the central (typic) segment of the group and others, called intergrades, that have properties of one great group and also one or more properties of another great group, suborder, or order. Subgroups may also be made in those instances where soil properties intergrade outside of the range of any other great group, suborder, or order. The names of subgroups are derived by placing one or more adjectives before the name of the great group.

FAMILY: Families are separated within a subgroup primarily on the basis of properties important to the growth of plants or behavior of soils where used for engineering. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence.

SERIES: The series consists of a group of soils that formed from a particular kind of parent material and have genetic horizons that, except for texture of the surface soil, are similar in differentiating characteristics and in arrangement in the profile. Among these characteristics are color, structure, reaction, consistence, and mineralogical and chemical composition.

New soil series must be established, and concepts of some established series, especially older ones that have been used little in recent years, must be revised in the course of the soil survey program across the country. A proposed new series has tentative status until review of the series at the State, regional, and national levels of responsibility for soil classification results in a judgement that the new series should be established.

General Nature of the County

This section provides general information about Seneca County. It discusses geology, physiography and drainage, water supply, climate, and other subjects of general interest.

Geology [10]

Seneca County is underlain by rock formations of the Silurian and of the Devonian Systems, which cross the county in distinct belts (*28*). These formations are deeply buried under glacial drift in the northern part of the county but are close to the surface or exposed in many places in the southern part.

The order in which these geologic formations are described is from the north to the south, which is also from the oldest formation to the youngest. It is also the order in which the formations contributed material to the glacial drift as the glacier advanced from the north.

Formations of the Silurian System are as follows:

Camillus Shale.—This is the oldest and most northerly rock formation in Seneca County. It is a member of the Salina Formation, which is above the red and green Vernon Shale. In its lower part, Camillus Shale consists of thin, uneven layers of dark dolomite and gray shales. The upper part consists of gypsiferous shale beds in which there are thin beds of dolomitic limestone. Camillus Shale is deeply buried for the most part, but it contributed some lime and silt and clay shale to the overburden of glacial drift.

Akron Dolomite (of Bertie Group).—The gypsum beds of the Camillus Shale are overlain by evenly bedded, impure magnesium limestone that is hard, dense, and dark colored when freshly broken but that weathers to a light bluish gray. It is exposed in places along the south side of the Seneca River but most commonly is

[10] By CARL S. PEARSON, soil scientist, Soil Conservation Service.

TABLE 10.—*Classification of soil series according to the current system and 1938 system*

Series	Current system [1]			1938 system	
	Family	Subgroup	Order	Great soil group	Order
Alden	Fine-loamy, mixed, nonacid, mesic.	Mollic Haplaquepts	Inceptisols	Humic Gley soils	Intrazonal.
Angola	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils	Zonal.
Appleton	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils	Zonal.
Arkport	Coarse-loamy, mixed, mesic	Psammentic Hapludalfs	Alfisols	Gray-Brown Podzolic soils	Zonal.
Arnot	Loamy-skeletal, mixed, mesic	Lithic Dystrochrepts	Inceptisols	Sols Bruns Acides	Zonal.
Aurora	Fine-loamy, mixed, mesic	Glossaquic Hapludalfs	Alfisols	Gray-Brown Podzolic soils	Zonal.
Canandaigua	Fine-silty, mixed, nonacid, mesic.	Mollic Haplaquepts	Inceptisols	Low-Humic Gley soils	Intrazonal.
Cazenovia	Fine-loamy, mixed, mesic	Glossoboric Hapludalfs	Alfisols	Gray-Brown Podzolic soils	Zonal.
Claverack	Sandy over clayey, mixed, mesic.	Aquic Eutrochrepts	Inceptisols	Sols Bruns Acides	Zonal.
Collamer	Fine-silty, mixed, mesic	Glossoboric Hapludalfs	Alfisols	Gray-Brown Podzolic soils	Zonal.
Conesus	Fine-loamy, mixed, mesic	Glossoboric Hapludalfs	Alfisols	Gray-Brown Podzolic soils	Zonal.
Cosad	Sandy over clayey, mixed, nonacid, mesic.	Aquic Udorthents	Entisols	Sols Bruns Acides	Zonal.
Danley	Fine-loamy, mixed, mesic	Glossaquic Hapludalfs	Alfisols	Gray-Brown Podzolic soils	Zonal.
Darien	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils	Zonal.
Dunkirk	Fine-silty, mixed, mesic	Glossoboric Hapludalfs	Alfisols	Gray-Brown Podzolic soils	Zonal.
Edwards	(2)		Histosols	Bog soils	Intrazonal.
Eel	Fine-loamy, mixed, mesic	Aquic Fluventic Eutrochrepts.	Inceptisols	Alluvial soils	Azonal.
Elnora	Sandy, mixed, mesic	Aquic Udipsamments	Entisols	Sols Bruns Acides	Zonal.
Erie	Fine-loamy, mixed, mesic	Aeric Fragiaquepts	Inceptisols	Sols Bruns Acides	Zonal.
Farmington	Loamy, mixed, mesic	Lithic Eutrochrepts	Inceptisols	Sols Bruns Acides	Zonal.
Fonda	Fine, illitic, nonacid, mesic	Mollic Haplaquepts	Inceptisols	Humic Gley soils	Intrazonal.
Honeoye	Fine-loamy, mixed, mesic	Glossoboric Hapludalfs	Alfisols	Gray-Brown Podzolic soils	Zonal.
Howard	Loamy, skeletal, mixed, mesic	Glossoboric Hapludalfs	Alfisols	Gray-Brown Podzolic soils or Sols Bruns Acides.	Zonal.
Ilion	Fine-loamy, mixed, mesic	Mollic Ochraqualfs	Alfisols	Low-Humic Gley soils	Intrazonal.
Lakemont	Fine, illitic, mesic	Udollic Ochraqualfs	Alfisols	Low-Humic Gley soils	Intrazonal.
Lamson	Coarse-loamy, mixed, nonacid, mesic.	Aeric Haplaquepts	Inceptisols	Low-Humic Gley soils or Humic Gley soils.	Intrazonal.
Langford	Fine-loamy, mixed, mesic	Typic Fragiochrepts	Inceptisols	Sols Bruns Acides	Zonal.
Lansing	Fine-loamy, mixed, mesic	Glossoboric Hapludalfs	Alfisols	Gray-Brown Podzolic soils	Zonal.
Lima	Fine-loamy, mixed, mesic	Glossoboric Hapludalfs	Alfisols	Gray-Brown Podzolic soils	Zonal.
Lyons	Fine-loamy, mixed, nonacid, mesic.	Mollic Haplaquepts	Inceptisols	Low-Humic Gley soils	Intrazonal.
Madalin	Fine, illitic, mesic	Mollic Ochraqualfs	Alfisols	Low-Humic Gley soils	Intrazonal.
Muck	(2)		Histosols	Bog soils	Intrazonal.
Niagara	Fine-silty, mixed, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils	Zonal.
Odessa	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils	Zonal.
Ontario	Fine-loamy, mixed, mesic	Glossoboric Hapludalfs	Alfisols	Gray-Brown Podzolic soils	Zonal.
Ovid	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils	Zonal.
Palmyra	Fine-loamy over sandy or sandy skeletal, mixed, mesic.	Glossoboric Hapludalfs	Alfisols	Gray-Brown Podzolic soils	Zonal.
Romulus	Fine-loamy, mixed, mesic	Udollic Ochraqualfs	Alfisols	Low-Humic Gley soils	Intrazonal.
Schoharie	Fine, illitic, mesic	Glossoboric Hapludalfs	Alfisols	Gray-Brown Podzolic soils	Zonal.
Sloan	Fine-loamy, mixed, noncalcareous, mesic.	Fluventic Haplaquolls	Mollisols	Alluvial soils, Low-Humic Gley soils, or Humic Gley soils.	Azonal.
Stafford	Mixed, mesic	Typic Psammaquents	Entisols	Sols Bruns Acides	Zonal.
Varick	Fine-loamy, mixed, mesic	Mollic Ochraqualfs	Alfisols	Low-Humic Gley soils	Intrazonal.
Wallkill	Fine-loamy, mixed, nonacid, mesic.	Thapto-Histic Haplaquepts.	Histosols	Bog or Alluvial soils	Azonal.

[1] Placement of some soil series in the current system of classification, particularly in families, may change as more precise information becomes available.

[2] Edwards soils and Muck have not been placed in a family and a subgroup.

deeply buried. This formation, about 25 feet thick, contributed lime to the glacial drift overburden. The Cobleskill Formation occurs immediately above the Bertie Group and consists of three or four layers, about 8 to 10 feet thick, of harder, darker, dolomitic limestone. Above this is the Rondont Formation, which is a dark-colored waterlime about 9 feet thick at Seneca Falls. The Rondont Formation is dolomitic, is shaly, and is deeply buried except for small exposures along the south side of Seneca River. These formations also contributed lime to the overburden of glacial drift. Akron Dolomite was formerly used as hydraulic cement.

Formations of the Devonian System are as follows:

Manlius Limestone (of Helderburg Group).—This formation, sometimes placed in the Silurian System, consists of a thin bed that is pinched out in the vicinity of Waterloo. It is composed of layers of hard, dark-blue limestone separated by thin partings of black, bituminous matter. The Oriskany Sandstone, estimated to be only 3 to 6 inches thick, separates the Manlius Limestone from the overlying Onondaga Limestone. It is considered by some geologists to be the basal formation of the Lower Devonian series. These formations are too thin to have had much influence on the overriding glacial drift.

Onondaga Limestone.—This important formation crosses the county in a belt that trends west-northwest and east-southeast. Its area of outcrop is divided by the Seneca River, and most exposures occur south of the river. This is a dense, hard limestone that is dark when freshly broken but weathers to a bluish gray. The formation is about 80 feet thick and consists of horizontal beds, some of which are 3 feet thick. In places the beds are separated by partings of carbonaceous shale. Black and bluish layers of chert stand out prominently in the upper beds.

This is probably the most important limestone bed in New York State, and it is quarried in many places for both highway and industrial uses. A large quarry is operated in Seneca County in the town of Fayette. Since the limestone outcropped at right angles to the direction of travel of the glaciers, it contributed most of the lime that occurs in the soils that formed in the overburden of glacial drift south of the outcrops.

Marcellus and Skaneateles Formation.—These formations consist mainly of shale, but there are some thin layers of limestone. The Marcellus Formation consists of black, slatelike bituminous shale containing layers that are rich in iron sulfide and calcareous concretions. The freshly broken shale is black, but it weathers to gray. It is very fissile and breaks easily into small, thin fragments that are often stained with iron oxide. The Marcellus Formation is about 50 feet thick and is overlain by about 185 feet of Skaneateles Shale, which is dark and fissile in the lower part but becomes calcareous and bluish gray in the upper part. These soft shales contribute to the dark color and heavy texture of the soils of the Danley, Darien, and Ilion series.

Ludlowville and Moscow Formations.—These formations consist of shale and thin limestone. The Ludlowville Shale is about 140 feet thick. The lower beds are hard, calcareous layers that are rich in coral. Because of their resistance to erosion, the lower beds are responsible for the falls and cascades in some of the ravines and gorges. The middle beds consist of soft, sandy shale containing calcareous lenses and an occasional layer of sandstone. The youngest or upper beds are more calcareous and are coarser in texture. They are gray but turn bluish gray upon prolonged exposure. Tichenor Limestone, composed of layers of dense, light-colored limestone several inches thick, separates the Ludlowville Formation from the overlying Moscow Formation.

The Moscow Formation is soft, gray, and calcareous in the lower part, and dark, highly friable, and less calcareous in the upper part. Weathered surfaces are light gray and are stained with iron oxide. This formation is about 140 feet thick and, together with the Ludlow Formation, contributes to the medium texture and shaly character of the soils in this part of the county.

Tully Limestone.—This formation is about 15 feet thick in Seneca County. It consists of limestone that is black when freshly broken but turns light gray when weathered. Tully Limestone is dense, hard, and brittle, and it breaks readily into angular fragments. It is exposed in many of the ravines and gullies and in the worked-out quarry 1 mile northeast of Ovid. It contributed some lime to the glacial drift and soil material but is too thin to have been of much significance.

Genesee Shale and West River Shale Groups.—Overlying the Tully Limestone is the Genesee Shale, which is the basal member of the Genesee Group. Genesee Shale is about 85 feet thick in Seneca County and is black where freshly broken but turns light gray when weathered. It is hard and compact in new exposures but becomes fissile upon weathering. Genesee Shale is separated from the overlying West River Shale by Genundewa Limestone, which is about 10 feet thick. Genundewa Limestone is a gray to black rock that is soft and very friable and which contains prominent, flat concretions. West River Shale is 65 to 75 feet thick, is dark gray to black, and contains occasional layers of calcareous shale and calcareous sandstone. These formations contributed dark shale fragments and medium textures to the local drift and to local soils.

Cashaqua Shale and Hatch Shale Formations.—Cashaqua Shale is 250 feet thick. It is composed of gray, calcareous shale that contains thin beds of sandstone and interlaid sandstones in the upper part. Hatch Shale is 300 to 500 feet thick. It is light gray to dark gray or black. The basal beds are composed of soft rocks, and the upper beds are of hard, sandy rocks. Layers of hard, gray sandstone that ranges in thickness from 2 to 30 inches are interbedded with layers of shale. These formations contributed flagstones, channery, and medium-textured materials to the soils in the southern part of the county.

Lower West Falls Group.—These formations underlie the highest parts of the county. They consist of thin-bedded, gray to dark shales interbedded with thin layers of fine-grained, dense sandstone. They consist of Grimes Sandstone, Nunda Sandstone, and Wiscoy Shale and occupy a small area in Seneca County. These formations contributed stone fragments and a medium texture to the overlying soils on the highest hills in the county.

Physiography and Drainage

Seneca County is in two of the major physiographic provinces in New York State. That part of the county south of Ovid and marked by the Portage Escarpment is in the Southern New York section of the Appalachian Plateau (*12*). The part north of Ovid comprises part of the Erie-Ontario-Mohawk Plain.

In the northwestern part of Seneca County are Deltaic sandhills and plains. This is an area of sandy, nearly level to rolling soils. It is part of an old delta built into glacial Lake Newberry, the predecessor of the present Seneca Lake. In places the sand is underlain by stratified sand and gravel deposited as outwash by glacial meltwater. Elevation ranges from 400 to 500 feet.

East of the sandhills and plains is a belt of drumlins and drumloid hills, which are elongated hills that trench north and south. These hills have crests that range from 20 feet to more than 75 feet in height and are composed of glacial till. The till is derived mainly from the shale, sandstone, and limestone of the underlying formations, or from closely adjacent formations to the north. The till contains many crystalline erratics. These are hard rocks from Canada and the Adirondack region that were able to survive the grinding action of the ice during transportation.

East of the drumlin and drumloid hill area is Montezuma Marsh, which consists of the drowned land at the north end of Cayuga Lake. This area generally corresponds with the filled northern extension of Cayuga Lake valley. It consists of muck 2 to 8 feet deep that is underlain by 2 to 10 feet of marl. The marl, in turn, is underlain by layers of sand, silt, and clay that are more than 100 feet thick.

The glacial lake plain area, where the waters of Seneca and Cayuga valleys coalesced, extends across the county along the Seneca River and is about 5 or 6 miles wide. This is a nearly level to rolling area of lake-laid sediment consisting of sand, silt, and clay. This sediment ranges from yellowish brown to pinkish where well drained to drab gray and brown where wet. The poorly developed drainage pattern and the low permeability of the lacustrine sediment necessitate the installation of systems to remove excess water before cultivation of many areas is practical. The elevation of this area ranges from 400 to 600 feet.

South of the glacial lake plain is the glacial till plain area. In this area the surface materials consist mostly of glacial till derived mainly from the soft, silty, underlying shale. The glacial till also contains a considerable amount of limestone from the Onondaga Formation, which underlies the county just north of the lake plain. The relief is generally mild, but the slopes bordering the lakes in the south are steep. On the divide between the lakes, the till commonly contains small spots that are thin and spots that are remnants of lake-laid deposits. Elevation, which ranges from 600 to 800 feet, increases from north to south.

The Appalachian Plateau area is a rolling upland that is slightly dissected by small streams and drainageways. It is separated from the glacial till plain by the Portage Escarpment in the vicinity of Ovid. The Appalachian Plateau area includes the highest parts of the county, and elevation ranges from 800 to 1,600 feet above sea level.

Water Supply

Rural areas of Seneca County depend on ground water to supply the needs of farms. The main source of ground water is precipitation, which averages about 33 inches annually. During protracted dry spells, many wells, ponds, and streams dry up, and water to meet the needs of some farms may have to be hauled from Seneca Lake and Cayuga Lake.

The ground water used in Seneca County comes from springs and from wells that are dug or drilled. Most wells in the southern part of the county are drilled into rock. This is because the glacial till mantle is so thin and compact that it makes a poor aquifer; therefore, the amount of water obtained from dug wells is low. Dug wells in the northern part of the county, however, generally meet the needs of the average farm, since in this area the mantle of glacial till or other material is much deeper and holds a greater amount of water.

Seneca Falls and Waterloo, the two largest villages, use surface water from their municipal supplies, but industry in this area uses water from drilled wells. Ovid and Interlaken use ground water for their municipal supplies. Seneca Ordnance Depot uses Seneca Lake as its source of supply. The two lakes, the Seneca River, and the Barge Canal are additional sources of large amounts of water. The Seneca River is a source of water for the irrigation of muck soils. This water can be supplied through drainage ditches or channels at some distance from the river.

Additional information on ground water resources of Seneca County can be found in a publication by Mazola (*15*).

Climate[11]

Seneca County has a climate of the humid, continental type. The flow of air is mainly continental. Cold, dry weather generally results when the flow is from the northwest or north, while warm, occasionally humid weather prevails when the flow is from the southwest or south. The Atlantic Ocean has a secondary influence. Occasionally, air from vigorous storm systems and other pressure patterns reaches the county from maritime sources off the mid- or north-Atlantic coast. Such a flow, coming from the northeast, east, or southeast, is generally associated with cool, cloudy, and damp weather.

Summers are warm in this county. Winters are long and cold, and there are frequent spells of stormy, unsettled weather. Most major weather systems affect Seneca County to some degree, and the frequency with which these different weather systems move across the county produces a variety of weather. Temperature and other atmospheric conditions usually vary from day to day, and the weather one week can be entirely different from that of the preceding or following week. Seasonal weather frequently shows appreciable variation from year to year.

[11] By A. BOYD PACK, climatologist for New York, National Weather Service, U.S. Department of Commerce.

Average monthly precipitation in Seneca County is comparatively uniform. There are no well-defined wet or dry seasons. The lightest monthly precipitation normally occurs in winter, and the heaviest from late in spring to midsummer.

Lake Ontario greatly influences the climate of the county. It has a moderating influence on temperature, which is diminished somewhat by distance in the southern and south-central parts. In summer the cooling effect of Lake Ontario tends to reduce daytime heating and thereby lessen the frequency of thunderstorms. Cooling at night is also reduced, and for this reason the frost-free growing season is longer as distance from the lake decreases. The kind and amount of precipitation, and especially the occurrence of heavy snowfall in winter, also is affected by the distance from Lake Ontario.

Elevation is not a major factor in the climate, although the gradual rise from north to south is probably responsible for minor differences, such as in the length of the frost-free season and the duration of snow cover. The large finger lakes on the western and eastern borders of Seneca County have an effect on the climate that generally is limited to the immediate shorelines.

Climatological records.—A cooperative station for the observation of both temperature and precipitation was maintained at Romulus, near the center of the county, from 1890 until it was closed in 1922. Temperatures have not been recorded at an official station in Seneca County since 1922. Average temperatures during the more than 30 years of record at this station have been determined to be comparable to corresponding averages recorded in recent decades at official stations in adjacent counties after due allowances are made for differences, such as geographical location.

Precipitation has been recorded for at least 35 years at each of three official weather stations in Seneca County. In the extreme northeastern part of the county, a cooperative weather station has been maintained at Mays Point Lock on the Barge Canal since 1918. Precipitation records at Waterloo were begun in 1923, while in the southern end of the county, a cooperative weather station was established at Ovid in 1932.

A summary of temperature and precipitation data is given in table 11.

In table 12 is shown the probability of freezing temperatures on or after given dates in spring and on or before given dates in fall.

Temperature.—The temperature data presented in this section are based on the records of the Romulus weather station. These records generally reflect the temperatures over most of Seneca County, but there may be slight differences because of the greater elevation in the south and the closer proximity to Lake Ontario in the north. More recent temperature records from stations in adjacent counties have been consulted where necessary.

The temperature in Seneca County reaches 90° F. or higher on 8 to 15 days in the majority of years. The number of days does not exceed 4 or 5 in unusually cool summers or 20 in especially hot summers. Temperatures of 90° or higher occur mostly in June, July, and August, but about 1 year out of 3 such temperatures are recorded in September. The temperature rarely reaches 100°.

TABLE 11.—*Temperature and precipitation data*

[Period of record: temperature, 1890–1922 at Romulus (elevation 720 feet); snowfall, 1941–65 at Ovid (elevation 920 feet); other precipitation, 1936–65 at Waterloo (elevation 452 feet)]

Month	Temperature				Average heating degree-days [1] [2]	Precipitation						
	Average daily maximum [1]	Average daily minimum [1]	7 years in 10 will have— Maximum equal to or higher than [1]—	7 years in 10 will have— Minimum equal to or lower than [1]—		Average total [3]	Record minimum [3]	3 years in 10 will have— More than [3]—	3 years in 10 will have— Less than [3]—	Average number of days with 0.10 inch or more [4]	Snow: Average total	Snow: 7 years in 10 will have more than [5]—
	°F.	°F.	°F.	°F.		In.	In.	In.	In.		In.	In.
January	32	16	46	0	1, 235	2. 1	0. 8	2. 3	1. 7	7	16	8
February	32	15	47	0	1, 110	2. 3	. 4	2. 8	1. 5	6	15	7
March	43	24	59	12	980	2. 8	. 4	3. 2	1. 9	7	10	6
April	56	35	74	22	575	2. 9	1. 1	3. 4	2. 4	8	3	1
May	68	46	83	33	280	3. 1	1. 0	3. 6	2. 0	7	([6])	[7] 1
June	78	55	89	43	70	2. 9	. 6	3. 6	1. 7	6	0	----------
July	82	60	92	51	15	3. 3	. 6	4. 3	2. 4	7	0	----------
August	80	58	89	48	35	2. 6	. 6	3. 1	2. 1	7	0	----------
September	73	52	87	39	150	2. 6	. 6	3. 0	1. 9	6	0	----------
October	61	42	78	30	420	3. 0	. 2	3. 4	1. 2	6	([6])	[7] 1
November	47	32	64	21	750	2. 6	. 6	3. 0	1. 9	7	6	1
December	36	21	52	5	1, 140	2. 1	. 6	2. 5	1. 6	6	12	5
Year	57. 3	38	94	−5	6, 760	32. 3	23. 6	35. 2	28. 1	80	62	46

[1] Based on 28-year record.
[2] Based on 65° daily mean temperature.
[3] Based on 30-year record.
[4] Based on 10-year record.
[5] Based on 25-year record.
[6] Less than 0.5 inch but more than 0.
[7] 1 year in 10 will have more than 1 inch.

TABLE 12.—*Probability of last freezing temperature in spring and first in fall* [1, 2]

Month	Dates for given probability and temperature					
	16° F. or lower	20° F. or lower	24° F. or lower	28° F. or lower	32° F. or lower	36° F. or lower
Spring:						
1 year in 10 later than	March 28	April 6	April 23	May 4	May 18	June 1
3 years in 10 later than	March 21	March 30	April 14	April 28	May 11	May 22
5 years in 10 later than	March 13	March 25	April 5	April 20	May 5	May 17
7 years in 10 later than	March 4	March 15	March 28	April 11	April 29	May 10
9 years in 10 later than	February 25	March 6	March 20	April 2	April 22	May 3
Fall:						
1 year in 10 earlier than	November 17	November 10	October 28	October 19	September 28	September 12
3 years in 10 earlier than	November 23	November 17	November 5	October 26	October 4	September 19
5 years in 10 earlier than	November 30	November 25	November 14	November 5	October 11	September 25
7 years in 10 earlier than	December 7	December 3	November 22	November 13	October 18	October 2
9 years in 10 earlier than	December 12	December 9	November 30	November 20	October 25	October 10

[1] The following example illustrates how to use and interpret the data in this table. Take a temperature of 32° F. or lower. In 1 year out of 10 (10-percent probability), a temperature of 32° or lower can be expected to occur later than May 18; in 5 years out of 10 (50-percent probability), a temperature of 32° or lower can be expected to occur later than May 5. The fall dates are interpreted similarly for a given temperature, but the occurrence is earlier than the given date.

[2] See the text for suggested adjustments for the southern part of the county.

A temperature of 0° or colder is recorded on 6 to 10 days during most winters. No more than 2 or 3 days when it is 0° or colder occur in unusually mild winters, while in abnormally cold winters, 15 or more such days can be expected. A temperature of 0° or colder can occur anytime from early December to early March. A temperature of 15° below zero or colder occurs about one winter in seven, but temperatures more than 20° below zero are rare. The coldest temperatures in the majority of winters vary between —3° and —15° over most of the county, including the northern half as well as the higher elevations in the south.

A temperature of 32° or colder prevails an average of 40 to 50 days from late November through mid-March. It is uncommon for the temperature to remain at or below 32° continuously for more than 4 days consecutively.

For most of Seneca County, the last average date in spring when the temperature is 32° or colder is about May 5; the corresponding first average date in fall is close to October 11. An adjustment of about 5 days later in spring and 5 days earlier in fall should be made for the higher elevations in the extreme southern part of the county. A freezing temperature can occur as late as the first week in June or as early as September 20. In most years however, the last spring freeze occurs between April 25 and May 20, and the first freeze in fall occurs between October 1 and 20.

The frost-free season averages about 160 days over most of the county. Where elevations are more than 1,000 feet, however, the season is shortened to approximately 150 days. The frost-free season in about 7 years in 10 ranges from 145 to 180 days.

The topography in Seneca County tends to minimize the occurrence of local frost pockets or any wide variations in the frequency of freezing temperatures over short distances. Additional information on freezing may be found in publications by Frederick, Johnson, and MacDonald (*13*) and by Havens and McGuire (*14*).

Precipitation.—The annual precipitation is comparatively uniform throughout Seneca County. Average annual totals range from 32.3 to 33.7 inches. The larger amounts fall in the central and extreme southern parts of the county.

The following discussion on precipitation is based on records of the weather station at Waterloo. Because of the relatively minor differences throughout the county, however, the statistics for the Waterloo area apply reasonably well to the remaining areas.

In 7 years in 10, the annual precipitation ranges from 26.5 to 37.5 inches. In a recent 30-year period, extreme annual amounts at Waterloo included a minimum total of 23.6 inches in 1965 and a maximum of 41.7 inches in 1945. Although annual precipitation generally varies several inches from one year to the next, it is possible for 2 or 3 rather dry, or rather wet years to occur in close succession.

Total rainfall during the May-September part of the growing season is ordinarily 14.5 to 15.5 inches, or about 45 percent of the average yearly total. Precipitation during this part of the growing season may be as light as 9 inches or less or as heavy as 18 inches, or even more in particularly wet seasons. Totals of 10 to 16 inches occur in the majority of growing seasons.

Average monthly precipitation increases in March, following the minimum amounts in the 3 winter months. Monthly amounts tend to increase gradually from March through July and then to decrease to somewhat lesser amounts in August and September. A small increase in monthly rainfall in October interrupts the gradual decline from late in summer to early in winter. The month in which precipitation is most variable is October. October was both the driest month and the wettest month in the 30 years of record at Waterloo.

The amount and distribution of precipitation is normally adequate for the growth and production of crops and other vegetation otherwise adapted to the county. Droughts occur in nearly every growing season but generally are short enough that they cause no more than temporary moisture stress for crops. Drought does not seriously limit farming in Seneca County, but its occurrence cannot be disregarded in long-range planning. Drought long enough to affect important crops seriously can be expected about 2 growing seasons in 10.

Precipitation during the growing season generally is from showers and thundershowers that fall intermittently as long as 2 or 3 days before cooler, drier, more stable air arrives in the wake of cold frontal passages. In winter, and occasionally in summer, precipitation in substantial amounts results from rather extensive, slow-moving storms that produce steady but less intense precipitation over a period of up to 24 hours. In winter precipitation is generally in the form of snow, but occasional winter storms yield all or most of their moisture as rain.

Precipitation of 1 inch or more in 24 hours occurs an average of 8 to 10 days per year, although the probability of somewhat larger amounts is greater during the warm months. A storm producing 2 inches or more of precipitation in 24 hours is uncommon. Additional information on precipitation can be found in publications by Dethier (*7*) and by Dethier and McGuire (*8*).

The average snowfall totals 60 to 65 inches in the central and southern parts of the county but increases to 70 inches or slightly more in parts near the northern county line. The annual snowfall ranges from 45 to 85 inches in the majority of winters, but the variation can be wider than this.

Snowfall is frequently heavy, both in terms of individual storm yields and of monthly amounts. At least one storm yielding 12 inches or more can be expected each winter. Monthly totals of more than 20 inches are common from December through March, and 10 inches or more often falls in November. Sometimes a late-season storm produces a substantial snowfall in April. In 25 years of record, the weather station at Ovid measured a monthly total of more than 30 inches on three occasions. The snowfall season usually begins by early or mid-November and continues through the first half of April.

Lake Ontario has a considerable influence on the snowfall in Seneca County, although the influence is somewhat less than in nearby counties to the north and east. During the cold season, air flowing across the relatively warm, unfrozen water of the lake brings frequent, often heavy snowfall as it moves inland. These storms frequently deposit a substantial amount of snow on the northern part of the county and extend to the southern part as light to moderately heavy snow flurries. Once or twice in most winters the prevailing wind and other factors are favorable, and these storms dump very large amounts of snow throughout the county.

The ground is covered by at least 1 inch of snow for much of the time between early December and mid-March. There is often a snow cover for short periods in November and April. Snow 8 inches deep or more is likely for one or more periods during winter. On the other hand, periods of mild temperatures may be sufficiently prolonged during midwinter to result in one or more brief intervals when there is no snow cover.

Clouds, wind, fog, and storms.—Observations at Syracuse and Rochester indicate that the amount of probable sunshine in Seneca County ranges from nearly 30 percent in November and December up to about 65 percent in June, July, and August.

Persistent cloudiness late in fall and in winter is typical of the climate of Seneca County. There is an average of 180 to 190 cloudy days per year, and 20 or more cloudy days may be expected each month from November through March. In summer the number of cloudy days decreases to around 10 per month. Clear days average about 70 to 75 per year, and partly cloudy days average about 105 to 110. From June through October an average of about 8 to 10 bright, clear days occur per month.

The prevailing wind is westerly, but tends to be northerly in winter and spring and southerly in summer and fall. The average wind velocity is about 8 or 9 miles per hour from June through September. It increases to about 10 miles per hour from October through February, and to 11 or 12 miles per hour in March and April. Wind damage to property and crops occurs occasionally in locally severe thunderstorms or in connection with the passage of vigorous storm systems. Strong winds often accompany the "lake-effect" snowstorms with the result that major and secondary highways become drifted with snow and travel is hazardous. Violent and damaging windstorms, however, are not a serious threat to life and property in Seneca County.

Dense fog that reduces visibility to less than one-half mile is quite uncommon, and no more than 10 or 15 days of such fog are observed per year. In summer the average relative humidity in the afternoon ranges from 50 to 60 percent. An uncomfortable combination of high temperature and high relative humidity occasionally is recorded in summer, but extended spells that last up to a week or longer are infrequent.

In terms of area and number of people affected, heavy snows are the most severe storm hazard in the county. Snowstorms off Lake Ontario produce moderate to heavy snowfall on several occasions each winter, which makes travel and other outdoor activities difficult. Blizzards are experienced from time to time. Seneca County is along or near the path of the well-developed winter storms that cross the continent, and it therefore often receives appreciable amounts of snow.

Thunderstorms occur an average of 25 to 30 days per year. Sometimes these storms are accompanied by locally damaging wind, heavy rain, or both. Flooding and soil erosion may result from intense downpours of rain. Hail is not a serious hazard to crops or property in Seneca County, but some of the more violent thunderstorms are accompanied by local or scattered hail damage.

Tornadoes have not been recorded in Seneca County, but they have struck neighboring areas. The climate therefore has the potential for their occurrence. Storms of freezing rain occur nearly every winter, but only an occasional such storm causes widespread damage to utility lines and trees. The county is removed from the usual paths of hurricanes. On the very rare occasion when a hurricane crosses the interior of New York State, however, damage from heavy rains and strong winds may be expected in Seneca County. Additional information and data applicable to Seneca County may be found in publications by Dethier and McGuire (*8*), by Dethier and Pack (*9*), by Dethier and Vittum (*10*), and by Dickerson (*11*).

Vegetation

Before the first settlers arrived, Seneca County was densely forested. The highlands of the Appalachian Plateau area had forests of mixed white pine, hardwoods, and hemlock. The dominant hardwoods were beech, hard maple, and red oak, but there were also black cherry, hickory, hophornbeam, elm, and aspen. In the northern part of the county, where the soils are higher in natural fertility and in lime content, there was less pine, hemlock, and beech and more basswood, white ash, white oak, yellow-poplar, black walnut, and black cherry. In the numerous poorly drained areas grew mainly elm, soft maple, and willow. Present forests and woodlots have reforested with the same species, although some have practically disappeared because of repeated cutting.

The marshlands always have had a cover of cattails, rushes, sedges, and swampgrass. Some of the land in Montezuma Marsh is forested.

Settlement

Permanent settlers arrived in Seneca County in 1789, and by 1810 the population had reached 16,609. According to the 1960 census, the population of Seneca County was 31,984. The largest villages, Seneca Falls and Waterloo, had a population of 7,439 and 4,395, respectively.

Industry, Transportation, and Markets

Industry in Seneca County is concentrated in the villages of Seneca Falls and Waterloo. It consists of light industry, mainly knitting and the manufacture of tools and pumps. Other nonfarm enterprises of considerable importance are the Seneca Ordnance Depot, which occupies about 10,587 acres in the vicinity of Romulus, and the Willard State Hospital. Industry employs about 30 percent of the work force; retail sales 17 percent; and farming 22 percent.

Seneca County is served by State, Federal, and county highways. The New York State Thruway crosses the northern part of the county, which is served by exits 41 and 42. Since through routes leading east and west need to be located north of the lakes, all important highways, railroads, and water routes are in this area. The Barge Canal, formerly the Erie Canal, utilizes the Clyde and Seneca Rivers. The Seneca Lake branch provides an entrance to Seneca and Cayuga Lakes. The main line of the Lehigh Valley Railroad crosses the county from Schuyler County on the south to Geneva. Branch lines of the Lehigh Valley and the Penn Central Railroads connect Seneca Falls and Waterloo with Geneva and Auburn.

Much of the dairy produce is marketed locally at Geneva, Waterloo, and Seneca Falls. Surpluses go to markets in Rochester, Syracuse, and Buffalo. Cooperative organizations handle a large part of the farm products through local receiving stations that process the produce for consumer markets.

Farming and Land Use

The 1964 Census of Agriculture shows that 64.3 percent, or 135,768 acres, of Seneca County is in farms. This includes 95,909 acres of cropland, 14,169 acres of woodland, 13,459 acres of pasture, and 12,220 acres of other land. Dairying is the main farm enterprise, and about 26 percent of the farms are dairy farms. In 1964, there was a total of 6,223 milk cows on these farms.

Changes in farming and land use have been dramatic in recent years. From 1950 to 1959, the land in farms decreased from 153,602 acres to 132,005 acres, and the number of farms decreased from 1,275 to 813. The average size of farms during this period increased from 120 acres to 162 acres, and since 1959 there has been an even more rapid increase in farm size.

Of the crops grown in Seneca County in 1964, 11,141 acres was in corn; 13,405 acres was in wheat; 15,824 acres was in oats; 1,616 acres was in buckwheat; 1,215 acres was in barley; and 7,711 acres was in dry beans.

Of the acreage in hay in 1964, 11,590 acres was in alfalfa or alfalfa mixtures; 8,442 acres was in clover, timothy, and mixtures of clover and grasses. More than half of the acreage in hay is in alfalfa and alfalfa mixtures, and this acreage is increasing.

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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.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

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, that 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.

Chroma. One of three variables of color. The relative purity or strength of the spectral color.

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.

Clean tillage. Cultivation to prevent the growth of all vegetation except the particular crop desired.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of slopes.

Complex, soil. A mapping unit consisting of different kinds of soils that occur in such small individual areas or in such an intricate pattern that they cannot be shown separately on a publishable soil map.

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.

Cover crop. A close-growing crop grown primarily to improve and to protect the soil between periods of regular crop production; or a crop grown between trees and vines in orchards and vineyards.

Diversion, or diversion terrace. A ridge of earth, generally a terrace, that is built to divert runoff from its natural course and, thus, to protect areas downslope from the effects of such runoff.

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

Esker (geology). A narrow, winding ridge or mound of stratified gravelly and sandy drift that was deposited by a subglacial stream.

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.

Fragipan. A loamy, brittle, subsurface horizon that is very low in organic matter 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 glaciers.

Gleization. The reduction, translocation, and segregation of soil compounds, notably of iron, usually in the lower horizons, as a result of waterlogging with poor aeration and drainage; expressed in the soil by mottled colors dominated by gray. The soil-forming processes leading to the development of a gley soil.

Graded stripcropping. Growing crops in strips that are slightly graded to drain into a protected waterway.

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.

Illuviation. The process of deposition of soil material removed from one horizon to another horizon of the soil.

Integrade. Soils that possess moderately well developed distinguishing characteristics of two or more soil groups.

Internal drainage. The downward movement of water through the soil profile. The rate of movement is determined by the texture, structure, and other characteristics of the soil profile and underlying layers, and by the height of the water table, either permanent or perched. Relative terms for expressing internal drainage are *none, very slow, slow, medium, rapid,* and *very rapid.*

Leaching, soil. The removal of soluble materials from soils or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state. In engineering, a high liquid limit indicates that the soil has a high content of clay and a low capacity for supporting loads.

Mottled. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: Abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent.* The size measurements are these: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Munsell notation. A system for designating color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with a hue of 10YR, a value of 6, and a chroma of 4.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

Permeability. The quality of a soil horizon that enables water or air to move through it. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Mildly alkaline	7.4 to 7.8
Very strongly acid	4.5 to 5.0	Moderately alkaline	7.9 to 8.4
Strongly acid	5.1 to 5.5	Strongly alkaline	8.5 to 9.0
Medium acid	5.6 to 6.0	Very strongly alkaline	9.1 and higher
Slightly acid	6.1 to 6.5		
Neutral	6.6 to 7.3		

Relief. The elevations or inequalities of a land surface, considered collectively.

Sand. Individual rock or mineral fragments in soils having diameters ranging from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

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.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are (1) *single grain* (each by itself, as in dune sand) or (2) *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly the part of the solum below plow depth.

Substratum. Technically the part of the soil below the solum.

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 surplus 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."

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.

Type, soil. A subdivision of the soil series that is made on the basis of differences in the texture of the surface layer.

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.

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