SOIL SURVEY

Cayuga County New York

Issued May, 1971

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 1945–64. Soil names and descriptions were approved in 1964. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1964. 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 Cayuga County Soil and Water Conservation District.

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 of Cayuga County contains information that can be applied in managing farms and woodlands; in selecting sites for roads, ponds, buildings, or other structures; and in determining the suitability of tracts of land for agriculture, industry, and recreation.

Locating Soils

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

On each sheet of the detailed map, soil areas are outlined and are identified by a symbol. 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 in the survey. This guide lists all of the soils of the county in alphabetical order by map symbol. It shows the capability unit and woodland group for each soil. It also shows the page where each soil and each capability unit is described.

Interpretations not included in the text can be developed by grouping the soils according to their suitability or limitations for a particular use. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

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

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

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

Community planners and others concerned with suburban development can read about the soil properties that affect the choice of homesites, industrial sites, and parks in the section "Nonfarm Uses of Soils."

Engineers and builders can find under "Engineering Applications" tables that give facts about engineering properties of the soils in the county and that name soil features that affect engineering practices and structures.

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

Newcomers in Cayuga County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the section "General Nature of the County," which gives additional information about the county.

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SOIL SURVEY OF CAYUGA COUNTY, NEW YORK

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

SOILS SURVEYED BY FRANK Z. HUTTON, JR., CARL S. PEARSON, AND ROBERT E. SMITH, JR., SOIL CONSERVATION SERVICE [1]

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

CAYUGA COUNTY is in the Finger Lakes region, near the geographical center of the State (fig. 1). Skaneateles Lake forms part of the eastern boundary, Cayuga Lake part of the western boundary, and Lake Ontario the northern boundary. Owasco Lake is entirely within the confines of the county.

The county is approximately 55 miles long from north to south. It is more than 22 miles wide near the southern boundary but narrows to less than 6 miles near Lake Ontario. It covers 699 square miles, or 447,360 acres. Auburn, the county seat, is centrally located.

Most of the soils formed in glacial deposits containing various amounts of sandstone, shale, and limestone. For the most part, these soils are deep, gently to moderately sloping, and medium textured. They are mainly well drained and are medium to high in content of lime. They are well suited to the type of farming common in the county.

[1] Others who contributed to field mapping were JOHN A. NEELEY and ALLEN BENTON, Soil Conservation Service.

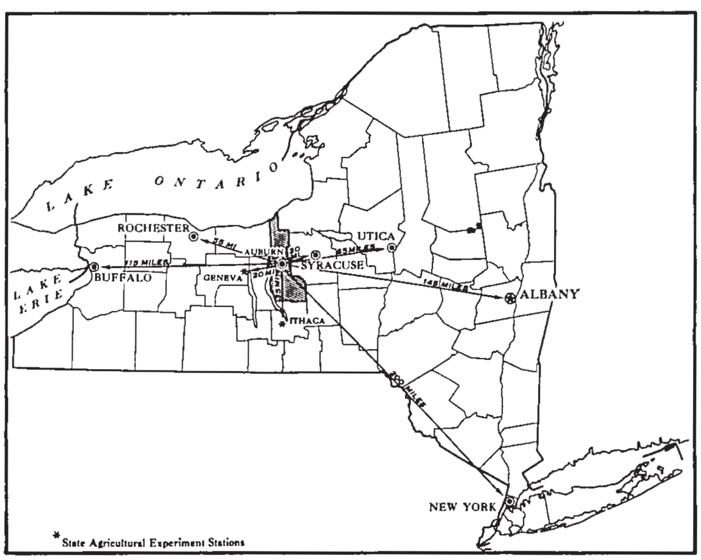

Figure 1.—Location of Cayuga County in New York.

About 70 percent of the county is farmland. Dairying is the principal type of farming, and much of the acreage is in crops used to feed dairy cattle. Winter wheat, grain corn, and other grain crops are also important. Vegetables are grown mainly on the organic soils in the northern part of the county. The recent construction of a large sugar processing plant just north of Montezuma has resulted in several thousand acres being used for the production of sugar beets.

About 30 percent of the county is forested. Although much of this acreage is small, scattered woodlots, several thousand acres in the high hill section in the southeastern part consists of abandoned farmland that has been reforested.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soils are in Cayuga County, where they are located, and how they can be used. They went into the county knowing they likely would find many soils they had already seen, and perhaps some they had not. As they traveled over the county, they observed steepness, length, and shape of slopes; size and speed of streams; kinds of native plants or crops; kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by roots of plants.

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. To use this survey efficiently, it is necessary to know the kinds of groupings most used in a local soil classification.

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. Honeoye and Ontario, 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 natural, undisturbed landscape. Soils of one series can differ somewhat in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man.

Many series contain soils that differ in texture of their surface layer. According to such differences in texture, separations called soil types are made. Within a series, all the soils having a surface layer of the same texture belong to one soil type. Ontario loam and Ontario fine sandy loam are two soil types in the Ontario series. The difference in texture of their surface layer is apparent from their names.

Some soil types vary so much in slope, degree of erosion, number and size of stones, or some other feature affecting their use that practical suggestions about their management could not be made if they were shown on the soil map as one unit. Such soil types are divided into phases. The name of a soil phase indicates a feature that affects management. For example, Ontario loam, 2 to 8 percent slopes, is one of several phases of Ontario loam, a soil type that has a slope range of 2 to 20 percent.

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 greatly help in drawing boundaries accurately. The soil map at the back of this survey 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 management of farms and fields, a mapping unit is nearly equivalent to a soil type or a phase of a soil type. 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 type or soil phase.

In preparing some detailed maps, the soil scientists have a problem of delineating areas where different kinds of soils are so intricately mixed or occur in such small individual tracts that it is not practical to show them separately on the map. Therefore, such an area is shown as one mapping unit and is called a soil complex. Ordinarily, a soil complex is named for the major kinds of soil in it, for example, Langford-Howard gravelly loams.

Most surveys include areas where the soil material is so rocky, so shallow, or so frequently worked by wind or water that it cannot be classified by soil series. These areas are shown on the soil map like other mapping units, but they are given descriptive names, such as Lake beaches or Made land, and are called land types.

Another kind of mapping unit is the undifferentiated group, which consists of two or more soils that may occur together without regularity in pattern or relative proportion. The individual tracts of the component soils could be shown separately on the map, but the differences between the soils are not important for the purpose of the soil survey. An example is Appleton and Lyons loams, 0 to 5 percent slopes.

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

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 readers, among them farmers, managers of woodland, engineers, and homeowners. Grouping soils that are similar in suitability for each specified use is the method of organization commonly used in a soil survey. On basis of the 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, they 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[2]

The general soil map at the back of this survey shows, in color, the soil associations in Cayuga County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of farming or other land use. Such a map is not suitable for planning the management of a farm or field, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect management.

The soil associations in the 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 soil acidity, or low pH value, limits crop production more frequently than any other one factor. The soils in associations designated as high lime may require some lime for optimum yields of legumes, but they do not need such heavy or such frequent applications as do the soils in the medium-lime and low-lime groups.

The soil associations shown on the general soil map for Cayuga County do not join, in every respect, those shown on a similar map in the soil survey for Tompkins County,

[2] CARL S. PEARSON, soil scientist, Soil Conservation Service, assisted in the preparation of this section.

N.Y. The more advanced concept of soil classification has resulted in a more detailed composition of each soil association than was possible at the time the general soil map of Tompkins County was drafted.

Associations Dominated by High-Lime Soils Developed on Glacial Till

These associations make up 59 percent of the county and occupy most of the central and southern parts. They extend from the northernmost limestone outcrop that occurs about 2 miles north of the villages of Victory and Cato southward into Tompkins County. The soils have a slightly acid to neutral surface layer and a neutral to alkaline subsoil. Free lime occurs at a depth of 18 to 30 inches. Lime normally is not needed for the growth of legumes. The dominant soils are fertile and respond well to management.

1. Cazenovia-Ovid-Ontario, moderately shallow, association

Deep, well-drained to somewhat poorly drained soils that have a moderately fine textured subsoil, and moderately shallow, well-drained soils that have a medium-textured subsoil over limestone bedrock

This association occurs mainly on a nearly level to hilly till plain that extends from east to west across the county in the vicinity of Auburn. It is made up mostly of high-lime soils that formed in glacial till. In places, limestone bedrock is fairly close to the surface and there are some outcrops of rock. The association occupies about 7 percent of the county. The area around Auburn has been extensively developed for residential and industrial uses. Most of the remaining acreage has been cleared and is intensively farmed. Little land is available for recreation or forestry.

Cazenovia soils occupy about 45 percent of the association, Ovid soils about 10 percent, and Ontario soils about 10 percent. Cazenovia soils are deep and are moderately well drained or well drained. They have gentle to steep, convex slopes on which little runoff accumulates. Ovid soils are deep, somewhat poorly drained, and nearly level to gently sloping. They occur on foot slopes and in depressions that receive runoff from Cazenovia soils. The Ontario soils in this association are moderately shallow variants of the normally deep Ontario soils. They are well drained, are 20 to 40 inches thick over limestone, and are nearly level to moderately sloping. They are scattered throughout the association.

Minor soils are Benson soils, which occupy about 7 percent of the total area, and Schoharie, Odessa, Lakemont, Arkport, Romulus, Lima, Kendaia, and Palmyra soils, which together occupy the remaining 28 percent of the association. Benson soils occur with Ontario soils, moderately shallow variant, but are shallower to bedrock.

Dairying is the principal type of farming. The main crops are alfalfa, oats, and silage corn. Winter wheat, grain, corn, and dry field beans are important cash crops. The major soils are suited to most crops grown in this region. Their high content of lime makes them particularly well suited to alfalfa and other deep-rooted legumes.

If the major soils are used as residential or industrial sites, rock may need to be excavated. The limestone bedrock, however, will support most structures. The soils have many features desirable at sites used for developments, but they have severe limitations if used as disposal fields for septic-tank effluent.

The Onondaga limestone under these soils is used for crushed stone and is the raw material for several industries. Material suitable for hard fill can be obtained in some places. Only small deposits of sand and gravel occur in this association. Topsoil in commercial quantities is available only along some streams.

Flooding is not a problem in this association. The flow of Owasco Creek is regulated to prevent flooding.

2. Cazenovia-Ovid association

Deep, well-drained to somewhat poorly drained soils that have a moderately fine textured subsoil

This association consists mainly of gently rolling ridges separated by level areas of lacustrine deposits. It occurs northwest of Auburn and accounts for slightly more than 1 percent of the county. Most of the association is used for farming, although there is some urban and industrial development around the northern fringe of Auburn.

Cazenovia soils occupy about 30 percent of the acreage, and Ovid soils about 25 percent. Cazenovia soils are deep and are well drained or moderately well drained. They have convex, gentle to steep slopes on which little runoff accumulates. Ovid soils are deep, somewhat poorly drained, and nearly level to gently sloping. They occupy broad areas above Cazenovia soils, where runoff is slow, and foot slopes below Cazenovia soils, where runoff accumulates.

Poorly drained Romulus, Lakemont, Madalin, and Canandaigua soils commonly are on flats and in swales between the low ridges. Together they occupy about 20 percent of the association. Other minor soils are Schoharie, Odessa, Fonda, Ontario, Honeoye, Lima, Appleton, Lyons, Benson, Dunkirk, Collamer, Niagara, Arkport, Eel, Genesee, Sloan, Palmyra, and Muck soils, which together occupy the remaining 25 percent.

Dairying is the principal type of farming in this association. Most of the crops grown are used to feed dairy herds. Establishing adequate drainage systems in the wetter areas and maintaining good tilth are important management needs. Erosion is a hazard on the rolling to steep soils.

The well drained and moderately well drained soils are well suited to trees that can tolerate high-lime conditions, but little acreage is available for forestry.

The major soils in this association are suitable as sites for industrial uses. The heavy underlying glacial till provides good bearing surface for structures, but it severely limits the use of these soils as disposal fields for septic-tank systems. The glacial till can be used as hard fill, although its use may be restricted in wet areas because of the somewhat high clay content. Topsoil in commercial quantities is not available, and there are only small deposits of sand and gravel.

Flooding occurs only on the narrow flood plains of small streams. It causes little damage because these areas are used mainly for permanent pasture.

3. *Honeoye-Lima association*

Deep, well drained and moderately well drained soils that have a medium-textured subsoil

This association is on the gently sloping and rolling till plains that cover much of the southern part of the county (fig. 2). The towns of Owasco, Scipio, Niles, Venice, Ledyard, and Genoa are largely in this association, which makes up about 28 percent of the county. Much of the acreage is farmed intensively. Little land is available for recreation or forestry.

Honeoye soils occupy about 35 percent of the association, and Lima soils about 25 percent. Honeoye soils are deep, well drained, and high in content of lime. They have convex gentle to moderately steep slopes. Lima soils are similar to Honeoye soils but are moderately well drained. They generally are adjacent to Honeoye soils but are at lower elevations.

The minor Kendaia and Lyons soils commonly occur in depressions. They occupy about 5 percent of the association. Alden, Angola, Aurora, Cazenovia, Eel, Genesee, Ovid, and Palmyra soils and Alluvial land occupy the remaining 35 percent.

Dairying and cash-crop farming are of about equal importance in this association. The principal crops are grain corn, silage corn, winter wheat, dry field beans, alfalfa, and oats. The major soils are high in lime, medium to high in potassium, and generally low in phosphorus. They are well suited to all of the common crops. Erosion is a moderate hazard on the gently sloping to steep soils.

The major soils have many features that are favorable for industrial or residential sites. They will support most structures, but they have moderate to severe limitations if used as disposal fields for septic-tank systems. The material underlying the major soils is suitable for hard fill, although it may contain some large stones. The few small deposits of sand and gravel are mainly in valleys and along the large streams. This material generally is very silty. Topsoil in commercial quantities is available along the larger streams.

Flooding occurs generally early in spring on the bottom lands along the numerous small streams. Little or no damage is done because most of this land is in permanent pasture.

4. *Lima-Kendaia association*

Deep, moderately well drained and somewhat poorly drained soils that have a medium-textured subsoil

This association is on nearly level to gently sloping till plains in the southern part of the county, mainly in

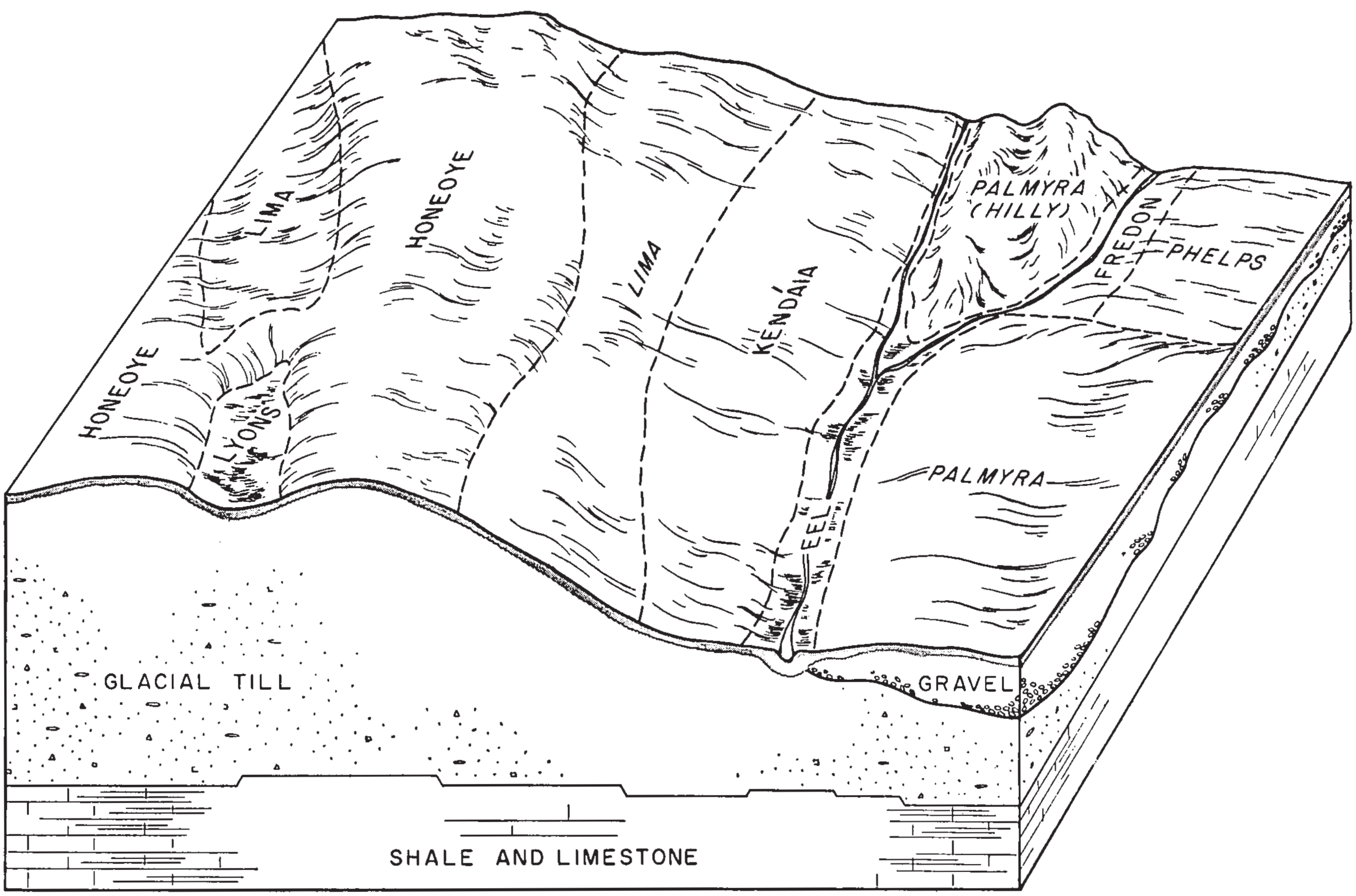

Figure 2.—**Typical cross section of Honeoye-Lima association.**

the towns of Ledyard and Venice. It makes up slightly more than 1 percent of the county. Most of the acreage is intensively farmed. Only a few small areas are idle or forested.

Lima soils occupy about 40 percent of the association, and Kendaia soils about 20 percent. Lima soils are deep, moderately well drained, and high in content of lime. They are nearly level to gently sloping. Little water accumulates on these soils. Kendaia soils are similar to Lima soils but are somewhat poorly drained. They commonly occupy foot slopes and depressions adjacent to Lima soils.

About 10 percent of this association consists of well-drained Honeoye and poorly drained Lyons soils, which formed in material similar to that in which Lima and Kendaia soils formed. The rest consists of Alden, Angola, Aurora, Eel, and Genesee soils and Alluvial land.

Most farms have dairy herds, and much of the acreage is used for hay crops, silage corn, and oats to feed dairy cattle. Winter wheat, dry field beans, and grain corn are important cash crops.

The better drained soils of this association have some features that are favorable for industrial and residential sites. These soils commonly provide a good bearing surface for structures, but they have severe limitations if used as disposal fields for septic-tank systems. The unconsolidated material that underlies these soils is suitable for hard fill, although it contains some large stones. Deposits of sand and gravel are small. Topsoil can be obtained from the major soils but is more plentiful on bottom land along streams.

Flooding occurs only along the small streams and does little or no damage.

5. Ontario association

Deep, well-drained soils that have a medium-textured to moderately coarse textured subsoil

This association is on gently sloping to steeply sloping drumlins and rolling upland till plains that are interspersed with lower lying, more gently sloping lake plains (fig. 3). The drumlins occur as a series of long, cigar-shaped hills that are roughly oriented in a north-south direction. They are part of an extensive belt that extends from Genesee County on the west to Oneida County on the east. This association makes up about 20 percent of the county. Much of the acreage is in native hardwoods or pasture.

Ontario soils occupy about 40 percent of this association. They are the dominant soils on drumlins and on the rolling upland till plains.

Moderately well drained Hilton soils occur on the smoother till plains at the base of drumlins. These are minor soils that occupy about 6 percent of the association. Palmyra soils, which occupy about 4 percent, formed in gravelly outwash on kames and terraces on

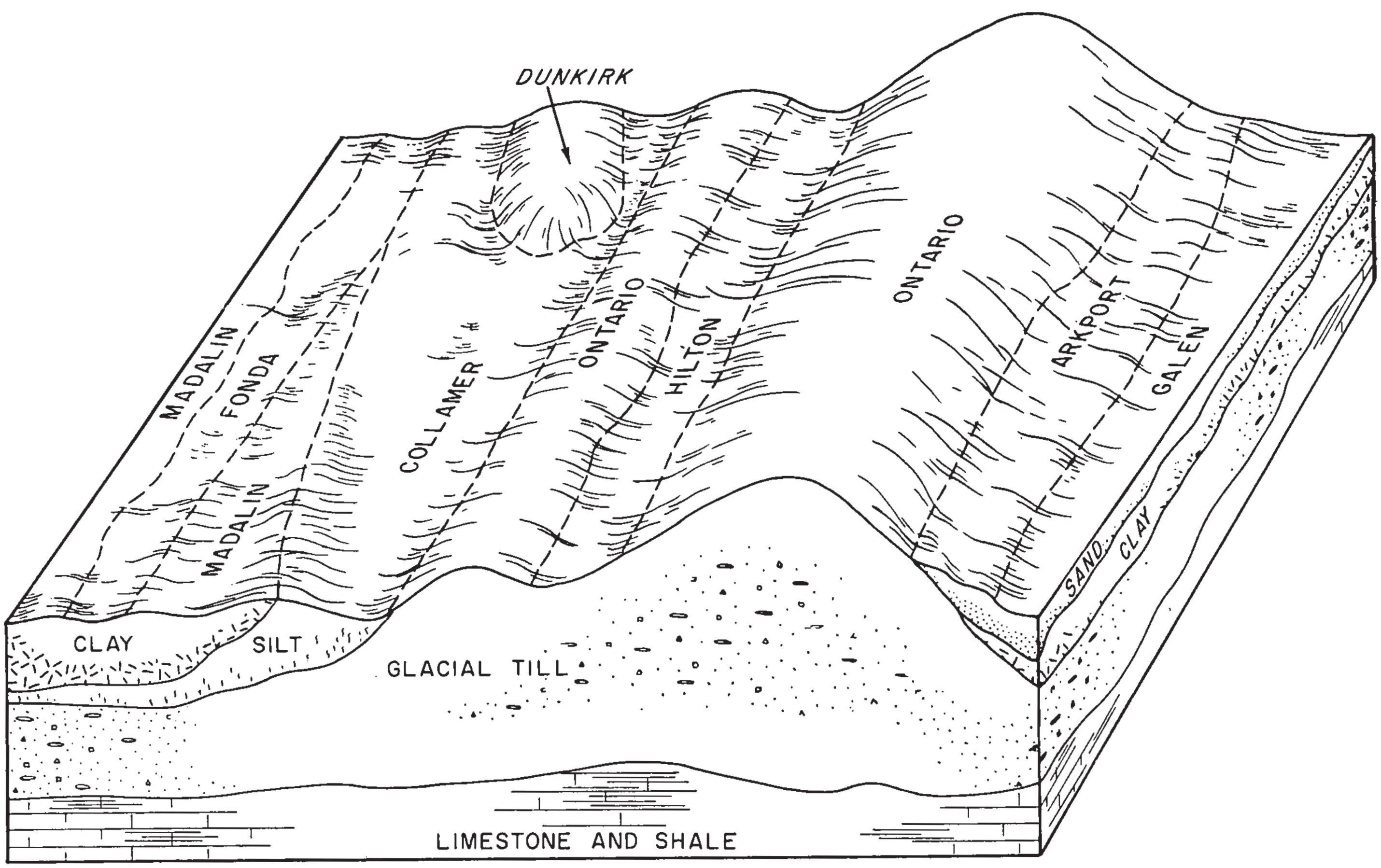

Figure 3.—Typical cross section of Ontario association in the north-central part of the county.

the sides of drumlins. About 6 percent of the association consists of somewhat poorly drained Niagara and poorly drained Canandaigua soils, which formed in silts and fine sands, and about 4 percent is poorly drained Madalin and very poorly drained Fonda soils, which formed in silt and clay. The remaining 40 percent consists mainly of scattered areas of Collamer, Galen, Camillus, Cazenovia, Appleton, Lima, and Ovid soils and Muck.

Dairying is the principal type of farming, mainly because the strong slopes are better suited to close-growing hay crops and to pasture than to cultivated crops. Part of the acreage is used for winter wheat and dry field beans, and a limited acreage is in vegetables.

Erosion is a moderate to severe hazard. Some of the steeper soils are severely eroded.

Native hardwood forests occupy a fairly large acreage. Most trees, except red pine, grow well. Food and cover for wildlife are plentiful.

Although in places the steep side slopes of the drumlins are a limiting factor, the dominant soils have many properties that are favorable for residential or light industrial sites. They have moderate to severe limitations for use as disposal fields for septic-tank systems.

The dominant soils are well suited to some types of recreational development. The strongly rolling topography provides interesting terrain for golf courses.

Borrow material for hard fill can be obtained from the dominant soils. This material is well graded and contains about the right amount of silt and clay for proper compaction, but it also contains some large stones. Small deposits of sand and gravel, generally of high quality, occur on the sides and on the south end of drumlins. Topsoil can be obtained from most of the soils, but it commonly is high in content of stones and gravel. The soils on bottom lands along the numerous small streams are the best source of topsoil.

Periodic flooding occurs mainly in spring on narrow first bottoms along the small streams. Damage is negligible because most of these areas are used for permanent pasture. Ponding in winter and early in spring is a hazard on many of the lower lying soils and in small areas of Muck.

6. Cazenovia-Aurora association

Deep and moderately deep, moderately well drained or well drained soils that have a moderately fine textured subsoil

This association occupies the gently sloping to steep till plain adjacent to Cayuga Lake. It occurs as a relatively narrow strip, ½ to 1 mile in width, extending from the Tompkins County line northward to Union Springs in the town of Springport. It makes up about 2 percent of the county. The soils in the southern part are mostly steep and are generally forested. Those in the northern part are less steep and, for the most part, are either cultivated or in pasture.

Cazenovia soils occupy about 35 percent of this association, and Aurora soils about 25 percent. The Cazenovia are deep, moderately well drained to well drained, high-lime soils that formed in glacial till. The Aurora are moderately well drained to well drained, medium-lime soils that formed in glacial till. They are underlain at a depth of 20 to 40 inches by local shale bedrock. Both soils have gentle to steep slopes on which little runoff accumulates.

About 10 percent of this association consists of reddish, moderately well drained Schoharie soils, which formed in lake-laid material. The remaining 30 percent consists of shallow Farmington soils; deep, well-drained Honeoye soils; very rocky Aurora, Benson, and Farmington soils, in steep, narrow gorges; and Genesee soils, on small alluvial fans. These fans build up where small streams empty into the lake.

Dairying is the principal type of farming in this association. Hay crops, silage corn, grain corn, and oats are the main crops.

The dominant soils are moderately to highly susceptible to erosion. Consequently, intensive conservation measures are needed if the moderately sloping soils are cultivated.

This association is well suited to reforestation. Native hardwoods have a high rate of growth, and all trees available for planting, except red pine, grow well.

Because of the proximity of the lake, this association is used to a considerable extent for residences. The entire lake shore is used for cottages and campsites, and many permanent residences have been built on the slopes overlooking the lake. Slow permeability, shallowness to bedrock, and steep slopes severely limit the use of the soils as drainage fields for septic-tank systems.

The suitability of the dominant soils as a source of fill material varies because of the difference in content of clay or soft shale. Topsoil, in commercial quantities, is not available.

Flooding generally is not a hazard, but occasionally a considerable amount of shaly debris is deposited by streams that flow through the narrow, steep-walled gorges to the lake.

Associations Dominated by Medium-Lime Soils Developed on Glacial Till

Only one association of medium-lime soils occurs in Cayuga County. This association makes up about 2 percent of the county and occurs in the southern part, in a transitional zone between associations of high-lime and low-lime soils. The dominant soils are suited to most crops and respond well to good management. They require more lime than high-lime soils, and less lime than low-lime soils.

7. Lansing-Conesus association

Deep, well drained and moderately well drained soils that have a medium-textured subsoil

This association occupies a nearly level to moderately steep till plain, 1 to 2 miles west of Moravia. It makes up about 2 percent of the county. Most of the acreage is farmed.

Lansing soils occupy about 40 percent of the association, and Conesus soils about 30 percent. Lansing soils are mostly on hilltops, on the upper part of side slopes, and in the more rolling areas. They are deep, well-drained, medium-textured soils that formed in glacial till derived from shale, fine-grained sandstone, and some limestone. Conesus soils, which are the moderately well drained associates of the Lansing soils, formed in similar material but are nearly level or gently sloping. They occur where runoff is slightly restricted or where some accumulates.

Somewhat poorly drained Kendaia soils and poorly drained Lyons soils occupy about 10 percent of the association. Very poorly drained Alden soils occupy about 5 percent. Small areas of Honeoye, Howard, Langford, Lima, and Palmyra soils and Alluvial land on narrow bottom lands make up the rest.

Dairying is the main type of farming in this association, and much of the acreage is in crops used to feed dairy cattle. A significant acreage is used for grain corn, winter wheat, and dry field beans. The soils are well suited or fairly well suited to most crops, including deep-rooted legumes, but they are susceptible to moderate or serious erosion unless measures are taken to protect them.

The dominant soils have many properties favorable for industrial and residential sites. They have good depth, moderate to good drainage, and good bearing strength. In some places, slope is a limiting factor.

Much of the acreage is suitable for the development of picnic areas, play areas, and golf courses. Many areas provide suitable sites for ponds.

Reforestation generally is successful. All trees common to the area can be grown. Many areas can be developed as habitat for openland wildlife and for certain kinds of woodland wildlife.

The underlying soil material consists mainly of glacial till derived from local rocks. It contains a few large stones but otherwise is suitable for hard fill. Fairly extensive deposits of sand and gravel occur on terraces and benches along Pine Hollow Brook, but most of the gravel is dirty or high in silt. Topsoil, in commercial quantities, can be obtained only from soils on the bottom land of Pine Hollow Brook. The other soils are high in content of gravel and small, angular stones.

Flooding is not a problem in this association.

Associations Dominated by Low-Lime Soils Developed on Glacial Till

These associations make up 19 percent of the county. They occur in the northern part and in the southeastern corner. Many of the soils have a moderately to strongly developed fragipan that restricts the growth of roots and the movement of water. Heavy applications of lime generally are needed for the successful growth of deep-rooted legumes.

8. Langford-Erie association

Deep, moderately well drained and somewhat poorly drained soils that have a medium-textured fragipan

This association is on gently sloping to steeply sloping till plains in the southeastern part of the county (fig. 4), where the elevation approaches 2,000 feet. It consists of four areas that make up about 14 percent of the county. A considerable acreage consists of idle or abandoned fields that are growing up in brush. Many hundreds of acres have been reforested by public agencies. The rest of the acreage is used mainly for dairy farming.

Langford soils occupy about 60 percent of the association, and Erie soils about 20 percent. Langford soils are deep, moderately well drained, gently sloping to steep, low-lime soils that formed in glacial till. These soils occupy convex hilltops and smooth side slopes on which little water accumulates. They have a well-developed fragipan at a depth of 18 to 24 inches. Erie soils are nearly level to gently sloping and are somewhat poorly drained. They also formed in glacial till, but they are shallower to the fragipan than Langford soils. They occur either on foot slopes below Langford soils, where runoff accumulates, or on broad, nearly level hilltops, where runoff is slow.

About 20 percent of the association is made up of minor soils, mainly very poorly drained Alden soils; medium-lime Lansing and Conesus soils; moderately deep, well-drained Lordstown soils; shallow Arnot soils; Eel, Sloan, and Muck soils; and Alluvial land.

Dairying is the principal type of farming, although one or two farms raise beef cattle. Practically all of the crops grown are used to feed livestock. Some winter wheat and dry field beans are grown as cash crops.

The dominant soils have a strongly acid surface layer and a neutral to mildly alkaline subsoil. The fragipan in these soils restricts the growth of roots and the movement of air and water. If the moderately steep to steep soils are cultivated, intensive measures are needed to control erosion.

Seasonal wetness and, in some places, the topography are the major limitations if the soils are used for industrial or residential sites. The glacial till that underlies the dominant soils provides good bearing surface for structures and can also be used for fill. There are severe limitations if the soils are used as drainage fields for septic-tank effluent.

The topography is favorable for the development of many kinds of recreational areas. Many of the soils provide favorable sites for ponds and impoundments. The large acreage in native forest and the reforested areas are suitable for picnic areas, play areas, trails for hiking, and campsites. They also provide suitable habitat for many kinds of wildlife.

The underlying glacial till is suitable for hard fill. Although there are a few small deposits of sand and gravel on deltas, outwash terraces, stratified moraines, and alluvial fans, this material is generally dirty and high in silt. It is suitable for fill material but is not suitable for concrete aggregate. Most of the soil material is too stony to be used for topsoil.

Flooding occurs along the small streams but causes little damage because most of the land along streams is in permanent pasture.

9. Scriba-Ira association

Deep, somewhat poorly drained and moderately well drained soils that have a medium-textured to moderately coarse textured fragipan

This association occurs mainly on nearly level to moderately steep till plains in the extreme northern part of the county, in the town of Sterling. It consists of two small areas that make up about 1 percent of the county. Much of the acreage is abandoned farmland that is re-

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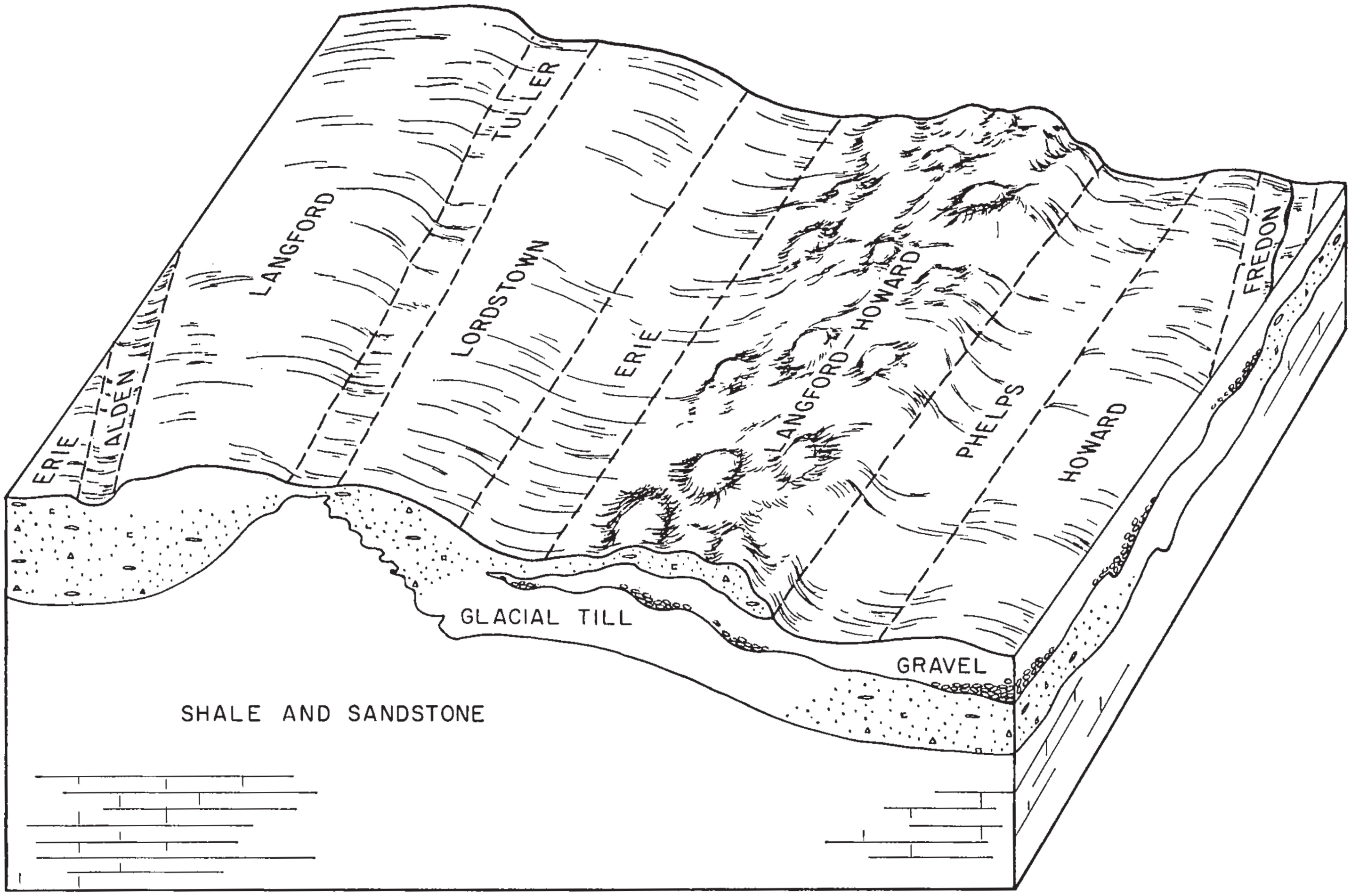

***Figure 4.*—Typical cross section of Langford-Erie association and Langford-Howard association in the southeastern part of the county.**

verting to brush and trees. The few remaining farms are dairy farms.

Scriba soils occupy about 25 percent of the association, and Ira soils about 20 percent. Scriba soils are deep, nearly level, somewhat poorly drained, low-lime soils that have a well-developed fragipan at a depth of about 13 inches. Runoff is slow on these soils, and water tends to accumulate. Ira soils are moderately well drained, gently sloping to moderately steep soils that have a well-developed fragipan at a depth of 17 to 20 inches. They occupy convex hilltops and smooth side slopes on which little runoff accumulates.

Well-drained Sodus soils, very poorly drained Alden soils, and Muck soils each make up about 10 percent of the association. Gravelly Alton soils, somewhat poorly drained Niagara soils, and poorly drained Canandaigua soils each make up about 5 percent. Small scattered areas of Lamson, Colonie, Williamson, and Sloan soils make up the rest.

Some drained areas are farmed, but most of this association is too wet or too stony to be well suited to farming. The income of most families is derived from work outside the association.

Seasonal wetness is the main limitation if the dominant soils are used as sites for residential or industrial developments. The compact glacial till provides good bearing surface for structures, and the topography generally is favorable. There are severe limitations, however, if the soils are used as drainage fields for septic-tank effluent.

There is little demand for private development of recreational areas because of the proximity of Lake Ontario and the Fair Haven State Park. Nevertheless, the terrain is favorable for the development of golf courses and playing fields. Swampy areas, native woodland, and brushy idle land are desirable habitat for many kinds of wildlife. There may be a scarcity of some kinds of wildlife food because little of the association is used for grain or corn. Successful plantations can be established if suitable trees are selected for planting.

The glacial till underlying the major soils can be used for borrow material, hard fill, or subgrades, but it is likely to contain some large stones. Only a few small deposits of sand and gravel occur in this association. Topsoil can be obtained from soils on the bottom lands of small streams. Although the surface layer of the other soils can be used for topsoil, this material is somewhat stony or gravelly.

Flooding occurs periodically on first bottoms along small streams but does little damage.

10. Sodus-Ira association

Deep, well drained and moderately well drained soils that have a medium-textured to moderately coarse textured fragipan

This association consists of nearly level to steeply sloping soils on drumlins and of rolling soils on till plains, interspersed with lower lying soils that formed in lake-laid deposits. It occurs in the extreme northern part of the county near Lake Ontario, in the towns of Sterling and Ira. The four areas that make up this association occupy about 4 percent of the county. Many areas, especially the steeper ones, are in native hardwoods or brushy growth. A few areas near the lake are used for orchards or vegetable farms. Much of the acreage that borders the lake is used as sites for cottages. The rest of the association is used mainly for dairy farms.

Sodus soils occupy about 40 percent of the association, and Ira soils about 15 percent. Sodus soils are deep, well-drained, gently sloping to steep, low-lime soils on which little or no runoff accumulates. They have a well-developed fragipan at a depth of 20 to 30 inches. Ira soils are nearly level to moderately steep. They are similar to Sodus soils but are moderately well drained and are shallower to the fragipan. Some water accumulates on these soils. In many places the surface layer of both the Sodus and Ira soils is very stony.

Somewhat poorly drained Scriba soils, which are minor soils, occupy about 5 percent of the association. The remaining 40 percent consists of silty Alden, Canandaigua, Niagara, and Williamson soils; gravelly Alton soils; clayey Madalin soils; alluvial Sloan soils; Muck; and Fresh water marsh.

Dairying is the principal enterprise, although snap beans and other cash crops are grown on the stone-free, more nearly level soils. Because of the favorable climate in the vicinity of Lake Ontario, some areas near the lake are used for the production of fruit, mainly apples and pears. For satisfactory yields, however, these areas need to be drained.

The moderate to steep slopes limit the use of the better drained soils for crops, and wetness limits the use of the more nearly level soils. Intensive measures are needed to control erosion if the steep side slopes of drumlins are cultivated. In most areas, stones interfere with the use of farm machinery.

Strongly rolling topography and seasonal wetness are among the major limitations for industrial and residential developments. The area that extends for about a mile along Lake Ontario is used mainly for cottages and campsites. Storm-wave action has caused active erosion of many of the drumlins and higher areas along the shoreline. Consequently, the use of such areas as sites for permanent cottages is hazardous.

Although recreational development is influenced largely by the lake and by Fair Haven Beach State Park on Little Sodus Bay, the rolling topography and drumlins provide interesting terrain for golf courses, picnic areas, play areas, and campsites.

This association is well suited to reforestation. A fairly large acreage is in native forest or in idle land that is reverting to brush. These areas provide good cover for wildlife. The wetlands and lake attract wildfowl to the area.

The substratum of the major soils contains some large stones but otherwise is suitable for road subgrade, borrow material, and hard fill. There are a few extensive deposits of sand and gravel in this association, and some small deposits of stratified material on the sides and ends of drumlins. The surface layer of the dominant soils can be used for topsoil, but it is likely to be gravelly and stony. Soils on bottom lands along Sterling Valley Creek and other major streams are the best source of topsoil.

Some flooding occurs on the soils along Sterling Valley Creek, but the overflow does little damage as these soils are not used for crops.

Associations Dominated by Soils Developed on Glacial Outwash Terraces and Kames

In this group are two associations that make up about 4 percent of the county. One association is in the vicinity of Port Byron. It consists of high-lime soils that require little or no lime for good plant growth. The other is in the southern part of the county. It consists of medium-lime and low-lime soils that formed in glacial till or glacial outwash deposits. These soils need moderate to heavy applications of lime if plants are grown.

11. Palmyra-Wampsville association

Deep, well-drained, high-lime soils that have a medium-textured or moderately fine textured subsoil over sand and gravel

This association consists of nearly level to steeply sloping soils on gravelly glacial outwash terraces and kames and of smaller areas of nearly level to moderately steep soils that formed in thin deposits of till over gray and red shale. It makes up about 1 percent of the county and extends from Port Bryon eastward along the New York State Thruway and the Seneca River to the county line. Most of the acreage is intensively farmed.

Palmyra soils make up about 30 percent of the association, and Wampsville soils about 25 percent. Palmyra soils are deep, well-drained, nearly level to steep, high-lime soils that formed in stratified sand and gravel derived mainly from gray shale, sandstone, and limestone. Wampsville soils are deep and nearly level to gently sloping. They are similar to Palmyra soils but formed in material derived from red shale, sandstone, and limestone, and they have a finer textured subsoil.

Minor soils make up the rest of this association. Moderately well drained Riga and Lairdsville soils, which are 20 to 40 inches thick over clay shale, make up about 20 percent, and somewhat poorly drained Brockport and Lockport soils, which are 20 to 40 inches thick over shale, make up about 10 percent. The rest consists of Camillus, Cazenovia, Collamer, Eel, Fonda, Madalin, Ontario, Phelps, Sloan, and Warners soils and small areas of Muck.

Dairying is the principal type of farming, and most of the acreage is in crops used to feed dairy cattle. Alfalfa and corn are the principal crops grown for this purpose. Dry field beans and winter wheat are important cash crops. Poorly drained soils are used mainly for permanent pasture. Palmyra and Wampsville soils are suited to irrigation, but at the present time there is only a small acreage in crops that are commonly irrigated.

Because the dominant soils, for the most part, are nearly level to gently sloping, erosion caused by runoff is not a serious hazard except during periods of alternate freezing and thawing.

The dominant soils are generally well suited as sites for industrial and residential developments. They are well drained, are commonly nearly level or gently sloping, and provide a good bearing surface. They have few limitations for use as drainage fields for septic-tank systems. Minor soils that have restricted drainage or that are shallow over bedrock have moderate to severe limitations for such use.

Recreation in this association is closely associated with the lakes, streams, and wetlands. The relief generally is favorable for the development of play areas, picnic areas, campsites, and golf courses. The high value of the soils for crops limits their use for forestry.

Most sand and gravel pits now operating in the county are in this association. The dominant soils are an excellent source of sand and gravel, but in some places this material may be cemented by lime. The soils normally are too gravelly to be used for topsoil.

Flooding generally does not occur on the dominant soils, which are on terraces and benches. Some minor soils are flooded or are under water for various periods each year.

12. Langford-Howard association

Deep, well-drained, medium-lime soils that have a medium-textured subsoil over sand and gravel, and deep, moderately well drained or well drained, low-lime soils that have a medium-textured fragipan

This association occupies gently undulating to steeply rolling valley sides in the southern part of the county (see fig. 4, page 8). It makes up about 3 percent of the county and consists of one area along both branches of Salmon Creek and one area along Owasco Inlet, Hemlock Creek, and Dresserville Creek. Much of the acreage is farmed, but there are some fairly extensive forested areas along the narrower valleys. The villages of Moravia and Locke are the main residential communities.

Langford soils make up about 30 percent of this association, and Howard soils about 27 percent. Langford soils are deep, moderately well drained to well drained, gently sloping to steep soils that formed in glacial till. These soils have a fragipan. Howard soils are deep, well-drained, mainly nearly level to gently rolling soils that formed in gravelly glacial outwash. In places Langford and Howard soils occur as small areas that are intricately mixed.

Lansing soils make up 10 percent of the association, Palmyra soils 7 percent, and Sloan soils 6 percent. The remaining 20 percent consists of spots of Cazenovia, Conesus, Dunkirk, Eel, Erie, Genesse, Honeoye, Lima, Madalin, and Schoharie soils and small areas of Muck and Alluvial land.

Dairying is the principal type of farming, and much of the acreage is in silage corn, oats, and hay used to feed dairy cattle. The important cash crops are winter wheat, dry field beans, and grain corn. Areas that have mild relief are used intensively for crops, whereas terrace fronts and strongly rolling, morainic areas are generally in permanent pasture.

Erosion is a serious hazard on the steeper slopes. Flooding occurs on bottom lands along the larger streams and results in some scouring and streambank cutting.

The dominant soils have many features that are favorable for industrial and residential sites. They vary in suitability for use as drainage fields for septic-tank systems.

The topography of the dominant soils is favorable for the development of play areas, picnic areas, and golf courses. The Howard soils, which formed in gravelly outwash, are too permeable to be used successfully as sites for ponds. All of the soils of this association are suitable for reforestation.

The codominant Howard soils formed in stratified or bedded sand and gravel. Thus, they are an excellent source of both borrow material and commercial sand and gravel. A large pit is in operation south of Locke, and there are many small pits throughout the area. Topsoil can be obtained from soils on bottom lands along streams. It commonly is many feet thick and fairly uniform in texture.

The bottom lands along the larger streams are periodically flooded, usually in spring before fieldwork begins. There generally is little damage except for some scouring and streambank cutting. Much of this acreage is in permanent pasture.

Associations Dominated by Soils Developed on Glacial Lake Sediments

These associations occupy about 9 percent of the county. They occur throughout the northern and central parts, adjacent to higher areas of soils that formed in glacial till.

The lime content of the soils ranges from high to low. The finer textured soils and the wet soils, which vary in texture, are high in content of lime. The other soils require heavy applications of lime for good plant growth.

13. Schoharie-Odessa association

Deep, well-drained to somewhat poorly drained, high-lime soils that have a fine-textured subsoil

This association occupies the nearly level to hilly, dissected lake plain bordering the north shore of Cayuga Lake, between Union Springs and Cayuga. It makes up slightly more than 1 percent of the county. Most of the acreage is used for dairy farms. A number of cottages have been built along the lake shore.

Schoharie soils make up about 40 percent of the association, and Odessa soils about 30 percent. Both formed in fine-textured, lake-laid sediments. Schoharie soils are deep and are well drained or moderately well drained. They have gentle to moderately steep, convex slopes on which little water accumulates. Odessa soils are deep, somewhat poorly drained, and nearly level to gently sloping. They occupy broad, flat hilltops, where runoff is slow, or foot slopes below Schoharie soils, where runoff accumulates.

Poorly drained Lakemont soils make up 10 percent of the association, and moderately well drained and well drained Cazenovia soils about 10 percent. The remaining 10 percent consists of small areas of Alden, Canandaigua, Fonda, Ontario, Madalin, and other minor soils.

These heavy textured soils are difficult to work, and they tend to puddle if worked when too moist. Thus, they are better suited to hay crops than to crops that require intensive cultivation. Dairying is the principal type of farming, and most of the crops grown are used to feed dairy cattle.

The soils of this association are high in clay content, and they are free of stones and gravel. They are highly susceptible to erosion, particularly in the more sloping areas.

The dominant soils have many properties that make them poorly suited as sites for industrial and residential developments. Drainage is slow, and the soil material is highly plastic when wet. The varved silts and clays in the substratum have poor bearing surface for structures. There are severe limitations if these soils are used as drainage fields for septic-tank effluent.

The rolling topography is favorable for the development of golf courses. Reforestation is successful if care is taken to select trees suited to the site. The growth rate of native hardwoods is high.

The dominant soils of this association formed in lake-laid sediments almost free of coarse, granular material. Consequently, they are limited in use for fill and are a poor source of sand and gravel. The 6- to 8-inch surface layer can be used as topsoil, but it commonly is high in clay content and too susceptible to puddling to be entirely satisfactory. The soils on bottom lands along Yawger Creek are a possible source of topsoil.

Flooding is a hazard only on the bottom lands along the small streams.

14. Arkport-Colonie association

Deep, well-drained to excessively drained, medium-lime and low-lime soils that have a moderately coarse textured or coarse textured subsoil over sand

This association consists mainly of undulating to hilly soils that formed in sandy, lake-laid or wind-blown deposits. It occupies two small areas that make up less than 1 percent of the county. One area, near the northern tip of Owasco Lake, is used for a cemetery and for residential developments. The other, which is about 2 miles east and north of Auburn, is mostly farmland.

Arkport soils make up about 50 percent of this association, and Colonie soils about 25 percent. Both are deep, well drained to excessively drained, and nearly level to moderately steep. Arkport soils differ from Colonie soils in that their subsoil contains bands of finer textured material. Because of these bands, the capacity of Arkport soils to hold moisture is slightly better than that of Colonie soils.

Schoharie soils make up about 10 percent of the association, and Odessa soils make up about 5 percent. The remaining 10 percent consists of small areas of Cazenovia, Honeoye, Lakemont, and Palmyra soils.

Only the area near Auburn is farmed. The soils in this area are used mainly for forage crops and are farmed with soils in the adjoining association.

The dominant soils are moderately susceptible to erosion, particularly in winter and early in spring when the ground is subject to freezing and thawing. They are also subject to wind erosion unless protected by a cover of vegetation.

This association is suitable for reforestation. Drainage is good, and most trees are well suited. The few remaining areas of woodland support excellent stands of hardwoods, mostly sugar maple, basswood, and tulip-poplar.

The dominant soils have some properties that are favorable for residential and industrial sites, but the bearing strength of the substratum varies considerably. Thus, careful investigation is required.

The sandy soil material commonly is free of stones and gravel. It is suitable for fill but is difficult to compact. In a few places there are strata of sand and gravel at a depth of 6 to 20 feet. The 6- to 8-inch surface layer is a fair source of topsoil. This sandy material can also be used as an amendment to finer textured topsoil material, and it is suitable for use as subbase in areas to be sodded.

Flooding is not a hazard in this association.

15. Williamson-Ira association

Deep, moderately well drained, low-lime soils that have a medium-textured to moderately coarse textured fragipan

This association occupies nearly level to gently sloping lake plains, on which there are scattered hills and mounds of till. It makes up about 6 percent of the county and occurs in the northern part in the towns of Sterling, Victory, and Ira. Some areas are used for dairy farms, and areas near Lake Ontario are used for fruits and vegetables, but much of the acreage is abandoned farmland that is reverting to trees and brush.

Williamson soils occupy about 25 percent of the association, and Ira soils about 15 percent. Both are deep, moderately well drained, low-lime soils that have a fragipan. Williamson soils formed in the silty, lake-laid deposits. Ira soils formed in glacial till on the mounds and hills and are at slightly higher elevations than the surrounding Williamson soils.

About 10 percent of this association consists of silty Niagara and Canandaigua soils, which formed in lake-laid deposits; another 10 percent consists of well-drained Sodus and somewhat poorly drained Scriba soils, which formed in glacial till; and the remaining 40 percent consists of Alden, Alton, and Colonie soils and Alluvial land, Muck, and Fresh water marsh.

Because of the favorable climate, areas bordering the lake are used for fruit, mainly apples and pears. These areas generally need intensive drainage for the satisfactory production of fruit. Some areas away from the lake are used for dairy farms and to a lesser extent for cash crops. The large areas of nearly level, stone-free soils are used for snap beans, potatoes, and other specialized crops. A large area near Martville is used for the commercial production of Christmas trees. Abandoned farmland throughout the association is reverting to brush and trees.

The dominant soils are susceptible to serious erosion.

The silty soils are particularly susceptible, either during periods of alternate freezing and thawing or when supplemental irrigation water is applied.

The soils as a whole have many properties that make them suitable for industrial and residential sites. The relief is mild, and drainage is good to moderately good. In the vicinity of Fair Haven State Park, the lakeshore is used as sites for cottages and camps. Much of the shore along the lake, however, is too swampy to be used for this purpose.

Recreational activity in this association is influenced by the lake and by Fair Haven State Park.

The wetlands and Fresh water marsh are excellent habitat for waterfowl. These areas and the fairly large areas of idle brushy land and native forest provide good cover for wildlife, but the food supply is limited because little grain or corn is grown in the area.

The dominant soils are well suited to most trees available for planting, but reforestation consists mainly of the commercial production of Christmas trees.

The substratum of the Ira soils is stony, but it can be used for hard fill. The lake-laid fine sands and silts, in which the Williamson soils formed, generally are not suitable for this purpose. The glacial outwash in which some of the minor soils formed is a good source of sand and gravel.

Topsoil in commercial quantities can be obtained from soils on the bottom lands along streams. The 6- to 8-inch surface layer of the soils that formed in siltlike deposits can also be used for topsoil, but the surface layer of the soils that formed from glacial till is too gravelly and stony.

Flooding is not a hazard in this association. Most soils are at an elevation above flood level.

16. Colonie-Alton association

Deep, well-drained, low-lime soils that have a coarse textured subsoil over sand or a moderately coarse textured subsoil over sand and gravel

This association occupies level to rolling sandy lake plains, outwash deposits, and gravelly glacial beach ridges. It occurs along the Wayne County line, in the town of Victory, and makes up less than 1 percent of the county. Most of the acreage is reverting to brush.

Colonie soils and Alton soils each make up about 30 percent of the association. Colonie soils are deep, well-drained to somewhat excessively drained, low-lime soils that formed in sandy deposits on the lake plains. Alton soils are deep, well-drained to excessively drained, gravelly, low-lime soils that formed in glacial outwash and beach deposits.

About 10 percent of this association consists of moderately well drained Williamson soils, which formed in silty lake-laid deposits. The remaining 30 percent consists of Canandaigua, Collamer, Hilton, Niagara, and Ontario soils.

The areas farmed are used mainly for grain corn, silage corn, oats, and hay. If irrigated, the more nearly level soils could be used intensively for market garden crops.

The soils absorb water readily. Thus, erosion by runoff is not a hazard except during periods of alternate freezing and thawing. Wind erosion is a serious hazard on Colonie soils, particularly early in spring.

The dominant soils have features that make them well suited as sites for industrial and residential developments. They have good drainage and good to fair bearing surfaces. They are sufficiently porous to be used as drainage fields for septic-tank systems.

Good drainage and the low content of clay make the soils suitable for the development of recreational areas. The main limitation for this use is the difficulty of establishing and maintaining a good sod cover.

The many brushy areas provide good cover for wildlife. Droughtiness and the sandy texture of the dominant soils are factors that should be considered in the selection of trees for reforestation.

Good fill material can be obtained from the gravelly soils, which formed in stratified deposits of gravel and sand. Fill material can also be obtained from the sandy soils, but it is difficult to compact. The dominant soils generally are considered too sandy or too gravelly to be a good source of topsoil.

Associations Dominated by Soils Developed on Flood Plains

There is only one association representing this group, which occupies about 1 percent of the county. The soils range from medium to high in content of lime. Thus, the amount of lime needed for good plant growth varies on the different soils.

17. Sloan-Eel association

Deep, very poorly drained to moderately well drained, medium-lime to high-lime soils that have a medium-textured subsoil

This association occurs on the nearly level flood plain along Owasco Inlet, between Moravia and Owasco Lake. It makes up less than 1 percent of the county. A few fields in the southern part of the association are cultivated, but most of the acreage is in permanent pasture or forest.

Sloan soils make up about 45 percent of the association, and Eel soils about 25 percent. Sloan soils are deep, nearly level, poorly drained or very poorly drained alluvial soils. Eel soils formed in similar material, but they are moderately well drained. Both soils are subject to periodic flooding.

About 15 percent of the association consists of spots of well-drained Genesee soils, which occur on flood plains and on gravelly fans. The remaining 15 percent consists of Dunkirk, Howard, Palmyra, and Schoharie soils.

Some areas in the southern part of this association are used for hay and corn, but most of the acreage is too wet or too frequently flooded to be used for crops. Much of it is in permanent pasture or forest.

The native forest consists mainly of soft maples, elms, and other water-tolerant trees. This association is too wet to be suited to reforestation, but the extensive areas of wetlands have value as habitat for wetland wildlife.

Poor drainage and periodic flooding severely limit the use of the soils for industrial and residential developments.

This association is a poor source of borrow material, sand, and gravel. It is a good source of topsoil. All of the soils on bottom lands, except those on fans, are deep and are uniform in texture. Prolonged wetness, however, may restrict digging operations.

Associations Dominated by Soils Developed on Organic Material

These associations occur mainly in the north-central part of the county where there are numerous shallow lakes in which organic material has collected. They make up about 6 percent of the county. The soils range from medium to high in content of lime.

18. Muck association

Deep to shallow, very poorly drained organic soils

This association consists of flat, swampy areas of organic soils, interspersed with smaller areas of mineral soils. It occupies three areas north of the Seneca River and makes up about 2 percent of the county. Some of the acreage has been drained and cultivated, but most of it is forested.

Muck soils make up about 60 percent of this association. About 40 percent of this is black granular muck over brown fibrous peat. This material is 2 to 3 feet thick. About 15 percent is black granular muck, less than 40 inches thick, over gray sand or clay. About 5 percent consists of fibrous peat and Edwards muck, which is underlain by white marl.

The rest of the association is made up of minor soils. About 15 percent is gravelly Alton and Palmyra soils, which occur as scattered, undulating upland areas, and 10 percent is sandy Galen and Colonie soils, which occur as small areas within or adjoining areas of muck. The remaining 15 percent consists of Alden, Canandaigua, Collamer, Fonda, Madalin, Niagara, and Williamson soils.

About a fourth of the acreage of muck, mainly deep muck, has been drained. These areas are managed intensively and are well suited to potatoes, celery, beets, carrots, lettuce, and other special crops. A few drained areas of shallow muck are used for general crops, including sugar beats, or for pasture. The larger areas of upland soils are also used for general crops. Potatoes and other market garden crops are grown in the larger sandy areas.

Undrained areas of muck are mostly in forest that consists largely of soft maples and elms. Only a few scattered areas are cattail marshes.

Muck is subject to damage by wind, whereas the sloping upland soils are likely to be eroded by water.

Muck and peat soils are highly unstable and have severe limitations for use as industrial or residential sites. The well-drained upland soils are suitable for such use.

This association is generally unsuitable for most recreational developments. The woodlands are mainly swampy, but they include small spots of uplands that provide good habitat for woodland wildlife.

Most of the soils of this association are a poor source of borrow material. The scattered areas of Alton and Palmyra soils are a good source of sand and gravel. Muck is a poor source of topsoil, although it commonly is used as a mulch or soil amendment to improve the quality of mineral soil, particularly in areas to be seeded to grass.

Some low areas adjacent to streams are subject to flooding in spring, and most low-lying areas are subject to ponding.

19. Muck-Warners association

Deep to shallow, very poorly drained organic soils, and very poorly drained to moderately well drained soils that developed in alluvium over marl

This association is on swampy flats that are under water for long periods of time. It occupies about 4 percent of the county and extends along the Seneca River, from north of Cayuga Lake eastward to the county line. Much of the acreage is in swampy woods or marsh grass.

Muck soils make up about 30 percent of the association, and Warners soils about 20 percent. Muck soils are very poorly drained. They consist of deep and shallow, granular muck, underlain by calcareous sand, silt, clay, or marl. A large part of the shallow muck is Edwards muck, which is shallow over lime marl.

Warners soils are deep, level to gently sloping, and very poorly drained to moderately well drained. They developed in alluvium 12 to 40 inches thick, over marl or over a mixture of marl, sand or silt, and muck.

About 10 percent of the association consists of poorly drained, clayey Madalin soils. Another 10 percent consists of sandy Stafford soils, sandy Lamson soils, and silty Canandaigua soils. The remaining 30 percent consists of small areas of Alton, Collamer, Dunkirk, Eel, Galen, Genesee, Hilton, Lairdsville, Minoa, Ontario, Palmyra, Sloan, Riga, and Wampsville soils.

Except for some of the minor, higher lying soils, most of the soils of this association are too wet to be used for crops unless they are drained and protected from flooding.

Erosion is not a hazard in the low, wet areas. Streambank cutting occurs but is not a serious hazard, because the water level of the Seneca River is controlled by the locks of the Barge Canal.

Although the soils generally are too wet to be desirable sites for industrial or residential developments, under special circumstances they are used for this purpose. A sugar refinery, built recently just north of Montezuma, was located on this site because of its proximity to the main line of the Penn Central Railroad and the New York State Thruway. Some of the minor upland soils are well suited as sites for individual homes or buildings.

The dominant soils are too wet for reforestation, but they provide good habitat for wetland wildlife. Most of the acreage has a cover of marsh grasses and water-tolerant trees. The Montezuma National Wildlife Refuge is directly across the Seneca River, and Howland's Island, a large game management area, is nearby.

This association is a poor source of sand, gravel, and borrow material. Topsoil can be obtained from the dominant mineral soils, but wetness may restrict digging operations.

The dominant soils are flooded annually, and they may be under water for extended periods in winter and in spring.

Use and Management of the Soils

In this section, the general management practices applicable to the soils of the county are discussed, the soils are grouped into capability classes to show their relative suitability for farming, and suggestions for the use and management of the soils in each capability unit are given. Included in this section is a table showing estimated average acre yields obtained from each of the soils at different levels of management. This section also groups the soils according to their suitability for use as woodland, and it discusses the suitability of the soils for wildlife habitat. The last part presents information about soil properties that are important to engineers and builders.

General Management for Farming [3]

This section is designed to help farmers, and those who advise farmers, to choose combinations of soil- and crop-management practices that are suitable for the wise and economic use of the soils on a farm and are appropriate for conditions prevailing at the time the choices are made. The user of this soil survey should modify his choices to take advantage of rapid advances in knowledge of soil and crop management resulting from agricultural research. 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. Other constantly revised information is available upon request from the Soil Conservation Service and 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 Cayuga County.

Acidity relationships of the soils

The natural lime content of the soils of Cayuga County ranges from very low to high. Figure 5 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.

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

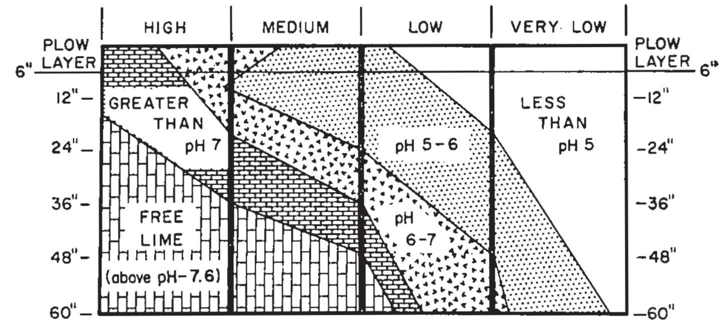

Figure 5.—Lime level of different soil profiles in Cayuga County.

Lime moves downward in a silt loam, the most common surface-soil texture in the county, at an average rate of about one-half inch each year. Also, a considerable amount of lime is removed by crops. Therefore, to maintain the desired pH in the plow layer of low-lime and medium-lime soils and of some high-lime soils, it is necessary to apply lime periodically, usually once each rotation sequence.

Subsoil characteristics that affect root growth

In choosing the crops to be grown on a specific 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 plant roots. Crops grown on these soils can send their roots to a great depth in quest of nutrients and moisture. Other soils, such as the Benson and Erie, contain an impeding layer, such as a fragipan or a layer of heavy clay, or they are shallow to bedrock. Such characteristics tend to inhibit root growth. Many of the high-lime and medium-lime soils have a subsoil that has blocky structure. 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 that have a fine-textured subsoil. Figure 6 shows the effect of soil drainage on root development.

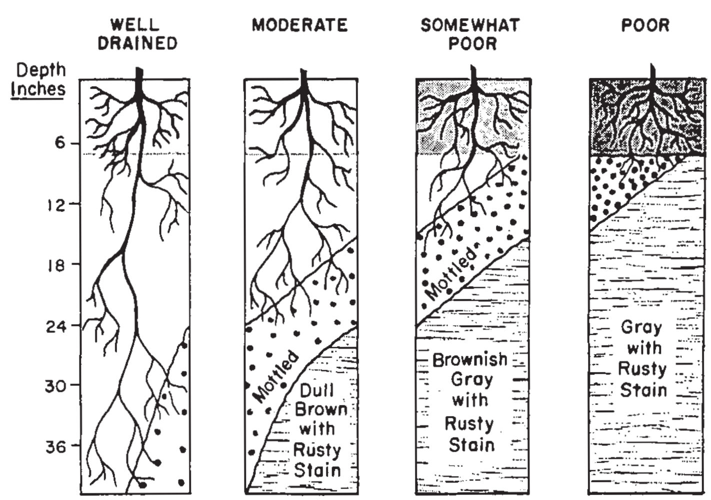

Figure 6.—Effect of soil drainage on root development.

[3] 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 studies performed on the Aurora and Mount Pleasant Research Farms by staff members and associates of the New York State College of Agriculture at Cornell University.

Nitrogen relationships of the soils

The average organic-matter content in the surface layer of soils on uplands in the county is 3.5 percent. This percentage was obtained from 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 nitrogen.

Phosphorus relationships of the soils

Most soils in the county are naturally somewhat low in ability to supply phosphorus, and the addition of appropriate amounts of phosphate [4] in the form of commercial fertilizer is essential for good crop growth. The moderately fine textured and fine textured soils have moderate phosphorus-supplying power. This means that they can release the equivalent of 20 to 25 pounds of phosphate annually. The medium-textured soils have low phosphorus-supplying power. This is equivalent to about 10 pounds of phosphate per year.

Potassium relationships of the soils

Extensive research trials at the Aurora Research Farm in Cayuga County show that soils high in clay content, such as the Odessa, have very high potassium-supplying power. Medium-textured soils that have an accumulation of clay in the subsoil, such as the Honeoye and Ontario, have moderate potassium-supplying power.

Soils that have high potassium-supplying power release approximately 120 pounds of potash [5] per year; soils that have moderate potassium-supplying power release approximately 70 pounds; and soils that have low potassium-supplying power generally release less than 70 pounds.

Crop adaptation relationships of the soils

Information about crops suited to the soils of Cayuga County is revised annually in the "Cornell Recommends" publications prepared by the staff of the New York State College of Agriculture at Cornell University. These publications are designed to keep New York farmers and those who advise farmers abreast of the latest applicable research findings in soil and crop management. The user of this soil survey is strongly urged to use current editions of these publications.

Capability Groups of Soils [6]

Capability classification is the grouping of soils to show, in a general way, their suitability for most kinds of farming. It is a practical classification based on limitations of the soils, the risk of damage when they are used, and the way they respond to treatment when used for the common field crops or for sown pasture. The classification does not apply to most horticultural crops and other corps that have special requirements. The soils are classified according to the degree and kind of permanent limitation, but without consideration of major and generally expensive land-forming that would change the slope, depth, or other characteristics of the soils, and without consideration of possible major reclamation projects.

In the capability system, all kinds of soils are grouped at three levels: the capability class, the subclass, and the unit.

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 require moderate conservation practices.
- Class III. Soils have severe limitations that reduce the choice of plants, or require special conservation practices, or both.
- Class IV. Soils have very severe limitations that restrict 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 food and cover.
- 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 food and cover.
- Class VII. Soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to grazing, woodland, or wildlife.
- Class VIII. Soils and landforms have limitations that preclude their use for commercial plant production 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 only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only subclasses indicated by *w*, *s*, and *c*, because the soils in it 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

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[4] To convert phosphorus (P) to phosphate (P_2O_5), multiply by 2.3; to convert phosphate to phosphorus, multiply by 0.43.

[5] To convert potash (K_2O) to potassium (K), multiply by 0.83; to convert potassium to potash, multiply by 1.2.

[6] This section prepared by ERNEST L. MCPHERRON, conservation agronomist, CHARLES R. BARNETT, JR., soil conservationist, and FRANK Z. HUTTON, JR., soil scientist, Soil Conservation Service.

unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-1 or IIIe-2. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraphs; and the Arabic numeral specifically identifies the capability unit within the subclass.

Management by Capability Units

In the following pages, each of the capability units in the county is described and suggestions for the use and management of the soils in each unit are given. The names of the soil series represented are mentioned in the description of each unit, but this does not mean that all of the soils in a given series are in the unit. The capability classification of each individual soil is shown in the "Guide to Mapping Units" at the back of this survey.

CAPABILITY UNIT I-1

This unit consists of deep, well-drained, nearly level to gently undulating soils of the Alton, Howard, Palmyra, and Wampsville series. These soils are on outwash terraces. They range from strongly acid to neutral in reaction. Their capacity to hold moisture and to supply plant nutrients is moderate to high.

These soils respond well to good management, are easy to work, and can be tilled fairly early in spring. Surface stones may interfere with machinery used to cultivate and harvest vegetable crops.

The soils of this unit are well suited to all of the crops commonly grown in the county and are especially well suited to deep-rooted crops. They generally are more valuable for rotation crops than for permanent pasture or woodland. Row crops can be grown repeatedly if the organic-matter content is maintained and soil structure is preserved. Organic matter can be replenished annually by use of crop residue and cover crops or occasionally by growing a sod crop. Minimum tillage helps to preserve soil structure. Irrigation water can be applied rapidly and in large quantities.

CAPABILITY UNIT I-2

Genesee silt loam, high bottom, is the only soil in this unit. This is a deep, level to very gently undulating, well-drained soil on high bottom lands along streams. Floods of short duration occur occasionally early in spring but do little or no damage to crops. The surface layer and subsoil range from slightly acid to slightly alkaline.

This soil is easy to work and responds well to good management. Its capacity to hold moisture and to supply plant nutrients is high.

This soil is excellent for all of the crops grown in the county. It generally is more valuable for rotation crops than for permanent pasture or woodland. Row crops can be grown continuously, but unless sod crops are included in the rotation, measures should be taken to maintain soil structure. Among these are use of cover crops, use of crop residue, and minimum tillage. Irrigation water can be applied rapidly and in large quantities. Streambank protection is needed in some places.

CAPABILITY UNIT IIe-1

This unit consists of gently sloping, or gently undulating soils of the Camillus, Honeoye, Lansing, and Ontario series. These are deep, well-drained soils that have a loamy to slightly clayey, neutral or slightly acid subsoil. Their capacity to hold moisture is high, and their ability to supply plant nutrients is moderate to high. Runoff is medium.

The soils of this unit are suited to all of the crops commonly grown in the county. Stones may interfere to some extent with machinery used to cultivate and harvest crops.

The more gentle and shorter slopes can be used almost continuously for row crops if tillage is kept to a minimum, fields are tilled across the slope, crop residues are returned to the soil, and a winter cover crop is grown. Good tilth can be maintained by minimum tillage, using a clod buster, disking before plowing, and curtailment of plowing when the soils are wet. Contour stripcropping, grassed waterways, and other erosion control measures are needed if the longer or steeper slopes are used moderately for row crops. Diversions help to shorten the length of slopes, but they may cause seep spots to form. Tile drainage is needed where wet spots are included in areas used for row crops.

CAPABILITY UNIT IIe-2

This unit consists of gently sloping or gently undulating soils of the Lordstown and Sodus series. These are deep and moderately deep, well-drained soils that have a very strongly acid to medium acid surface layer and subsoil. The moderately deep soils are underlain by acid sandstone or shale at a depth of 20 to 40 inches. The deep soils have a fragipan at a depth of 18 to 30 inches. The content of lime increases below the pan.

The capacity of these soils to hold moisture is moderate, and their ability to supply plant nutrients is good. Runoff is moderate, and erosion is a hazard.

The soils of this unit are suited to most of the forage and field crops commonly grown in the county. Heavy applications of lime are generally needed for legumes and other crops.

The more gentle or shorter slopes can be used almost continuously for row crops if a winter cover crop is grown and measures are taken to preserve tilth. Among the measures needed are minimum tillage, disking before plowing, use of a clod buster, and the utilization of crop residues. Contour stripcropping, grassed waterways, and other measures are needed to help control erosion if row crops are grown on the longer or steeper slopes. The long slopes in the southeastern part of the county can be used more intensively for row crops if diversions are constructed. A moderate amount of stones and gravel may interfere to some extent with the operation of machinery used to cultivate and harvest truck crops and sugar beets.

CAPABILITY UNIT IIe-3

This unit consists of deep, well-drained, gently sloping or gently undulating soils of the Alton, Howard, Palmyra, and Wampsville series. These soils occupy gravelly outwash terraces. Unless limed, they range from very strongly acid to neutral in both the surface layer and the subsoil. The lime content increases with depth.

The moisture-holding capacity of these soils is moderate, and their ability to hold plant nutrients is good. There is a slight to moderate hazard of erosion and of moisture loss because of the slope.

The soils of this unit generally are more valuable for rotation crops than for permanent cover crops. They are well suited to all the crops commonly grown in the county, and they are especially well suited to early planted crops and vegetables and to varieties of alfalfa that require good drainage and a deep rooting zone. Fruit crops are commonly grown. The gravel content may interfere to some extent with the use of machinery for cultivation. A moderate amount of lime generally is needed on soils that occur in the northern and southeastern parts of the county.

Contour measures should be used on the longer, uniform slopes to help control erosion. A cropping system that includes a sod crop can be used in undulating areas where contour measures are not practical. Minimum tillage and the return of crop residues to the soil are effective measures to maintain the organic-matter content and to preserve good tilth.

These soils are excellent for irrigated crops because infiltration is rapid and there is little or no crusting or sealing. They can also be cultivated soon after irrigation because there is little or no danger of compaction.

CAPABILITY UNIT IIe-4

Arkport fine sandy loam, 1 to 6 percent slopes, is the only soil in this unit. This is a deep, well-drained to excessively drained soil. The surface layer is strongly acid to slightly acid. The lime content gradually increases with depth. The natural supply of plant nutrients is low.

This soil is easy to work. It is especially well suited to vegetables, fruit crops, and other specialized crops. Although all crops common to the county can be grown, they may be adversely affected by erosion, droughtiness, and low natural fertility. Thus, deep-rooted crops should be favored. Lime and an annual topdressing of phosphate-potash fertilizer are needed.

Both wind and water erosion are hazards. Water erosion is a serious hazard on slopes that are bare and frozen. Where possible, fields should be tilled on the contour. Where contour tillage is not practical, a cropping system that includes hay crops is needed. Crop-residue management in addition to a winter cover crop is important in fields that are used for vegetables or that are intensively cropped. Minimum tillage and light tillage to break crusts, in combination with the use of a cover crop and the utilization of crop residue, are important measures to help control wind and water erosion and to maintain good tilth. Land smoothing or the filling of low, wet spots permits the more efficient use of farm machinery.

Irrigation is needed if this soil is used intensively for high-value crops. The response to lime and fertilizer is good when there is an adequate amount of moisture. Fertilizer should be applied when plants are ready to use it because this soil is low to moderate in moisture-holding capacity and it is readily leached of plant nutrients.

CAPABILITY UNIT IIe-5

Genesee gravelly loam, fan, is the only soil in this unit. This is a deep, nearly level to gently sloping, well-drained, gravelly soil on alluvial fans. It ranges from medium acid to neutral in both the surface layer and subsoil.

The moisture-holding capacity of this soil is moderate to high, and its ability to supply plant nutrients is moderate. The erosion hazard is slight to moderate. Occasional flooding results in some scouring and in changes in stream channels. The deposition of rubble is also a hazard. Measures are needed to maintain existing stream channels.

This soil is suited to all of the crops commonly grown in the county. It is easy to work, and it responds well to good management. The high content of gravel, however, may interfere with tillage and hinder the harvesting of sugar beets and other special crops. The maximum intensity of use should not exceed 3 years of a cultivated crop before a year of a sod crop.

This soil can be cultivated intensively if overflow can be diverted from cultivated areas. The use of cover crops, the utilization of crop residue, and minimum tillage are measures needed to improve soil structure, to increase moisture intake, and to control erosion. Contour tillage helps to control erosion in the more sloping areas.

CAPABILITY UNIT IIe-6

This unit consists of deep, gently sloping, moderately well drained soils that have a medium-textured to moderately fine textured, neutral to slightly acid subsoil. These soils are of the Conesus, Hilton, and Lima series. Their surface layer ranges from medium acid to neutral. Free lime generally occurs at a depth between 16 and 48 inches.

The capacity of these soils to hold moisture and to supply plant nutrients is good. Erosion is a moderate hazard. Thus, measures are needed to conserve soil and water.

The soils of this unit are well suited to all of the common crops and to many special crops. The selection of crops may be somewhat limited by slight to moderate stoniness. Tilth is good, but at times slight wetness delays planting in spring.

Slopes commonly are long, and they erode readily where water concentrates. Grassed waterways combined with contour stripcropping are generally effective in controlling erosion. Unless such erosion control measures are used, the maximum intensity of the rotation should not exceed 1 year of a row crop, 1 year of grain, and 1 year of sod.

Small included areas of wetter soils require random drainage. Main drainage outlets are needed in some places. Measures are needed to preserve tilth if the rotation includes more than 2 years of a row crop. Among these are minimum tillage, curtailment of plowing when the soils are wet, disking before plowing, and return of crop residue.

Deep-rooted perennials may be winterkilled in areas where drainage is inadequate and ice sheets form. Crops in these areas respond favorably to extra nitrogen in spring and summer.

The soils of this unit erode rapidly when saturated. The removal of excess water by underdrainage is an effective erosion control measure. If surface water inlets are properly located, the use of such drains reduces or eliminates the need for grassed waterways. There is a moderate erosion hazard when irrigation water is applied rapidly or in large quantities.

CAPABILITY UNIT IIe-7

This unit is made up of deep, gently sloping, moderately well drained soils of the Collamer and Williamson series. These soils have either a moderately heavy subsoil or a fragipan underlain by stratified silt, clay, or fine sand. The surface layer is very strongly acid to neutral. The lime content increases with depth. The moderately heavy subsoil or the fragipan restricts the movement of water. Consequently, planting may be delayed briefly in spring. Erosion is a hazard if these silty soils are left bare.

The soils of this unit are well suited to crops commonly grown in the county. They need careful management to reduce crusting, to control erosion, and to prevent the compaction of the subsoil. Good soil structure is difficult to maintain. Thus, plowing should not be done when the soils are wet. Minimum tillage, return of crop residue, and use of a winter cover crop help to maintain good tilth. Contour tillage to control erosion generally is impractical on the complex slopes. In these areas, cross-slope farming, combined with crop-residue management and a cropping system that includes a winter cover crop, helps to reduce soil loss. On unprotected slopes, the cropping system should not be more intensive than 1 year of a row crop, 1 year of grain, and 1 year of a sod crop.

The drainage of wet spots helps to make these soils more useful for all crops. These spots can be drained by land shaping and a random-tile drainage system.

CAPABILITY UNIT IIe-8

This unit consists of deep, gently sloping, moderately well drained to well drained soils of the Lairdsville, Riga, and Schoharie series. These soils have a medium-textured surface layer and a slightly clayey to clayey subsoil. The surface layer is neutral to slightly acid. Free lime occurs at a depth of 16 to 30 inches.

The soils of this unit are highly susceptible to erosion if left bare. After 1 or 2 years in a row crop, they tend to become cloddy or to crust severely. Measures are needed to preserve soil structure and to conserve both soil and water. Planting may be delayed briefly in spring because the heavy subsoil restricts the movement of water.

These soils are well suited to most crops commonly grown in the county, and they are especially well suited to alfalfa. The difficulty of maintaining good tilth limits their use for intertilled crops.

Cultivating these soils when the plow layer is too moist causes crusting, the formation of clods, and compaction of the soil material. The growing of sod crops and deep-rooted legumes helps to preserve soil structure. Unless slopes are terraced and water disposal systems are established to safely remove surface runoff, these soils should be kept in sod at least 3 years out of 5.

In many areas, the relief is too uneven to allow contour farming. Consequently, control of erosion is difficult if crops such as beans and sugar beets are grown. Occasionally, the cropping system should include a close-growing crop, a crop that produces a large amount of residue, or a year of a cover crop. Random tile drainage systems or grassed waterways are needed in places to drain wet spots.

CAPABILITY UNIT IIe-9

This unit consists of a deep, well-drained soil that has a moderately fine textured subsoil. This soil, Dunkirk silt loam, 1 to 6 percent slopes, has a medium acid to neutral surface layer. The content of lime increases with depth. The moisture-holding capacity is high, and the ability to supply phosphorus and potassium is moderate.

Although good soil structure is difficult to maintain, this soil is well suited to crops commonly grown in the county, if management is good. It is susceptible to erosion, and measures are needed to conserve both soil and water. The use of cover crops, the utilization of crop residue, and minimum tillage are effective in controlling erosion on slopes of less than 3 percent. These practices combined with terracing, grassed waterways, and, if practical, contour stripcropping are needed to help control erosion on slopes of 3 to 6 percent. In unprotected areas, the maximum intensity of the rotation should not exceed 1 year of a row crop, 1 year of grain, and 3 years of sod. A random tile system is needed in places to drain wet spots and natural waterways.

CAPABILITY UNIT IIe-10

This unit consists of deep and moderately deep, gently sloping, moderately well drained to well drained soils that have a moderately fine textured subsoil. These soils are of the Aurora and Cazenovia series. Their surface layer is neutral to slightly acid. The lime content increases with depth. The moderately deep soils are underlain by dark-gray, soft shale or limestone at a depth of 2 to 3 feet.

If properly managed, the soils of this unit are well suited to crops commonly grown in the county. Erosion is a hazard, however, and good tilth is difficult to maintain. Because the heavy subsoil restricts the movement of water, slight wetness may delay planting briefly in spring. The soil material tends to compact if farmed when wet.

These soils can be used for row crops, provided careful measures are taken to control erosion. If supporting practices such as stripcropping, minimum tillage, winter cover crops, and sod waterways are used, the rotation can be as intensive as 2 years of a row crop, 2 years of a small grain, and 3 years of hay. The response to a complete fertilizer is excellent.

Tile drainage systems and systems to remove excess surface water are needed in orchards and vineyards. Random tile drains commonly are needed in scattered wet spots.

Irrigation water is likely to cause erosion if applied too rapidly. Before irrigation water is applied, the soils should be cultivated to break any crusts that have formed.

CAPABILITY UNIT IIe-11

This unit consists of deep or moderately deep, gently sloping, acid soils of the Ira, Howard, and Langford series. Most of these soils are moderately well drained and have a well-expressed fragipan at a depth of 15 to 24 inches. The exception is the Howard soil, which is mapped as a complex with a Langford soil. The Howard soil is well drained, and it lacks a fragipan, but its use is governed by that of the Langford soil. The soils of this unit have an acid to slightly acid surface layer. The lime content increases with depth.

Slight wetness may delay planting briefly in spring. The fragipan restricts the depth of the rooting zone and thus limits both the amount of moisture available to plants and the supply of plant nutrients. Erosion is a moderate hazard, and measures are needed to conserve soil and moisture.

If well managed, these soils are fairly well suited to crops grown in support of dairying. They are well suited to rotations that include hay crops. Surface stones may interfere somewhat with machinery used in the tillage of truck crops and sugar beets.

If row crops are grown on the steeper and longer slopes, among the erosion control measures needed are contour tillage, stripcropping, and diversions. It may be practical to drain small, wet spots if the rotation includes more than 1 year of a row crop. The benefits of underdrainage systems are limited on these soils.

CAPABILITY UNIT IIw-1

Ira gravelly loam, 0 to 3 percent slopes, is the only soil in this unit. This is a deep, moderately well drained soil that contains a strong fragipan at a depth of 15 to 24 inches. The fragipan restricts the movement of water and the growth of plant roots. The surface layer is strongly acid to medium acid. The content of lime increases below the pan. The capacity of this soil to hold moisture is moderate to low, and its ability to supply plant nutrients is moderate. Erosion is not a hazard.

This soil is moderately well suited to row crops, and it is well suited to sod crops, small grain, and wood crops. Short-season row crops that do not require early planting or late harvesting are desirable. Stones may interfere with machinery used to till or harvest truck crops or sugar beets. Frost heaving is fairly common.

A good fertility program helps to lessen the adverse effect of the fragipan. Lime is needed if legumes are grown. A suitable legume mixture consists of alfalfa and grass or of alfalfa and trefoil.

Minimum tillage and disking stubble before plowing are among the measures needed to help maintain good tilth if this soil is used intensively for row crops.

Tile drainage systems are only moderately effective on this soil. Interceptor drains are fairly effective in areas where seepage or runoff collects.

CAPABILITY UNIT IIw-2

This unit consists of deep, moderately well drained, nearly level, loamy soils of the Collamer, Galen, and Williamson series. These soils occur at moderately low elevations and have a fluctuating water table. At a depth below 3 feet, they are underlain by clayey material that restricts the movement of water. Their surface layer is strongly acid to neutral. The content of lime increases with depth.

If properly managed, these soils are well suited to vegetables and other special crops. Slight wetness may delay planting briefly in spring. Freedom from stones and the ease with which crops can be sidedressed with nitrogen during the growing season make these soils particularly desirable for vegetables.

Among the measures needed if row crops are grown continuously are drainage, fertilization, and crop-residue management. Wind erosion is a hazard if fields are left bare. Thus, windbreaks are needed in broad, exposed areas.

A complete drainage system commonly is needed in areas used for early crops. The tile should be wrapped to prevent sand from entering the tile lines. Random tile is needed to drain low spots.

CAPABILITY UNIT IIw-3

Eel silt loam, high bottom, is the only soil in this unit. This is a deep, moderately well drained soil that occurs along streams. It is occasionally flooded for short periods early in spring, but there is little or no damage to crops. The height of the water table is governed by the water level of nearby streams. The surface layer and subsoil are slightly acid to slightly alkaline. The capacity of this soil to hold moisture and to supply plant nutrients is high.

This soil is suited to all of the crops commonly grown in the county, but it is especially well suited to crops that can tolerate wetness for short periods in spring. Short-season crops and annual forage crops grow well. A winter cover crop should follow a row crop. Vegetable crops generally respond well to irrigation.

Onsite investigation is needed to determine the need for diverting floodwater and protecting streambanks. Small, local wet spots can be eliminated by land smoothing.

CAPABILITY UNIT IIw-4

The only soil in this unit, Genesee silt loam, is deep and well drained. This soil occurs on bottom lands that are occasionally flooded. Although flooding is most common early in spring, it may occur at any time. The capacity of this soil to store moisture is high, and its ability to supply plant nutrients is good to excellent. The surface layer and subsoil are medium acid to mildly alkaline.

This soil is easy to work, and it is well suited to all of the crops commonly grown in the county, including deep-rooted crops. If it is used intensively for cultivated crops, dikes or diversions are needed to reduce the damage caused by flooding and by the deposition of debris. Few special management practices are needed. Small, included wet spots can be eliminated by land smoothing.

CAPABILITY UNIT IIw-5

This unit consists of deep, moderately well drained soils of the Eel and Warners series. These soils are on bottom lands that occasionally receive damaging overflow. Flooding is most common early in spring, but it may occur at any time. The capacity of these soils to store moisture and to supply plant nutrients is good to excellent.

The surface layer is neutral or slightly acid. The lime content commonly increases with depth.

Flooding limits the use of these soils for crops. If flooding is controlled, these soils can be used intensively for row crops. They are easy to work, but wetness may delay planting briefly in spring. Winter cover crops are needed in areas that are adjacent to rapidly flowing streams. Small grain is likely to lodge.

The improvement and maintenance of existing channels and the construction of levees are among the measures needed to reduce streambank cutting, scouring, and the deposition of debris. Land shaping is needed in some areas to provide better drainage.

Where flooding is not controlled, these soils can be used for sod crops that can tolerate wet conditions. Sod crops provide good forage if nitrogen fertilizer is applied annually.

CAPABILITY UNIT IIw-6

The soils in this unit are deep, nearly level, and moderately well drained. They are of the Conesus, Hilton, Lima, and Phelps series. Their surface layer is loamy, and in some places it is gravelly. It ranges from neutral to medium acid. The subsoil is loamy or slightly clayey. The lime content increases with depth. Drainage is somewhat restricted because of the seasonal high water table or the texture of the subsoil material. The capacity of these soils to store moisture and to supply plant nutrients is excellent.

The soils of this unit are well suited to all of the crops commonly grown in the county. They are easy to work, but slight wetness may delay planting briefly in spring. Crops respond well to nitrogen fertilizer applied early in spring when these soils tend to be cold and wet. In some areas, stones may interfere with machinery used to till truck crops or sugar beets. Frost heaving is a hazard, and perennial deep-rooted crops may be winterkilled.

Row crops can be grown continuously if all residue is returned to the soil. Minimum tillage and a rotation that includes a sod crop every 4 or 5 years help to preserve soil structure. Among the measures needed in fields that are likely to erode are minimum tillage, winter cover crops, cross-slope tillage, terraces, and sod waterways.

The random drainage of wet spots is important in many areas. Frequently, these spots are wet because of the partial failure of old drains.

CAPABILITY UNIT IIw-7

This unit consists of only one soil, Galen fine sandy loam, 2 to 6 percent slopes. This deep, friable soil is moderately well drained mainly because of a fluctuating water table or a clayey substratum.

If well managed, this soil is suited to vegetables and other special crops. It is easy to till but may crust if worked intensively. Thus, minimum tillage and frequent light cultivation are important. Slight wetness may delay planting briefly in spring. Areas that are left bare are susceptible to both wind and water erosion. Erosion can be controlled if fields are tilled on the contour or terraced, cover crops are grown, and all crop residue is left on the surface during winter months.

Underdrainage ranges from rapid in areas where the subsoil is sandy to slow in areas where the substratum is silty or clayey. When saturated, sand flows readily into the tile lines. Erosion control is essential to prevent the clogging of open drains.

The application of nitrogen fertilizer in spring is important for most crops. Because of excessive leaching, fertilizer should be applied often and according to the needs of the crop. If this soil is farmed intensively, cover crops and all crop residue should be returned to the soil each year to help maintain the organic-matter content.

CAPABILITY UNIT IIs-1

Ontario silt loam, moderately shallow variant, 0 to 3 percent slopes, is the only soil in this unit. This soil is well drained. It is underlain by limestone at a depth of 20 to 40 inches. Spots of both shallower and deeper soils occur in places. The reaction ranges from mildly acid to mildly alkaline.

The moisture-holding capacity of this soil is moderate to high, depending on the depth to bedrock, and its ability to hold and supply plant nutrients is good.

This soil is well suited to most crops common to the county, and it can be used for early planted crops. Good tilth is easily maintained if management is good. Erosion is not a hazard. Supplemental irrigation may be needed in dry years.

The supply of phosphorus and potassium is moderate, but additions of lime and fertilizer are needed for optimum yields. A high level of fertility helps to compensate for the effect of shallowness if the moisture supply is adequate. Lack of moisture may limit crop yields.

Efforts should be made to maintain soil depth. Farm machinery may be damaged by the underlying rock in shallow spots or by rock outcrops. Both water intake and soil structure are benefited by the use of cover crops, the utilization of crop residue, and minimum tillage.

CAPABILITY UNIT IIs-2

This unit consists of only one soil, Alton gravelly sandy loam, 0 to 3 percent slopes. This is a deep, well-drained or excessively drained soil on outwash terraces. Unless limed, the surface layer is very strongly acid to medium acid. The lime content increases with depth.

The moisture-holding capacity of this soil is moderate, infiltration is rapid, and natural fertility is low to moderate.

This soil is easy to work, and it can be planted early in spring. It can be used for all of the crops commonly grown in the county, but it is better suited to irrigated crops and to early vegetables because internal drainage is rapid. Deep-rooted crops are preferable for general cropping. Shallow-rooted crops may need frequent irrigation to maintain optimum yields. The content of gravel interferes to some extent with machinery used for cultivation.

Lime and fertilizer, especially potash, are needed. Fertilizer should be applied during the growing season to supply nutrients needed by the crop. The untimely application of large amounts of fertilizer or irrigation water can result in excessive loss of plant nutrients through leaching. General productiveness can be greatly improved by the use of cover crops, the utilization of crop residue, and minimum tillage. Some of the more sandy areas need to be protected from wind erosion.

CAPABILITY UNIT IIs-3

In this unit are deep, well-drained or excessively drained, gently sloping or undulating soils that have a moderately coarse textured surface layer. These soils are of the Alton, Colonie, and Palmyra series. They are strongly acid to neutral in the surface layer but generally increase in lime content with depth. Their moisture-holding capacity is low to moderate, infiltration is moderate to rapid, and natural fertility is low to medium.

The soils of this unit are easy to work, and they can be planted early in spring. They can be used for all of the crops commonly grown in the county but are better suited to irrigated crops and to early vegetables because internal drainage is rapid. Deep-rooted crops are preferable for general cropping. Shallow-rooted crops may need frequent irrigation to maintain optimum yields. The content of gravel interferes to some extent with machinery used for cultivation.

These soils are likely to erode, particularly in winter, because of the slope. Unless a winter crop is grown, the cropping system should not be more intensive than 3 years of a cultivated crop before a year of a sod crop. To keep these soils productive, organic matter should be replenished each year by returning winter cover crops, sod crops, or crop residue to the soil. The Colonie soil is susceptible to wind erosion and needs the protection of a cover crop or of crop residue during the winter.

CAPABILITY UNIT IIIe-1

The only soil in this unit, Farmington shaly silt loam, 1 to 12 percent slopes, is well drained. This soil is acid to alkaline, and it is underlain by alkaline to medium acid shale at a depth of 10 to 20 inches. It is low to moderate in moisture-holding capacity and moderate in ability to supply plant nutrients. Roots commonly penetrate the fracture planes of bedrock in search of moisture. Runoff is moderate to rapid, and erosion is a hazard. Measures are needed to conserve both soil and water.

This soil is suited to all of the crops commonly grown in the county. Shallowness to shale limits the amount of moisture that can be stored. Consequently, crops may be damaged during dry periods. The most suitable crops are those that mature early or that can withstand dry periods. The maximum intensity of the rotation should not exceed 1 year of a cultivated crop and 4 years of a sod crop. Supporting practices are needed to keep soil and water losses to a minimum. Among these are use of cover crops, utilization of crop residue, and if slopes are more than 3 percent, stripcropping or contour cultivation (fig. 7).

Lime is needed, and fertilizer should be applied each year to meet the needs of the growing crop.

CAPABILITY UNIT IIIe-2

This unit consists of deep, sloping or strongly sloping, well-drained soils that have a loamy surface layer and a slightly finer textured subsoil. These soils are of the Honeoye, Lansing, and Ontario series. Their surface layer is neutral to medium acid. The lime content increases with depth.

The capacity of these soils to hold moisture and to supply plant nutrients is good. Surface runoff is rapid, and measures are needed to conserve both soil and water. The stones and strong slopes make the use of precision machinery difficult.

The slope restricts the use of these soils for cultivated crops unless multiple measures are taken to control erosion. Among the measures needed are contour farming, contour stripcropping, diversions, and grassed waterways. These measures also help to increase the rate of water intake and to conserve moisture. Minimum tillage and the use of a cover crop or crop residue to stabilize the surface are important supporting practices. Tile drainage systems are needed in wet spots and along waterways. If adequate control measures are used, a suitable rotation consists of 1 year of a row crop followed by 1 year of small grain and 2 years of a sod crop.

Unless runoff and seepage are intercepted (fig. 8), water from these soils will collect on the level or nearly level soils downslope.

CAPABILITY UNIT IIIe-3

This unit consists of moderately deep and deep, strongly sloping, well-drained, acid soils of the Lordstown and Sodus series. The moderately deep soils have a loamy subsoil underlain by acid sandstone or shale at a depth of 20 to 40 inches. The deep soils have a fragipan at a depth of 18 to 30 inches. The lime content increases below the pan.

The soils of this unit are moderate to high in their capacity to hold moisture and moderate in their ability to hold plant nutrients. The strong slopes and the fragipan or the moderate depth to bedrock somewhat limit their use for crops. Runoff is medium. Thus, measures are needed to conserve both soil and water.

These soils are fairly well suited to crops commonly grown in the county, and they respond well to good management. Among the measures needed to control erosion and to conserve moisture are contour stripcropping, grassed waterways, and diversions to break up long slopes. Minimum tillage, use of cover crops, and utilization of crop residue help to preserve soil structure and to increase the rate of water intake.

Unless slopes of more than 300 feet in length are protected, the maximum intensity of the rotation should not exceed 1 year of a cultivated crop followed by 2 years of a sod-forming crop. Deep-rooted legumes are desirable because they make full use of the moisture available.

Deep placement of lime by plowing is desirable on these soils.

CAPABILITY UNIT IIIe-4

This unit consists of a deep, moderately well drained soil, Langford channery silt loam, 8 to 15 percent slopes. This soil has a well-expressed fragipan at a depth of 15 to 24 inches. Its surface layer is acid, and the fragipan is slightly acid to neutral.

The fragipan causes this soil to be slightly wet in spring. It also restricts the depth of the rooting zone and thus limits the amount of moisture available to plants. The slope somewhat limits the use of the soil for crops. Runoff is rapid, and erosion is a moderate hazard.

If well managed, this soil is fairly well suited to crops commonly grown in the county. Among the measures needed to control erosion and to conserve moisture are contour stripcropping and minimum tillage. Diversions are needed in some places to break up long slopes.

Figure 7.—In background, stripcropping on class IIIe soils. In foreground, broader strips are on class IIe soils.

Unless measures are taken to control erosion, the maximum intensity of the rotation should not exceed 1 year of a row crop, 1 year of small grain, and 5 years of a sod crop. Crops commonly grown in support of dairying respond well to fertilization and liming. There is some likelihood of slight frost heaving and of seepage in waterways. Thus, a mixture of alfalfa and trefoil is desirable in a rotation that includes more than 2 or 3 years of a hay crop. The preservation of good tilth is seldom a problem if the rotation includes from 3 to 5 years of a sod crop.

Underdrainage generally is not satisfactory on this soil, because of the fragipan. Consequently, contour strips should be graded to grassed waterways.

CAPABILITY UNIT IIIe-5

This unit consists of a deep, moderately well drained, acid soil, Williamson silt loam, 6 to 12 percent slopes. The high content of silt and of very fine sand gives this soil a "floury" texture. A fragipan, which begins at a depth of 15 to 24 inches, causes the soil to be slightly wet in spring.

This soil is readily eroded because of its silty texture and strong slopes. Many slopes are moderately complex, which makes contour cultivation difficult. Although the natural supply of potassium is low, the ability of this soil to hold and supply plant nutrients is good. Its moisture-holding capacity is moderate.

If properly managed, this soil is suited to all of the crops commonly grown in the county. Although grassland farming is a more practical use because of the complex slopes, vegetables and grain are also grown because the soil is free of stones and has high production potential.

The length of time that fields are left bare should be kept to a minimum to prevent erosion. Slopes of more than 300 feet in length need the protection of contour stripcropping, sod waterways, crop residue, and winter cover crops. Where complex slopes make contour operations impractical, the maximum intensity of the rotation should not exceed 1 year of a row crop and 6 years of a sod crop.

Care should also be taken to preserve soil tilth. Frequent tillage causes severe erosion, crusting, loss of organic matter, and the development of a plowpan.

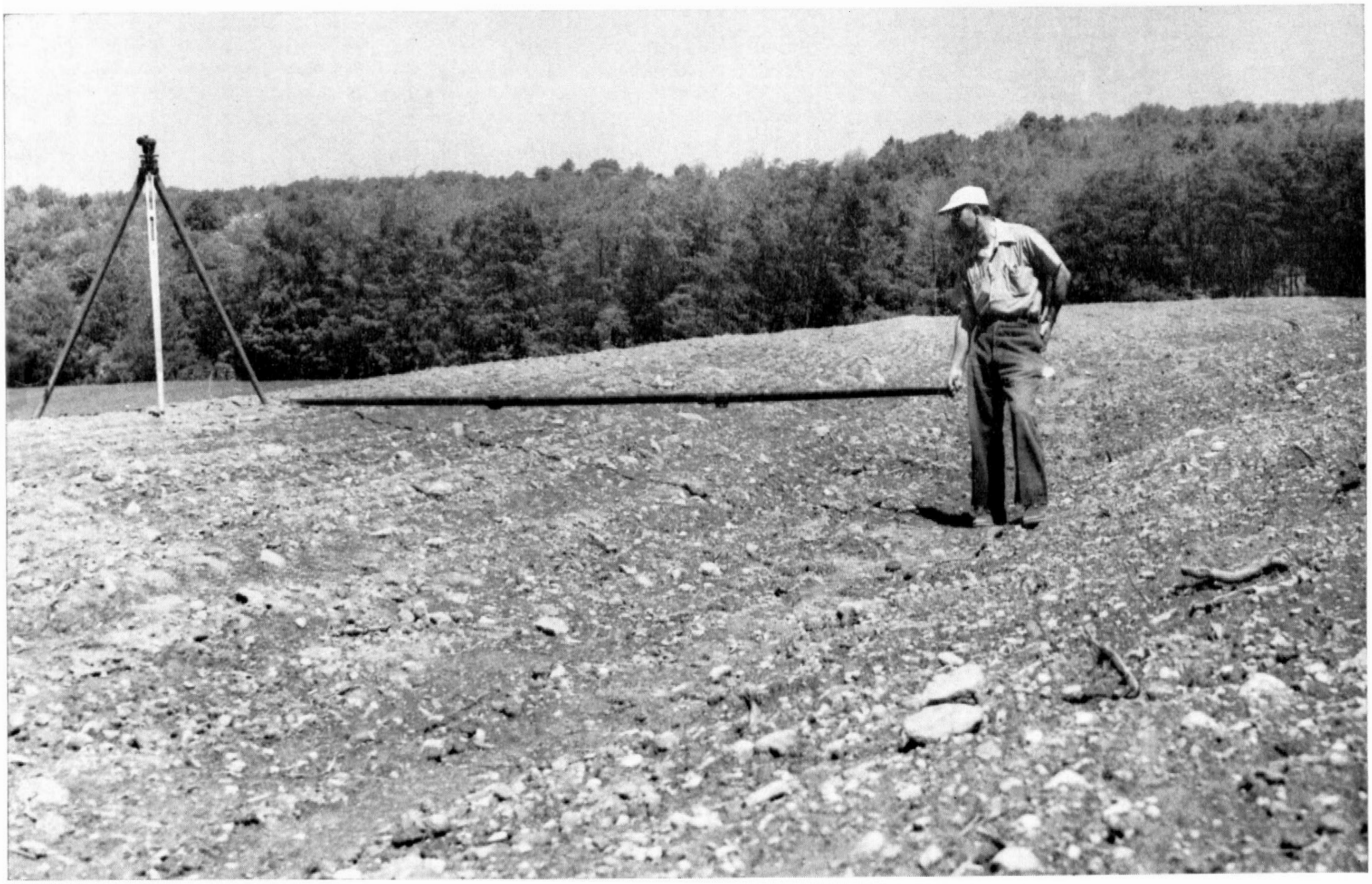

Figure 8.—Constructing a diversion ditch on Lansing gravelly silt loam, 8 to 14 percent slopes, to intercept seepage and runoff. The high content of gravel and angular stone fragments is typical of Lansing soils.

Careful management is needed in irrigated areas to prevent serious erosion and loss of water.

CAPABILITY UNIT IIIe-6

In this unit are deep to moderately deep, strongly sloping, moderately well drained to well drained soils of the Aurora and Cazenovia series. These soils have a neutral to medium acid, medium-textured surface layer. The lime content increases with depth.

The soils of this unit may be slightly wet in spring. They are subject to severe erosion if left bare. Measures to control erosion and to conserve moisture are needed.

Among the measures needed if these soils are used for row crops are contour stripcropping, diversions, and grassed waterways. Supporting practices that help to preserve tilth and to control erosion are minimum tillage, use of winter cover crops, and utilization of crop residue. Tillage should be kept to a minimum of three plowings between 2 years or more of a sod crop. Where the complex slopes make contour farming impractical, crops should be limited to small grain and hay.

Forage production can be maintained at a high level if the fertility needs of the crop are met and if forage is harvested when plants have a strong root system.

Grassed waterways should have underdrains and surface inlets. The underlying shale may interfere with the placement of tile lines in wet spots and drainageways.

CAPABILITY UNIT IIIw-1

This unit consists only of Muck, deep. This material is more than 40 inches thick over marl or over sand, silt, clay, or a combination of these materials. The muck is mainly slightly acid or neutral in reaction. The underlying material ranges from medium acid to calcareous. The capacity of this soil to hold moisture and to supply plant nutrients is high. Wind erosion and fire are serious hazards.

If this soil is adequately drained and fertilized, it can be used intensively for a variety of row crops. The drainage system should consist of open and closed drains, pumping systems, and water-level control structures. Either manmade or vegetative windbreaks are needed. Excessive tillage encourages the oxidation of organic matter and should be avoided. All crop residue should be returned to the soil. Drained muck gradually subsides because of oxidation or wind erosion. Frosts are common late in spring and early in fall.

The cost of drainage and special equipment generally prohibits the use of muck for hay, small grain, and field crops. Grain crops are likely to lodge. Muck generally is not suitable for use as improved pasture.

CAPABILITY UNIT IIIw-2

This unit consists of deep, medium-textured and moderately coarse textured soils of the Appleton, Canandaigua, Fredon, Kendaia, Lyons, Minoa, Niagara, and Stafford series. These soils are poorly drained or somewhat poorly drained as a result of a high water table or a slowly permeable substratum. Their surface layer ranges from neutral to medium acid. The lime content increases with depth.

The capacity of these soils to hold moisture and to supply plant nutrients is good. Wind erosion is a hazard on the more sandy soils.

Adequately drained areas are well suited to all of the common field crops and to most vegetables. Both tile drainage systems and open drainage ditches can be used, provided they are carefully designed and properly installed, especially in the more silty and sandy soils. When saturated, the silt and sand flow readily and plug both open and closed drains.

Minimum tillage and the return of all crop residue are important practices if row crops are grown continuously. A sod crop or a green-manure crop, grown in rotation with other crops, helps to preserve soil structure.

Undrained areas are better suited to birdsfoot trefoil, timothy, or other hay and forage crops that can tolerate some wetness.

CAPABILITY UNIT IIIw-3

This unit consists of deep and moderately deep, nearly level, somewhat poorly drained, loamy soils. These soils are of the Erie and Scriba series. They have a very dense, slowly permeable fragipan at a depth of 12 to 18 inches and in most places are underlain by bedrock at a depth below 20 inches. The surface layer is acid, and the fragipan is slightly acid to neutral.

These soils generally are more than 15 percent stone fragments, by volume. The fragipan causes them to be seasonally wet, limits the amount of water available, and restricts the depth of the rooting zone.

Undrained areas are suitable for forage crops that can tolerate wetness. Tile can be used for the random drainage of wet spots in the deeper soils, but a complete drainage system should include a pattern of open drains because of the shallow depth to the slowly permeable fragipan.

Forage crops can be harvested more readily if water from higher areas is diverted from these soils. A heavy annual application of nitrogen fertilizer on sod crops that can tolerate wetness increases forage production.

CAPABILITY UNIT IIIw-4

This unit consists of deep, poorly drained and very poorly drained, silty and loamy soils on bottom lands that are subject to flooding. These soils are of the Warners and Sloan series. They are underlain at a depth of 2 to 4 feet by gravel, sand, silt, clay, or marl. The height of the water table is governed by the water level of nearby streams and lakes.

The organic-matter content of these soils is high, and their capacity to hold moisture and to supply plant nutrients is good.

Where the water level of nearby streams and lakes is lowered and controlled, these soils can be drained and used for crops. If well drained and protected from flooding, they have high potential for intensive cropping. They are excellent for crops in dry years. Only lime-tolerant crops should be grown in areas where marl occurs at a depth of 13 to 30 inches. Undrained areas generally are better suited to pasture or woodland.

CAPABILITY UNIT IIIw-5

This unit consists of deep, nearly level, somewhat poorly drained soils of the Odessa and Ovid series. These soils have a clayey subsoil that restricts drainage. The surface layer is slightly acid to neutral in reaction. The lime content increases with depth.

The ability of these soils to supply plant nutrients is moderate to high. Planting commonly is delayed in spring because of moderate wetness, and plant growth is affected during wet periods. Maintaining good soil structure generally is difficult.

An extensive system of underdrainage is essential if these soils are used for crops. Tile lines need to be closely spaced because the subsoil is slowly permeable. Land smoothing is desirable to supplement tile drainage. Inadequately drained areas should be used mainly for moisture-tolerant crops.

If these soils are used moderately intensively for crops, they need careful management to maintain good tilth. They must not be plowed when wet, and they should not be plowed more often than 3 years in succession before they are used at least 1 year for a sod crop. In addition, all crop residue should be returned to the soil, and tillage should be kept to a minimum. It is desirable to disk stubble before plowing and to use a pulverizer when plowing. There are no stones to interfere with precision machinery.

These soils crust readily if irrigation water is applied rapidly.

CAPABILITY UNIT IIIw-6

This unit consists of deep and moderately deep, gently sloping, somewhat poorly drained soils that have a clayey or slightly clayey subsoil. These soils are of the Angola, Odessa, and Ovid series. Their surface layer is slightly acid to neutral. The lime content increases with depth.

The soils of this unit have moderate to high moisture-holding capacity. They are high in potassium and are medium in nitrogen and phosphorus. Drainage is restricted by the heavy subsoil. The hazard of erosion is serious.

If adequately drained and otherwise well managed, these soils are fairly well suited to all of the crops commonly grown in the county. Nevertheless, the maximum intensity of the rotation should not exceed 2 years of a row crop, 1 year of small grain, and 1 year of a sod crop. Undrained areas should be limited to short-season crops, small grain, or sod crops that can tolerate wetness.

The complex slopes are more likely to erode and thus should be used less intensively than the longer slopes.

Terraces or contour graded strips, grassed waterways, and winter cover crops help to control erosion on long slopes. Good tilth can be maintained by curtailment of plowing when the soils are wet, disking stubble before plowing, minimum tillage, and return of all crop residue. Stoniness is not a limitation in the use of these soils for truck crops.

The response to underdrainage varies. In some places, only the random drainage of wet spots is desirable.

Irrigation water needs to be carefully controlled to prevent serious erosion.

CAPABILITY UNIT IIIw-7

In this unit are moderately deep, gently sloping, somewhat poorly drained soils of the Brockport and Lockport series. These soils have a clayey subsoil and are underlain by soft, clay shale at a depth of 24 to 36 inches. Their surface layer is slightly acid to neutral. The lime content increases with depth.

These soils are difficult to drain and to keep in good tilth. Both the clayey subsoil and the underlying clay shale retrict drainage. Consequently, wetness may delay planting in spring.

Unless these soils are drained, their use for crops is limited. Most areas are used for hay, small grain, and an occasional row crop. A closely spaced pattern of underdrains is needed if row crops are grown. Runoff from higher areas should be channeled to safe outlets. The smoothing of surface depressions helps to supplement tile drainage systems. Even in drained areas, the rotation should not be more intensive than 2 years of a row crop, 1 year of small grain, and 3 years of a sod crop. Long slopes need the protection of graded strips, grassed waterways, and winter cover crops.

Management of tilth is essential and complex. Plowing should be done when the moisture content is moderate or low. Fall plowing is desirable in the more nearly level areas. All crop residue should be returned to the soil.

Undrained areas produce good forage crops if water-tolerant varieties are used and a complete fertilizer, high in nitrogen content, is applied annually.

CAPABILITY UNIT IIIw-8

This unit consists of poorly drained and very poorly drained soils in depressions or in flat areas. These soils are of the Alden and Lamson series. Their surface layer is neutral to slightly acid. The lime content increases with depth.

The soils of this unit are very wet and commonly have a mucky, silt loam or fine sandy loam surface layer. Wetness is caused mainly by the high water table. The capacity of these soils to hold moisture and to supply plant nutrients is good.

If adequately drained and otherwise well managed, these soils are well suited to crops commonly grown in the county. Drained areas can be used intensively for row crops.

The response to deep underdrainage is excellent if outlets are available. Care needs to be taken in installing both closed and open drains to prevent saturated silt and fine sand from the substratum plugging drains. Among the supporting practices needed are use of cover crops, return of crop residue, and minimum tillage.

Undrained areas are too wet for cultivated crops, and they are not suited to improved pasture.

CAPABILITY UNIT IIIw-9

In this unit are deep and moderately deep, gently sloping, somewhat poorly drained soils that have a dense, slowly permeable fragipan at a depth of 12 to 18 inches. These soils are of the Erie series. Their surface layer is acid, and the fragipan is slightly acid to neutral. Angular stone fragments occur throughout the soil material.

The soils of this unit are limited in use for crops mainly because of excess wetness, but they are also susceptible to erosion. The fragipan restricts drainage and limits the amount of water and nutrients available to plants. As roots cannot penetrate the pan, crops commonly are damaged by lack of moisture during dry periods.

These soils are suitable for selected crops if measures are taken to improve drainage and to conserve soil and moisture. Long-term hay rotations are most suitable. The rotation can be as intensive as 1 year of a row crop and 2 years of hay if supporting measures include graded contour stripcropping, grassed waterways, drainage diversions, crop-residue management, use of cover crops, and minimum tillage. Small grain can be grown in a rotation with sod crops.

Tile drainage systems generally are impractical on these soils. Only small local wet spots should be underdrained. Surface runoff can be controlled and safely disposed of by a system of diversion terraces. These terraces also help in erosion control, which is important because of shallowness to the fragipan. Surface stones may interfere with machinery used to harvest some crops.

CAPABILITY UNIT IIIw-10

This unit consists of only one soil, Kendaia silt loam, 3 to 8 percent slopes. This is a somewhat poorly drained soil that formed in limy glacial till. The surface layer is neutral to slightly acid. Free lime occurs at a depth of 18 to 30 inches.

The capacity of this soil to hold moisture is high, and its ability to supply plant nutrients is moderate. Planting commonly is delayed in spring because of moderate wetness, and plant growth is affected during wet periods. Erosion is a moderate hazard.

Adequately drained areas can be used for all of the crops commonly grown in the county. The rotation can be as intensive as 1 year of a sod crop for each 5 years of a row crop if all practical measures are taken to control erosion and to preserve soil tilth. On unprotected slopes, the rotation should not be more intensive than 1 year of a cultivated crop, 1 year of a small grain, and 2 years of a sod crop.

Deep underdrainage systems function well. In places diversions and terraces are needed to dispose of surface runoff from higher areas. Among the measures needed to preserve good tilth if this soil is used intensively are minimum tillage, curtailment of plowing when the soil is wet, and disking stubble before plowing.

CAPABILITY UNIT IIIs-1

This unit consists of a deep, acid soil, Colonie loamy fine sand, 1 to 6 percent slopes. This soil is low to moderate in moisture-holding capacity and low in natural fertility. Its ability to supply applied nutrients is good if moisture is available. The hazard of water erosion is slight, but the hazard of wind erosion is severe.

This soil is easy to work, and it can be planted early in spring. If irrigated and heavily fertilized, it is well suited to early truck crops. Although it can be used for some field crops, only moderate yields can be expected. Deep-rooted crops that can withstand dry periods should be selected.

If this soil is used intensively for vegetables, it needs to be heavily fertilized, irrigated, and protected from wind erosion. Overirrigation results in excessive loss of plant nutrients. To reduce nutrient loss through leaching, a complete fertilizer should be applied in amounts needed by the crop during the growing season.

This soil erodes readily during winter unless the surface is protected by crop residue or by a winter cover crop. A combination of measures is needed to control wind erosion. Among these are vegetative windbreaks, stripcropping, and the careful use of crop residue. Maintenance of good tilth is not a problem if crop residue is used to protect this soil from erosion.

CAPABILITY UNIT IIIs-2

This unit consists of a shallow, well-drained soil, Benson loam, 1 to 8 percent slopes. This soil is underlain at a depth of 10 to 20 inches by limestone.

Shallowness to bedrock limits the amount of moisture that can be stored. Consequently, plants are affected by lack of moisture even during short dry periods. Outcrops of bedrock make the use of farm machinery difficult.

This soil can be used for all of the crops commonly grown in the county, but it is better suited to short-season crops because of its low moisture-holding capacity. A suitable rotation consists of 1 year of a cultivated crop, a winter grain, and 6 years of a sod crop. Sod crops that can be harvested early should be selected. Nitrogen fertilizer, applied early in spring, helps to increase forage yields.

Contour cultivation, utilization of crop residue, and use of cover crops help to reduce soil loss and to conserve moisture. To make the best use of available moisture, a complete fertilizer should be applied each year according to the needs of the growing crop.

CAPABILITY UNIT IVe-1

This unit consists of deep and moderately deep, rolling to moderately steep, well-drained soils of the Honeoye, Lansing, and Ontario series. The surface layer is acid to neutral in reaction. The lime content increases with depth.

The capacity of these soils to hold moisture is moderate, and their ability to supply plant nutrients is moderate to high. Runoff is rapid, and erosion is a serious hazard.

These soils generally are not suited to contour farming. Contour tillage is impractical on the strongly rolling slopes, and it would be hazardous to operate farm machinery on the contour on the steep slopes.

On the rolling slopes, long rotations can be safely used. A suitable rotation could consist of either 1 year of corn, 1 year of wheat, and 6 years of hay or 2 years of small grain and 5 years of hay. If stripcropping is used, a more intensive rotation could be followed. It could consist of 1 year of corn, 1 year of small grain, and 3 years of sod. A fall grain or a cover crop should immediately follow a corn crop that is removed for silage. Deep-rooted crops produce well under good management.

Field strips and grassed waterways should be used where practical. Crop residue should be utilized, and tillage kept to a minimum. Random tile lines are needed in places to drain wet spots or protect drainageways. Diversions generally are not practical.

CAPABILITY UNIT IVe-2

This unit consists of deep and moderately deep, sloping and strongly sloping, well-drained soils of the Camillus, Honeoye, Lansing, and Ontario series. Past erosion has depleted the organic-matter content of these soils and in places has exposed the finer textured subsoil. The present surface layer is slightly acid or neutral in reaction. The lime content increases with depth.

The soils of this unit have good moisture-holding capacity and fair ability to supply plant nutrients, but they clod and seal over readily. Maintenance of good tilth is difficult, and erosion is a serious hazard. The numerous rills and gullies that have formed as a result of past erosion make the control of further erosion difficult.

These soils are suitable for hay and pasture crops if they are fertilized and harvested to maintain optimum yields. If erosion is controlled, a high-residue crop that provides winter cover can be included in the rotation. Where fields are farmed on the contour, the rotation can be as intensive as 1 year of corn for grain, 1 year of oats, 1 year of wheat, and 6 years of a hay crop, or it can consist of 1 year of silage corn, 1 year of wheat, and 6 years of a hay crop. Among the measures needed if row crops are grown are contour stripcropping, grassed waterways, use of cover crops, and minimum tillage. Fertility should be kept at a high level.

An alternate use for these soils is long-term hay. When necessary, reseeding can be done in narrow strips, as nearly on the contour as practical.

CAPABILITY UNIT IVe-3

This unit consists of deep, strongly sloping to moderately steep, well drained and moderately well drained, acid soils of the Howard, Langford, and Sodus series. Most of these soils have a neutral to slightly acid fragipan at a depth of 15 to 24 inches. The Howard soils lack the fragipan, but they are mapped as a complex with Langford soils and are used and managed in the same way. Some areas of the Sodus soils are eroded.

Because the soils of this unit have rapid to very rapid runoff, the amount of moisture retained is limited, and the hazard of erosion is serious. Measures are needed to conserve both soil and water.

All crops common to the county can be grown, but crops that produce forage for livestock are better suited. If the simple slopes are stripcropped, the rotation can be as intensive as 2 years of a row crop and 6 years of a close-growing crop.

Large amounts of crop residue and manure should be returned annually to the eroded soils. A winter cover crop is essential if a row crop is grown.

The use of farm machinery on the steep slopes is hazardous, and the loss of moisture through runoff may limit crop yields. Lime and fertilizer are needed to maintain productive sod crops. Minimum tillage, in combination with a cover crop or use of crop residue, helps to reduce soil and water loss in cultivated fields. Grassed waterways are needed to dispose of excess water.

CAPABILITY UNIT IVe-4

This unit consists mainly of shallow, gently sloping to moderately steep, excessively drained to moderately well drained soils of the Arnot, Aurora, Benson, and Farmington series. These soils are underlain at a depth of 10 to 20 inches by shale, sandstone, or limestone. Rock outcrops are common. The reaction ranges from very strongly acid to neutral.

The rooting zone of these soils is limited because of shallowness to bedrock, and their moisture-holding capacity is low or very low. Loss of moisture through runoff or loss of soil material through erosion can be critical on these shallow soils.

Droughtiness limits the use of these soils for crops. Shallow spots and rock outcrops are likely to hinder tillage operations. Sod crops should be grown as much of the time as possible because of the serious consequences of erosion. Reseeding should be done in strips across the slope.

These soils generally can be tilled fairly early in spring. Thus, they generally are suitable for early maturing grain crops. Grasses and legumes that can tolerate droughtiness are also suitable. The growth of pasture plants is fair early in spring but poor early in summer.

CAPABILITY UNIT IVe-5

This unit consists of a moderately well drained, acid soil, Williamson silt loam, 6 to 12 percent slopes, eroded. This soil has a fragipan that restricts the movement of water and the growth of plant roots. In an uneroded soil, the depth to the fragipan ranges from 18 to 24 inches, but in this soil, the depth has been lessened as much as 8 inches by erosion.

The organic-matter content of this soil has been depleted, and tilth is poor. The capacity to hold moisture and to supply plant nutrients is low. There are numerous rills and gullies, too deep to be removed by normal tillage.

This soil is suited to most crops common to the county, except alfalfa or other crops that require a deep, well-drained rooting zone. The maximum intensity of the crop rotation should be no more than 1 year of a row crop, 1 year of grain, and 2 or 3 years of a hay crop, preferably with a winter cover crop. Contour stripcropping and diversions should be used where practical. Minimum tillage and utilization of crop residue help to restore good soil structure.

CAPABILITY UNIT IVe-6

This unit consists of a moderately deep, somewhat poorly drained soil, Angola silt loam, 6 to 12 percent slopes. Most slopes are short. This soil is susceptible to moderate to severe erosion. Gullies that penetrate into the underlying bedrock are common.

Planting commonly is delayed in spring because of moderate wetness, and plant growth is affected during wet periods. Runoff, from adjacent areas, and seepage contribute to the wetness hazard. The ability of this soil to supply plant nutrients is moderate to low, depending on the degree of erosion. The moisture-holding capacity is low. Thus, droughtiness is a hazard during dry periods. Shallow spots and occasional outcrops of bedrock hinder tillage.

If this soil is cultivated, sod crops should make up a large proportion of the crop rotation. Stripcropping generally is not practical on these short slopes, but contour tillage or cross-slope tillage is needed if intertilled crops are grown or if fields are plowed frequently. Measures are also needed to help prevent cloddiness. Among these are fall plowing on the contour, use of winter cover crops, and utilization of crop residue.

CAPABILITY UNIT IVe-7

In this unit are deep and moderately deep, sloping to rolling, moderately well drained and well drained soils of the Lairdsville, Riga, and Schoharie series. These soils have a medium-textured surface layer and a moderately fine textured to fine textured subsoil. They are high in potassium, medium in phosphorus, and low in nitrogen. The surface layer is neutral to medium acid. The lime content increases with depth.

The soils of this unit are highly erodible because of their texture and slow rate of water intake. The organic-matter content has been depleted, and soil structure is poor. The moisture-holding capacity ranges from moderate to high.

These soils can be used for common field crops, but they are better suited to permanent pasture. If a complete fertilizer is used, deep-rooted legumes and other forage crops grow well. In cultivated fields, either crop-residue management or a winter grain crop is needed, along with other measures, for control of erosion. Where fields are stripcropped, a safe rotation consists of 1 year of corn and 4 years of a sod crop. Contour tillage generally is difficult or impractical because many areas are undulating or rolling.

These soils can be tilled within only a narrow range of moisture content. They should not be tilled when wet. They crust easily unless tillage is kept to a minimum.

CAPABILITY UNIT IVe-8

The only soil in this unit, Dunkirk silt loam, 6 to 12 percent slopes, eroded, is deep and well drained. Erosion has depleted the organic-matter content and in places has exposed the finer textured subsoil. The present surface layer is slightly acid to neutral in reaction. The lime content increases with depth.

The capacity of the soil to hold moisture is fair to good. The ability to supply plant nutrients is low. Control of erosion is difficult because of the rolling slopes and numerous rills and gulleys.

Unless adequate control measures are employed, this soil is better suited to permanent cover crops than to other crops. Frequent tillage breaks down soil structure and causes the surface to crust readily. Crusting results in reduced water intake, large amounts of runoff, and severe loss of soil and organic matter.

Grassed waterways and diversions as supplements to the use of cover crops, crop-residue management, and proper tillage are needed to minimize the erosion hazard. Where erosion control measures are used, a suitable rotation consists of 1 year of a row crop and 4 years of sod.

Grassed waterways and diversions are needed in most areas. Measures such as use of cover crops, crop-residue management, and minimum tillage are important.

CAPABILITY UNIT IVe-9

This unit consists of deep, moderately well drained to well drained, moderately steep or strongly rolling soils that have a loamy surface layer and a slightly finer textured subsoil. These soils are of the Cazenovia series. Their surface layer ranges from medium acid to mildly alkaline.

The ability of these soils to supply nitrogen and phosphorus is medium, and their ability to supply potassium is high. The moisture-holding capacity is high. Because of the slope and soil texture, the hazard of erosion is serious, and the loss of moisture through runoff is high. Most slopes are steep enough to make the use of farm machinery difficult and hazardous.

These soils are better suited to hay and pasture crops than to row crops. They are well suited to all of the grasses and legumes commonly grown in the county, including varieties of alfalfa that require good drainage and a deep rooting zone. Reseeding should be done in strips across the slope. Slopes generally are too steep or too irregular for the use of diversions.

CAPABILITY UNIT IVe-10

This unit consists of deep and moderately deep, strongly sloping or rolling, well drained and moderately well drained, medium-textured soils of the Aurora and Cazenovia series. Past erosion has depleted the organic-matter content and reduced the moisture-holding capacity, especially of the moderately deep soils. Runoff is rapid, and erosion is a serious hazard. The ability of these soils to supply potassium is fairly high, and their ability to supply phosphorus is low. Tilth is poor.

Control of erosion is important on these soils. Their use for cultivated crops should be kept to a minimum, and measures such as stripcropping and diversions to break up long slopes should be used. Where measures are taken to control erosion, the rotation can be as intensive as 1 year of a row crop followed by 2 years of a sod crop.

These soils crust readily, and they clod if worked when wet. Minimum tillage and the utilization of crop residue help to restore good tilth.

CAPABILITY UNIT IVe-11

Arkport fine sandy loam, 6 to 12 percent slopes, is the only soil in this unit. This is a deep, well-drained to excessively drained soil. The surface layer is medium acid to mildly alkaline. The lime content increases with depth.

The capacity of this soil to hold moisture and to supply plant nutrients is low. Most slopes are rolling or strongly undulating. Thus, runoff is rapid, and erosion is a serious hazard. Wind erosion is also a hazard in some areas. Measures to conserve moisture and to control erosion are needed but are difficult to apply because of the complex slopes.

This soil is better suited to sod crops or to deep-rooted hay crops than to cultivated crops. If used for cultivated crops, the maximum intensity of the rotation should not exceed 1 year of a cultivated crop and 5 to 6 years of a sod crop.

This soil can be grazed or worked early in spring if every precaution is taken to control erosion. The use of crop residue, winter grain, and cover crops helps to reduce loss of soil, moisture, and plant nutrients. Contour farming generally is impractical.

Fertilizer should be applied according to the needs of the crop because plant nutrients are quickly lost through leaching.

If this soil is reshaped by grading, it can be used for vegetables, fruit crops, and other specialized crops. All crops common to the county can be grown, but they may be adversely affected by erosion, droughtiness, and low natural fertility. Graded fields that are irrigated, protected from erosion, and adequately fertilized can be used intensively for vegetables.

CAPABILITY UNIT IVe-12

This unit consists of deep, rolling or moderately steep, well-drained to excessively drained soils of the Alton, Howard, and Palmyra series. These soils formed in gravelly and sandy materials. They have a loamy subsoil and become coarser textured with depth. The surface layer ranges from medium acid to neutral in reaction. The lime content increases with depth.

Runoff is rapid, and the moisture-holding capacity of these soils is only moderate. Thus, measures are needed to conserve moisture.

For the most part, these soils are too steep or too rolling to be used for cultivated crops. They are suitable for orchards that have a sod cover, and they are well suited to alfalfa and other deep-rooted crops if management is good. Reseeding should be done in narrow strips as nearly on the contour as practical. Short slopes or moderately steep slopes can be used for an occasional cultivated crop, grain, and a sod crop that provides winter cover or produces a large amount of residue. A high level of fertility should be maintained. To prevent loss of plant nutrients through leaching, nitrogen and potash fertilizer should be applied according to the needs of the crop.

CAPABILITY UNIT IVw-1

This unit consists of deep, level, poorly drained and very poorly drained soils of the Fonda, Lakemont, Madalin, and Romulus series. These soils have a medium-textured to moderately fine textured surface layer and a moderately fine textured to fine textured subsoil. The surface layer is slightly acid to mildly alkaline. The content of lime increases with depth. The supply of phosphorus is medium, and the supply of potassium is high. Nitrogen commonly is deficient in spring but is abundant in midsummer.

These soils occur in low areas that are subject to ponding during wet periods. Their use is restricted, mainly because of ponding, slow permeability, frost heaving, poor tilth, summer droughtiness, and the difficulty of harvesting late in the season.

Undrained areas are too wet for cultivated crops. Winter flooding may result in a damaging ice cover. If measures were taken to overcome these limitations, these soils could be used for annual crops, such as corn and beans, and they would be among the better soils for sugar beets. The removal of excess water by underdrainage would require a close-patterned system because the subsoil is slowly permeable.

Among the intensive practices needed to maintain good tilth are fall plowing, tilling when moisture conditions are favorable, utilizing crop residue, land smoothing, and minimum tillage. Fields should not be plowed more than three times between sod crops.

Partly drained areas can be kept in permanent sod crops that tolerate ponding. Applications of nitrogen are needed for the production of forage.

The use of machinery and trampling by livestock should be avoided if any part of the uppermost 15 inches of these soils is wet enough to be pressed into a firm ball.

CAPABILITY UNIT IVw-2

This unit consists of deep, nearly level to gently sloping, poorly drained and very poorly drained, medium-textured soils of the Alden and Ellery series. The Ellery soil has a fragipan at a depth of 10 to 16 inches.

Unless drained, these soils are wet for long periods. They are high in nitrogen content, but they release nitrogen slowly in spring. Their ability to supply potassium and phosphorus is high. The surface layer ranges from medium acid to neutral in reaction. The lime content increases with depth. Erosion is not a hazard.

These soils need to be drained before they can be used for selected cultivated crops, but drainage is difficult. Surface runoff from higher areas should be diverted around these low areas. Tile drainage systems function well on the Alden soils if deep outlets are available. Generally, it is desirable to drain small areas that occur within larger areas of better drained soils.

Large open areas can be used for water-tolerant sod crops if surface water is removed. The forage produced can be used for summer feed, especially in dry years when feed crops in other areas are dormant or are less productive. To maintain productivity, the sod crops need to be topdressed annually with a complete fertilizer, high in nitrogen content.

CAPABILITY UNIT IVw-3

The only soil in this unit, Tuller channery silt loam, 1 to 8 percent slopes, is somewhat poorly drained. It is underlain at a depth of 10 to 20 inches by fine-grained, acid sandstone. Outcrops of rock occur in some places.

This soil is wet in spring and early in summer, but it dries out by midsummer. Although it is high in nitrogen content, it releases nitrogen slowly in spring. The supply of potassium and phosphorus is medium. The moisture-holding capacity is low. Normally, erosion is not a hazard.

Drainage generally is difficult because this soil is shallow to bedrock. Only long-lived crops that can tolerate wetness in spring and droughtiness in summer should be grown. When it is necessary to reseed old sod, chemicals can be used to help control competing vegetation before the frost seeding of suitable grasses and legumes. Fertilizer, high in nitrogen, is needed to maintain yields. It can be applied after harvest if this soil is too wet for fertilization in spring or in summer. Rocks interfere with management in areas used for hay crops.

CAPABILITY UNIT IVw-4

Varick silt loam is the only soil in this unit. This is a moderately deep, poorly drained soil in level areas and depressions. In most places the depth to shale bedrock ranges from 30 to 40 inches, but in some places, it is as shallow as 20 inches. Generally, the upper 12 to 18 inches of the shale is weathered or soft and can be readily excavated.

This soil is high in nitrogen content, but it releases nitrogen slowly in spring. It is high in potassium and medium in phosphorus. The surface layer is medium acid to neutral in reaction. The lime content increases with depth. The moisture-holding capacity is moderate to high. Erosion is not a hazard.

Drained areas can be used for selected cultivated crops if adequate measures are taken to preserve soil tilth. Otherwise, this soil clods readily if cultivated.

Undrained areas can be used to produce summer forage. Grasses tolerant of wet conditions should be grown. A complete fertilizer, high in nitrogen, is needed to maintain productivity.

Many factors limit the use of this soil to sod crops. Among these are ponding, frost heaving, wetness at harvest time, a slowly permeable subsoil, and the difficulty of maintaining good tilth.

CAPABILITY UNIT IVw-5

This unit consists of Edwards muck, which is moderately deep over marl, and of Muck, shallow, which is underlain by mineral material. These soils are level or nearly level, and they are very poorly drained. They occur in low-lying areas on lake plains. In most places the muck is slightly acid to neutral in reaction. In a few places it ranges from strongly acid to calcareous.

The muck is rapidly permeable, but layers of slowly permeable peat occur in places. The underlying material varies in permeability. The ability to supply plant nutrients is high, and the organic-matter content is very high. Both wind erosion and fire are serious hazards.

Areas that are adequately drained and fertilized are well suited to many selected crops. Drainage systems, water-level control structures, and windbreaks are needed. All crop residue should be returned to the soil. Because muck gradually subsides if cultivated, it generally is not economically feasible to drain areas in which the muck is less than 3½ feet thick.

CAPABILITY UNIT IVs-1

The only soil in this unit, Colonie loamy fine sand, 6 to 12 percent slopes, is deep and excessively drained. Most areas are rolling or strongly undulating. Thus, contour tillage is impractical. The surface layer is acid, but the lime content generally increases with depth.

This soil is readily leached, and it is low in moisture-holding capacity and in natural fertility. It is susceptible to both wind and water erosion.

This soil is easy to work, and it can be planted early in spring, but unless managed intensively, it is better suited to sod crops that can tolerate droughtiness than to cultivated crops. If vegetables are grown, frequent applications of fertilizer and of irrigation water are needed. Most areas need reshaping and grading to be suitable for irrigation.

Among the measures needed to protect crops and to reduce the loss of soil and moisture are minimum tillage, utilization of crop residue, and use of cover crops and vegetative windbreaks. Wind and water erosion are likely to be severe if fields are left bare.

To reduce the loss of nutrients through leaching, a complete fertilizer should be applied in amounts needed by the crop. The response to fertilization is good if moisture is adequate.

CAPABILITY UNIT Vw-1

This unit consists of Alluvial land. This land is adjacent to streams and is frequently flooded. Drainage ranges from very poor to excessive but is dominantly poor.

Most of this land is not suited to cultivation, but it is suited to permanent vegetation or pasture. Areas that are drained and protected from overflow commonly are farmed with adjoining fields. Areas that can be mowed periodically for weed and brush control can be cleared and seeded to reed canarygrass or to birdsfoot trefoil and timothy. Regulation of grazing is necessary to permit the regrowth of pasture plants and to avoid compaction of the soil material. A mixture of orchardgrass and Ladino clover can be used in some of the higher areas.

CAPABILITY UNIT Vs-1

This unit consists only of Scriba very stony loam. This is a level to very gently sloping, somewhat poorly drained, acid soil. A fragipan at a depth of 10 to 15 inches causes this soil to be wet during wet periods and droughty during extended dry periods. Erosion is not a hazard.

This soil is too stony for the use of farm machinery. Some areas, however, provide low-quality pasture. There are a few areas in which the removal of brush, frost seeding, liming, and fertilizing may be economically feasible.

CAPABILITY UNIT VIe-1

This unit consists of well drained and moderately well drained, moderately steep to steep soils of the Alton, Aurora, Cazenovia, Dunkirk, Honeoye, Howard, Langford, Lansing, Ontario, Palmyra, Schoharie, and Sodus series. Slopes are steep enough to make the use of farm machinery extremely difficult and hazardous. Some areas are severely eroded. The surface layer ranges from medium acid to alkaline. The lime content increases with depth.

The soils of this unit have moderate to good moisture-holding capacity, but they lose a considerable amount of water through rapid runoff.

Because of the difficulty in working these soils and the serious hazard of erosion, much of the acreage should be left in permanent grass or trees. In areas where lime and fertilizer can be spread and mowers operated, it may be economically feasible to grow long-term pasture grasses and legumes. Moderately good growth of suitable pasture plants can be expected early in the growing season. Generally, these steep slopes are suited to early field grazing.

Local investigation of individual sites is necessary to determine the limitations for planned use. If these soils are tilled, the surface should be protected by crop residue, and the amount of surface left bare should be kept to a minimum. In order to maintain a strong stand, all forage plants need ample time after harvest to permit regrowth.

CAPABILITY UNIT VIe-2

This unit consists of shallow, well drained and moderately well drained, moderately steep to steep soils of the Aurora, Arnot, and Farmington series. Slopes are steep enough to make the use of farm machinery difficult as well as hazardous. Rock outcrops are common.

The soils of this unit are strongly acid to medium acid. Shallowness to bedrock limits the moisture content and restricts the depth of the rooting zone. Consequently, plants are likely to be affected by droughtiness in summer. Runoff is very rapid, and the hazard of erosion is serious.

These soils are suited to permanent cover crops. Topdressing with nitrogen fertilizer in spring increases the early growth of well-established sod. Brush control is needed to maintain sod yields. Some of the less sloping areas can be renovated by seeding shallow-rooted grasses and legumes that can tolerate some dryness. Tillage operations should be done in strips across the slope. Timely grazing and the application of adequate amounts of lime and fertilizer are the essential management practices needed to maintain good growth.

CAPABILITY UNIT VIs-1

In this unit are moderately well drained and well drained, nearly level to moderately steep, very stony soils of the Ira and Sodus series. There are enough large, rounded stones and boulders on the surface to make the use of farm machinery impractical.

The soils of this unit are low in natural fertility. A moderately developed to strongly developed fragipan limits the depth of the rooting zone and restricts the amount of moisture available to plants.

Stoniness limits the use of these soils for cultivated crops. Their most suitable use is permanent pasture, although brush control may be difficult on well-established sod.

CAPABILITY UNIT VIs-2

In this unit are deep, excessively drained, moderately steep, sandy soils of the Arkport and Colonie series. These soils are extremely droughty, and they are susceptible to severe wind and water erosion. They are low in natural fertility and are readily leached of plant nutrients. Slopes are steep enough to make the use of farm machinery both difficult and hazardous. Runoff is rapid.

Although long-lived forage crops that can tolerate severe droughtiness in summer are suitable, yields do not justify the cost of liming and annual fertilization.

CAPABILITY UNIT VIs-3

This unit consists of a well-drained to excessively drained soil, Benson very rocky loam, 2 to 20 percent slopes. This soil is underlain at a depth of 10 to 20 inches by limestone, and there are numerous outcrops of limestone.

The moisture-holding capacity of this soil is low or very low, and its ability to supply plant nutrients is low to medium. The outcrops of rock and shallowness to bedrock restrict the use of farm machinery. Control of erosion is not a major problem.

This soil is too droughty and too rocky for the good growth of pasture plants. It does, however, provide some grazing early in spring. Topdressing with a high nitrogen fertilizer is possible in some places.

CAPABILITY UNIT VIIe-1

In this unit are deep, well-drained to excessively drained, very steep soils of the Ontario, Honeoye, and Lansing series. Runoff is very rapid, and erosion is a serious hazard.

Slopes are too steep to permit the use of farm machinery. Grazing should be restricted to permit the maximum development of a protective cover of vegetation.

CAPABILITY UNIT VIIw-1

This unit consists of Peat and Muck. These are very poorly drained, organic soils that occur in level areas or depressions and are wet during the entire year. Some areas are good sites for wetland wildlife, but most areas should be allowed to remain in natural vegetation.

CAPABILITY UNIT VIIs-1

This unit consists of shallow, steep and very steep, very rocky soils of the Arnot, Aurora, Benson, and Farmington series. These soils are droughty, and they are susceptible to severe erosion.

The soils of this unit are not suitable for cultivation. Grazing animals should not be permitted in these areas. All natural ground cover produced should be maintained to help control erosion and to increase the rate of water intake.

CAPABILITY UNIT VIIIw-1

This unit consists of Fresh water marsh along the margins of lakes and ponds. These areas are saturated throughout the year. Drainage is not considered feasible, because the water level is affected by the water level of the lakes.

Wetness precludes the use of these areas for the commercial production of plants and restricts their use to recreation areas or to wetland wildlife habitat.

CAPABILITY UNIT VIIIs-1

Lake beaches make up this unit. These areas consist of sand and gravel bars along the shores of the major lakes in the county. They are subject to strong wave action during storms.

This land can be developed for recreation areas, or it can be maintained for its esthetic value. Both wheel and foot traffic must be restricted if a stabilizing cover of vegetation is desired. Annual applications of a nitrogen fertilizer are needed to maintain the vigor of selected plants.

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Estimated Yields [7]

Table 1 gives the estimated average acre yields of the principal crops grown on soils in Cayuga County, under two levels of management.

The figures in columns A represent yields to be expected under average management. Under the A level of management, less than half the conservation and management practices needed are used. The estimates shown in columns A are a little above the average yields obtained by farmers in the county in the early 1960's.

The figures in columns B represent yields that can be expected under improved management. This management consists of using suitable crop rotations; applying lime and fertilizer in kinds and amounts indicated by soil tests; providing adequate drainage and irrigation, where needed; using contour farming, stripcropping, sodded waterways, or other measures to conserve soil and water; controlling weeds and insects; and tilling at the right time and in the right way.

The annually revised editions of "Cornell Recommends for Field Crops" and "Cornell Recommends for Vegetable Crops" can be used as a guide for the management needed to obtain the yields shown in columns B.

Woodland [8]

About 30 percent, or 134,000 acres, of Cayuga County is forested. State forest makes up 8,399 acres, and State parks make up a total of 1,877 acres.

The average size of farm woodlands in the county varies. In six towns it is less than 10 acres per farm, but in the remaining towns, farm woodland ranges up to 33 acres per farm. Only a few farms in the county lack woodland.

Most of the forests in the county are on excellent sites, and the trees show superior form and rapid growth. Hardwoods grow well (fig. 9, p. 37) because the climate is suitable and the soils are high in content of lime.

Heavily stocked stands of elm and soft maple are common on soils that have poor or very poor drainage. Oak and hickory grow on the dry drumlin slopes; sugar maple, basswood, white birch, and hickory grow in well drained and moderately well drained areas; and oak is abundant on the slopes along Cayuga Lake. Some plantations have been established on patches of idle land, such as the steep sides of drumlins. Christmas trees grow well on the Alton soils, which are mainly in the northern part of the county. Redcedar occurs in abandoned fields near Cayuga Lake. Although Norway spruce and white spruce generally are suited to most drainage conditions, they apparently are not suited to rapid fluctuation in drainage or temperature. Consequently, they are poorly suited to the well drained and moderately well drained soils that have a south, southwest, or west aspect. Such soils occur, to a large extent, on the east side of the finger lakes and on drumlins.

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[7] CHARLES R. BARNETT, JR., Soil Conservation Service, and FRANCIS J. VUILLEMOT, county cooperative extension agent, assisted in the preparation of this subsection.

[8] This section prepared by MEREDITH A. PETERS, woodland conservationist, Soil Conservation Service, Syracuse, N.Y.

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

[Figures in columns A represent yields to be expected under average management; those in columns B represent yields to be expected under improved management. Dashes indicate that crop is not suited to the soil or commonly is not grown on it. Blank spaces indicate that estimates will have to be made for individual sites]

Soil	Corn for silage		Corn for grain		Oats		Wheat		Sugar beets [1]		Dry beans		Snap beans		Forage mixtures (hay): Alfalfa-grass (3- to 5-year stands)		Forage mixtures (hay): Birdsfoot trefoil-grass (3- to 6-year stands)	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
	Tons	*Tons*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*
Alden mucky silt loam	---	17	---	90	---	60	---	35	---	18	---	35	---	2. 8	---	---	1. 0	3. 0
Alden mucky silt loam, till substratum	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Alluvial land.																		
Alton cobbly loam, 0 to 3 percent slopes	11	18	75	110	55	70	35	45	---	---	---	---	---	---	3. 0	4. 5	---	---
Alton cobbly loam, 3 to 8 percent slopes	11	18	75	110	55	70	35	50	---	---	---	---	---	---	3. 0	4. 5	---	---
Alton gravelly sandy loam, 0 to 3 percent slopes	10	14	60	85	50	70	30	45	---	12	22	30	1. 3	2. 8	2. 5	4. 5	---	---
Alton gravelly sandy loam, 3 to 8 to percent slopes	10	14	60	85	50	70	30	45	---	10	22	30	1. 0	2. 8	3. 0	4. 5	---	---
Alton gravelly sandy loam, 8 to 15 percent slopes	8	14	45	85	40	60	25	35	---	---	18	25	---	---	3. 0	4. 5	---	---
Alton and Howard soils, 15 to 25 percent slopes	---	---	---	---	40	60	---	---	---	---	---	---	---	---	2. 5	3. 5	1. 0	3. 0
Angola silt loam, 1 to 6 percent slopes	10	15	60	90	50	65	30	50	---	15	18	30	1. 7	2. 5	3. 0	3. 5	2. 5	3. 5
Angola silt loam, 6 to 12 percent slopes	11	14	65	85	50	70	30	50	---	15	18	30	1. 7	2. 5	3. 0	3. 5	2. 5	3. 5
Appleton and Lyons loams, 0 to 5 percent slopes	9	19	50	110	25	70	25	45	---	20	15	30	1. 0	2. 8	2. 0	3. 5	2. 0	3. 0
Arkport fine sandy loam, 1 to 6 percent slopes	---	14	---	80	30	50	25	40	---	13	---	25	---	2. 0	2. 5	3. 5	---	---
Arkport fine sandy loam, 6 to 12 percent slopes	---	10	---	60	30	50	25	35	---	---	---	---	---	---	2. 3	3. 3	---	---
Arnot channery silt loam, 3 to 15 percent slopes	---	---	---	---	40	60	---	---	---	---	---	---	---	---	3. 0	4. 0	1. 5	2. 5
Arnot channery silt loam, 15 to 25 percent slopes	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1. 0	2. 0
Arnot soils, 25 to 45 percent slopes	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Aurora silt loam, 2 to 6 percent slopes	10	15	60	90	50	65	30	50	12	16	15	30	1. 7	2. 5	3. 0	3. 5	2. 5	3. 5
Aurora silt loam, 6 to 12 percent slopes	9	13	45	70	40	60	25	40	---	---	15	30	1. 7	2. 5	3. 5	5. 0	2. 5	3. 5
Aurora silt loam, 6 to 12 percent slopes, eroded	9	13	45	70	40	60	25	40	---	---	10	25	1. 5	2. 0	3. 5	5. 0	2. 5	3. 5
Aurora silt loam, 12 to 18 percent slopes, eroded	---	13	---	60	40	60	25	35	---	---	---	---	---	---	3. 0	4. 0	2. 5	3. 5
Aurora silt loam, 18 to 30 percent slopes	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3. 0	4. 0	2. 5	3. 5
Aurora silt loam, limestone substratum, 2 to 8 percent slopes	11	14	50	80	55	75	25	40	---	19	15	25	1. 5	2. 0	3. 0	4. 5	2. 2	3. 5
Aurora and Farmington shaly silt loams, 12 to 18 percent slopes	---	---	---	---	40	60	---	---	---	---	---	---	---	---	3. 5	4. 5	2. 5	3. 0
Aurora and Farmington shaly silt loams, 18 to 40 percent slopes	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Aurora, Farmington and Benson very rocky soils, 20 to 70 percent slopes	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Benson loam, 1 to 8 percent slopes	---	---	---	---	50	70	30	45	---	---	---	---	---	---	3. 5	4. 5	---	---
Benson loam, 8 to 14 percent slopes	---	---	---	---	40	60	30	45	---	---	---	---	---	---	3. 5	4. 5	---	---
Benson very rocky loam, 2 to 20 percent slopes	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

See footnote at end of table.

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

Soil	Corn for silage		Corn for grain		Oats		Wheat		Sugar beets [1]		Dry beans		Snap beans		Forage mixtures (hay)			
															Alfalfa-grass (3- to 5-year stands)		Birdsfoot trefoil-grass (3- to 6-year stands)	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
	Tons	*Tons*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*
Brockport and Lockport silty clay loams, 2 to 6 percent slopes	6	10	----	60	25	50	20	30	----	----	10	15	1.0	2.0	----	----	2.5	3.5
Camillus silt loam, 2 to 6 percent slopes	12	16	70	95	60	80	40	55	----	18	25	35	1.5	3.0	3.5	5.0	2.5	3.5
Camillus silt loam, 6 to 12 percent slopes, eroded	9	14	60	80	43	70	35	50	----	----	15	25	1.0	2.0	3.5	5.0	2.0	3.0
Cazenovia silt loam, 2 to 8 percent slopes	12	18	70	110	60	85	40	55	----	22	25	35	2.0	3.0	3.0	4.5	2.5	3.5
Cazenovia silt loam, 8 to 14 percent slopes	11	17	60	110	60	85	40	55	----	----	20	35	2.0	3.0	3.0	4.5	2.5	3.5
Cazenovia silt loam, 5 to 14 percent slopes, eroded	11	17	60	100	60	85	40	55	----	----	20	30	1.8	2.5	3.0	4.5	2.5	3.5
Cazenovia silt loam, rolling	11	17	60	110	60	85	40	55	----	----	----	----	----	----	3.0	4.5	2.5	3.5
Cazenovia silt loam, 12 to 20 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----	----	----	2.2	3.2	1.5	2.3
Cazenovia and Schoharie soils, 20 to 40 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	1.5	2.0
Collamer silt loam, 0 to 2 percent slopes	11	16	60	90	43	60	25	45	----	18	15	30	1.5	2.8	2.5	3.0	2.5	3.5
Collamer silt loam, 2 to 6 percent slopes	12	17	70	100	45	75	35	55	----	18	25	30	1.8	3.0	2.5	3.0	2.5	3.5
Colonie fine sandy loam, 1 to 6 percent slopes	----	----	----	80	----	----	----	30	----	----	----	----	----	----	----	2.5	----	----
Colonie loamy fine sand, 1 to 6 percent slopes	----	----	----	70	----	----	----	30	----	----	----	----	----	----	----	2.5	----	----
Colonie loamy fine sand, 6 to 12 percent slopes	----	----	----	60	----	----	----	30	----	----	----	----	----	----	----	2.5	----	----
Colonie and Arkport soils, 12 to 22 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----	----	----	2.5	3.5	----	----
Conesus gravelly silt loam, 0 to 3 percent slopes	10	15	60	90	45	65	30	45	----	19	25	30	1.5	2.6	2.0	3.0	2.5	3.5
Conesus gravelly silt loam, 3 to 8 percent slopes	12	16	70	100	45	70	30	45	----	19	25	30	1.5	2.6	2.5	3.5	2.5	3.5
Dunkirk silt loam, 1 to 6 percent slopes	12	17	60	100	55	75	35	50	----	19	25	35	1.6	2.6	3.0	4.0	2.0	3.5
Dunkirk silt loam, 6 to 12 percent slopes, eroded	11	16	50	90	55	75	35	50	----	15	20	30	1.2	2.0	3.0	4.0	2.0	3.5
Dunkirk silt loam, 12 to 18 percent slopes, eroded	----	----	----	----	50	70	30	40	----	----	----	----	----	----	3.0	4.0	2.0	3.5
Dunkirk soils, 18 to 35 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	2.0	3.0
Edwards muck	----	----	----	----	----	----	----	----	18	25	----	----	----	----	----	----	----	----
Eel silt loam	7	18	45	110	50	80	30	55	----	22	20	30	1.2	3.0	----	----	1.8	3.5
Eel silt loam, high bottom	12	20	70	120	65	90	35	50	----	22	20	35	1.2	3.0	3.0	4.0	2.5	3.5
Ellery and Alden silt loams, 3 to 8 percent slopes	----	----	----	----	20	35	----	----	----	----	----	----	----	----	----	----	1.5	2.5
Erie channery silt loam, 0 to 3 percent slopes	8	10	----	----	35	45	----	----	----	----	----	----	----	----	----	1.5	1.5	3.0
Erie channery silt loam, 3 to 8 percent slopes	8	12	45	70	35	50	----	----	----	----	18	25	----	----	----	1.5	2.0	3.0
Erie channery silt loam, moderately shallow variant, 0 to 3 percent slopes	6	10	----	----	30	40	----	----	----	----	----	----	----	----	----	----	1.5	3.0
Erie channery silt loam, moderately shallow variant, 3 to 8 percent slopes	8	12	40	60	20	45	----	----	----	----	18	25	----	----	----	1.5	1.5	3.0
Farmington shaly silt loam, 1 to 12 percent slopes	8	----	45	----	40	60	25	35	----	----	----	----	----	----	3.0	4.0	2.0	3.0
Fonda mucky silt loam	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	3.0
Fredon loam	8	19	40	110	25	70	15	50	----	20	10	30	1.7	2.7	----	2.0	1.5	3.0
Fresh water marsh	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Galen fine sandy loam, 0 to 2 percent slopes	10	17	60	85	40	70	25	40	----	20	20	35	2.0	3.0	2.0	3.0	2.0	3.0

See footnote at end of table.

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

Soil	Corn for silage		Corn for grain		Oats		Wheat		Sugar beets [1]		Dry beans		Snap beans		Forage mixtures (hay): Alfalfa-grass (3- to 5-year stands)		Forage mixtures (hay): Birdsfoot trefoil-grass (3- to 6-year stands)	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
	Tons	*Tons*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*
Galen fine sandy loam, 2 to 6 percent slopes	10	17	60	85	40	70	25	40	----	20	20	35	1. 2	3. 0	2. 0	3. 0	2. 0	3. 0
Genesee silt loam	11	18	70	110	50	80	35	50	----	22	20	35	1. 5	3. 0	3. 0	4. 5	1. 5	3. 0
Genesee silt loam, high bottom	12	18	75	110	60	90	35	55	----	22	25	35	1. 8	3. 0	3. 0	4. 5	1. 5	3. 0
Genesee gravelly loam, fan	11	18	70	100	50	80	35	45	----	20	20	30	1. 6	2. 7	3. 0	4. 0	1. 2	2. 2
Hilton loam, 0 to 3 percent slopes	11	16	65	90	40	60	20	45	----	16	20	30	1. 0	2. 7	2. 0	3. 0	2. 0	3. 0
Hilton loam, 3 to 8 percent slopes	11	18	65	110	45	70	30	45	----	16	25	30	1. 2	2. 7	2. 5	3. 5	2. 0	3. 0
Honeoye silt loam, 2 to 8 percent slopes	12	18	75	110	65	80	40	55	----	19	25	35	1. 8	2. 7	3. 5	4. 5	2. 5	3. 5
Honeoye silt loam, 8 to 14 percent slopes	13	18	80	110	65	80	40	55	----	----	25	35	1. 5	2. 7	3. 5	4. 5	2. 5	3. 5
Honeoye silt loam, 8 to 14 percent slopes, eroded	9	14	55	85	60	75	25	40	----	----	18	----	1. 0	----	3. 0	4. 5	2. 0	3. 5
Honeoye soils, rolling	9	15	50	80	35	65	25	40	----	----	18	----	----	----	3. 5	4. 5	2. 5	3. 5
Honeoye and Lansing gravelly silt loams, 14 to 20 percent slopes	----	----	----	----	50	70	----	----	----	----	----	----	----	----	3. 5	4. 5	2. 5	3. 5
Howard gravelly loam, 0 to 3 percent slopes	13	18	75	110	55	80	35	50	----	----	25	35	1. 2	2. 7	3. 0	4. 5	----	----
Howard gravelly loam, 3 to 8 percent slopes	13	18	75	110	55	80	35	50	----	----	25	35	1. 2	2. 7	3. 0	4. 5	----	----
Howard gravelly loam, 8 to 15 percent slopes	8	14	55	90	55	80	35	45	----	----	25	35	----	----	3. 0	4. 5	1. 8	2. 8
Ira gravelly loam, 0 to 3 percent slopes	7	13	40	75	40	65	25	35	----	14	15	25	----	----	----	----	2. 0	3. 5
Ira gravelly loam, 3 to 8 percent slopes	7	13	45	75	45	70	30	40	----	14	15	30	----	----	----	----	2. 5	3. 5
Ira and Sodus very stony loams, 2 to 20 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	1. 5	2. 5
Kendaia silt loam, 3 to 8 percent slopes	8	20	50	110	30	65	20	45	----	20	20	30	1. 5	3. 0	2. 0	3. 5	2. 0	2. 5
Kendaia and Lyons silt loams, 0 to 3 percent slopes	8	20	40	110	30	65	20	45	----	20	20	30	1. 5	3. 0	----	3. 5	1. 5	3. 5
Lake beaches	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Lakemont silty clay loam	----	10	----	----	20	40	----	----	----	----	----	----	----	----	----	----	1. 8	3. 0
Lamson fine sandy loam	8	17	50	90	25	65	20	40	----	18	15	30	8	2. 8	----	----	1. 5	2. 5
Lamson mucky fine sandy loam	----	17	----	90	----	60	----	40	----	18	----	30	----	2. 8	----	----	1. 0	3. 0
Langford channery silt loam, 2 to 8 percent slopes	8	12	45	70	40	60	----	----	----	----	15	25	----	----	2. 0	3. 0	1. 5	3. 0
Langford channery silt loam, 8 to 15 percent slopes	8	12	45	70	45	65	----	----	----	----	15	25	----	----	2. 5	3. 5	1. 5	3. 0
Langford channery silt loam, rolling	8	12	45	65	45	60	----	----	----	----	----	----	----	----	2. 5	3. 5	1. 5	3. 0
Langford channery silt loam, 15 to 25 percent slopes	----	----	----	----	35	60	----	----	----	----	----	----	----	----	2. 5	3. 5	1. 5	2. 5
Langford-Howard gravelly loams, 2 to 8 percent slopes	9	18	55	90	55	70	35	40	----	----	20	25	1. 6	2. 8	2. 5	3. 5	2. 0	3. 0
Langford-Howard gravelly loams, 8 to 15 percent slopes	9	15	50	80	55	70	30	40	----	----	20	25	1. 0	2. 0	2. 5	3. 5	2. 0	3. 0
Langford-Howard gravelly loams, 15 to 25 percent slopes	----	----	----	----	40	60	----	----	----	----	----	----	----	----	2. 5	3. 5	1. 5	2. 5
Langford-Howard gravelly loams, 25 to 45 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Langford channery silt loam, moderately shallow variant, 2 to 8 percent slopes	8	12	45	60	45	60	----	----	----	----	15	25	----	----	2. 0	3. 0	1. 5	3. 0
Lansing gravelly silt loam, 2 to 8 percent slopes	13	18	70	110	60	80	40	55	----	18	25	35	1. 8	2. 7	4. 0	4. 5	2. 5	3. 5
Lansing gravelly silt loam, 8 to 14 percent slopes	12	18	65	90	50	70	30	45	----	----	20	30	1. 5	2. 7	4. 0	4. 5	2. 0	2. 5
Lansing gravelly silt loam, 8 to 14 percent slopes, eroded	12	16	60	80	40	60	25	40	----	----	15	25	1. 0	2. 2	3. 0	4. 0	----	----
Lansing gravelly silt loam, rolling	----	----	----	----	----	50	----	----	----	----	----	----	----	----	3. 0	4. 0	2. 0	3. 0

See footnote at end of table.

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

Soil	Corn for silage		Corn for grain		Oats		Wheat		Sugar beets [1]		Dry beans		Snap beans		Forage mixtures (hay): Alfalfa-grass (3- to 5-year stands)		Forage mixtures (hay): Birdsfoot trefoil-grass (3- to 6-year stands)	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
	Tons	*Tons*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*
Lima silt loam, 0 to 3 percent slopes	10	18	65	110	40	90	35	50	----	22	25	35	1.5	2.7	3.0	4.0	2.5	3.5
Lima silt loam, 3 to 8 percent slopes	11	18	70	110	40	90	35	50	----	22	25	35	1.8	2.7	3.0	4.0	2.7	3.5
Lordstown channery silt loam, 2 to 8 percent slopes	8	13	50	75	50	60	----	----	----	----	20	25	----	2.0	2.0	3.5	----	----
Lordstown channery silt loam, 8 to 15 percent slopes	8	11	50	65	40	60	----	----	----	----	----	25	----	2.0	2.0	3.5	----	----
Madalin silt loam	5	11	30	70	30	70	20	50	----	12	----	30	----	2.4	----	----	2.0	3.5
Madalin silt loam, sandy subsoil variant	5	13	30	80	30	70	20	50	----	18	----	30	----	2.4	----	----	2.0	3.5
Made land, sanitary land fill	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Made land, tillable.																		
Minoa fine sandy loam	10	17	50	85	45	70	25	35	----	20	20	30	1.2	2.7	1.5	3.0	2.0	3.0
Muck, deep	10	18	----	----	----	----	----	----	----	25	25	35	----	----	----	----	----	----
Muck, shallow	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Niagara fine sandy loam	8	14	50	80	25	55	20	35	----	14	10	30	.8	2.5	----	----	1.5	3.5
Niagara and Canandaigua silt loams	8	17	50	90	25	65	20	40	----	18	10	35	.8	2.8	----	3.0	1.5	3.5
Odessa silt loam, 0 to 2 percent slopes	8	15	45	85	40	65	30	45	----	16	15	25	1.8	2.5	2.5	3.0	2.5	3.5
Odessa silt loam, 2 to 6 percent slopes	8	12	35	65	45	65	30	45	----	16	20	30	1.6	2.5	2.5	3.0	2.2	3.5
Ontario fine sandy loam, 2 to 8 percent slopes	12	15	70	90	60	80	35	45	----	16	25	35	1.6	2.5	2.5	4.0	2.0	3.0
Ontario fine sandy loam, 8 to 14 percent slopes	11	15	65	90	55	75	30	40	----	----	20	30	1.4	2.3	2.5	4.0	2.0	3.0
Ontario fine sandy loam, rolling	10	14	50	75	55	75	30	40	----	----	----	----	----	----	2.5	4.0	2.0	3.0
Ontario loam, 2 to 8 percent slopes	11	16	75	100	65	85	35	45	----	20	26	35	1.6	2.8	3.0	4.5	2.0	3.5
Ontario loam, 8 to 14 percent slopes	9	16	65	100	55	75	30	45	----	----	20	30	----	----	3.0	4.5	2.0	3.5
Ontario loam, 8 to 14 percent slopes, eroded	9	12	50	75	50	65	25	35	----	----	14	----	----	----	3.0	4.5	2.0	3.5
Ontario loam, rolling	11	16	55	80	55	75	25	40	----	----	18	----	----	----	3.0	4.5	2.0	3.5
Ontario loam, 14 to 20 percent slopes	----	----	----	----	40	65	----	----	----	----	----	----	----	----	2.5	4.0	1.6	3.5
Ontario loam, 14 to 20 percent slopes, eroded	----	----	----	----	35	60	----	----	----	----	----	----	----	----	2.0	3.5	1.3	3.0
Ontario silt loam, moderately shallow variant, 0 to 3 percent slopes	10	16	65	90	60	80	35	45	----	16	25	35	1.5	2.5	3.0	4.5	2.0	3.0
Ontario silt loam, moderately shallow variant, 3 to 8 percent slopes	10	15	65	85	60	80	35	45	----	16	25	35	1.5	2.5	3.0	4.5	2.0	3.0
Ontario silt loam, moderately shallow variant, 8 to 14 percent slopes	10	13	60	80	50	70	30	40	----	----	20	30	----	----	3.0	4.5	1.5	2.5
Ontario, Honeoye and Lansing soils, 20 to 35 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Ontario, Honeoye and Lansing soils, 35 to 50 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Ovid silt loam, 0 to 2 percent slopes	9	18	55	100	40	60	30	45	----	16	20	30	1.8	2.7	3.0	4.0	2.5	3.5
Ovid silt loam, 2 to 6 percent slopes	9	18	55	100	45	70	30	45	----	16	20	30	1.8	2.7	3.0	4.0	2.7	3.5
Palmyra gravelly sandy loam, 3 to 8 percent slopes	10	14	60	85	55	80	35	50	----	20	25	35	1.7	3.0	3.5	4.8	----	----
Palmyra gravelly sandy loam, 8 to 15 percent slopes	8	14	50	85	55	80	35	45	----	----	25	35	----	----	3.5	4.5	1.5	2.5
Palmyra gravelly loam, 0 to 3 percent slopes	11	18	75	110	55	80	35	45	----	20	25	35	1.7	3.0	3.5	5.0	----	----
Palmyra gravelly loam, 3 to 8 percent slopes	11	18	75	110	55	80	35	45	----	----	25	35	1.7	3.0	3.5	5.0	----	----

See footnote at end of table.

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

Soil	Corn for silage		Corn for grain		Oats		Wheat		Sugar beets [1]		Dry beans		Snap beans		Forage mixtures (hay): Alfalfa-grass (3- to 5-year stands)		Forage mixtures (hay): Birdsfoot trefoil-grass (3- to 6-year stands)	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
	Tons	*Tons*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*
Palmyra gravelly loam, 8 to 15 percent slopes	8	14	55	90	55	80	35	45	----	----	25	35	-----	-----	3.5	4.5	1.8	2.8
Palmyra soils, 15 to 25 percent slopes	----	----	----	-----	35	55	25	35	----	----	----	----	-----	-----	3.5	4.5	1.0	2.0
Palmyra, Howard and Alton soils, 25 to 40 percent slopes	----	----	----	-----	----	----	----	----	----	----	----	----	-----	-----	------	------	------	------
Peat and Muck	----	----	----	-----	----	----	----	----	----	----	----	----	-----	-----	------	------	------	------
Phelps gravelly silt loam	10	18	60	110	40	60	35	50	----	20	25	30	1.2	2.6	2.5	3.5	2.5	3.5
Riga and Lairdsville silt loams, 2 to 6 percent slopes	8	17	45	90	45	70	35	50	----	18	20	35	1.8	3.0	3.0	4.5	2.5	3.5
Riga and Lairdsville silty clay loams, 6 to 12 percent slopes, eroded	9	14	50	80	30	70	25	40	----	----	----	30	-----	2.0	3.0	4.5	2.5	3.5
Romulus silty clay loam	5	11	30	70	30	70	20	50	----	12	----	20	-----	2.0	------	------	2.0	3.0
Schoharie silt loam, 2 to 6 percent slopes	12	18	70	100	55	80	40	55	----	22	20	35	1.8	3.0	3.0	4.5	2.5	3.5
Schoharie silty clay loam, 6 to 12 percent slopes	8	14	40	80	30	70	25	40	----	----	----	30	-----	2.0	3.0	4.5	2.5	3.5
Schoharie silty clay loam, 12 to 20 percent slopes	----	----	----	-----	----	----	----	----	----	----	----	----	-----	-----	3.0	4.0	2.5	3.5
Scriba gravelly loam	----	10	----	-----	25	40	----	----	----	----	----	----	-----	-----	------	------	2.0	2.8
Scriba very stony loam	----	----	----	-----	----	----	----	----	----	----	----	----	-----	-----	------	------	------	1.5
Sloan silt loam	----	18	----	100	----	80	----	50	----	----	----	----	-----	-----	------	------	1.5	3.0
Sodus gravelly loam, 2 to 8 percent slopes	8	14	60	90	50	70	30	40	----	----	20	30	1.6	2.8	2.5	3.5	2.0	3.0
Sodus gravelly loam, 8 to 14 percent slopes	10	14	55	85	50	70	30	40	----	----	20	30	1.5	2.5	2.0	3.5	2.0	3.0
Sodus gravelly loam, 8 to 14 percent slopes, eroded	8	12	50	75	40	70	25	35	----	----	16	----	-----	-----	2.0	3.5	1.5	2.5
Sodus gravelly loam, rolling	8	12	50	70	40	65	25	35	----	----	20	----	-----	-----	2.0	3.5	1.5	2.5
Sodus gravelly loam, 14 to 20 percent slopes	----	----	----	-----	30	55	20	30	----	----	----	----	-----	-----	------	------	1.0	2.5
Sodus gravelly loam, 20 to 40 percent slopes	----	----	----	-----	----	----	----	----	----	----	----	----	-----	-----	------	------	------	------
Stafford fine sandy loam	8	15	50	85	20	60	15	40	----	20	15	35	1.2	2.8	------	2.0	1.0	2.0
Tuller channery silt loam, 1 to 8 percent slopes	----	----	----	-----	----	----	----	----	----	----	----	----	-----	-----	------	------	------	------
Varick silt loam	----	12	----	70	30	50	----	40	----	----	----	----	-----	-----	------	------	2.0	3.0
Wampsville gravelly silt loam, 0 to 3 percent slopes	11	18	75	110	55	80	35	45	----	----	25	35	1.7	2.7	3.5	4.5	------	------
Wampsville gravelly silt loam, 3 to 8 percent slopes	11	18	75	110	55	80	35	45	----	----	25	35	1.7	2.7	3.5	4.5	------	------
Warners loam	----	14	----	-----	----	40	----	30	----	----	----	----	-----	-----	------	------	2.5	3.5
Warners loam, fan	7	18	45	110	50	80	30	55	----	20	20	30	1.2	3.0	------	------	2.2	3.5
Williamson silt loam, 0 to 2 percent slopes	8	17	45	95	40	60	35	45	----	16	20	35	2.0	2.8	2.0	3.0	2.0	3.5
Williamson silt loam, 2 to 6 percent slopes	8	16	45	95	40	60	35	45	----	16	20	35	2.0	2.8	2.0	3.0	2.0	3.0
Williamson silt loam, 6 to 12 percent slopes	8	15	45	80	40	60	35	45	----	----	20	35	1.5	2.2	2.0	3.0	2.0	3.0
Williamson silt loam, 6 to 12 percent slopes, eroded	8	12	40	70	35	50	20	30	----	----	15	25	1.0	1.5	2.0	3.0	1.8	2.5

[1] Yield information for sugar beets is limited.

Figure 9.—**Excellent growth of hardwoods on well-managed woodlot on soil in woodland suitability group 2a.**

The volume of good hardwood harvested in the county often averages from 2,000 to 3,000 board feet per acre. This is several times the State average on privately owned forests (*15*).[9]

Woodland suitability groups

To assist owners of woodland in planning the use of their soils, the soils of the county have been placed in 20 woodland suitability groups. Each group is made up of soils that are similar in potential productivity, are suited to similar trees, and require similar management.

Table 2 describes the woodland groups in the county and lists the map symbols for the soils in each group. This table gives ratings of productivity and evaluates the hazards and limitations that affect management. The species suitable for planting and to favor in existing stands are listed.

The potential productivity of the soils in each group is expressed in relative terms: good, fair, or poor. Each rating indicates the capacity of the soils to produce wood crops. A rating of poor indicates that tree planting generally is not recommended except for erosion control or to provide food and cover for wildlife.

Seedling mortality refers to the expected degree of mortality of natural 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. The mortality is *slight* if the expected loss of seedlings is less than 25 percent; *moderate* if the loss is between 25 and 50 percent; and *severe* if it is 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. The 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 factors that affect plant competition are available moisture capacity, degree of erosion, and drainage.

Equipment limitation indicates the degree to which soil features restrict the use of equipment commonly used in woods operations. The limitation is *slight* if there is little or no restriction on 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. Among the factors that affect the use of equipment are 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 needed to control erosion.

Windthrow hazard depends on the development of roots and the capacity of the soils to hold trees firmly. The hazard is *slight* if windthrow is not an important concern. 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[10]

Wildlife is an important natural resource of Cayuga County. The county, which is in the Lake Plains Region fringing the Allegheny Plateau, has large populations of rink-necked pheasants, cottontail rabbits, woodcock, white-tailed deer, ruffed grouse, and gray squirrels. Waterfowl have been attracted to the area through the development of the Howland Island Game Management Area in the west-central part of the county and the Montezuma National Wildlife Refuge in adjacent Seneca County. The Cayuga, Owasco, and Skaneateles Lakes also attract migrating waterfowl.

[9] Italic numbers in parentheses refer to Literature Cited, p. 202.

[10] This subsection was prepared by ROBERT E. MYERS, wildlife biologist, Soil Conservation Service, Syracuse, N.Y.

TABLE 2.—*Suitability*

Woodland groups	Potential productivity	Seedling mortality	Plant competition
Group 1. Deep and moderately deep, well drained and moderately well drained, medium-textured soils that formed in high-lime materials. The moderately well drained soils have a seasonal, moderately high water table.			
1a—0 to 14 percent slopes: Camillus (CaB, CaC3; Ee1, (Ee, Eh)): Genesee (Gn, Go, Gv); Hilton (HlA, HlB); Honeoye (HnB, HnC, HnC3, HoCK); Lima (LtA, LtB); Ontario (OfB, OfC, OfCK, OnB, OnC, OnC3, OnCK, OrA, OrB, OrC); Wampsville (WaA, WaB); Warners (Wf).	Good	Slight	Severe
1b—14 to 35 percent slopes: Honeoye and Lansing (HsD); Ontario (OnD, OnD3); Ontario, Honeoye and Lansing (OtE).	Good	Slight	Severe
1c—35 to 50 percent slopes: Ontario, Honeoye and Lansing (OtF)	Good	Slight	Severe
Group 2. Deep and moderately deep, moderately well drained and well drained, moderately fine textured and fine textured soils that formed in medium-lime and high-lime materials. The moderately well drained soils have a moderately slowly permeable, clayey subsoil and in a few places a seasonal high water table.			
2a—2 to 20 percent slopes: Aurora (AxB); Cazenovia (CeB, CeC, CeC3, CeCK, CeD); Riga and Lairdsville (RgB, RlC3); Schoharie (SeB, ShC, ShD).	Good	Slight	Severe
2b—20 to 40 percent slopes: Cazenovia and Schoharie (ChE)	Good	Slight	Severe
Group 3. Deep, excessively drained to moderately well drained, medium-textured or moderately coarse textured, high-lime soils that formed in gravelly and sandy materials.			
3a—0 to 15 percent slopes: Palmyra (PaB, PaC, PgA, PgB, PgC); Phelps (Pv).	Good	Slight	Moderate
3b—15 to 25 percent slopes: Palmyra (PmD)	Good	Slight	Moderate
Group 4. Deep, well-drained to excessively drained, medium-textured or moderately coarse textured soils that formed in low-lime sand and gravel.			
0 to 15 percent slopes: Alton (AmA, AmB, AnA, AnB, AnC); Howard (HwA, HwB, HwC).	Good	Slight to moderate.	Slight
Group 5. Deep, well drained and moderately well drained, medium-textured soils that formed in acid or low-lime materials derived mainly from fine-grained sandstone. The Sodus soils have a slight fragipan at a depth of 24 to 30 inches; the Ira and Williamson soils have a firm fragipan at a depth of 18 to 24 inches that restricts the growth of roots.			
5a—0 to 20 percent slopes: Ira (IrA, IrB); Sodus (SoB, SoC, SoC3, SoCK, SoD); Williamson (WmA, WmB, WmC, WmC3).	Good	Slight	Moderate
5b—2 to 20 percent slopes: Ira and Sodus (IsD)	Good	Slight	Moderate
5c—20 to 40 percent slopes: Sodus (SoE)	Good	Slight	Moderate
Group 6. Somewhat excessively drained, well drained and moderately well drained, medium-textured to moderately coarse textured soils that formed in low-lime to medium-lime materials. The moderately well drained soils have a seasonal, moderately high water table.			
6a—0 to 14 percent slopes: Arkport (AtB, AtC); Aurora (AwB, AwC); Collamer (ClA, ClB); Conesus, (CsA, CsB); Dunkirk (DuB, DuC3); Galen (GaA, GaB); Lansing (LsB, LsC, LsC3, LsCK).	Good	Slight	Severe
6b—6 to 18 percent slopes: Aurora (AwC3); Dunkirk (DuD3)	Good	Slight	Moderate
6c—12 to 35 percent slopes: Aurora (AwD3, AwE); Dunkirk (DvE)	Good	Slight	Moderate
Group 7. Deep, moderately well drained to excessively drained, medium-textured, acid and low-lime soils that formed in gravelly and sandy materials.			
7a—2 to 15 percent slopes: Langford-Howard (LhB, LhC)	Good	Slight to moderate.	Severe
7b—15 to 45 percent slopes: Langford-Howard (LhD, LhE)	Good	Slight to moderate.	Moderate
Group 8. Deep and moderately deep, moderately well drained and well drained, medium-textured soils that formed in acid or low-lime sandstone glacial till. The deep soils have a fragipan at a depth of 18 to 24 inches.			
8a—2 to 15 percent slopes: Langford (LgB, LgC, LgCK, LnB); Lordstown (LwB, LwC).	Good	Slight	Severe
8b—15 to 25 percent slopes: Langford (LgD)	Good	Slight	Moderate

of the soils for woodland

Equipment limitation	Erosion hazard	Windthrow hazard	Species suitability— For planting	Species suitability— To favor in existing stands
Slight	Slight	Slight	Austrian pine, Scotch pine, Norway spruce, white spruce, white-cedar, redcedar, Japanese larch, black locust. Limited suitability: white pine.	Sugar maple, white oak, red oak, basswood, hickory, white ash, beech.
Moderate	Moderate	Slight		
Moderate	Severe	Slight		
Moderate	Slight to moderate.	Slight	Austrian pine, Scotch pine, Norway spruce, white spruce, white-cedar, Japanese larch, black locust. Limited suitability: white pine.	Sugar maple, white ash, red oak, white oak, basswood, hickory.
Moderate	Severe	Slight		
Slight	Slight	Slight	Austrian pine, Scotch pine, white pine, Norway spruce, white spruce, white-cedar, Japanese larch, black locust, black walnut.	Sugar maple, white ash, basswood, red oak, black cherry, hickory, black walnut.
Moderate	Moderate	Slight		
Slight	Slight	Slight	Austrian pine, Scotch pine, white pine, Japanese larch, black locust. Limited suitability: red pine, Norway spruce, white spruce.	Sugar maple, white ash, basswood, red oak, black cherry, beech, hickory.
Slight	Slight	Moderate	Scotch pine, white pine, Norway spruce, white spruce, Japanese larch. Limited suitability: red pine.	Sugar maple, white ash, basswood, red oak, black cherry, hickory, beech, hemlock.
Moderate	Moderate	Moderate		
Moderate	Moderate	Moderate		
Slight	Slight	Slight	Austrian pine, Scotch pine, Norway spruce, white spruce, white-cedar, Japanese larch. Limited suitability: red pine, white pine, black locust.	Sugar maple, basswood, black cherry, white ash, red oak, white oak, yellow-poplar, hickory, beech.
Moderate	Moderate	Slight		
Moderate	Moderate	Slight		
Slight	Slight	Slight	Scotch pine, red pine, white pine, white-cedar, Japanese larch. Limited suitability: Austrian pine, Norway spruce, white spruce, black locust.	Sugar maple, red oak, beech, black cherry, yellow birch, black birch.
Moderate	Moderate	Slight		
Slight	Slight	Moderate	Scotch pine, white pine, Japanese larch. Limited suitability: Austrian pine, red pine, Norway spruce, white spruce, white-cedar, black locust.	Sugar maple, white ash, red oak, black cherry, basswood, beech, red maple.
Slight	Moderate	Moderate		

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TABLE 2.—*Suitability of the*

Woodland groups	Potential productivity	Seedling mortality	Plant competition
Group 9. Well-drained to somewhat excessively drained, acid to neutral, medium-textured soils that are shallow to moderately deep over shale.			
9a—1 to 12 percent slopes: Farmington (FaC)	Good	Moderate	Slight
9b—12 to 18 percent slopes: Aurora and Farmington (AyD)	Good	Moderate	Slight
9c—18 to 40 percent slopes: Aurora and Farmington (AyE)	Good	Moderate	Slight
Group 10. Somewhat droughty, medium-textured, neutral to calcareous soils that are shallow over limestone. Numerous outcrops of bedrock.			
10a—1 to 14 percent slopes: Benson (BeB, BeC)	Fair	Severe	Slight
10b—2 to 20 percent slopes: Benson (BkD)	Fair	Severe	Slight
Group 11. Somewhat poorly drained and poorly drained, medium-textured soils, and somewhat poorly drained, moderately fine textured and fine textured soils that formed in medium-lime and high-lime materials. These soils have a seasonal high water table.			
0 to 12 percent slopes: Angola (ArB, ArC); Appleton and Lyons, (AsB); Brockport and Lockport (BlB); Fredon (Fr); Kendaia (KeB); Kendaia and Lyons (KlA); Odessa (OdA, OdB); Ovid (OvA, OvB).	Fair to good	Moderate	Severe
Group 12. Nearly level, deep, somewhat poorly drained and poorly drained, medium-textured to moderately coarse textured soils that formed in medium-lime to high-lime sandy materials. These soils have a seasonal high water table.			
Lamson (Le); Minoa (Mf); Niagara (Na); Niagara and Canandaigua (Nc); Stafford (St).	Fair	Moderate	Severe
Group 13. Nearly level, deep, somewhat poorly drained, medium-textured soils that have a well-developed fragipan at a depth of 12 to 18 inches. The surface layer is acid; the fragipan ranges from acid to neutral.			
Scriba (Sk, Sm)	Fair	Moderate	Severe
Group 14. Moderately well drained and well drained, shallow, medium-textured, acid soils.			
14a—3 to 5 percent slopes: Arnot (AuC)	Fair	Moderate	Slight
14b—15 to 45 percent slopes: Arnot (AuD, AvE)	Fair	Moderate	Slight
Group 15. Somewhat poorly drained to poorly drained, medium-textured, acid soils. The Erie soils are deep to moderately deep over sandstone and shale, but at a depth of 12 to 18 inches, they have a very firm fragipan that restricts the growth of roots. The Tuller soils are underlain by sandstone at a depth of 10 to 20 inches.			
0 to 8 percent slopes: Erie (ErA, ErB, EsA, EsB); Tuller (TuB)	Fair	Moderate	Slight
Group 16. Very shallow to deep, well-drained, medium-textured, acid to calcareous soils that occur mainly in the steeper gorges, bordering the finger lakes.			
20 to 70 percent slopes: Aurora, Farmington and Benson (AzF)	Fair	Moderate to severe.	Slight
Group 17. Deep, excessively drained, medium-textured to moderately coarse textured and coarse textured soils that formed in low-lime to high-lime gravels and sands.			
17a—1 to 12 percent slopes: Colonie (CmB, CmC, CnB)	Fair	Moderate	Slight
17b—12 to 40 percent slopes: Alton and Howard (AoD); Colonie and Arkport (CpD); Palmyra, Howard and Alton (PnE).	Fair	Moderate	Slight

soils for woodland—Continued

Equipment limitation	Erosion hazard	Windthrow hazard	Species suitability— For planting	Species suitability— To favor in existing stands
Slight Moderate Moderate	Slight Moderate Severe	Moderate Moderate Moderate	Limited suitability: Austrian pine, Scotch pine, red pine, white pine, Norway spruce, black locust.	Sugar maple, red oak, white oak, black cherry, basswood, hickory, red maple, black oak.
Slight Moderate	Slight Slight	Moderate Moderate	Limited suitability: Austrian pine, Scotch pine, white-cedar, black locust.	Sugar maple, white ash, basswood, red oak, black cherry, black walnut, hickory, redcedar.
Moderate	Slight	Moderate	White spruce, white-cedar. Limited suitability: white pine, Norway spruce, Japanese larch.	Red maple, swamp white oak, black ash, white ash, sugar maple, basswood.
Moderate	Slight	Moderate	Norway spruce, white spruce, white-cedar. Limited suitability: Scotch pine, white pine, Japanese larch.	Red maple, swamp white oak, black ash, white ash, sugar maple, basswood.
Moderate	Slight	Severe	Norway spruce, white spruce. Limited suitability: Scotch pine, white pine, white-cedar, Japanese larch.	Red maple, elm, swamp white oak, black ash.
Slight Moderate	Slight Moderate	Moderate Moderate	Limited suitability: Scotch pine, white pine, Norway spruce, white spruce, Japanese larch.	Sugar maple, red oak, beech, black cherry, black birch.
Moderate	Slight	Severe	White spruce. Limited suitability: Scotch pine, white pine, Norway spruce, Japanese larch.	Sugar maple, basswood, red maple, black cherry.
Severe	Severe	Moderate	Limited suitability: Austrian pine, Scotch pine, red pine, white pine, black locust.	Sugar maple, basswood, white ash, black cherry, red oak, white oak.
Slight Slight	Slight Moderate	Slight Slight	Scotch pine, white pine, Japanese larch. Limited suitability: Austrian pine, red pine.	Sugar maple, basswood, red oak, black cherry, white ash, hickory, beech.

TABLE 2.—*Suitability of the*

Woodland groups	Potential productivity	Seedling mortality	Plant competition
Group 18. Nearly level, poorly drained, deep and moderately deep, moderately fine textured soils that formed in medium-lime and high-lime materials. The surface layer is neutral in reaction. These soils are waterlogged for 6 to 8 months each year. Lakemont (Lc); Madalin (Ma, Mb); Romulus (Ro); Varick (Va)	Fair	Severe	Severe
Group 19. Nearly level, mainly poorly drained and very poorly drained soils that range from calcareous to neutral in reaction. These soils are frequently flooded. Alluvial land is subject to flash floods. Some areas of Alluvial land are moderately well drained. Alluvial land (Al); Sloan (Sn); Warners (We)	Fair to good	Severe	Severe
Group 20. Very poorly drained, mineral and organic soils that vary widely in slope, texture, and other characteristics. These soils commonly are waterlogged from 8 to 10 months each year. Each site must be examined to determine its suitability for woodland. Alden (Ac, Ad); Ellery and Alden (ElB); Fonda (Fo); Lamson (Lf); Edwards (Ed); Muck, (Mr, Ms); Peat and Muck (Pu); Fresh water marsh (Fw); Lake beaches (Lb); Made land (Mc, Md).			

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 wildlife habitat, (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) openland, (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.

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 moisture-holding capacity and are not subject to frequent flooding. These soils can be safely planted to a wide variety of grain crops each year. Soils that are not so well suited require more intensive management and are suited to fewer crops.

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 moisture-holding 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 are generally 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 *soils for woodland*—Continued

Equipment limitation	Erosion hazard	Windthrow hazard	Species suitability—	
			For planting	To favor in existing stands
Moderate	Slight	Moderate	White-cedar. Limited suitability: white pine, Norway spruce, white spruce, Japanese larch.	Red maple, swamp white oak.
Moderate	Slight	Moderate	White-cedar. Limited suitability: Norway spruce, white spruce, black locust.	Red maple, swamp white oak. Better drained sites: basswood, white ash.
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the shrubs that can be grown on soils rated well suited are autumn-olive, Amur honeysuckle, Tatarian honeysuckle, crabapple, 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 can commonly be transplanted successfully.

Coniferous wildlife habitat.—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 those 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 Applications" 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 Applications" shows some limitations of the soils for use in reservoir areas and embankments for ponds.

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

[A rating of 1 indicates that the soil is well suited; 2, that the soil is suited; 3 that the soil is poorly suited; and 4, that the soil is not suited. Not rated are Alluvial land, Fresh water marsh, Lake beaches, and Made land]

Soil name	Wildlife habitat elements								Classes of wildlife		
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood plants	Coniferous wildlife habitat	Wetland food and cover plants	Shallow diked impoundments [1]	Shallow excavated impoundments [1]	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	1	1	3	2	1
Alton cobbly loam, 0 to 3 percent slopes	2	1	1	2	2	4	4	4	1	2	4
Alton cobbly loam, 3 to 8 percent slopes	2	1	1	2	2	4	4	4	1	2	4
Alton gravelly sandy loam, 0 to 3 percent slopes	2	1	1	2	2	4	4	4	1	2	4
Alton gravelly sandy loam, 3 to 8 percent slopes	2	1	1	2	2	4	4	4	1	2	4
Alton gravelly sandy loam, 8 to 15 percent slopes	2	1	1	2	2	4	4	4	1	2	4
Alton and Howard soils, 15 to 25 percent slopes	3	2	1	2	2	4	4	4	2	2	4
Angola silt loam, 1 to 6 percent slopes	2	2	1	1	2	3	3	3	2	1	3
Angola silt loam, 6 to 12 percent slopes	2	2	1	1	2	4	4	4	2	1	4
Appleton and Lyons loams, 0 to 5 percent slopes:											
Appleton	2	2	1	1	2	3	2	2	2	1	2
Lyons	4	3	3	2	2	2	2	2	3	2	2
Arkport fine sandy loam, 1 to 6 percent slopes	2	1	1	2	2	4	4	4	1	2	4
Arkport fine sandy loam, 6 to 12 percent slopes	2	1	1	2	2	4	4	4	1	2	4
Arnot channery silt loam, 3 to 15 percent slopes	2	2	2	2	2	4	4	4	2	3	4
Arnot channery silt loam, 15 to 25 percent slopes	3	2	2	2	2	4	4	4	2	3	4
Arnot soils, 25 to 45 percent slopes	4	3	2	2	2	4	4	4	3	3	4
Aurora silt loam, 2 to 6 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Aurora silt loam, 6 to 12 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Aurora silt loam, 6 to 12 percent slopes, eroded	3	1	1	1	3	4	4	4	1	1	4
Aurora silt loam, 12 to 18 percent slopes, eroded	4	2	1	1	3	4	4	4	2	2	4
Aurora silt loam, 18 to 30 percent slopes	4	3	1	1	3	4	4	4	3	2	4
Aurora silt loam, limestone substratum, 2 to 8 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Aurora and Farmington shaly silt loams, 12 to 18 percent slopes:											
Aurora	3	2	1	1	3	4	4	4	2	2	4
Farmington	3	2	2	2	2	4	4	4	2	2	4
Aurora and Farmington shaly silt loams, 18 to 40 percent slopes:											
Aurora	4	3	1	1	3	4	4	4	3	2	4
Farmington	4	3	2	2	2	4	4	4	3	2	4
Aurora, Farmington and Benson very rocky soils, 20 to 70 percent slopes	4	4	2	2	2	4	4	4	4	2	4
Benson loam, 1 to 8 percent slopes	2	2	2	2	2	4	4	4	2	2	4
Benson loam, 8 to 14 percent slopes	2	2	2	2	2	4	4	4	2	2	4

See footnote at end of table.

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

Soil name	Wildlife habitat elements								Classes of wildlife		
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood plants	Coniferous wildlife habitat	Wetland food and cover plants	Shallow diked impoundments [1]	Shallow excavated impoundments [1]	Openland	Woodland	Wetland
Benson very rocky loam, 2 to 20 percent slopes	3	2	2	2	2	4	4	4	2	2	4
Brockport and Lockport silty clay loams, 2 to 6 percent slopes	2	2	1	1	2	3	3	3	2	1	3
Camillus silt loam, 2 to 6 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Camillus silt loam, 6 to 12 percent slopes, eroded	2	1	1	1	3	4	4	4	1	1	4
Cazenovia silt loam, 2 to 8 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Cazenovia silt loam, 8 to 14 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Cazenovia silt loam, 5 to 14 percent slopes, eroded	3	1	1	1	3	4	4	4	2	1	4
Cazenovia silt loam, rolling	2	1	1	1	3	4	4	4	1	1	4
Cazenovia silt loam, 12 to 20 percent slopes	3	2	1	1	3	4	4	4	2	2	4
Cazenovia and Schoharie soils, 20 to 40 percent slopes	4	3	1	1	3	4	4	4	3	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
Colonie loamy fine sand, 1 to 6 percent slopes	3	2	2	2	2	4	4	4	2	2	4
Colonie loamy fine sand, 6 to 12 percent slopes	3	2	2	2	1	4	4	4	2	2	4
Colonie fine sandy loam, 1 to 6 percent slopes	3	2	2	2	1	4	4	4	2	2	4
Colonie and Arkport soils, 12 to 22 percent slopes	3	2	2	2	1	4	4	4	2	2	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
Dunkirk silt loam, 1 to 6 percent slopes	2	1	1	1	3	4	4	4	1	1	4
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 18 percent slopes, eroded	4	2	1	1	3	4	4	4	2	2	4
Dunkirk soils, 18 to 35 percent slopes	4	3	1	1	3	4	4	4	3	2	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
Eel silt loam, high bottom	2	1	1	1	3	4	3	3	1	1	3
Ellery and Alden silt loams, 3 to 8 percent slopes:											
Ellery	4	3	3	2	2	2	1	1	3	2	1
Alden	4	3	3	2	1	1	2	1	3	2	1
Erie channery silt loam, 0 to 3 percent slopes	3	2	2	2	3	2	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
Farmington shaly silt loam, 1 to 12 percent slopes	2	2	2	2	2	4	4	4	2	2	4
Fonda mucky silt loam	4	3	3	2	1	1	2	1	3	2	1
Fredon loam	2	2	1	1	2	3	4	4	2	1	4

See footnote at end of table.

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

Soil name	Wildlife habitat elements								Classes of wildlife		
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood plants	Coniferous wildlife habitat	Wetland food and cover plants	Shallow diked impoundments [1]	Shallow excavated impoundments [1]	Openland	Woodland	Wetland
Galen fine sandy loam, 0 to 2 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Galen fine sandy loam, 2 to 6 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Genesee silt loam	2	1	1	1	3	4	4	4	1	1	4
Genesee silt loam, high bottom	1	1	1	1	3	4	4	4	1	1	4
Genesee gravelly loam, fan	1	1	1	1	3	4	4	4	1	1	4
Hilton loam, 0 to 3 percent slopes	2	1	1	1	3	4	3	3	1	1	3
Hilton loam, 3 to 8 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Honeoye silt loam, 2 to 8 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Honeoye silt loam, 8 to 14 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Honeoye silt loam, 8 to 14 percent slopes, eroded	3	1	1	1	3	4	4	4	2	1	4
Honeoye soils, rolling	2	1	1	1	3	4	4	4	1	1	4
Honeoye and Lansing gravelly silt loams, 14 to 20 percent slopes	3	2	1	1	3	4	4	4	2	2	4
Howard gravelly loam, 0 to 3 percent slopes	2	1	1	2	2	4	4	4	1	2	4
Howard gravelly loam, 3 to 8 percent slopes	2	1	1	2	2	4	4	4	1	2	4
Howard gravelly loam, 8 to 15 percent slopes	2	1	1	2	2	4	4	4	1	2	4
Ira gravelly loam, 0 to 3 percent slopes	2	1	1	2	2	4	3	3	1	2	3
Ira gravelly loam, 3 to 8 percent slopes	2	1	1	2	2	4	4	4	1	2	4
Ira and Sodus very stony loams, 2 to 20 percent slopes	4	3	1	1	2	4	4	4	3	2	4
Kendaia silt loam, 3 to 8 percent slopes	2	2	1	1	2	3	4	4	2	1	4
Kendaia and Lyons silt loams, 0 to 3 percent slopes:											
Kendaia	2	2	1	1	2	3	2	2	2	1	2
Lyons	4	3	3	2	2	2	2	2	3	2	2
Lakemont silty clay loam	4	3	3	2	2	2	2	1	3	2	2
Lamson fine sandy loam	4	3	3	2	2	1	4	4	3	2	4
Lamson 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, rolling	2	1	1	2	2	4	4	4	1	2	4
Langford channery silt loam, 15 to 25 percent slopes	3	2	1	2	2	4	4	4	2	2	4
Langford-Howard gravelly loams, 2 to 8 percent slopes	2	1	1	2	2	4	4	4	1	2	4
Langford-Howard gravelly loams, 8 to 15 percent slopes	2	1	1	2	2	4	4	4	1	2	4
Langford-Howard gravelly loams, 15 to 25 percent slopes	3	2	1	2	2	4	4	4	2	2	4
Langford-Howard gravelly loams, 25 to 45 percent slopes	4	3	1	2	2	4	4	4	3	2	4

See footnote at end of table.

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

Soil name	Wildlife habitat elements								Classes of wildlife		
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood plants	Coniferous wildlife habitat	Wetland food and cover plants	Shallow diked impoundments [1]	Shallow excavated impoundments [1]	Openland	Woodland	Wetland
Langford channery silt loam, moderately shallow variant, 2 to 8 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
Lansing gravelly silt loam, 8 to 14 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Lansing gravelly silt loam, 8 to 14 percent slopes, eroded	3	1	1	1	3	4	4	4	1	1	4
Lansing gravelly silt loam, rolling	2	1	1	1	3	4	4	4	1	1	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
Lordstown channery silt loam, 2 to 8 percent slopes	2	2	1	2	2	4	4	4	2	2	4
Lordstown channery silt loam, 8 to 15 percent slopes	2	2	1	2	2	4	4	4	2	2	4
Madalin silt loam	4	3	3	2	2	2	2	1	3	2	2
Madalin silt loam, sandy subsoil variant	4	3	3	2	2	2	4	4	3	2	4
Minoa fine sandy loam	2	2	2	2	2	3	4	4	2	2	4
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 fine sandy loam	2	2	1	1	2	3	2	2	2	1	2
Niagara and Canandaigua silt loams:											
Niagara	2	2	1	1	2	3	2	2	2	1	2
Canandaigua	4	3	3	2	2	2	2	2	3	2	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 14 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Ontario fine sandy loam, rolling	2	1	1	1	3	4	4	4	1	1	4
Ontario loam, 2 to 8 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Ontario loam, 8 to 14 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Ontario loam, 8 to 14 percent slopes, eroded	3	1	1	1	3	4	4	4	2	1	4
Ontario loam, rolling	2	1	1	1	3	4	4	4	1	1	4
Ontario loam, 14 to 20 percent slopes	3	2	1	1	3	4	4	4	2	2	4
Ontario loam, 14 to 20 percent slopes, eroded	4	2	1	1	3	4	4	4	2	2	4
Ontario silt loam, moderately shallow variant, 0 to 3 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Ontario silt loam, moderately shallow variant, 3 to 8 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Ontario silt loam, moderately shallow variant, 8 to 14 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Ontario, Honeoye and Lansing soils, 20 to 35 percent slopes	4	3	1	1	3	4	4	4	3	3	4

See footnote at end of table.

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

Soil name	Wildlife habitat elements								Classes of wildlife		
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood plants	Coniferous wildlife habitat	Wetland food and cover plants	Shallow diked impoundments [1]	Shallow excavated impoundments [1]	Openland	Woodland	Wetland
Ontario, Honeoye and Lansing soils, 35 to 50 percent slopes	4	4	1	1	3	4	4	4	4	2	4
Ovid silt loam, 0 to 2 percent slopes	2	2	1	1	2	3	2	2	2	1	2
Ovid silt loam, 2 to 6 percent slopes	2	2	1	1	2	3	4	4	2	1	4
Palmyra gravelly sandy loam, 3 to 8 percent slopes	2	1	1	2	2	4	4	4	1	2	4
Palmyra gravelly sandy loam, 8 to 15 percent slopes	2	1	1	2	3	4	4	4	1	2	4
Palmyra gravelly loam, 0 to 3 percent slopes	2	1	1	2	3	4	4	4	1	2	4
Palmyra gravelly loam, 3 to 8 percent slopes	2	1	1	2	3	4	4	4	1	2	4
Palmyra gravelly loam, 8 to 15 percent slopes	2	1	1	2	3	4	4	4	1	2	4
Palmyra soils, 15 to 25 percent slopes	3	2	1	2	3	4	4	4	1	2	4
Palmyra, Howard and Alton soils, 25 to 40 percent slopes	4	3	1	2	3	4	4	4	3	2	4
Peat and Muck	4	3	3	2	2	1	4	2	3	3	2
Phelps gravelly silt loam	2	1	1	2	2	4	4	4	1	2	4
Riga and Lairdsville silt loams, 2 to 6 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Riga and Lairdsville silty clay loams, 6 to 12 percent slopes, eroded	3	1	1	1	3	4	4	4	2	1	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, 6 to 12 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Schoharie silty clay loam, 12 to 20 percent slopes	3	2	1	1	3	4	4	4	2	2	4
Scriba gravelly loam	2	2	1	1	3	3	2	2	2	1	2
Scriba very stony loam	3	2	2	2	2	3	3	3	2	2	3
Sloan silt loam	4	3	3	2	2	1	3	3	3	2	3
Sodus gravelly loam, 2 to 8 percent slopes	2	1	1	2	3	4	4	4	1	2	4
Sodus gravelly loam, 8 to 14 percent slopes	2	1	1	2	2	4	4	4	1	2	4
Sodus gravelly loam, 8 to 14 percent slopes, eroded	3	1	1	2	2	4	4	4	2	2	4
Sodus gravelly loam, rolling	2	1	1	2	2	4	4	4	1	2	4
Sodus gravelly loam, 14 to 20 percent slopes	3	2	1	2	2	4	4	4	2	2	4
Sodus gravelly loam, 20 to 40 percent slopes	4	3	1	2	2	4	4	4	3	2	4
Stafford fine sandy loam	3	2	2	2	2	3	4	4	2	2	4
Tuller channery silt loam, 1 to 8 percent slopes	3	2	2	2	1	3	4	4	2	2	4
Varick silt loam	4	3	3	2	2	2	3	3	3	3	3
Wampsville gravelly silt loam, 0 to 3 percent slopes	1	1	1	1	3	4	4	4	1	1	4
Wampsville gravelly silt loam, 3 to 8 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Warners loam	4	3	3	2	1	1	4	4	3	2	4
Warners loam, fan	4	3	3	2	1	1	4	4	3	2	4
Williamson silt loam, 0 to 2 percent slopes	2	1	1	1	3	4	3	3	1	1	3

See footnote at end of table.

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

Soil name	Wildlife habitat elements								Classes of wildlife		
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood plants	Coniferous wildlife habitat	Wetland food and cover plants	Shallow diked impoundments [1]	Shallow excavated impoundments [1]	Openland	Woodland	Wetland
Williamson silt loam, 2 to 6 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Williamson silt loam, 6 to 12 percent slopes	2	1	1	1	3	4	4	4	1	1	4
Williamson silt loam, 6 to 12 percent slopes, eroded	3	1	1	1	3	4	4	4	2	1	4

[1] Detailed investigation is needed at the site of a proposed shallow diked impoundment or a shallow excavated impoundment to determine the feasibility. Table 6 in the subsection "Engineering Applications" lists the soil features that affect the construction of the reservoir area and embankment of farm 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—openland, 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 openland 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.

OPENLAND WILDLIFE.—Examples of openland 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 and red squirrels, gray foxes, white-tailed deer, and raccoons.

WETLAND WILDLIFE.—Ducks, geese, rails, herons, shore birds, red-wing 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 (fig. 10).

Engineering Applications [11]

This soil survey for Cayuga County, although made primarily for farm use, has great value for other uses. Some soil properties are of special interest to engineers because they affect the design, construction, and maintenance of roads, airports, pipelines, building foundations, and sewage disposal systems. Among the properties most important to the engineer are permeability to water, shear strength, grain size, compaction characteristics, soil drainage, plasticity, and pH. Equally important are relief, depth to the water table, depth to bedrock, and kind of bedrock.

Information in this survey can be used to:

1. Make studies that will aid in selecting and developing sites for industrial, commercial, residential, and recreational purposes.
2. Make preliminary estimates of soil properties that are significant 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 locations for highways and in planning detailed investigations of selected locations.
4. Locate probable sources of gravel and other materials for use in construction.
5. Correlate performance of engineering structures with soils and thus gain information that will be useful in planning the design of and in maintaining other structures.
6. Determine the suitability of the soils for cross-country movement of vehicles and construction equipment.

[11] This section was prepared by JOHN B. FLECKENSTEIN, senior agronomist, EDWARD A. FERNAU, assistant soils engineer, and JOHN DRAGONETTI, assistant engineering geologist, New York State Department of Transportation, Bureau of Soil Mechanics, and by WALTER S. ATKINSON, State conservation engineer, Soil Conservation Service.

Figure 10.—**Lowland area of Fonda mucky silt loam and of Madalin silt loam. These soils are suitable for wetland wildlife habitat.**

7. Supplement information obtained from other published maps and reports and from aerial photographs 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 reported here can be useful for many purposes. It should be emphasized that they may not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads and excavations deeper than the depths of layers here reported. Even in these situations, the soil map is useful for planning more detailed field investigations and for suggesting the kinds of problems that may be expected.

Tables 4, 5, and 6 give information and interpretations most significant to engineers.

Additional information about the soils can be found in other sections of the survey, particularly the sections "Descriptions of the Soils" and "Formation and Classification of Soils."

Terminology

Some of the terms used by soil scientists may be unfamiliar to engineers, and some terms—for example, clay, silt, and sand—have a special meaning in soil science. These terms and others are defined in the Glossary at the back of this publication. Following are definitions of several terms used in this section of the survey.

Bearing capacity.—The unit load that can be placed on a soil without detrimental deformation to the structure that is supported. It is generally expressed in tons or pounds per square foot. In this survey the adjective ratings given for bearing capacity are estimated and should not be used to assign specific values of bearing capacity.

Compressibility.—The capability of a soil to be compressed by a superimposed load.

Liquid limit.—The moisture content at which the soil material passes from a plastic to a viscous, semiliquid state.

Moisture content.—The ratio of the weight of water contained in the soil to the dry weight of the soil. It is generally expressed as a percentage.

Moisture-density relations.—If a soil material is compacted at a successively higher moisture content, assuming that the compactive effort remains constant, the density of the compacted material will increase until the optimum moisture content is reached. After that, the density decreases with increase in moisture content. The highest dry density obtained in the compaction test is termed maximum dry density. The moisture-density relationship is important in earthwork, for, as a rule, optimum stability is obtained for any given compactive effort if the soil is compacted to about the maximum dry density when it is at approximately the optimum moisture content.

PLASTIC LIMIT.—The moisture content at which the soil material passes from a semisolid to a plastic state.

PLASTICITY INDEX.—The numerical difference between the liquid limit and the plastic limit. The plasticity index indicates the range of moisture content within which a soil material is plastic.

SHEAR STRENGTH.—The ability to resist sliding along internal surfaces within a soil mass when external forces are applied.

SHRINKAGE LIMIT.—The moisture content of soil material at which no further shrinkage occurs.

SHRINK-SWELL POTENTIAL.—An indication of the volume change to be expected of the soil material with changes in moisture content.

Engineering classification systems

In this section, soil texture is described according to the classification system used by the U.S. Department of Agriculture; the system used by the American Association of State Highway Officials (AASHO) (*2*); and the Unified system developed by the Corps of Engineers, U.S. Army (*18*).

In the system used by scientists of the U.S. Department of Agriculture, the texture of the soil horizon depends on the proportional amounts of the different sized mineral particles. The percentage of soil material smaller than 2.0 millimeters (classified as clay, silt, and sand) determines the textural classification. Coarse fragments greater than 2 millimeters, such as gravel, become part of the textural class when they are present in sufficient quantity.

The AASHO system 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 grouped together 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).

The Unified soil classification system is based on identification of soils according to their texture and plasticity and on their performance as engineering construction materials. In this system 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. The letters 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. If the soils are on the borderline between two classifications, a joint classification is used, for example, GM-GC.

Soil data and interpretations

Table 4 presents data obtained by laboratory tests on samples of eight soils that are extensive in the county. The soils were sampled at one or more locations. These soils formed in highly variable glacial till and water-deposited materials, which range considerably in grain size (texture). Thus, the engineering soil classification given in table 4 may not apply to all parts of the mapped soil unit. The classification does apply to the soil as it occurs throughout most of its acreage in the county. In establishing the engineering soil classification, particles larger than 3 inches were not considered.

Table 5 lists estimated properties of the soils that are significant to engineers. The estimates in table 5 are based on test data shown in table 4, on information taken from the soil survey, and on knowledge gained through experience in using the soils for engineering construction.

Table 6 lists some appraisals of the suitability of the soils for use in highways, embankments, and building foundations and as a source of topsoil, sand, and gravel. Also shown in table 6 are characteristics that affect the suitability of the soils for the installation of conservation engineering structures.

Engineering properties of geologic deposits and bedrock

The following geologic deposits occur in Cayuga County: glacial till, glacial outwash, lacustrine sediments, alluvium, and organic deposits. In addition, part of the county was mapped as Fresh water marsh; Lake beaches; Made land, sanitary land fill; and Made land, tillable.

Each geologic unit has engineering significance that differs from that of other geologic units. Each unit is described in the following paragraphs, and the broad engineering significance is given.

THICK GLACIAL TILL

Thick glacial till occurs on the uplands, mostly where the topography is sloping or hilly. Ordinarily, the deposits are more than 3½ feet thick over bedrock. Compactness of the material in place varies, depending on whether the till was overridden by the ice or left in place when the ice melted. Glacial till is generally unstratified, although in places pockets of sand, gravel, silt, or clay have formed within the soil mass as a result of some sorting.

The Alden soil, till substratum, and the Appleton, Cazenovia, Conesus, Ellery, Erie, Hilton, Honeoye, Ira, Kendaia, Langford, Lansing, Lima, Ontario, Ovid, Romulus, Scriba, and Sodus soils formed in thick glacial till.

The glacial till provides stable subgrades, good embankment foundations, and, with proper treatment, stable cut slopes for highways. It also furnishes good foundation support for buildings. If properly compacted, material excavated from till deposits, either from highway cuts or from outside borrow areas, can be used to form stable embankments. Some till deposits, however, contain many boulders and coarse fragments.

TABLE 4.—*Engineering*

[Tests performed by New York State Department of Transportation, Bureau of Soil Mechanics,

Soil name and location	Parent material	SCS report No. S63NY-6	Depth	In-place moisture content	In-place dry density	Moisture-density data [1] Optimum moisture	Moisture-density data [1] Maximum dry density	Percolation rate [2]	Specific gravity [3]	Reaction	Organic content [4]
			In.	*Pct.*	*Lb. per cu. ft*	*Pct.*	*Lb. per cu. ft.*	*Min. per inch*		*pH*	*Pct.*
Alden mucky silt loam: Town of Aurelius, 2 mi. W. of Half Acre, 250 yds. N. of W. Genesee St. Rd.	Glacial lacustrine deposits dominated by gray silt, very fine sand, and reddish clay. Water table encountered at depth of 35 to 42 inches.	4–1	0–12	------	------			3.00	2.49	7.4	11.70
		4–2	12–15	------	------	------	------	------	2.59	7.5	4.38
		4–3	15–17	------	------	16.8	108.5	------	2.63	7.5	2.18
		4–4	17–24	22.6	102.5	19.4	105.0	------	2.71	7.5	.84
		4–5	24–35	------	------	13.5	117.4	------	2.71	7.6	.29
Cazenovia silt loam: Town of Aurelius, 2 mi. ESE. of Cayuga, 200 yds. ENE. of railroad crossing on Chamberlain Rd. (Light side of texture range intergrading to Honeoye.)	Calcareous glacial till consisting of reworked lacustrine clay, limestone, and sandstone.	6–1	0–9	13.0	85.4	------	------	2.50	2.62	6.2	4.76
		6–2	9–13	------	------	15.6	111.8	[10] 6.00	2.72	6.6	1.12
		6–3	13–25	9.4	105.9	16.4	110.7	[10] 6.00	2.72	7.3	.49
		6–4	25–41	8.1	124.7	10.7	124.8	>120.00	2.76	8.1	------
Town of Brutus, 1½ mi. WNW. of Weedsport, 50 ft. WNW. of intersection of Sarr and Town Line Rds. (Intergrading to Ontario.)	Calcareous glacial till dominated by limestone, sandstone, and some reworked lacustrine sediments, and clayey Vernon shale.	8–1	0–10	8.2	89.4	------	------	[10] 15.00	2.64	6.7	3.32
		8–2	10–16	------	------	13.5	116.8	[10] 15.00	2.68	6.0	1.43
		8–3	16–40	8.1	106.2	15.3	113.0	35.00	2.74	6.5	.34
		8–4	40–48	6.1	119.6	11.0	124.5	------	2.76	8.1	------
Town of Sennett, ¾ mi. SSE. of village of Sennett, 100 ft. N. of Miller Rd. (Modal.)	Calcareous glacial till dominated by reworked lacustrine clay and limestone.	10–1	0–11	9.6	95.1	------	------	1.00	2.62	6.7	2.33
		10–2	11–15	------	------	13.3	116.0	------	2.66	7.2	1.05
		10–3	15–24	14.1	108.0	15.6	113.7	2.50	2.73	8.0	.43
		10–4	24–40	14.3	114.2	15.0	115.0	>120.00	2.76	8.2	------
Honeoye silt loam: Town of Scipio, 3½ mi. SW. of village of Fleming, 150 ft. N. of Mosher Rd., ½ mi. E. of route 34–B. (Modal.)	Calcareous glacial till dominated by limestone, shale, and sandstone.	12–1–2	0–7	14.3	94.1	------	------	3.00	2.68	7.8	3.34
		12–3	7–15	8.5	105.5	13.0	118.5	13.00	2.73	8.0	1.38
		12–4	15–36	8.2	124.0	9.5	129.5	>120.00	2.76	7.4	------
Town of Springport, 1 mi. S. of Union Springs, 200 ft. W. of Dildine Rd. (Intergrading to Cazenovia.)	Multiple deposits of calcareous glacial till; some dominated by reworked lacustrine sediments; some by limestone, sandstone, and shale.	14–1	0–7	10.9	85.9	16.3	107.5	9.00	2.64	7.2	3.36
		14–2	7–16	14.6	101.1	17.5	108.5	4.00	2.72	7.7	1.53
		14–3	16–25	20.0	93.2	16.6	110.0	15.00	2.73	7.4	.95
		14–4	25–38	12.3	108.0	11.2	123.5	16.00	2.73	7.3	1.09
		14–5	38–40	------	------	------	------	------	2.73	7.4	------
		14–6	40–42	------	------	8.5	131.0	------	2.75	7.4	------
		14–7	42–48	8.7	132.6	7.7	136.0	>120.00	2.76	8.1	------

See footnotes at end of table.

test data

in accordance with standard procedures of the American Association of State Highway Officials (AASHO) (*2*)]

Mechanical analysis [5] [6]												Liquid limit	Plasticity index [7]	Classification	
Percentage passing sieve—								Percentage smaller than—						AASHO	Unified [8]
3-in.	1-in.	¾-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.				
												Pct.			
------	------	------	------	100.0	99.9	98.6	86.8	(9)	------	------	------	------	------	------	------
------	------	------	------	100.0	99.8	97.2	77.4	(9)	------	------	------	39.1	15.5	A-6 (10)	CL
------	------	------	------	100.0	99.8	97.8	80.4	57.2	39.7	23.0	16.0	29.9	12.0	A-6 (9)	CL
------	------	------	------	100.0	99.9	98.6	79.2	60.7	37.6	23.3	18.6	24.1	6.9	A-4(8)	ML-CL
------	------	------	------	100.0	99.9	99.5	91.9	67.7	36.9	18.0	12.2	22.1	7.1	A-4(8)	ML-CL
100.0	98.7	97.8	95.8	94.3	92.8	86.3	66.1	(9)	------	------	------	32.8	4.3	A-4(6)	ML
100.0	99.9	99.2	97.3	96.0	93.7	87.2	67.4	52.1	42.6	29.6	20.7	25.8	8.2	A-4(6)	CL
100.0	98.4	97.5	95.3	93.1	91.6	87.2	65.3	48.0	38.6	28.3	21.8	28.4	13.1	A-6(7)	CL
100.0	98.5	97.1	94.8	91.7	89.5	84.1	68.5	53.5	43.3	27.9	20.0	21.7	8.2	A-4(7)	CL
100.0	97.0	96.5	93.8	91.2	89.2	84.3	64.5	(9)	------	------	------	26.8	4.9	A-4(6)	ML-CL
100.0	98.1	96.9	94.5	90.6	87.4	80.1	59.5	46.8	35.4	21.1	12.2	22.0	6.0	A-4(5)	ML-CL
100.0	98.9	97.1	95.3	93.2	91.3	86.9	65.1	49.7	39.1	29.7	23.8	25.0	10.8	A-6(6)	CL
100.0	89.9	88.2	82.3	77.5	73.4	65.9	45.7	33.3	26.6	16.5	12.2	17.8	5.7	A-4(2)	SM-SC
------	------	------	------	100.0	99.1	96.8	67.8	(9)	------	------	------	27.2	6.6	A-4(7)	ML-CL
------	------	------	100.0	99.4	96.6	92.2	65.2	45.6	31.3	16.0	11.0	20.2	4.4	A-4(6)	ML-CL
------	------	------	------	100.0	99.5	98.5	88.9	74.2	61.3	36.8	25.9	27.1	10.6	A-6(8)	CL
------	------	------	100.0	99.8	99.2	98.0	93.5	81.6	71.5	38.6	28.0	25.0	9.2	A-4(8)	CL
100.0	96.6	94.9	92.7	89.2	86.4	81.1	65.4	(9)	------	------	------	30.0	7.2	A-4(6)	ML-CL
100.0	93.2	91.6	89.2	86.6	82.0	75.2	62.4	51.9	39.3	23.4	15.5	29.5	9.8	A-4(5)	CL
100.0	92.7	90.3	86.1	82.4	76.3	67.1	55.1	44.5	34.9	16.8	10.6	20.2	5.3	A-4(4)	ML-CL
100.0	99.2	98.2	95.7	93.2	90.5	84.6	62.5	(9)	------	------	------	27.6	10.9	A-6(6)	CL
100.0	99.1	98.3	96.8	95.3	92.7	87.6	68.4	54.7	42.8	29.3	21.4	32.4	14.3	A-6(8)	CL
100.0	96.9	95.7	92.7	90.8	87.2	81.7	67.7	54.2	39.5	21.4	14.4	22.1	7.9	A-4(7)	CL
100.0	99.6	98.9	96.7	94.9	92.1	85.2	67.9	50.7	37.7	19.3	13.5	18.8	5.2	A-4(7)	ML-CL
------	------	------	100.0	97.7	92.4	79.1	64.8	46.7	35.7	20.0	13.9	21.0	6.5	A-4(6)	ML-CL
------	100.0	98.9	97.2	95.5	93.1	80.2	38.2	22.7	14.8	8.3	6.8	------	NP	A-4(1)	SM
100.0	97.9	97.1	93.7	86.6	80.1	69.9	54.0	41.9	28.8	15.9	11.7	18.2	6.8	A-4(4)	ML-CL

TABLE 4.—*Engineering*

Soil name and location	Parent material	SCS report No. S63NY-6	Depth	In-place moisture content	In-place dry density	Moisture-density data [1]: Optimum moisture	Moisture-density data [1]: Maximum dry density	Percolation rate [2]	Specific gravity [3]	Reaction	Organic content [4]
			In.	*Pct.*	*Lb. per cu. ft*	*Pct.*	*Lb. per cu. ft.*	*Min. per inch*		*pH*	*Pct*
Honeoye silt loam—Continued											
Town of Venice, 1 mi. NE. of East Venice, 200 ft. W. of Stanton Rd. (Nonmodal; intergrading to Lansing.)	Eolian mantle about 1 foot thick over multiple deposits of calcareous glacial till dominated by sandstone, shale, and limestone. The topmost layer of the till is ground moraine; the underlying layers have been reworked to some extent by water.	16-1	0-7	23.3	73.3	------	------	[10] 4.00	2.61	5.8	4.89
		16-2	7-10	19.6	82.8	24.8	96.3	[10] 4.00	2.65	5.4	3.31
		16-3	10-18	15.8	86.8	19.8	104.5	1.40	2.67	6.1	1.63
		16-4	18-33	------	------	9.7	126.3	------	2.73	7.9	.66
		16-5	33-37	------	------	8.5	130.2	------	2.71	7.8	------
		16-6	37-62	10.6	118.0	11.5	123.0	>120.00	2.74	8.1	------
		16-7	62-68	------	127.4	11.0	124.5	1.00	2.71	7.5	------
		16-8	68-85	8.2	------	9.5	129.5	30.00	2.73	8.0	------
Howard gravelly loam:											
Town of Locke, 1 mi. SW. of village of Locke, 500 yds. W. of intersection of cemetery and cat path roads. (Nonmodal.)	Glacial outwash dominated by sandstone and shale but includes some limestone.	17-1	0-9	13.7	88.2	13.7	113.5	.65	2.65	5.3	5.67
		17-2	9-15	------	------	8.5	130.3	------	2.70	5.4	3.04
		17-3	15-37	------	------	7.3	134.7	.40	2.71	5.7	1.57
		17-4	37-53	------	------	7.0	138.0	<1.00	2.72	7.5	.74
Kendaia silt loam:											
Town of Aurelius, ¾ mi. W. of Fosterville, 100 ft. S. of Turnpike Rd.	Calcareous glacial till dominated by silty shale. Weathered shale at depth of 41 to 48 inches.	7-1	0-9	21.2	79.0	22.8	92.8	[10] 1.50	2.61	7.3	5.69
		7-2	9-13	------	------	------	------	[10] 1.50	2.63	7.3	4.68
		7-3	13-21	18.6	93.2	18.8	106.3	------	2.72	7.5	1.12
		7-4	21-33	21.5	99.6	19.4	105.0	1.60	2.72	7.7	.54
		7-5	33-41	28.6	96.1	25.7	95.0	------	2.72	8.0	------
		7-6	41-48	------	------	------	------	------	2.67	7.9	------
Town of Scipio, 3½ mi. SW. of village of Fleming, 100 ft. N. of Mosher Rd., ¼ mi. E. of route 34-B. (Modal.)	Calcareous glacial till dominated by limestone, shale, and sandstone.	11-1	0-9	21.7	81.8	------	------	1.70	2.62	7.2	5.81
		11-2	9-15	------	------	12.5	117.0	18.00	2.67	7.5	1.03
		11-3	15-48	10.9	129.0	13.3	133.8	>120.00	2.74	8.0	------
Town of Venice, 2¼ mi. N. of East Venice, 200 ft. W. of Stanton Rd., behind building. (Nonmodal.)	Calcareous glacial till dominated by sandstone, shale, and limestone.	15-1	0-10	20.4	83.9	------	------	2.50	2.62	6.2	5.56
		15-3	12-18	11.9	105.7	14.3	115.3	7.00	2.71	7.5	.83
		15-4	18-38	14.2	117.0	13.0	118.3	8.50	2.73	7.9	.42
		15-5	38-60	8.9	113.9	9.6	129.0	>120.00	2.75	8.1	------
Lakemont silty clay loam:											
Town of Sennett, 1 mi. E. of Auburn City line, 200 yds. N. of U.S. Highway No. 20. (Modal.)	Glacial lacustrine deposits dominated by reddish calcareous clay and silt.	3-1	0-9	------	------	------	------	------	2.40	5.7	15.80
		3-2	9-14	------	------	24.5	95.1	------	2.68	5.2	2.36
		3-3	14-19	13.8	112.0	16.1	111.0	35.00	2.71	7.1	.67
		3-4	19-26	19.0	106.9	18.7	105.9	------	2.76	7.4	------
		3-5	26-42	16.7	113.5	19.1	105.5	>120.00	2.78	7.8	------
Town of Aurelius, 1¼ mi. E. of Cayuga, 250 yds. E. of Walker Rd., ⅓ mi. S. of West Genesee St. (Nonmodal; moderately deep over till.)	Lacustrine silt and clay over calcareous gravelly loam glacial till.	5-1	0-8	18.9	78.7	------	------	.25	2.58	6.3	8.00
		5-2	8-24	23.1	81.6	33.9	84.5	.03	2.74	7.3	2.47
		5-3	24-30	9.4	122.1	10.0	127.2	>120.00	2.76	7.9	------

See footnotes at end of table.

test data—Continued

Mechanical analysis [5, 6]												Liquid limit	Plasticity index [7]	Classification	
Percentage passing sieve—								Percentage smaller than—						AASHO	Unified [8]
3-in.	1-in.	¾-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.	*Pct*			
100.0	98.5	97.0	93.9	90.6	87.1	79.7	60.0	(9)	------	------	------	------	NP	A-4(5)	ML
100.0	93.4	92.6	88.8	85.8	82.4	76.9	59.6	(9)	------	------	------	36.6	10.9	A-6(5)	ML-CL
100.0	86.3	83.3	78.2	73.7	69.4	62.6	46.0	38.6	28.3	12.0	8.3	24.2	5.8	A-4(2)	SM-SC
100.0	87.3	83.8	77.5	71.9	65.5	55.8	38.8	30.2	19.1	8.8	5.4	18.8	5.6	A-4(1)	SM-SC
100.0	92.9	91.4	83.5	73.1	62.3	49.6	29.4	20.2	12.6	5.0	3.0	------	NP	A-2-4(0)	SM
97.3	89.8	87.4	80.3	73.8	68.1	58.7	42.3	32.2	22.7	11.6	6.8	17.7	5.8	A-4(1)	SM-SC
97.7	78.1	74.7	63.9	54.8	46.0	27.5	16.7	13.1	7.8	7.4	2.9	23.6	5.4	A-1-6(0)	GM-GC
96.4	87.6	84.9	78.2	71.8	64.6	53.5	34.6	23.6	12.1	4.8	2.7	------	NP	A-2-4(0)	SM
100.0	78.3	72.4	62.2	54.0	45.5	32.6	26.4	(9)	------	------	------	45.3	14.4	A-2-7(0)	GM
96.4	65.8	58.7	47.2	38.2	27.3	12.9	8.6	(11)	------	------	------	------	NP	A-1-a(0)	GW-GM
96.8	59.7	53.2	43.1	36.0	27.5	11.0	6.3	(11)	------	------	------	------	NP	A-1-a(0)	GW-GM
89.1	63.5	57.3	45.1	35.5	24.5	14.4	9.0	(11)	------	------	------	------	NP	A-1-a(0)	GW- GM
------	100.0	99.5	97.9	96.3	94.9	90.8	69.8	(9)	------	------	------	38.8	8.1	A-4(7)	ML
100.0	97.3	96.5	94.9	93.4	92.1	87.3	66.3	(9)	------	------	------	37.7	13.0	A-6(7)	ML-CL
100.0	93.9	92.2	89.8	87.8	85.9	81.7	65.0	51.7	32.1	16.6	10.6	26.0	8.1	A-4(6)	CL
100.0	98.4	97.3	95.5	83.0	68.3	58.8	52.9	46.8	33.2	12.2	7.2	25.6	8.0	A-4(4)	CL
------	------	------	100.0	99.9	98.9	97.4	96.5	78.4	50.6	15.9	9.7	------	NP	A-4(8)	ML
100.0	98.7	96.0	78.9	64.3	43.1	18.2	10.7	9.5	5.1	1.7	1.1	------	NP	A-1-a(0)	SW-SM
100.0	96.9	96.1	95.5	95.0	93.5	88.8	71.1	(9)	------	------	------	40.2	5.3	A-4(7)	ML&OL
------	------	------	100.0	------	95.9	90.7	64.5	48.9	28.6	15.8	11.1	20.9	5.6	A-4(6)	ML-CL
96.8	84.7	80.8	74.2	69.5	64.0	54.1	39.1	33.6	23.9	9.7	6.3	17.7	5.6	A-4(1)	GM-GC
100.0	99.2	98.8	97.2	95.2	93.5	89.6	72.4	(9)	------	------	------	35.8	6.6	A-4(7)	ML
100.0	99.1	98.3	96.0	93.6	89.9	79.0	48.4	36.5	25.8	14.3	10.2	21.2	6.8	A-4(3)	SM-SC
100.0	93.3	91.2	85.3	79.9	73.8	63.7	45.1	35.9	25.9	12.9	8.9	21.2	7.2	A-4(2)	SC
100.0	92.7	90.1	83.8	77.8	71.2	60.6	46.4	36.7	27.5	12.8	7.9	17.6	5.0	A-4(2)	SM-SC
------	------	------	------	100.0	99.8	97.6	89.4	(9)	------	------	------	------	------	------	------
------	------	------	------	100.0	99.0	93.5	87.1	77.6	69.9	46.0	32.5	42.8	17.2	A-7-6(11)	ML-CL
------	------	------	100.0	99.9	99.2	96.9	81.1	67.6	61.4	41.7	33.0	31.4	13.5	A-6(10)	CL
------	------	------	------	100.0	99.8	98.7	88.6	72.5	68.1	54.8	42.0	36.7	19.0	A-6(12)	CL
------	------	------	------	------	100.0	99.8	99.3	89.0	83.6	52.1	36.7	30.6	13.9	A-6(10)	CL
------	------	------	100.0	99.7	99.0	95.9	82.5	(9)	------	------	------	44.5	10.5	A-7-5(9)	ML&OL
------	------	------	100.0	99.8	99.5	98.2	93.6	81.3	73.4	59.2	48.5	46.1	21.3	A-7-6(14)	CL-ML
100.0	96.1	94.2	91.0	87.4	84.6	78.3	59.2	46.0	33.7	20.0	14.0	20.8	7.7	A-4(5)	CL

TABLE 4.—*Engineering*

Soil name and location	Parent material	SCS report No. S63NY-6	Depth	In-place moisture content	In-place dry density	Moisture-density data [1]: Optimum moisture	Moisture-density data [1]: Maximum dry density	Percolation rate [2]	Specific gravity [3]	Reaction	Organic content [4]
			In.	*Pct.*	*Lb. per cu. ft*	*Pct.*	*Lb. per cu. ft.*	*Min. per inch*		*pH*	*Pct.*
Langford channery silt loam:											
Town of Sempronius, 1 mi. W. of village of Dresserville, 350 ft. N. of Brockway Rd. and 6.3 mi. E. of Moravia Post Office. (Nonmodal; questionable spodic horizons.)	Acid to slightly acid glacial till dominated by sandstone and shale.	19-1	0-10	20. 0	77. 1	------	------	. 70	2. 63	6. 4	5. 15
		19-2	10-16	14. 3	88. 6	17. 5	108. 5	1. 30	2. 69	5. 3	2. 17
		19-4	21-25	------	------	------	------	------	2. 71	5. 2	. 97
		19-5	25-63	20. 3	98. 8	13. 2	116. 5	30. 00	2. 75	5. 3	. 40
		19-6	63-76	9. 6	114. 5	11. 1	124. 3	>120. 00	2. 72	8. 0	. 53
Town of Summer Hill, 1 mi. SE of village of Summer Hill, 75 ft. S. of Montgomery Rd., ½ mi. E. of Salt Rd. (Nonmodal; morainic position.)	Acid to slightly acid glacial till dominated by sandstone and shale.	18-1	0-9	23. 4	78. 4	------	------	1. 00	2. 62	6. 2	6. 10
		18-2	9-17	15. 3	85. 4	18. 9	106. 0	3. 50	2. 68	5. 4	2. 00
		18-3	17-20	------	------	------	------	------	2. 71	5. 2	. 78
		18-4	20-40	11. 7	109. 5	12. 7	119. 3	30. 00	2. 73	4. 2	. 67
		18-5	40-60	14. 4	107. 5	11. 7	122. 0	>120. 00	2. 73	5. 8	------
Palmyra gravelly loam:											
Town of Sennett, 1 mi. SE. of village of Sennett, 100 yds. N. of Miller Rd., 100 ft. S. of gravel pit. (Modal.)	Calcareous gravelly and sandy outwash material dominated by red and gray sandstone and limestone gravel.	9-1-2	0-11	9. 2	82. 4	------	------	------	2. 59	6. 5	7. 38
		9-3	11-32	6. 3	85. 6	17. 0	109. 0	7. 00	2. 62	7. 4	1. 82
		9-5	34-60	1. 3	106. 6	9. 2	130. 0	. 50	2. 74	8. 3	------
Town of Scipio, 2 mi. SW. of village of Fleming, 100 yds. S. of Town Line Rd., between towns of Scipio and Fleming, ¼ mi. E. of Cork St. (Nonmodal; poorly sorted, high in fines.)	Calcareous glacial outwash dominated by poorly sorted limestone, sandstone, and shale.	13-1	0-10	11. 3	87. 3	------	------	[10]. 70	2. 64	6. 6	4. 64
		13-2	10-13	------	------	16. 5	108. 8	[10]. 70	2. 67	7. 2	2. 80
		13-3	13-20	15. 2	85. 2	14. 8	113. 7	[10]. 80	2. 70	7. 5	2. 90
		13-4	20-32	------	------	13. 0	119. 0	[10]. 80	2. 72	7. 2	2. 38
		13-5	32-48	4. 4	102. 0	9. 5	129. 4	. 70	2. 73	7. 9	------

[1] Based on AASHO Designation: T 99-57, Method C (*2*).

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

[3] Specific gravity test performed on fraction passing ¾-inch sieve.

[4] Wet combustion method, based on 1942 Cornell University agronomy test procedure, modified by Bureau of Soil Mechanics.

[5] Mechanical analysis according to the AASHO Designation: T 88-57 (*2*). Results by this procedure may differ somewhat from results 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 analysis data used in this table are not suitable for naming textural classes for soils.

[6] Fragments larger than 3 inches in diameter were discarded in field sampling. The largest proportion of any sample discarded was 40 percent.

test data—Continued

Mechanical analysis [5] [6]												Liquid limit	Plasticity index [7]	Classification	
Percentage passing sieve—								Percentage smaller than—						AASHO	Unified [8]
3-in.	1-in.	¾-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.				
												Pct.			
100.0	86.0	82.8	75.2	69.3	63.8	56.2	48.7	(9)	------	------	------	------	NP	A-4(3)	GM
100.0	85.4	81.7	73.7	66.8	60.1	51.0	43.1	34.8	21.4	6.5	4.0	33.8	6.1	A-4(2)	GM
87.6	66.1	62.7	55.6	50.3	44.1	35.9	29.1	24.4	16.3	9.1	6.0	22.5	7.3	A-2-4(0)	GC
100.0	79.2	75.5	68.4	62.3	55.0	44.5	36.8	28.9	20.0	11.4	7.2	20.8	4.3	A-4(0)	GM-GC
100.0	90.8	87.6	79.2	72.5	66.0	54.9	46.5	36.0	28.1	14.2	10.0	24.0	9.3	A-4(2)	GC
100.0	91.3	87.6	80.5	73.5	66.8	58.1	44.3	(9)	------	------	------	42.8	7.8	A-5(2)	SM
100.0	93.2	91.5	85.6	79.7	72.2	61.2	36.5	25.1	12.0	3.4	2.5	------	NP	A-4(0)	SM
100.0	81.2	78.4	71.5	65.1	58.9	49.6	40.5	31.0	22.5	9.2	6.0	21.3	6.8	A-4(1)	GM-GC
100.0	84.0	79.9	72.0	65.7	59.8	50.7	42.1	35.0	23.8	10.3	6.3	23.0	6.2	A-4(1)	GM-GC
100.0	92.2	89.7	82.8	77.0	70.4	58.0	48.1	39.8	29.6	15.4	9.8	24.3	9.3	A-4(3)	SC
100.0	94.6	92.6	88.0	81.6	74.5	67.5	53.3	(9)	------	------	------	45.7	6.6	A-5(4)	ML&OL
100.0	96.2	94.6	88.4	82.6	76.2	67.2	54.1	42.2	28.0	28.0	13.4	28.0	9.5	A-4(4)	CL
100.0	91.3	87.1	72.3	54.9	32.2	17.4	5.6	(11)	------	------	------	------	NP	A-1-a(0)	SW-SM
100.0	94.8	92.8	88.9	85.5	81.2	72.2	62.8	(9)	------	------	------	35.4	8.4	A-4(6)	ML
100.0	96.0	95.0	89.5	85.1	80.4	70.1	61.0	51.6	37.2	18.9	9.3	34.2	10.3	A-4(5)	ML-CL
100.0	75.2	69.2	61.3	54.8	47.5	37.6	33.6	27.0	20.2	11.3	7.2	34.4	8.7	A-2-4(0)	GM-GC
83.4	59.4	54.1	44.7	39.0	33.8	24.2	21.4	18.4	12.9	5.8	3.0	35.0	8.3	A-2-4(0)	GM
95.8	63.7	56.2	43.0	35.4	26.2	9.3	7.0	(11)	------	------	------	25.2	6.2	A-1-a(0)	GW-GC

[7] NP=Nonplastic.

[8] SCS and BPR have agreed to consider that all soils having plasticity indexes within two points from A-line are to be given a borderline classification. Examples of borderline classifications obtained by this use are GM-GC, ML-CL, and SW-SM.

[9] Hydrometer analysis was not performed on soil horizons containing a considerable amount of organic material, because organic matter has a flocculating effect on organic portions of the sample and results are unreliable.

[10] Composite field tests were taken on two or more horizons where tests on individual horizons were prevented by thinness of the horizons. Other laboratory data are for the separate horizons.

[11] Hydrometer analysis was not performed on soil samples that contained little or no clay and in which less than 10 percent of the particles passed the No. 200 sieve.

TABLE 5.—*Estimated*

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	4+	0	0–9	Mucky silt loam
			9–40	Silt loam or loam
Ad	4+	0	0–9	Mucky silt loam
			9–40	Loam to silt loam
			40–48	Dense firm gravelly loam or gravelly silt loam till.
Alluvial land: [2] Al. (All properties variable.)				
Alton:				
AnA, AnB, AnC, AoD (For Howard part of AoD, see Howard series.)	4+	3+	0–41	Gravelly sandy loam
			41–120	Stratified sand and gravel
AmA, AmB. (Properties same as those for rest of this series, except that cobblestones make up from 15 to 50 percent of the volume.)				
Angola: ArB, ArC	1½–3½	½–1½	0–9	Silt loam
			9–24	Silty clay loam
			24	Soft fractured shale bedrock
Appleton: AsB (for Lyons part of AsB, see Lyons series.)	3½+	½–1	0–14	Loam to very fine sandy loam
			14–20	Loam to light sandy clay loam
			20–52	Loam to fine sandy loam till
Arkport: AtB, AtC	4+	3+	0–48	Fine sandy loam and loamy fine sand with thin bands of fine sandy loam.
			48–55	(3)
Arnot: AuC, AuD, AvE	1–1⅔	1–1½	0–17	Channery silt loam
			17	Bedrock.
Aurora:				
AwB, AwC, AwC3, AwD3, AwE, AyD, AyE (For Farmington part of AyD and AyE, see Farmington series.)	1½–3½	1½–2	0–13	Silt loam
			13–32	Coarse silty clay loam, shaly silty clay loam
			32–40	Soft shale bedrock.
AxB. (Properties same as those for rest of this series, except that soil is underlain by limestone instead of shale.)				
AzF. (Properties not estimated. Deep gorges, vertical rock walls, and rock outcrops.)				
Benson:				
BeB, BeC	1–1½	(4)	0–18	Loam
			18	Limestone bedrock.
BkD. (Properties same as those for rest of this series, except that there are numerous outcrops of rock.)				
Brockport: BlB (For Lockport part of BlB, see Lockport series.)	2–4	0–1	0–8	Silty clay loam
			8–28	Clay or silty clay
			28–60	Soft shale bedrock.
Camillus: CaB, CaC3	1½–3½	3+	0–36	Friable silt loam
			36	Fractured soft shale bedrock.
Canandaigua	4+	0	0–27	Silt loam
			27–43	Very fine sandy loam, silt loam, or coarse clay loam.

See footnotes at end of table.

properties of the soils

Classification—Continued		Percentage passing sieve—			Permeability	Reaction [1]	Available moisture capacity
Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)			
					Inches per hour	*pH*	*Inches per inch of soil*
OL, OH or Pt	A-6, A-4	95-100	95-100	60-95	0. 63-2. 0	6. 1-7. 3	0. 30+
ML or CL	A-4, A-6	95-100	95-100	60-95	0. 63-2. 0	6. 0-7. 5+	0. 20-0. 23
OL, OH or Pt	A-6, A-4	95-100	90-100	85-95	0. 63-2. 0	6. 0-7. 4	0. 30+
ML or CL	A-6, A-4	95-100	90-100	60-95	0. 20-2. 0	7. 0-7. 5+	0. 17-0. 19
ML, CL, GM or GC	A-4	50-80	45-75	40-60	<0. 63	7. 0-7. 5+	0. 13-0. 17
GM	A-1 or A-2	35-45	25-35	15-25	0. 63-6. 3	5. 0-7. 4	0. 12-0. 17
GW, GM or GP-GM	A-1 or A-2	50-80	30-65	8-20	>6. 3	6. 0-7. 5+	0. 07-0. 10
ML, ML-OL, CL	A-6 or A-7	90-95	85-95	70-90	0. 20-0. 63	5. 0-7. 4	0. 16-0. 20
ML or CL	A-6, A-7	70-85	65-75	50-80	<0. 20	5. 0-7. 5+	0. 15-0. 17
GC, SC or CL	A-2, A-4 or A-6	30-85	30-80	30-70	<0. 20	7. 5+	------------
ML	A-4	75-100	70-95	55-80	0. 63-2. 0	5. 5-7. 2	0. 15-0. 20
ML or CL	A-4	75-100	70-90	50-60	0. 20-0. 63	6. 0-7. 5	0. 13-0. 20
GM or GC, or SM or SC	A-4 or A-2	60-80	45-70	30-50	<0. 63	7. 0-7. 5+	------------
SM or SP-SM	A-1, A-2 or A-4	100	95-100	10-50	>2. 0	5. 0-7. 5+	0. 06-0. 10
([3])	([3])	([3])	([3])	([3])	([3])	([3])	([3])
ML	A-4	60-80	60-70	50-60	0. 63-2. 0	4. 5-5. 5	0. 13-0. 16
ML, CL	A-4 or A-6	90-95	90-95	75-90	0. 20-0. 63	5. 0-7. 0	0. 15-0. 20
CL or ML	A-6 or A-7	85-100	90-100	85-100	<0. 20	5. 0-7. 5+	0. 13-0. 17
ML	A-4	70-95	60-80	50-60	0. 63-6. 3	6. 0-7. 5+	0. 14-0. 20
CL or CH	A-7 or A-6	85-95	80-95	75-80	<0. 20	6. 0-7. 5	0. 16-0. 19
CH or CL	A-7 or A-6	90-100	90-100	90-95	<0. 20	6. 0-7. 5+	0. 12-0. 16
ML	A-4	90-95	80-90	70-80	0. 63-2. 0	5. 5-7. 5+	0. 15-0. 20
ML or CL	A-6 or A-4	95-100	95-100	60-95	0. 20-2. 0	6. 0-7. 5+	0. 15-0. 20
([3])	([3])	([3])	([3])	([3])	([3])	7. 0-7. 5+	0. 15-0. 20

TABLE 5.—*Estimated*

Soil series and map symbols	Depth to bedrock	Depth to seasonal high water table	Depth from surface	Classification
				USDA texture
	Feet	*Feet*	*Inches*	
Cazenovia: CeB, CeC, CeCK, CeC3, CeD, ChE (For Schoharie part of ChE, see Schoharie series.)	3–25+	1–3	0–12	Fine silt loam or fine loam
			12–36	Coarse silty clay loam
			36–65	Coarse silty clay loam till
Collamer: ClA, ClB	5–40+	1–2	0–40	Very fine sandy loam to coarse silty clay loam.
Colonie: CmB, CmC, CnB, CpD (For Arkport part of CpD, see Arkport series.)	5–40+	3+	0–40	Loamy fine sand
Conesus: CsA, CsB	4–20+	1–2	0–19	Gravelly silt loam
			19–36	Gravelly silt loam
			36–42	Gravelly loam till
Dunkirk: DuB, DuC3, DuD3, DvE	5–50+	2	0–48	Silt loam to coarse silty clay loam
Edwards muck: Ed. (All properties variable.)				
Eel silt loam: [2] Ee, Eh	4–20+	1–1½	0–40	Silt loam to very fine sandy loam
Ellery: ElB (For Alden part of ElB, see Alden series.)	4–20+	0–½	0–10	Silt loam
			10–48	Channery (gritty) silt loam or loam
Erie:				
ErA, ErB	3–12+	½–1½	0–13	Channery silt loam
EsA, EsB. (Properties same as those for rest of this series, except that bedrock is at a depth of 1½ to 3 feet.)			13–48	Channery (gritty) silt loam or loam
Farmington: FaC	1–1½	([5])	0–12	Shaly silt loam
			12–42	Highly fractured shale bedrock.
Fonda: Fo	4–20	0	0–13	Silt loam or coarse silty clay loam
			13–60	Silty clay or fine silty clay loam
Fredon: Fr	4–15	0–½	0–15	Silt loam or loam
			15–30	Gravelly loam to gravelly sandy loam
			30–40	Stratified sand and gravel
Fresh water marsh: Fw. (Properties not estimated.)				
Galen: GaA, GaB	4–20	1–2	0–43	Fine sandy loam to loamy fine sand
Genesee: [2]				
Gn, Go	5+	2–3	0–40	Silt loam to very fine sandy loam
Gv	5+	2–3	0–40	Gravelly silt loam to shaly loam
Hilton: HlA, HlB	3+	1–2	0–15	Loam
			15–31	Fine loam to coarse sandy clay loam
			31–40	Fine sandy loam or loam containing up to 25 percent gravel.
Honeoye:				
HnB, HnC, HnC3, HoCK, HsD (For Lansing part of HsD, see Lansing series.)	3–50+	2–3½	0–10	Silt loam
			10–30	Fine silt loam to fine loam
			30–72	Gritty loam
Howard: HwA, HwB, HwC	5–50+	3+	0–29	Gravelly loam
			29–62	Very gravelly loam
			62–96	Stratified sand and gravel
Ira: IrA, IrB, IsD (For Sodus part of IsD, see Sodus series.)	5–50+	1	0–21	Gravelly loam to gravelly fine sandy loam
			21–48	Gravelly loam to gravelly fine sandy loam

See footnotes at end of table.

properties of the soils—Continued

Classification—Continued		Percentage passing sieve—			Permeability	Reaction [1]	Available moisture capacity
Unified	AASHO	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	90–100	80–100	60–75	0. 20–0. 63	6. 0–7. 5	0. 16–0. 19
CL	A-6	90–100	85–100	60–90	0. 20–0. 63	6. 5–7. 5+	0. 13–0. 17
CL or SM-SC	A-6	75–100	70–100	40–90	<0. 20	7. 5+	----------
ML or CL	A-4 or A-6	95–100	90–100	60–85	([3])	5. 5–7. 5+	0. 15–0. 19
SM	A-2	100	95–100	15–25	>6. 3	4. 5–6. 0	0. 06–0. 10
ML or CL	A-4	80–95	80–90	50–65	0. 63–2. 0	5. 0–6. 0	0. 13–0. 17
SM-SC, ML	A-4	75–95	65–90	50–60	0. 20–0. 63	5. 6–7. 3	0. 12–0. 16
SM or SC, GM or GC	A-4	50–80	40–75	35–50	<0. 63	7. 3–7. 5+	----------
ML or CL	A-4, A-6	95–100	90–100	60–85	([3])	6. 0–7. 5+	0. 16–0. 19
ML	A-4	95–100	90–100	60–90	0. 63–2. 0	6. 5–7. 3	0. 16–0. 20
ML or CL	A-4 or A-6	60–90	55–85	55–80	0. 63–2. 0	6. 0–6. 5	0. 13–0. 19
SM or SC, GM or GC	A-4	60–85	55–80	40–50	<0. 20	6. 0–7. 5+	0. 02–0. 07
ML or CL	A-5, A-6	80–95	75–90	55–80	0. 63–2. 0	5. 0–6. 5	0. 18–0. 22
SMor SC, GM or GC	A-4	60–85	50–80	35–50	<0. 20	6. 0–7. 5+	0. 02–0. 07
ML	A-4	75–90	60–80	50–60	0. 63–2. 0	5. 5–6. 5	0. 13–0. 19
ML or OL	A-5 or A-6	100	95–100	80–95	0. 20–0. 63	6. 0–7. 5	0. 15–0. 21
CL or CH	A-6, A-7	100	85–100	60–95	<0. 20	6. 5–7. 5+	0. 13–0. 17
ML or CL	A-4	85–100	70–85	55–65	2. 0–6. 3	6. 5–7. 0	0. 15–0. 20
GM or SM	A-2 to A-4	40–75	30–50	25–40	>6. 3	6. 5–7. 5+	0. 10–0. 17
GM	A-1 to A-2	20–50	15–40	15–25	>6. 3	7. 5+	----------
SM or ML or CL	A-4, A-2	95–100	90–100	25–55	>2. 0	5. 0–7. 4	0. 07–0. 15
ML	A-4	75–100	60–80	55–70	0. 63–2. 0	6. 5–7. 5+	0. 16–0. 20
SM or GM	A-2	40–70	30–50	25–35	>6. 3	6. 0–7. 5+	0. 17–0. 16
ML	A-4	85–95	70–95	50–70	0. 63–2. 0	5. 5–6. 8	0. 13–0. 18
ML or CL or SM	A-4	70–95	65–90	45–60	0. 20–0. 63	6. 5–7. 5	0. 13–0. 18
SM, SC	A-4	65–95	60–85	40–50	<0. 63	7. 0–7. 5+	----------
ML or CL	A-4 or A-6	80–95	75–90	55–75	0. 63–2. 0	5. 5–7. 0	0. 15–0. 19
ML or CL or SM	A-4	75–95	65–85	45–70	0. 63–2. 0	6. 0–7. 5+	0. 15–0. 19
GM or GC, SM or SC	A-1, A-2, A-4	55–95	45–90	15–50	<0. 63	7. 5+	----------
GM, GC, ML, CL, SM, SC	A-1, A-4, A-2, A-5	60–90	45–80	15–65	>6. 3	5. 0–6. 0	0. 10–0. 17
GM or GC, GW, SM-SC	A-2-4	25–65	20–60	3–30	>6. 3	5. 5–7. 0	0. 06–0. 10
GW, GM, GW or GP, GC or SM, or SC	A-1, A-2	25–80	20–55	5–20	>6. 3	7. 0–7. 5+	----------
ML or CL	A-4 to A-6	75–90	70–85	50–60	0. 63–2. 0	5. 0–6. 5	0. 10–0. 16
GM or GC, SM or SC	A-1, A-2	55–70	50–75	15–30	0. 2–0. 63	6. 0–7. 5+	0. 03–0. 08

TABLE 5.—*Estimated*

Soil series and map symbols	Depth to bedrock	Depth to seasonal high water table	Depth from surface	Classification
				USDA texture
	Feet	*Feet*	*Inches*	
Kendaia: KeB, KlA (For Lyons part of KlA, see Lyons series.)	3–50+	½–1	0–20	Silt loam to gravelly silt loam
			20–40	Gravelly loam
Lake beaches: Lb. (Properties not estimated.)				
Lairdsville	2–4	½–2½	0–12	Gravelly silt loam
			12–30	Silty clay loam to clay or silty clay
			30–60	Soft shale bedrock.
Lakemont: Lc	2½–50+	0–½	0–14	Silty clay loam
			14–42	Silty clay
Lamson: Le, Lf	6–30+	0–½	0–28	Very fine sandy loam to loamy very fine sand.
			28–42	Loamy fine sand to loamy very fine sand
Langford: LgB, LgC, LgCK, LgD, LhB, LhC, LhD, LhE (For Howard part of LhB, LhC, LhD, and LhE, see Howard series.)	3–50+	1–2½	0–18	Channery silt loam
			18–62	Channery loam to channery silt loam
LnB. (Properties same as those for rest of this series, except that bedrock is at a depth of 30 inches.)				
Lansing: LsB, LsC, LsC3, LsCK	3–50+	2–3½	0–12	Gravelly silt loam
			12–37	Gravelly fine silt loam
			37–45	Gravelly loam glacial till
Lima: LtA, LtB	3–50+	1½–2	0–12	Silt loam, loam
			12–25	Gravelly loam
			25–40	Stony loam
Lockport	2–4	0–1	0–8	Silty clay loam
			8–28	Clay or silty clay
			28–40	Soft shale bedrock.
Lordstown: LwB, LwC	1½–3½	1½–3	0–26	Channery silt loam
			26–60	Hard shale acid sandstone bedrock.
Lyons	4+	0–½	0–30	Silt loam to loam
			30–48	Gritty loam
Madalin: Ma	4–50+	0–½	0–8	Silt loam
			8–40	Fine silty clay loam or silty clay
Mb	4–50+	0–½	0–7	Silt loam
			7–28	Fine silty clay loam or silty clay to clay
			28–40	Fine sandy loam
Made land: Mc, Md. (Properties not estimated.)				
Minoa: Mf	4–50+	½–1	0–27	Fine sandy loam
			27–55	Loamy fine sand and stratified sand, fine sand, and silt.
Muck: Mr, Ms. (Variable. Properties not estimated.)				
Niagara: Na, Nc (For Canandaigua part of Nc, see Canandaigua series.)	4+	½–1	0–35	Very fine sandy loam to fine silt loam
			35–48	Stratified very fine sandy loam, silt, and loamy very fine sand.

See footnotes at end of table.

properties of the soils—Continued

Classification—Continued		Percentage passing sieve—			Permeability	Reaction [1]	Available moisture capacity
Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)			
					Inches per hour	*pH*	*Inches per inch of soil*
SM or SC, ML or OL	A-4	85-100	85-100	45-75	0. 63-6. 3	6. 0-7. 5	0. 13-0. 20
GM-GC, SM-SC	A-2, A-4	60-85	40-70	15-50	<0. 63	7. 0-7. 5+	0. 10-0. 18
ML or CL	A-6	80-90	70-80	60-70	0. 20-0. 63	6. 0-7. 0	0. 16-0. 18
CH or CL	A-7	90-100	90-100	90-95	<0. 20	6. 0-7. 5+	0. 12-0. 16
ML or CL or OL	A-7	95-100	95-100	80-95	0. 20-0. 63	6. 0-7. 3	0. 15-0. 19
CL	A-6	100	100	80-100	<0. 20	7. 0-7. 5	0. 11-0. 18
SM or OL	A-2, A-4	95-100	90-100	35-50	>6. 3	6. 0-7. 3	0. 07-0. 15
SM or SC	A-2 or A-4	95-100	90-100	20-40	2. 0-6. 3	6. 0-7. 5+	0. 11-0. 14
GM or GC	A-2 or A-4	50-70	40-65	25-50	0. 63-6. 3	5. 0-6. 5	0. 13-0. 17
GM or GC	A-2 or A-4	50-70	45-65	30-45	<0. 20	5. 5-7. 5+	0. 02-0. 07
ML or CL	A-4	80-90	75-90	55-65	0. 63-2. 0	5. 5-6. 5	0. 13-0. 17
SM or CL, ML, SC	A-4	75-95	65-90	40-60	0. 63-2. 0	6. 0-7. 3	0. 13-0. 16
GM or GC, SM or SC	A-4, A-2	50-75	40-65	10-40	<0. 63	7. 0-7. 5+	-------------
ML or CL	A-4, A-7	80-95	75-90	55-75	0. 63-2. 0	6. 0-7. 3	0. 14-0. 18
GM-GC, CL	A-4, A-6	65-90	65-90	40-70	0. 63-2. 0	6. 5-7. 5+	0. 13-0. 16
SM or SC, GM or GC, ML or CL	A-4	85-100	70-85	40-60	<0. 63	7. 5+	-------------
CL or CH	A-7-6	85-95	80-95	75-80	<0. 20	6. 0-7. 3	0. 16-0. 19
CH or CL	A-7-6	90-100	90-100	90-95	<0. 20	6. 0-7. 5+	0. 12-0. 16
ML	A-4	60-75	60-70	50-60	0. 63-2. 0	4. 5-5.	0. 13-0. 17
ML or OL	A-4	90-100	90-100	65-90	0. 63-6. 3	6. 0-7. 5+	0. 15-0. 20
GM or GC, SM or SC	A-4	60-80	55-70	35-50	<0. 63	7. 5+	0. 10-0. 17
ML or CL	A-14 or A-6	95-100	95-100	75-95	0. 20-0. 63	5. 5-7. 3	0. 13-0. 19
CL, CH	A-7-6	90-100	85-100	75-100	<0. 20	6. 5-7. 5+	0. 13-0. 17
ML or CL	A-4 or A-6	95-100	95-100	75-95	0. 20-0. 63	5. 5-7. 3	0. 13-0. 19
CL or CH	A-7-6	90-100	85-100	75-100	<0. 20	6. 5-7. 5+	0. 13-0. 17
ML or SM	A-4	90-100	85-100	40-55	0. 20-0. 63	6. 5-7. 5+	0. 13-0. 17
SM	A-4	95-100	90-100	40-50	2. 0-6. 3	5. 5-7. 5	0. 07-0. 16
ML or CL, SM, SC	A-4	95-100	90-100	50-65	2. 0-6. 3	6. 0-7. 5+	0. 05-0. 13
ML or CL	A-4	90-100	90-100	80-90	0. 63-2. 0	6. 0-7. 5	0. 13-0. 18
ML or CL	A-4, A-6	90-100	90-100	50-70	(3)	7. 0-7. 5+	(3)

TABLE 5.—*Estimated*

Soil series and map symbols	Depth to bedrock	Depth to seasonal high water table	Depth from surface	Classification: USDA texture
	Feet	*Feet*	*Inches*	
Odessa: OdA, OdB	4–50+	½–1	0–8	Fine silt loam
			8–44	Fine silty clay loam to coarse silty clay
Ontario:				
OnB, OnC, OnC3, OnCK, OnD, OnD3, OtE, OtF (For Honeoye and Lansing parts of OtE and OtF, see their respective series.)	3–50+	2–3+	0–15	Loam
			15–34	Fine loam
			34–50	Dense loam to fine sandy loam till
OfB, OfC, OfCK. (Properties same as those for rest of this series, except that sand content throughout profile generally is higher.)				
OrA, OrB, OrC. (Properties same as those for rest of this series, except that limestone bedrock is at a depth of 1½ to 3 feet.)				
Ovid: OvA, OvB	4–50+	½–1	0–12	Fine silt loam
			12–40	Silty clay loam
Palmyra:				
PgA, PgB, PgC, PnE (For Howard and Alton parts of PnE, see their respective series.)	4–50+	3+	0–11	Gravelly loam
			11–34	Gravelly fine loam to very gravelly fine loam.
PaB, PaC, PmD. (Properties same as those for rest of this series, except that sand content throughout profile generally is higher.)			34–60	Stratified sand and gravel
Peat and Muck: Pu. (Variable. Properties not estimated.)				
Phelps: Pv	5+	1–2	0–12	Gravelly silt loam to gravelly loam
			12–28	Gravelly fine loam to gravelly sandy loam
			28–48	Stratified sand and gravel
Riga: RgB, RlC3 (For Lairdsville part of RgB and RlC3, see Lairdsville series.)	2–4	½–2½	0–14	Silt loam
			14–29	Silty clay loam to clay loam
			29–60	Soft shale bedrock.
Romulus: Ro	3+	0–½	0–13	Coarse silty clay loam
			13–50	Silty clay loam
Schoharie: SeB, ShC, ShD	3–50+	1–2½	0–7	Fine silt loam
			7–40	Silty clay loam to silty clay
Scriba: Sk, Sm	3–50+	½–1	0–13	Gravelly loam or gravelly fine sandy loam
			13–54	Gravelly fine sandy loam, stony below depth of 30 inches.
Sloan:[2] Sn	3+	0–½	0–29	Silt loam
			29–40	Coarse silty clay loam
Sodus: SoB, SoC, SoC3, SoCK, SoD, SoE	3–50+	3+	0–20	Gravelly loam to gravelly very fine sandy loam.
			20–85	Gravelly loam to gravelly very fine sandy loam.
Stafford: St	5–50+	½–1	0–9	Fine sandy loam
			9–48	Loamy fine sand
Tuller: TuB	1–1⅔	0–1	0–19	Channery silt loam
			19–40	Bedrock.

See footnotes at end of table.

properties of the soils—Continued

Classification—Continued		Percentage passing sieve—			Permeability	Reaction [1]	Available moisture capacity
Unified	AASHO	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-6, A-7	95–100	85–100	60–90	0. 20–0. 63	6. 0–7. 5	0. 15–0. 20
CL or CH, ML or MH	A-7	95–100	90–100	80–95	<0. 20	7. 0–7. 5+	0. 13–0. 16
SM or SC, ML or CL	A-4	80–95	75–90	40–55	0. 63–2. 0	5. 5–7. 2	0. 16–0. 20
ML or CL	A-4	80–90	80–85	50–60	0. 63–2. 0	6. 5–7. 5	0. 14–0. 18
ML, SM or SC	A-4	75–85	70–80	45–55	<0. 63	7. 0–7. 5+	-------------
ML or CL	A-4	85–100	80–100	60–75	0. 20–0. 63	6. 0–7. 5	0. 16–0. 19
CL	A-6	85–100	80–100	60–90	0. 20–0. 63	6. 5–7. 5+	0. 10–0. 17
ML or CL	A-4, A-5	75–85	75–85	50–70	>6. 3	5. 5–7. 3	0. 10–0. 14
GM or GC, CL	A-2, A-4	50–80	40–70	20–50	>6. 3	6. 0–7. 5	0. 11–0. 15
GW-GC, SW-SM	A-1 or A-2	35–60	20–35	5–15	>6. 3	7. 5 +	-------------
ML or CL	A-4, A-5	75–95	70–90	50–70	>6. 3	5. 5–7. 5	0. 12–0. 18
GM or GC	A-2, A-4	50–80	40–80	30–50	>6. 3	6. 0–7. 5	0. 11–0. 15
GW-GC, GM, SW-SM	A-1 to A-2	30–65	20–40	5–10	>6. 3	7. 5–7. 5+	-------------
ML or CL	A-6	90–100	85–95	65–85	0. 20–0. 63	6. 0–7. 0	0. 16–0. 18
CH or CL	A-6 or A-7	90–100	90–100	90–95	<0. 20	7. 0–7. 5+	0. 12–0. 16
ML or OL	A-7 or A-5	90–100	85–100	65–85	0. 20–0. 63	6. 0–7. 3	0. 15–0. 20
CL	A-6 or A-7	70–100	65–100	50–100	<0. 20	6. 5–7. 5+	0. 13–0. 17
ML or CL	A-7	95–100	85–100	55–100	0. 20–0. 63	6. 0–7. 2	0. 13–0. 20
CL or CH	A-7	95–100	90–100	80–100	<0. 20	6. 5–7. 5+	0. 10–0. 16
ML or CL, GM or GC	A-4	75–90	70–85	45–55	0. 63–2. 0	5. 0–6. 5	0. 10–0. 16
GM or GC, SM or SC	A-2 to A-4	60–80	50–75	25–40	<0. 20	5. 5–7. 5+	0. 03–0. 08
ML or OL	A-4	90–100	90–100	80–100	0. 63–2. 0	6. 0–7. 5	0. 16–0. 20
CL	A-6 or A-7	95–100	95–100	80–100	<0. 20	7. 0–7. 5+	0. 14–0. 17
ML or CL, GM or GC	A-4	75–90	70–85	45–55	0. 63–2. 0	5. 0–6. 5	0. 10–0. 16
GM or GC, SM or SC	A-1 to A-4	60–80	50–75	20–40	<0. 63	5. 5–7. 5+	0. 03–0. 08
SM	A-2	95–100	95–100	15–35	>6. 3	5. 0–6. 5	0. 08–0. 12
SM or SC	A-2	95–100	95–100	12–20	>6. 3	5. 0–6. 5	0. 08–0. 10
ML	A-4	75–85	65–80	55–65	0. 63–2. 0	4. 5–5. 5	0. 13–0. 17

TABLE 5.—*Estimated*

Soil series and map symbols	Depth to bedrock	Depth to seasonal high water table	Depth from surface	Classification
				USDA texture
	Feet	*Feet*	*Inches*	
Varick: Va	1½–3½	0–½	0–11	Fine silt loam
			11–29	Silty clay loam to fine silt loam
			29–40	Soft shale bedrock.
Wampsville: WaA, WaB	4–50+	3+	0–12	Gravelly silt loam to gravelly fine sandy loam.
			12–29	Gravelly sandy clay loam
			29–72	Stratified sand and gravel, clay shale fragments.
Warners: We, Wf	3+	0–½	0–24	Organic silt loam, loam
			24–40	Soft marl
Williamson: WmA, WmB, WmC, WmC3	5–40	1–2½	0–19	Silt loam
			19–36	Silt loam
			36–48	Stratified sand and silt

[1] pH 7.5+ indicates that the horizon is calcareous.
[2] Subject to flooding.
[3] Variable.

TABLE 6.—*Interpretation of engineering*

Soil series and map symbols	Suitability as source of—			Soil features affecting engineering	
	Topsoil	Granular material (sand and gravel)	Fill material	Highway location [1]	Embankment foundations
Alden: Ac, Ad	Fair to good; wet in natural state. Ad: stony in some places.	Unsuitable	Ac: poor. Ad: Surface soil unsuitable; material below depth of 3½ feet fair if drained; erodible.	Organic surface soil; high water table; subgrade and cut slopes unstable; depressional topography.	Ac: variable strength and stability. Ad: soil material over till unstable; strength of material below depth of 2 to 2½ feet adequate for moderately high embankments; high water table.
Alluvial land: Al	Variable; may be wet in natural state.	Generally unsuitable.	Variable	Subject to flooding; high water table; unstable.	Variable strength; underlain in places by wet, compressible soil material; high water table; substratum may be pervious.
Alton: AmA, AmB, AnA, AnB, AnC, AoD: (For interpretations of Howard component of AoD, see Howard series.)	Unsuitable; gravel and cobblestones.	Generally good; commonly cemented with depth.	Good; highly erodible. AmA, AmB: stony.	Cut slopes subject to seepage and sloughing; subgrade subject to differential frost heave; variable bearing capacity.	Adequate strength for moderately high embankments; pervious substratum. AoD: moderately steep slopes.

See footnotes at end of table.

properties of the soils—Continued

Classification—Continued		Percentage passing sieve—			Permeability	Reaction [1]	Available moisture capacity
Unified	AASHO	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	90–100	90–95	60–85	<0. 63	5. 5–7. 3	0. 15–0. 20
ML or CL	A–7, A–6	90–100	90–95	60–85	<0. 20	5. 5–7. 5+	0. 15–0. 20
ML or CL	A–4	75–95	70–90	50–70	2. 0–6. 3	6. 0–7. 2	0. 13–0. 20
SC, GC or CL	A–4	50–90	40–80	40–70	0. 63–2. 0	6. 5–7. 5	0. 14–0. 18
GW–GM, SM or SC	A–1 or A–2	30–60	30–40	10–25	2. 0–6. 3	7. 0–7. 5+	0. 06–0. 12
OL or ML	A–6	85–95	75–90	60–70	0. 63–2. 0	7. 5+	0. 13–0. 20
(3)	(3)	(3)	(3)	(3)	(3)	7. 5+	(3)
ML or OL	A–6	95–100	95–100	80–95	0. 63–6. 3	4. 5–6. 0	0. 13–0. 18
ML or CL	A–4 or A–6	95–100	95–100	90–95	<0. 63	5. 0–6. 0	0. 04–0. 08
ML	A–4	95–100	95–100	85–95	0. 20–0. 63	5. 5–7. 5	----------

[4] Perched water table on bedrock.
[5] Seasonally on bedrock.

properties of soils

Soil features affecting engineering—Continued						
Building foundations [1]	Farm ponds		Agricultural drainage	Irrigation	Diversions	Waterways
	Reservoir areas	Embankments				
Ac: variable bearing capacity. Ad: high water table; stability of material below depth of 2 to 2½ feet generally good; low compressibility.	Prolonged high water table. Ac: pervious sand lenses in substratum. Ad: moderately slow to slow permeability below depth of 3½ feet.	Organic surface soil. Ac: fair to poor stability; subject to piping. Ad: fair to poor stability to depth of 3½ feet, good to fair below this depth; upper part subject to piping.	Slow permeability; prolonged high water table; depressional topography; fine sands; subject to sloughing and piping; locating outlets may be a problem.	(2)	(2)	(2).
Subject to flooding.[2]	Subject to frequent flooding; may be permeable in substratum.	Variable; high water table; subject to flooding.	Cut slopes unstable; natural outlets inadequate.	(2)	(2)	(2).
Variable bearing capacity depending on characteristics of underlying material; large settlements possible under vibratory loads. AoD: moderately steep slopes.	Moderately rapid to rapid permeability. AnC, AoD: strong to moderately steep slopes.	Good stability and shear strength for outside shell; permeable; readily eroded by wind and water. AmA, AmB: stony.	Generally not needed.	High water-intake rate; moderate to low available moisture capacity. AmA, AmB: stony. AoD: moderately steep slopes.	Rapid permeability. AmA, AmB: stony.	Rapid permeability; highly erodible. AoD: moderately steep slopes.

TABLE 6.—*Interpretation of engineering*

Soil series and map symbols	Suitability as source of—			Soil features affecting engineering	
	Topsoil	Granular material (sand and gravel)	Fill material	Highway location [1]	Embankment foundations
Angola: ArB, ArC	Fair to poor	Unsuitable	Fair; low yield of soil material per acre.	Fractured shale bedrock at depth of 1½ to 3½ feet; seepage problems.	Adequate strength for high embankments; soft, fractured shale bedrock at depth of 1½ to 3½ feet.
Appleton: AsB (For interpretations of Lyons component, see Lyons series.)	Fair; seasonally wet.	Unsuitable	Good	Seasonal high water table; cut slopes subject to seepage and sloughing.	Adequate strength for high embankments.
Arkport: AtB, AtC	Fair; sandy	Generally unsuitable.	Good to fair; readily eroded by wind and water.	Subgrade subject to differential frost heave; cut slopes very erodible; seepage problems.	Generally adequate strength for low embankments; underlain in places by wet, compressible soil material.
Arnot: AuC, AuD, AvE	Unsuitable	Unsuitable	Good; low yield of soil material per acre.	Pervious sandstone bedrock at depth of 10 to 20 inches; seepage problems.	Adequate strength for high embankments; pervious sandstone at depth of 10 to 20 inches. AuD, AvE: moderately steep to steep slopes.
Aurora: AwB, AwC, AwC3, AwD3, AwE, AxB.	Fair to poor	Unsuitable	Good; low yield of soil material per acre.	Shale or limestone bedrock at depth of 20 to 40 inches; seepage problems.	Adequate strength for high embankments; bedrock may be pervious. AwD3, AwE: moderately steep slopes.
AyD, AyE	Unsuitable	Unsuitable	Unsuitable	Shale bedrock at depth of 10 to 40 inches.	Adequate strength for high embankments; shale bedrock may be pervious. AyE: steep slopes.
AzF	Unsuitable	Unsuitable	Unsuitable	Steep to very steep gorges.	([2])

See footnotes at end of table.

properties of soils—Continued

Soil features affecting engineering—Continued						
Building foundations [1]	Farm ponds		Agricultural drainage	Irrigation	Diversions	Waterways
	Reservoir areas	Embankments				
High bearing capacity; bedrock encountered in most cuts.	Fractured, pervious shale bedrock at depth of 1½ to 3½ feet; slow permeability.	Limited yield of soil material per acre.	Slow permeability; pervious shale bedrock at depth of 1½ to 3½ feet; perched water table.	Limited rooting depth; high available moisture capacity in uppermost 2 feet.	Shale bedrock at depth of 1½ to 3½ feet.	Prolonged seepage.
Moderately high bearing capacity; low compressibility; seasonal high water table.	Seasonal high water table; moderately slow to slow permeability.	Generally no adverse conditions.	Cut slopes unstable; seasonal high water table.	Moderately high water-intake rate; high available moisture capacity; seasonal high water table.	Seasonal high water table; long, narrow depressions.	Prolonged seepage.
Variable bearing capacity and compressibility; large settlements possible under vibratory loads.	(2)	Poor stability; poorly graded fine sand; subject to piping; very erodible.	(2)	High water-intake rate; low available moisture capacity; droughty.	Rapid permeability.	Very erodible.
High bearing capacity; bedrock encountered in shallow cuts. AuD, AvE: moderately steep and steep slopes.	(2)	(2)	Sandstone bedrock at depth of 10 to 20 inches. AuD, AvE: moderately steep to steep slopes.	(2)	Sandstone bedrock at depth of 10 to 20 inches.[2]	Sandstone bedrock at depth of 10 to 20 inches.[2]
High bearing capacity; bedrock encountered in most excavations; seepage problems. AwD3, AwE: moderately steep slopes.	Soft shale or limestone bedrock at depth of 20 to 40 inches; may be pervious. AwD3, AwE: moderately steep slopes.	Limited yield of soil material per acre; soft shale fragments unstable.	Shale or limestone bedrock at depth of 20 to 40 inches; subject to runoff from adjacent areas; perched water table. AwD3, AwE: moderately steep slopes.	Good water-intake rate; high available moisture capacity. AwD3, AwE: moderately steep slopes.	Shale or limestone bedrock at depth of 20 to 40 inches. AwD3, AwE: moderately steep slopes.	Very erodible; bedrock at depth of 20 to 40 inches. AwD3, AwE: moderately steep slopes.
High bearing capacity; shale bedrock encountered in excavations. AyE: steep slopes.	(2)	Very low yield of soil material per acre.	(2)	(2)	Shale bedrock at depth of 10 to 40 inches; numerous rock outcrops. AyE: steep slopes.	Shale bedrock at depth of 10 to 40 inches; numerous rock outcrops. AyE: steep slopes.
(2)	(2)	(2)	(2)	(2)	(2)	(2).

TABLE 6.—*Interpretation of engineering*

Soil series and map symbols	Suitability as source of—			Soil features affecting engineering	
	Topsoil	Granular material (sand and gravel)	Fill material	Highway location [1]	Embankment foundations
Benson: BeB, BeC, BkD	Unsuitable	Unsuitable	Poor; very low yield of soil material per acre; stony.	Limestone bedrock at depth of 10 to 20 inches.	Adequate strength for high embankments; pervious limestone at depth of 10 to 20 inches.
Brockport: BlB (For interpretations of Lockport component, see Lockport series.)	Fair to poor; high clay content.	Unsuitable	Fair; low yield of soil material per acre; clayey material difficult to work when wet; high water table.	Shale bedrock at depth of 20 to 40 inches; seasonal high water table; seepage problems.	Shrink-swell problems; shale bedrock may be pervious.
Camillus: CaB, CaC3	Fair to good	Unsuitable	Good; low yield of soil material per acre.	Shale bedrock at depth of 20 to 40 inches.	Adequate strength for high embankments; shale bedrock at depth of 20 to 40 inches.
Canandaigua	Good; may be wet in natural state.	Unsuitable	Fair to poor	High water table; subgrade and cut slopes unstable; depressional topography.	Generally adequate strength for low embankments; underlain in places by wet, compressible soil material.
Cazenovia: CeB, CeC, CeC3, CeCK, CeD, ChE. (For interpretations of Schoharie component of ChE, see Schoharie series.)	Fair; high clay content in some places.	Unsuitable	Good below depth of 2 to 2½ feet; surface soil may have high clay content.	Seasonal high water table; variable soil material over till; cut slopes may be unstable; subgrade subject to differential frost heave.	Strength and stability of surface soil variable; strength of material below depth of 2 to 2½ feet adequate for moderately high embankments; substratum may have pervious lenses.
Collamer: ClA, ClB	Good	Unsuitable	Fair	Seasonal high water table; subgrade and slopes unstable; seepage problems.	Generally adequate strength for low embankments; underlain in places by wet, compressible soil material.

See footnotes at end of table.

properties of soils—Continued

Soil features affecting engineering—Continued						
Building foundations [1]	Farm ponds		Agricultural drainage	Irrigation	Diversions	Waterways
	Reservoir areas	Embankments				
High bearing capacity; limestone bedrock at depth of 10 to 20 inches; numerous rock outcrops. BkD: moderately steep slopes.	(2)	(2)	(2)	(2)	(2)	(2).
Shale bedrock at depth of 20 to 40 inches; seasonal high water table; seepage problems.	Shale bedrock at depth of 20 to 40 inches; may be pervious; seasonal high water table.	Low shear strength; poor workability if wet; low yield of soil material per acre; seasonal high water table.	(2)	(2)	(2)	(2).
Shale bedrock at depth of 20 to 40 inches; high bearing capacity.	(2)	Good stability; low yield of soil material per acre.	Shale bedrock at depth of 20 to 40 inches.	Good water-intake rate; high available moisture capacity; limited rooting depth.	Undulating topography; shale bedrock at depth of 20 to 40 inches.	Very erodible; shale bedrock at depth of 20 to 40 inches.
Low bearing capacity; high water table; variable compressibility.	Prolonged high water table; stratified sand subject to excess seepage in dry periods.	Fair to poor stability; fine sand subject to piping; surface soil high in organic-matter content.	Natural outlets may be inadequate; cut slopes unstable; fine sand subject to piping; prolonged high water table.	Fair to good water-intake rate; high available moisture capacity.[2]	(2)	(2).
Stability of material below depth of 2 to 2½ feet good; generally low compressibility. CeD, ChE: moderately steep to steep slopes.	Seasonal high water table; slow permeability. CeD, ChE: moderately steep to steep slopes.	Good stability; poor workability if wet; seasonal high water table.	Seasonal high water table. CeD, ChE: moderately steep to steep slopes.	Moderately slow water-intake rate; high available moisture capacity. CeD, ChE: moderately steep to steep slopes.	CeD, ChE: moderately steep to steep slopes.	Very erodible. CeD, ChE: moderately steep to steep slopes.
Low bearing capacity; variable compressibility; large settlements possible under heavy or vibratory loads; seasonal high water table.	Variable permeability; sand layers in some places; excess seepage; seasonal high water table.	Fair stability; slow permeability; erodible.	Cut slopes subject to seepage and sloughing; fine sand subject to piping; seasonal high water table.	Moderate water-intake rate; high available moisture capacity.	Prolonged seepage.	Very erodible; seasonal high water table.

TABLE 6.—*Interpretation of engineering*

Soil series and map symbols	Suitability as source of—			Soil features affecting engineering	
	Topsoil	Granular material (sand and gravel)	Fill material	Highway location [1]	Embankment foundations
Colonie: CmB, CmC, CnB, CpD.	Fair	Generally unsuitable.	Good; readily eroded by wind and water.	Cut slopes unstable; subject to differential frost heave; fine sand hinders hauling operations.	Generally adequate strength for low embankments; underlain in places by wet, compressible soil material. CpD: moderately steep slopes.
Conesus: CsA, CsB	Poor; gravelly	Unsuitable	Good	Bedrock encountered in some deep cuts; seepage in deep cuts.	Adequate strength for high embankments.
Dunkirk: DuB, DuC3, DuD3, DvE.	Good	Unsuitable	Fair to good	Seasonal high water table; cut slopes subject to seepage and sloughing; unstable subgrade; hauling operations hindered when soil is wet.	Generally adequate strength for low embankments; underlain in places by wet, compressible soil material. DuD3, DvE: moderately steep to steep slopes.
Edwards: Ed	Possible use as amendment for mineral soils.	Unsuitable	Unsuitable	Highly organic material; prolonged high water table.	(2)
Eel: Ee, Eh	Generally good	Unsuitable	Generally unsuitable.	Subject to flooding; high water table.	Variable strength and compressibility; subject to flooding; high water table.
Ellery: ElB (For interpretations of Alden component, see Alden series.)	Poor; channery	Unsuitable	Good, when dry; high water table.	Prolonged high water table; seepage problems; slopes unstable.	Generally adequate strength for high embankments; high water table.
Erie: ErA, ErB, EsA, EsB	Poor; channery	Unsuitable	Good. EsA, EsB: low yield of soil material per acre.	Cut slopes subject to seepage and sloughing. EsA, EsB: bedrock encountered in cuts.	Adequate strength for high embankments; bedrock may be pervious.

See footnotes at end of table.

properties of soils—Continued

Soil features affecting engineering—Continued						
Building foundations [1]	Farm ponds		Agricultural drainage	Irrigation	Diversions	Waterways
	Reservoir areas	Embankments				
Variable bearing capacity, depending on characteristics of underlying material; large settlements possible under vibratory loads. CpD: moderately steep slopes.	Rapid permeability. CpD: moderately steep slopes.	Fair stability; fine sand subject to piping; rapid permeability; erodible; fine sand hinders hauling operations.	Unstable ditchbanks; fine sand subject to piping. CpD: moderately steep slopes.	High water-intake rate; low available moisture capacity; droughty; subject to wind erosion. CpD: moderately steep slopes.	Wind erosion hazard; plugging of channel likely. CpD: moderately steep slopes.	Very erodible. CpD: moderately steep slopes.
Moderately high bearing capacity; low compressibility; seasonal high water table.	Seasonal high water table; moderate to slow permeability.	Good shear strength and stability; slow permeability if compacted.	Except for small wet spots, drainage generally not needed.	Good water-intake rate; high available moisture capacity; seasonal high water table.	Generally no adverse conditions.	Erodible on slopes; seepage problems.
Generally low bearing capacity; variable compressibility. DvE: steep slopes; subject to seepage and sloughing.	Variable permeability; sandy layers subject to excess seepage; seasonal high water table. DuD3, DvE: moderately steep to steep slopes.	Moderate to low shear strength and stability; slow permeability if compacted.	Cut slopes unstable; stratified sand and silt layers subject to piping. DuD3, DvE: moderately steep to steep slopes.	Good water-intake rate; high available moisture capacity. DuD3, DvE: moderately steep to steep slopes.	Irregular topography. DuD3, DvE: moderately steep to steep slopes.	Very erodible. DuD3, DvE: moderately steep to 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)	Subject to flooding: prolonged high water table; excess seepage in dry periods; variable permeability.	Fair to poor stability; fine silt and sand subject to piping.	Subject to annual flooding; cut slopes unstable. Ee: natural outlets inadequate.	(2)	(2)	(2).
Moderately high bearing capacity; low compressibility; high water table.	Slow permeability; perched water table.	Fair stability; fine sand subject to piping; slow permeability; erodible.	Unstable ditchbanks; fine sand subject to piping; perched water table.	High water-intake rate; moderate to low available moisture capacity.	Wind erosion hazard; silting of channel likely.	Very erodible.
High bearing capacity; low compressibility. EsA, EsB: bedrock encountered in most excavations; seasonal high water table.	Seasonal high water table; slow permeability. EsA, EsB: moderately shallow to pervious sandstone and shale bedrock.	Good stability and shear strength; slow permeability. EsA, EsB: limited yield of soil material per acre.	Slowly permeable layer at depth of 13 inches; cut slopes subject to seepage and sloughing; seasonal high water table.	Limited rooting depth; generally not irrigated.	Slowly permeable layer at depth of 13 inches; prolonged seepage.	Prolonged seepage; difficult to establish vegetation.

TABLE 6.—*Interpretation of engineering*

Soil series and map symbols	Suitability as source of—			Soil features affecting engineering	
	Topsoil	Granular material (sand and gravel)	Fill material	Highway location [1]	Embankment foundations
Farmington: FaC	Unsuitable	Unsuitable	Good; low yield of soil material per acre.	Shale bedrock at depth of 10 to 20 inches; seasonal seepage.	Adequate strength for high embankments.
Fonda: Fo	Good to fair; seasonally wet.	Unsuitable	Fair when dry; surface soil high in organic-matter content; high water table.	Prolonged high water table; cut slopes unstable; hauling operations hindered when soil is wet.	Variable strength and compressibility; high water table; slow permeability.
Fredon: Fr	Poor; gravelly	Generally good; stratified sand and gravel at depth below 30 inches.	Good; readily eroded by wind and water.	Prolonged high water table; low, level topography; subgrade subject to differential frost heave.	Variable strength, depending on characteristics of underlying material; high water table; stratified sand and gravel.
Fresh water marsh: Fw	(2)	(2)	(2)	(2)	(2)
Galen: GaA, GaB	Poor	Unsuitable	Good; readily eroded by wind and water; high water table.	Seasonal high water table; cut slopes subject to seepage and sloughing; sandy material hinders hauling operations.	Variable strength; underlain in places by wet, compressible soil material; high water table.
Genesee:					
Gn	Very good	Unsuitable	Generally unsuitable.	Flat topography; subject to annual flooding.	Variable strength and compressibility.
Go	Good	Unsuitable	Variable	Subject to occasional flooding; cut slopes and subgrade unstable.	Variable strength and compressibility.

See footnotes at end of table.

properties of soils—Continued

Soil features affecting engineering—Continued						
Building foundations [1]	Farm ponds		Agricultural drainage	Irrigation	Diversions	Waterways
	Reservoir areas	Embankments				
High bearing capacity; low compressibility; seasonal seepage on shallow bedrock.	(2)	(2)	(2)	(2)	(2)	(2).
Variable bearing capacity; prolonged high water table.	Prolonged high water table; slow permeability; poor workability when soil is wet.	Poor stability; surface soil high in organic-matter content; clayey material; poor workability when soil is wet; high water table.	Ditchbanks unstable; internal water movement slow; natural outlets inadequate; high water table.	(2)	(2)	(2).
Variable bearing capacity and compressibility; large settlements possible under heavy or vibratory loads; prolonged high water table.	Prolonged high water table; rapid permeability in stratified sand and gravel.	Good stability and shear strength for outside shell; rapid permeability.	Cut slopes unstable; fine sand subject to piping; natural outlets may be inadequate; high water table.	Generally not irrigated.	(2)	(2).
(2)	(2)	(2)	(2)	(2)	(2)	(2).
Variable bearing capacity; large settlements possible under heavy or vibratory loads; seasonal high water table.	Moderately rapid permeability; seasonal high water table.	Poor stability; fine sand subject to piping; rapid permeability; highly erodible.	Ditchbanks unstable; fine sand subject to piping.	High water-intake rate; moderate available moisture capacity.	Wind erosion hazard; plugging of channel likely.	Very erodible; difficult to establish vegetation.
(2)	Subject to annual flooding; variable permeability.	Good stability; slow permeability if compacted.	Cut slopes unstable; fine sand subject to piping; natural outlets inadequate; subject to annual flooding.	Subject to annual flooding; generally not irrigated.	(2)	(2).
Subject to occasional flooding; variable bearing capacity; large settlements possible under vibratory loads; perched water table.	Subject to occasional flooding; variable permeability.	Good stability; slow permeability if compacted.	Cut slopes unstable; fine sand subject to piping; natural outlets inadequate; subject to occasional flooding.	Subject to occasional flooding; good water-intake rate; high available moisture capacity.	(2)	(2).

TABLE 6.—*Interpretation of engineering*

Soil series and map symbols	Suitability as source of—			Soil features affecting engineering	
	Topsoil	Granular material (sand and gravel)	Fill material	Highway location [1]	Embankment foundations
Genesee—Continued Gv	Poor	Possibly suitable in lower layers.	Good	Subject to flash floods; cut slopes and subgrade unstable.	Variable strength and compressibility.
Hilton: HlA, HlB	Fair	Unsuitable	Good	High or perched water table.	Adequate strength for high embankments.
Honeoye: HnB, HnC, HnC3, HoCK, HsD. (For interpretations of Lansing component of HsD, see Lansing series.)	Fair; stony in some places.	Unsuitable	Good	Generally good soil conditions.	Adequate strength for high embankments.
Howard: HwA, HwB, HwC	Unsuitable	Generally good; stratified sand and gravel below depth of 3½ feet.	Good; highly erodible if sandy.	Cut slopes subject to seepage and sloughing; subgrade subject to differential frost heave.	Adequate strength for moderately high embankments.
Ira: IrA, IrB, IsD. (For interpretations of Sodus component of IsD, see Sodus series.)	Poor; gravelly	Unsuitable	Good. IsD: very stony.	Seasonal high water table; some flat topography.	Adequate strength for high embankments.
Kendaia: KeB, KlA	Fair	Unsuitable	Good; may be wet in natural state; high water table.	Seasonal high water table; some depressional topography; cut slopes subject to seepage and sloughing.	Adequate strength for high embankments.
Lairdsville	Eroded soil poor; otherwise fair.	Unsuitable	Fair: low yield of soil material per acre; hauling operations hindered when soil is wet.	Bedrock at depth of 20 to 40 inches; seepage problems.	Adequate strength for embankments.

See footnotes at end of table.

properties of soils—Continued

Soil features affecting engineering—Continued						
Building foundations	Farm ponds		Agricultural drainage	Irrigation	Diversions	Waterways
	Reservoir areas	Embankments				
Subject to flash floods; variable bearing capacity; large settlements possible under vibratory loads; perched water table.	Subject to flash floods; variable permeability.	Good stability and shear strength; slow permeability if compacted.	Drainage not generally needed; subject to flash floods.	Subject to flash floods; good water-intake rate; moderate available moisture capacity.	(2)	(2).
Moderately high bearing capacity; low compressibility; high or perched water table.	Seasonal high water table; moderately slow permeability.	Good stability and shear strength; slow permeability if compacted.	Seasonal high water table; fine sand subject to piping; perched water table.	Good water-intake rate; high available moisture capacity.	Generally no adverse conditions.	Erodible on steep slopes.
High bearing capacity; low compressibility; seasonal high water table. HsD: moderately steep slopes.	Seasonal high water table; moderately slow permeability. HsD: moderately steep stopes.	Generally no adverse conditions.	Drainage generally not needed, except in small wet areas. HsD: moderately steep slopes.	Moderate water-intake rate; high available moisture capacity. HsD: moderately steep slopes.	Generally no adverse conditions. HoCK: very irregular slopes.	Prolonged seepage; erodible on moderately steep slopes.
Variable bearing capacity, depending on characteristics of underlying material; large settlements possible under heavy or vibratory loads.	Rapid permeability.	Good stability and shear strength for outside shell; rapid permeability.	(2)	High water-intake rate; moderate to high available moisture capacity; pervious substratum.	Rapid permeability.	Rapid permeability.
Generally high bearing capacity; low compressibility; seepage.	Seasonal high water table; slow to moderate permeability in substratum.	Good stability and shear strength; slow permeability. IsD: very stony.	Moderately slowly permeable layer at depth of 18 to 24 inches; internal water movement slow. IsD: very stony.	Moderate water-intake rate; moderate available moisture capacity; limited rooting depth.	Moderately slowly permeable layer at depth of 18 to 24 inches; stony.	Prolonged seepage; stony.
Generally high bearing capacity; low compressibility; severe seepage.	Seasonal high water table; moderately slow to slow permeability.	Generally no adverse conditions.	Seasonal high water table; cut slopes may be unstable.	Good water-intake rate; high available moisture capacity.	Subject to runoff from higher areas.	Prolonged seepage.
High bearing capacity; bedrock at depth of 20 to 40 inches.	Bedrock at depth of 20 to 40 inches.	Low shear strength; low yield of soil material per acre; shrink-swell problems.	Bedrock at depth of 20 to 40 inches.	Generally not irrigated.	Bedrock at depth of 20 to 40 inches.	Bedrock at depth of 20 to 40 inches; may be erodible.

TABLE 6.—*Interpretation of engineering*

Soil series and map symbols	Suitability as source of—			Soil features affecting engineering	
	Topsoil	Granular material (sand and gravel)	Fill material	Highway location [1]	Embankment foundations
Lake beaches: Lb	Unsuitable	Possibly suitable in some places.	Generally good	Subject to overflow by waves; cuts not practical.	Generally adequate strength for low embankments.
Lakemont: Lc	Fair; seasonally wet.	Unsuitable	Poor to fair when dry; high water table.	High water table; subgrade and cut slopes unstable; level or depressional topography; hauling operations hindered when soil is wet.	Very low strength; moderately high to high compressibility.
Lamson: Le, Lf	Fair to good; seasonally wet.	Unsuitable	Fair; readily eroded by wind and water.	Organic surface soil; prolonged high water table; natural outlets inadequate; cut slopes and subgrade unstable; fine sand hinders hauling operations.	Very low strength; moderately high compressibility.
Langford: LgB, LgC, LgCK, LgD, LhB, LhC, LhD, LhE. (For interpretations of Howard component of LhB, LhC, LhD, and LhE, see Howard series.)	Poor	Unsuitable	Good	Cut slopes subject to seepage and sloughing; shallow to slowly permeable layer.	Adequate strength for high embankments. LgD, LhD, LhE: moderately steep to steep slopes.
LnB	Poor	Unsuitable	Good; low yield of soil material per acre; shallow to bedrock.	Sandstone and hard shale at depth of 20 to 40 inches; cut slopes subject to seepage and sloughing.	Adequate strength for high embankments.
Lansing: LsB, LsC, LsC3, LsCK.	Poor	Unsuitable	Good	Generally good soil conditions; cut slopes subject to erosion and seepage.	Adequate strength for high embankments.
Lima: LtA, LtB	Poor to fair	Unsuitable	Good	Flat topography; otherwise good soil conditions.	Adequate strength for high embankments.
Lockport	Fair to poor; high clay content.	Unsuitable	Fair; low yield of soil material per acre; clayey material difficult to work when wet.	Shale bedrock at depth of 20 to 40 inches; seasonal high water table; seepage problems.	Shrink-swell problems; shale bedrock may be pervious.

See footnotes at end of table.

properties of soils—Continued

Soil features affecting engineering—Continued						
Building foundations [1]	Farm ponds		Agricultural drainage	Irrigation	Diversions	Waterways
	Reservoir areas	Embankments				
(2)	Subject to overflow by waves; pervious.	Fair stability; sandy material very erodible.	(2)	(3)	(2)	(2).
(2)	Prolonged high water table; slow permeability.	Poor stability; subject to shrink-swell conditions; poor workability if wet; high water table.	Cut slopes unstable; prolonged high water table; natural outlets inadequate.	(2)	(2)	(2).
(2)	Prolonged high water table; rapid permeability.	Fair to poor stability; fine sand subject to piping; very erodible.	Cut slopes unstable; fine sand subject to piping; natural outlets inadequate.	(2)	(2)	(2).
High bearing capacity; low compressibility. LgD, LhD, LhE: moderately steep to steep slopes.	Seasonal high water table; slow permeability. LgD, LhD, LhE: moderately steep to steep slopes.	Good stability and shear strength; slow permeability.	Generally no adverse conditions. LgD, LhD, LhE: moderately steep to steep slopes.	Limited rooting depth. LgD, LhD, LhE: moderately steep to steep slopes.	LgCK: complex slopes. LgD, LhD, LhE: moderately steep to steep slopes.	Prolonged seepage. LgD, LhD, LhE: moderately steep to steep slopes.
High bearing capacity; bedrock encountered in cuts at depth of 20 to 40 inches.	Pervious sandstone bedrock at depth of 20 to 40 inches.	Good stability; low yield of soil material per acre; shallow to bedrock.	Bedrock at depth of 20 to 40 inches.	Limited rooting depth.	Bedrock at depth of 20 to 40 inches.	Prolonged seepage.
Moderately high bearing capacity; low compressibility; seasonal high water table.	Moderately slow permeability; sand and gravel pockets; excess seepage.	Good stability and shear strength; slow permeability if compacted.	Except for small wet spots, drainage generally not needed.	Good water-intake rate; high available moisture capacity.	LsCK: complex slopes.	Very erodible.
Moderately high bearing capacity; low compressibility; seasonal high water table.	Moderately slow permeability; seasonal high water table.	Good stability and shear strength; slow permeability.	Except for small wet spots, drainage generally not needed.	Good water-intake rate; high available moisture capacity.	Generally no adverse conditions.	Erodible on slopes.
Shale bedrock at depth of 20 to 40 inches; seasonal high water table; seepage problems.	Shale bedrock at depth of 20 to 40 inches; may be pervious; seasonal high water table.	Seasonal high water table.	(2)	(2)	(2)	(2).

TABLE 6.—*Interpretation of engineering*

Soil series and map symbols	Suitability as source of—			Soil features affecting engineering	
	Topsoil	Granular material (sand and gravel)	Fill material	Highway location [1]	Embankment foundations
Lordstown: LwB, LwC	Unsuitable	Unsuitable	Good; low yield of soil material per acre.	Seepage on sandstone bedrock at depth of 20 to 40 inches.	Adequate strength for high embankments.
Lyons	Good	Uns itable	Surface layer unsuitable.	Seasonal high water table; cut slopes subject to seepage and sloughing.	Adequate strength for high embankments.
Madalin:					
Ma	Poor to fair	Unsuitable	Poor	Prolonged high water table; flat or depressional topography; cut slopes unstable.	Very low strength; shrink-swell problems; high water table.
Mb	Poor to fair	Unsuitable	Fair; sandy material readily eroded by wind and water.	Prolonged high water table; flat or depressional topography; cut slopes unstable.	Generally adequate strength for low embankments; high water table.
Made land: Mc, Md	(3)	(3)	(3)	(3)	(3)
Minoa: Mf	Poor	Unsuitable	Good; readily eroded by wind and water.	Seasonal high water table; large flat areas; cut slopes unstable; subgrade unstable below water table.	Generally adequate bearing capacity for low embankments; underlain in places by wet, compressible soil material.
Muck: Mr, Ms	Possible use as amendment to mineral soil.	Unsuitable	Unsuitable	Prolonged high water table; highly organic material; cuts not practical.	(2)
Niagara: Na, Nc (For interpretations of Canandaigua component of Nc, see Canandaigua series.)	Good; may be wet in natural state.	Unsuitable	Fair to poor	High water table; subgrade and cut slopes unstable; depressional topography.	Generally adequate strength for low embankments; underlain in places by wet, compressible soil material.
Odessa: OdA, OdB	Fair to good	Unsuitable	Fair to good when dry; high water table.	Seasonal high water table; cut slopes and subgrade unstable; hauling operations hindered when soil is wet.	Variable strength and compressibility; shrink-well problems.

See footnotes at end of table.

properties of soils—Continued

Soil features affecting engineering—Continued						
Building foundations [1]	Farm ponds		Agricultural drainage	Irrigation	Diversions	Waterways
	Reservoir areas	Embankments				
High bearing capacity; bedrock at depth of 20 to 40 inches; seepage problems.	Pervious sandstone bedrock at depth of 20 to 40 inches.	Good stability; low yield of soil material per acre.	Seepage on bedrock at depth of 20 to 40 inches; drainage generally not needed.	Limited rooting depth; stony.	Bedrock at depth of 20 to 40 inches; stony.	Stony.
Moderately high bearing capacity; low compressibility; seasonal high water table.	Seasonal high water table; moderately slow to slow permeability.	Generally no adverse conditions.	Cut slopes unstable; seasonal high water table.	Moderately high water-intake rate; high available moisture capacity; seasonal high water table.	Seasonal high water table; long, narrow depressions.	Prolonged seepage.
(2)	Prolonged high water table; slow permeability; occasional flooding.	Poor stability; poor workability if wet; shrink-swell problems.	Cut slopes unstable; slow internal water movement; natural outlets may be inadequate.	(2)	(2)	(2).
(2)	Prolonged high water table; sandy subsoil subject to excess seepage.	Fair stability; sandy material may hinder hauling operations; very erodible.	Prolonged high water table; cut slopes unstable; fine sand subject to piping.	(2)	(2)	(2).
(3)	(3)	(3)	(3)	(3)	(3)	(3).
Variable bearing capacity; large settlements possible under vibratory loads; severe seepage problems.	Moderately rapid to rapid permeability.	Fair stability; fine sand subject to piping; erodible.	Ditchbanks unstable; fine sand subject to piping.	High water-intake rate; moderate to low available moisture capacity.	(2)	(2).
(2)	(2)	(2)	Very high shrinkage when first drained; underlying material at various depth.	Good water-intake rate; high available moisture capacity.	(2)	(2).
Low bearing capacity; high water table; variable compressibility.	Prolonged high water table; stratified sand subject to excess seepage in dry periods.	Fair to poor stability; fine sand subject to piping; surface soil high in organic-matter content.	Natural outlets may be inadequate; cut slopes unstable; fine sand subject to piping; prolonged high water table.	Fair to good water-intake rate; high available moisture capacity.[2]	(2)	(2).
Variable bearing capacity; shrink-swell problems; severe seepage problems.	Seasonal high water table; slow permeability.	Low shear strength; shrink-swell problems; poor workability.	Cut slopes unstable; seasonal high water table; internal water movement slow.	(2)	(2)	(2).

TABLE 6.—*Interpretation of engineering*

Soil series and map symbols	Suitability as source of—			Soil features affecting engineering	
	Topsoil	Granular material (sand and gravel)	Fill material	Highway location [1]	Embankment foundations
Ontario: OfB, OfC, OfCK, OnB, OnC, OnC3, OnCK, OnD, OnD3.	Good	Unsuitable	Good	Generally good soil conditions; bedrock encountered in some deep cuts.	Adequate strength for high embankments. OnD, OnD3: moderately steep slopes.
OrA, OrB, OrC	Fair; stony in some places.	Unsuitable	Good; low yield of soil material per acre.	Limestone bedrock at depth of 20 to 40 inches.	Adequate strength for high embankments.
OtE, OtF	Generally unsuitable.	Unsuitable	Good	Excessive seepage on long slopes; unstable slopes possible in deep cuts.	Steep to very steep slopes.
Ovid: OvA, OvB	Fair	Unsuitable	Fair	Seasonal high water table; subgrade subject to differential frost heave; cut slopes unstable; hauling operations hindered when soil is wet.	Generally adequate strength for high embankments.
Palmyra: PaB, PaC, PgA, PgB, PgC, PmD.	Generally unsuitable.	Good	Good; highly erodible if sandy.	PmD: moderately steep slopes.	Generally adequate strength for moderately high embankments. PmD: moderately steep slopes.
PnE	Generally unsuitable.	Good	Good; highly erodible if sandy.	Steep slopes	Generally adequate strength for moderately high embankments; steep slopes.
Peat and Muck: Pu	Possible use as amendment to mineral soils.	Unsuitable	Unsuitable	(2)	(2)

See footnotes at end of table.

properties of soils—Continued

Soil features affecting engineering—Continued						
Building foundations [1]	Farm ponds		Agricultural drainage	Irrigation	Diversions	Waterways
	Reservoir areas	Embankments				
High bearing capacity; low compressibility. OnD, OnD3: moderately steep slopes.	Sand layers subject to excess seepage. OnD, OnD3: moderately steep slopes.	Good stability and shear strength; slow permeability if compacted.	Except for small wet spots, drainage generally not needed. OnD, OnD3: moderately steep slopes.	Good water-intake rate; high available moisture capacity. OnD, OnD3: moderately steep slopes.	Generally no adverse conditions.	Erodible on steep slopes. OnD, OnD3: moderately steep slopes.
High bearing capacity; limestone bedrock at depth of 20 to 40 inches.	Limestone bedrock at depth of 20 to 40 inches.	Good stability; low yield of soil material per acre.	Limestone bedrock at depth of 20 to 40 inches.	Generally not irrigated.	Bedrock at depth of 20 to 40 inches.	Bedrock at depth of 20 to 40 inches.
Steep to very steep slopes.	(2)	Good stability; slow permeability if compacted.	(2)	(2)	(2)	(2).
Moderately high bearing capacity; shrink-swell problems; severe seepage problems.	Seasonal high water table; moderately slow permeability.	Good stability; slow permeability if compacted; hauling operations hindered when soil is wet.	Cut slopes unstable; internal water movement slow; moderately slowly permeable layer at depth of 24 inches.	Moderate water-intake rate; moderate to high available moisture capacity.	Moderately slowly permeable layer at depth of 24 inches.	Prolonged seepage.
Moderately high bearing capacity; large settlements may occur under vibratory loads. PmD: moderately steep slopes.	(2)	Good stability and shear strength for outside shell; rapid permeability.	Except for small wet spots, drainage generally not needed. PmD: moderately steep slopes.	Good water-intake rate; moderate available moisture capacity; some areas droughty. PmD: moderately steep slopes.	Rapid permeability. PmD: moderately steep slopes.	Erodible. PmD: moderately steep slopes.
Moderately high bearing capacity; large settlements may occur under vibratory loads; steep slopes.	(2)	Good stability and shear strength for outside shell; rapid permeability.	Steep slopes	Good water-intake rate; moderate available moisture capacity; some areas droughty; steep slopes.	Rapid permeability; steep slopes.	Erodible; steep slopes.
(2)	(2)	(2)	(2)	(2)	(2)	(2).

TABLE 6.—*Interpretation of engineering*

Soil series and map symbols	Suitability as source of—			Soil features affecting engineering	
	Topsoil	Granular material (sand and gravel)	Fill material	Highway location [1]	Embankment foundations
Phelps: Pv	Unsuitable	Generally good	Good; highly erodible if sandy.	Seasonal high water table; level topography; cut slopes and subgrade unstable below water table; subject to differential frost heave.	Generally adequate strength for moderately high embankments.
Riga: RgB, RlC3 (For interpretations of Lairdsville component, see Lairdsville series.)	RgB: fair. RlC3: poor.	Unsuitable	Fair; low yield of soil material per acre; hauling operations hindered when soil is wet.	Bedrock at depth of 20 to 40 inches; seepage problems.	Adequate strength for high embankments.
Romulus: Ro	Fair	Unsuitable	Fair: seasonally wet; high water table; level to depressional topography.	Prolonged high water table; depressional topography; cut slopes and subgrade unstable; hauling operations hindered when soil is wet.	Adequate strength for moderately high embankments.
Schoharie: SeB, ShC, ShD	Fair; high in clay content.	Unsuitable	Fair when dry	Seasonal high water table; cut slopes unstable; hauling operations hindered when soil is wet.	Low strength; shrink-swell problems; deep substratum may be pervious outwash or dense glacial till. ShD: moderately steep slopes.
Scriba: Sk, Sm	Unsuitable	Unsuitable	Sk: good. Sm: fair; stony.	Seasonal high water table; large flat areas; seepage and stability problems.	Adequate strength for high embankments.
Sloan: Sn	Good; seasonally wet.	Unsuitable	Generally unsuitable.	Subject to flooding; highly organic surface soil; natural drainage outlets inadequate; high water table.	Variable strength and compressibility; pervious sand lenses in some places.

See footnotes at end of table.

properties of soils—Continued

Soil features affecting engineering—Continued						
Building foundations [1]	Farm ponds		Agricultural drainage	Irrigation	Diversions	Waterways
	Reservoir areas	Embankments				
Moderately high bearing capacity; large settlements possible under vibratory loads.	Rapid permeability.	Good stability and shear strength for outside shell; rapid permeability.	Except for small wet spots, drainage generally not needed.	Good water-intake rate; moderate to high available moisture capacity.	(2)	(2).
High bearing capacity; bedrock at depth of 20 to 40 inches.	Bedrock at depth of 20 to 40 inches.	Low shear strength; low yield of soil material per acre; shrink-swell problems.	Bedrock at depth of 20 to 40 inches.	Generally not irrigated.	Bedrock at depth of 20 to 40 inches.	Bedrock at depth of 20 to 40 inches; may be erodible.
Moderately high bearing capacity; shrink-swell problems; prolonged high water table.	Prolonged high water table; slow permeability.	Low shear strength; slow permeability; poor workability if wet.	Cut slopes unstable; internal water movement slow.	Prolonged high water table; generally not irrigated.	(2)	(2).
Low bearing capacity; variable compressibility; severe seepage problems. ShD: moderately steep slopes.	Seasonal high water table; slow permeability; substratum may be pervious. ShD: moderately steep slopes.	Low shear strength; slow permeability; poor workability if wet.	High water table; cut slopes unstable; internal water movement slow. ShD: moderately steep slopes.	High water table; generally not irrigated. ShD: moderately steep slopes.	Poor workability if wet; high water table.	Very erodible. ShD: moderately steep slopes.
High bearing capacity; low compressibility. Sm: very stony; high water table.	Seasonal high water table; slow permeability.	Good stability and shear strength; slow permeability if compacted. Sm: very stony.	Slowly permeable layer at depth of 12 to 15 inches; cut slopes subject to seepage and sloughing; seasonal high water table.	Generally not irrigated.	Sm: very stony.	Sm: very stony.
(2)	High water table; subject to flooding; sand lenses subject to excess seepage.	Poor stability; low shear strength; subject to flooding.	Subject to flooding; fine sand lenses subject to piping; natural outlets inadequate; high water table.	(2)	(2)	(2).

TABLE 6.—*Interpretation of engineering*

Soil series and map symbols	Suitability as source of—			Soil features affecting engineering	
	Topsoil	Granular material (sand and gravel)	Fill material	Highway location [1]	Embankment foundations
Sodus: SoB, SoC, SoC3, SoCK, SoD, SoE.	Poor; stony	Unsuitable	Good	Stony; excess seepage; steep slopes erodible.	Adequate strength for high embankments; lenses of pervious sand and gravel in some places. SoD, SoE: moderately steep to steep slopes.
Stafford: St	Fair	Unsuitable	Fair; readily eroded by wind and water.	Seasonal high water table; cut slopes and subgrade unstable; fine sand hinders hauling operations.	Underlain in places by wet, soft compressible soil material.
Tuller: TuB	Unsuitable	Unsuitable	Good; low yield of soil material per acre.	Sandstone bedrock at depth of 10 to 20 inches; seepage problems.	Adequate strength for high embankments; pervious bedrock.
Varick: Va	Poor	Unsuitable	Good; low yield of soil material per acre; shale bedrock at depth of 20 to 40 inches.	Shale bedrock at depth of 20 to 40 inches.	Adequate strength for high embankments; shale bedrock at depth of 20 to 40 inches.
Wampsville: WaA, WaB	Unsuitable	Poor to fair, depending on durability of shale particles.	Good	Slopes subject to seepage and sloughing; subgrade subject to differential frost heave.	Adequate strength for moderately high embankments; stratified substratum over shale.
Warners: We, Wf	Possible use as amendment to mineral soil.	Unsuitable	Unsuitable	Subject to annual flooding.	Very low strength; severe settlement problems; subject to flooding.
Williamson: WmA, WmB, WmC, WmC3.	Good	Unsuitable	Fair; highly erodible; fine sand hinders hauling operations.	Seasonal high water table; cut slopes subject to seepage and sloughing; subgrade subject to differential frost heave.	Adequate strength for low embankments.

[1] Engineers and others should not apply specific values to the estimates given for bearing capacity of soils.
[2] Generally not applicable or not needed.

properties of soils—Continued

Soil features affecting engineering—Continued						
Building foundations [1]	Farm ponds		Agricultural drainage	Irrigation	Diversions	Waterways
	Reservoir areas	Embankments				
High bearing capacity; low compressibility. SoD, SoE: moderately steep to steep slopes; seasonal seepage.	Gravel and sand layers subject to excess seepage. SoD, SoE: moderately steep to steep slopes.	Good stability and shear strength; slow permeability if compacted.	Except for small wet spots, drainage generally not needed.	Moderate water-intake rate; moderate available moisture capacity; limited rooting depth. SoD, SoE: moderately steep to steep slopes.	Slowly permeable layer at depth of 18 to 24 inches. SoCK: complex slopes. SoD, SoE: moderately steep to steep slopes.	Prolonged seepage; erodible on steep slopes. SoD, SoE: moderately steep to steep slopes.
Variable bearing capacity; large settlements possible under vibratory loads; severe seepage problems; high water table.	Rapid permeability.	Fair to poor stability; fine sand subject to piping; very erodible.	Prolonged high water table; fine sand subject to piping; cut slopes unstable; natural outlets may be inadequate.	Good water-intake rate; moderate to low available moisture capacity.[2]	(2)	(2).
High bearing capacity; bedrock at depth of 10 to 20 inches; seasonal wetness.	(2)	Good stability; very low yield of soil material per acre; shallow to hard sandstone bedrock.	Seasonal wetness; shallow to hard sandstone bedrock.	(2)	(2)	(2).
High bearing capacity; shale bedrock at depth of 20 to 40 inches; seasonal wetness.	Pervious shale bedrock at depth of 20 to 40 inches; seasonal wetness.	Good stability; low yield of soil material per acre.	Shale bedrock at depth of 20 to 40 inches; high water table.	(2)	(2)	(2).
Moderately high bearing capacity; large settlements possible under vibratory loads.	(2)	Fair to poor stability, depending on durability of shale fragments; slow permeability if compacted.	Except for small wet spots, drainage generally not needed.	Good water-intake rate; high available moisture capacity.	Stony	Erodible on steep slopes; stony.
(2)	Subject to annual flooding; variable permeability in subsoil and substratum.	(2)	(2)	(2)	(2)	(2).
Low bearing capacity; large settlements possible under heavy or vibratory loads; seasonal high water table.	Seasonal high water table; sand layers subject to excess seepage.	Poor stability and shear strength; fine sand subject to piping; erodible.	Cut slopes unstable; fine sand subject to piping; slowly permeable layer at depth of 15 to 20 inches.	Good water-intake rate; moderate to low available moisture capacity; limited rooting depth.	Wind erosion hazard.	Readily eroded by wind and water.

[2] All properties are variable.

Thin Glacial Till

This material is similar to thick 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 coarse fragments commonly is higher than in the thicker glacial till.

The Angola, Arnot, Aurora, Benson, Brockport, Camillus, Farmington, Lairdsville, Lockport, Lordstown, Riga, Tuller, and Varick soils and the moderately shallow variants of the Erie, Langford, and Ontario soils formed in thin glacial till.

Some of these soils are underlain by soft shale that tends to disintegrate and become unstable if exposed to the effect of frost or to alternate wetting and drying.

Soils that formed in glacial till furnish satisfactory embankment foundations, because the soil material is thin enough that little settlement occurs and the underlying rocks are unyielding. Some of these soils are in gorges and other steep areas. In some of these places shear keys may be needed to prevent sliding.

Thin till material can also be used for highway fills. If cuts extend into the underlying bedrock, considerable difficulty may ensue in placing the fill material in layers thin enough to obtain good compaction with most standard compaction equipment. The blasted rock fragments are likely to be large and, hence, oversized for thin lifts.

Glacial Outwash

This material consists mainly of sorted sand and gravel deposited by meltwater from a glacier, but it commonly includes localized strata and lenses of silt, which impede drainage. The deposits include outwash terraces, deltas, valley trains, kames, and lake beaches.

Alton, Fredon, Howard, Palmyra, Phelps, and Wampsville soils formed in deposits of glacial outwash.

Sand and gravel from outwash are suitable for many uses. Depending on gradation, soundness, and plasticity, this material 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 ice control on highways. This granular material may be too permeable for use as embankments intended to hold water. Cut slopes in the more sandy material are subject to severe erosion.

Lacustrine Sediments

These deposits consist of the finer textured material that washed into glacial lakes and eventually settled to the bottom. In some places they are stratified fine sand and silt; in others they are varved silt and clay. Occasional lenses of sand and silt are interbedded with the varved material. Because lake elevations fluctuated, silt and clay lacustrine sediments underlie many of the outwash deposits.

Many of these lacustrine deposits have a high water table. Thus, loose, wet silt and clay may underlie the surface material. In most places lacustrine sediments are increasingly wetter with depth. Infiltration is restricted, and where the topography is flat, runoff is slow.

The landform consists of plains or terraces. In places the terraces are dissected, and there are steep, unstable terrace fronts. Here, erosion is serious and landslides are common.

Soils that formed in lacustrine sediments are the Alden, Arkport, Canandaigua, Collamer, Colonie, Dunkirk, Fonda, Galen, Lakemont, Lamson, Madalin, Minoa, Niagara, Odessa, Schoharie, Stafford, and Williamson.

In proportion to their extent, soils that formed in lacustrine deposits present more engineering problems than any other soils in the county, except Peat and Muck. They may settle considerably under heavy fills and structures, they are highly susceptible to frost heave, and they lose strength when thawing increases the moisture content. Cut slopes may be unstable unless flattened.

Alluvial Sediments

Alluvial sediments consist of soil material that has been moved and redeposited on land by streams. These deposits, which form the flood plains adjacent to streams, vary widely in texture within short distances.

Alluvium is subject to periodic flooding. Surface drainage varies, and a water table near the surface is characteristic.

In Cayuga County, Eel, Sloan, Genesee, and Warners soils and Alluvial land formed in alluvial sediments.

Soils formed in recent alluvium should be avoided as building sites. Sewage disposal by leaching is always troublesome because the water table is seasonally or permanently high. Most alluvial soils are a good source of topsoil.

Organic Deposits

These accumulations are mostly muck and peat, but they may contain various amounts of inorganic material. They occur in swamps and at the surface of other poorly drained depressional areas.

The organic soils in the county are Edwards muck; Muck, deep; Muck, shallow; and Peat and Muck.

Ordinarily, organic soils are unsuitable for highway and other embankment sites, because they are highly compressible and unstable. They generally are underlain by soft wet alluvium, marl, or lacustrine sediments.

Bedrock

The extent and geographical occurrence of the different kinds of bedrock underlying the soils of Cayuga County are described in the subsection "Geology." Bedrock is encountered at a shallow depth in areas where the glacial till is thin, and it may be encountered in some deeper cuts in areas where the till is thick. In addition, there are some exposed outcrops of bedrock.

All of the bedrock in the county furnishes excellent foundations for highway embankments. Bedrock encountered in the foundation of dams for storing water may require sealing to prevent excess seepage.

Soils and engineering construction

Highways, dams, bridges, buildings, drainage installations, and other engineering structures are constructed either on or partly of earth material. Thus, the design of such structures should reflect the nature and physical properties of the soils involved. Some features of engineering works are highly dependent on such soil properties as depth to bedrock, depth to the water table, texture, and permeability. Discussed in the following paragraphs are the soil features that commonly affect engineering structures for soil and water conservation and that influence the location of highways or the placement of embankments.

Soil and Water Conservation Work

Farm drainage, irrigation, farm ponds, dikes and levees, diversions, and waterways are used to conserve soil and water.

Some of the soils derived from glacial till are underlain by a compact fragipan or a platy substratum that retards the movement of water. Langford soils are examples of those with a fragipan; Lima soils are examples of those with a platy substratum. Seepage along the top of these layers causes wet spots. Thus, interception drains of both surface and subsurface types may be required. The installation of irrigation systems in these soils and in soils that are shallow to bedrock requires careful investigation at the site because depth of the tillable soil is limited.

Most soils that formed in glacial till have impeded permeability and are suitable for the construction of farm ponds, although some contain sandy lenses that can cause excess seepage from the reservoir. The sandy lenses may also cause piping and instability in drainage structures.

Soils that formed in lacustrine sediments, Collamer and Dunkirk, for example, have extremely variable engineering properties and require careful investigation for most uses. The clayey lacustrine soils, such as Odessa and Schoharie, are generally suitable for farm ponds, but in places they contain lenses of sand that may cause piping.

Alton, Palmyra, and other soils derived from glacial outwash and Eel, Genesee, and other soils derived from alluvium generally are more permeable than soils derived from glacial till. If farm ponds for storing water above ground are built in these soils, a sealing agent may be needed to prevent seepage of water from the reservoir. Ponds that are dug to store water below the surface have been successful in areas 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 some gravelly and sandy outwash soils are droughty and have moderate to low water-holding capacity should be considered when planning an irrigation system.

Soil Features Affecting Highway Location

Highway location may be influenced by many soil features. Consideration must be given both to location on the landscape and to the selection of the gradeline with respect to the surface.

Highway construction on sloping to steep soils generally involves cuts and fills. More earthwork is involved in construction on these soils than on nearly level to gently sloping soils that are well drained and free from flooding.

Undulating or gully-dissected, silty and clayey lacustrine soils also require cuts and fills. Cuts in these soils may involve both the handling of wet material and the instability of foundation embankments. By comparison, the volume of earthwork on till uplands and outwash deposits may be greater than on a lacustrine landscape, but the overall cost of construction may be less. In wet seasons, construction is generally easier on a till landscape than on a lacustrine landscape. As a rule, however, sandy lacustrine sediments present few difficulties, although cuts in this material may be troublesome because of ground water.

On terraces of well-drained granular material (sand and gravel), highway construction generally is easy and involves relatively light cuts and fills. Good drainage permits uninterrupted grading operations. Even after rainstorms, these areas can be occupied without delay.

The gradeline selected for highway location is influenced by drainage, soil texture, topography, and other soil properties. Areas that are poorly drained and subject to flooding require a moderately high gradeline. In granular material, strata having variable permeability may be encountered in cuts. As a result, subgrades in such cuts are not uniform.

Alluvial soils are variable. They are subject to overflow and often have a relatively high water table. Consequently, a moderately high gradeline is necessary to avoid roadway flooding and wet subgrades. Borrow material generally must be obtained from a source other than adjacent alluvial soils, which are also likely to be wet and hence unsuitable for use as embankment material. Unless alluvial deposits are sandy, compaction of the subgrade soil is difficult. Subgrades that are not adequately compacted eventually yield enough to cause pavements to be uneven.

Some soils in the county 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.

Where soils, such as the Arnot, are shallow over bedrock, the grade should be high enough, if possible, to avoid the blasting of rock for ditches.

Soil Features Affecting Embankment Foundations

The major soil features that affect the placement of embankments are compressibility, shear strength, and shrink-swell potential. Topography is also an important feature.

Most soils formed in glacial till, such as the Ontario, are relatively low in clay content. Consequently, these soils will support embankments of 10 feet or more of fill material. Some soils formed in till, such as the Cazenovia, are fairly high in clay content and generally are suitable only for moderately high embankments of 5 to 10 feet. Soils formed in glacial outwash may contain substratum layers of wet, compressible soil material. Thus, they too may be suitable only for moderately high embankments. Most soils formed in lacustrine material, such as the Odessa, Lakemont, Arkport, and Colonie, are underlain by wet, compressible material of low shear strength and are generally suitable only for low embankments of less than 5 feet.

Soils formed in alluvium vary in their ability to support embankments, and organic soils are not suitable for the placement of embankments unless the organic material is completely removed.

Soil slope generally becomes a factor to be considered if it is more than 15 percent.

Nonfarm Uses of Soils [12]

This subsection is designed to aid in the comprehensive planning and developing of land for selected nonfarm uses. Table 7 lists the soils in the county and shows the kind and estimated degree of limitations that affect

[12] L. W. Kick and C. E. Rice, soil scientists, Soil Conservation Service, assisted in the preparation of this subsection.

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

[Made land, sanitary land fill (Mc) and Made land,

Soil	Septic-tank effluent disposal	Homesites	Streets and parking lots
Alden mucky silt loam.	Severe: Prolonged wetness; moderately slow permeability.	Severe: Prolonged wetness.	Severe: Prolonged wetness.
Alden mucky silt loam, till substratum.	Severe: Prolonged wetness; moderately slow or slow permeability.	Severe: Prolonged wetness.	Severe: Prolonged wetness.
Alluvial land.	Severe: Flooding; prolonged wetness.	Severe: Flooding; prolonged wetness.	Severe: Flooding; prolonged wetness.
Alton cobbly loam, 0 to 3 percent slopes. Alton cobbly loam, 3 to 8 percent slopes.	Slight	Slight	Slight on slopes of 0 to 3 percent; moderate on slopes of 3 to 8 percent.
Alton gravelly sandy loam, 0 to 3 percent slopes. Alton gravelly sandy loam, 3 to 8 percent slopes.	Slight	Slight	Slight on slopes of 0 to 3 percent; moderate on slopes of 3 to 8 percent.
Alton gravelly sandy loam, 8 to 15 percent slopes.	Moderate: Slope	Moderate: Slope	Severe: Slope
Alton and Howard soils, 15 to 25 percent slopes.	Severe: Slope	Severe: Slope	Severe: Slope
Angola silt loam, 1 to 6 percent slopes. Angola silt loam, 6 to 12 percent slopes.	Severe: Slow permeability; bedrock at depth of 20 to 40 inches; seasonal wetness.	Severe: Seasonal wetness.	Moderate: Seasonal wetness; rippable bedrock at depth of 20 to 40 inches; slope.
Appleton and Lyons loams, 0 to 5 percent slopes.	Severe: Moderately slow or slow permeability; prolonged wetness.	Severe: Prolonged wetness.	Severe: Prolonged wetness.
Arkport fine sandy loam, 1 to 6 percent slopes.	Slight	Slight	Moderate: Slope
Arkport fine sandy loam, 6 to 12 percent slopes.	Moderate: Slope	Moderate: Slope	Moderate: Slope
Arnot channery silt loam, 3 to 15 percent slopes.	Severe: Bedrock at depth of 10 to 20 inches; slope.	Severe: Bedrock at depth of 10 to 20 inches.	Severe: Bedrock at depth of 10 to 20 inches; slope.

their use for specified purposes. *Slight* indicates that no special measures are required to overcome limitations imposed by soil properties. *Moderate* indicates that moderate problems exist but that they can be overcome or corrected. *Severe* indicates that usually expensive measures are needed to overcome the limitations imposed, but it does not imply that the soil properties prevent the use of the soil for the specified use. The evaluations are general and do not eliminate the need for onsite investigations for a given use.

Soil properties may not restrict all types of nonfarm uses equally. For example, the deep, well-drained, nearly level to gently sloping Howard and Palmyra soils have slight limitations for residential use, but they have severe limitations for use as athletic fields for organized games, such as football or baseball, because they are high in

for selected nonfarm uses of the soils

tillable (Md) are too variable to be rated]

Sanitary land fill	Lawns and fairways	Athletic fields	Paths and trails	Campsites	Picnic areas 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 or slow permeability.	Severe: Prolonged wetness.	Severe: Prolonged wetness; moderately slow or slow permeability.	Severe: Prolonged wetness.	Severe: Prolonged wetness; moderately slow or slow permeability.	Severe: Prolonged wetness.
Severe: Flooding; prolonged wetness.	Severe: Flooding; prolonged wetness.	Severe: Flooding; prolonged wetness; cobblestones.	Severe: Flooding; prolonged wetness.	Severe: Flooding; prolonged wetness.	Severe: Flooding; prolonged wetness.
Severe: Rapid permeability below depth of 3 feet.	Severe: Cobblestones.	Severe: Cobblestones.	Moderate: Cobblestones.	Severe: Cobblestones.	Severe: Cobblestones.
Severe: Rapid permeability below depth of 3 feet.	Moderate: Gravel	Severe: Gravel	Slight	Moderate: Gravel	Slight.
Severe: Rapid permeability.	Moderate: Gravel; slope.	Severe: Gravel; slope.	Slight	Moderate: Gravel	Moderate: Slope.
Severe: Slope; rapid permeability.	Severe: Slope	Severe: Slope; gravel.	Moderate: Slope	Severe: Slope	Severe: Slope.
Severe: Seasonal wetness; slow permeability; bedrock at depth of 20 to 40 inches.	Moderate: Seasonal wetness; bedrock at depth of 20 to 40 inches.	Severe: Seasonal wetness; slow permeability; slopes up to 12 percent.	Moderate: Seasonal wetness.	Severe: Seasonal wetness; slow permeability.	Moderate: Seasonal wetness; slopes up to 12 percent.
Severe: Prolonged wetness; moderately slow or slow permeability.	Severe: Prolonged wetness.	Severe: Prolonged wetness; moderately slow or slow permeability.	Severe: Prolonged wetness.	Severe: Prolonged wetness; moderately slow or slow permeability.	Severe: Prolonged wetness.
Severe: Rapid permeability below depth of 3 feet.	Slight	Moderate: Slope	Slight	Slight	Slight.
Severe: Rapid permeability below depth of 3 feet.	Moderate: Slope	Severe: Slope	Slight	Moderate: Slope	Moderate: Slope.
Severe: Bedrock at depth of 10 to 20 inches.	Severe: Bedrock at depth of 10 to 20 inches.	Severe: Bedrock at depth of 10 to 20 inches; slope; sandstone fragments.	Slight	Severe: Bedrock at depth of 10 to 20 inches.	Severe: Bedrock at depth of 10 to 20 inches.

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

Soil	Septic-tank effluent disposal	Homesites	Streets and parking lots
Arnot channery silt loam, 15 to 25 percent slopes. Arnot soils, 25 to 45 percent slopes.	Severe: Bedrock at depth of 10 to 20 inches; slope.	Severe: Bedrock at depth of 10 to 20 inches; slope.	Severe: Bedrock at depth of 10 to 20 inches; slope.
Aurora silt loam, 2 to 6 percent slopes.	Severe: Slow permeability; bedrock at depth of 20 to 40 inches.	Moderate: Rippable bedrock at depth of 20 to 40 inches.	Moderate: Rippable bedrock at depth of 20 to 40 inches; slope.
Aurora silt loam, 6 to 12 percent slopes. Aurora silt loam, 6 to 12 percent slopes, eroded.	Severe: Slow permeability; bedrock at depth of 20 to 40 inches.	Moderate: Rippable bedrock at depth of 20 to 40 inches; slope.	Severe: Slope
Aurora silt loam, 12 to 18 percent slopes, eroded. Aurora silt loam, 18 to 30 percent slopes.	Severe: Slow permeability; bedrock at depth of 20 to 40 inches; slope.	Severe: Bedrock at depth of 20 to 40 inches; slope.	Severe: Slope
Aurora silt loam, limestone substratum, 2 to 8 percent slopes.	Severe: Slow permeability; bedrock at depth of 20 to 40 inches; seasonal wetness.	Severe: Bedrock at depth of 20 to 40 inches.	Severe: Bedrock at depth of 20 to 40 inches.
Aurora and Farmington shaly silt loams, 12 to 18 percent slopes.	Severe: Bedrock at depth of 10 to 40 inches; slope; variable permeability.	Severe: Bedrock at depth of 10 to 40 inches.	Severe: Slope
Aurora and Farmington shaly silt loams, 18 to 40 percent slopes. Aurora, Farmington and Benson very rocky soils, 20 to 70 percent slopes.	Severe: Slope; bedrock at depth of 10 to 40 inches; variable permeability.	Severe: Slope; bedrock at depth of 10 to 40 inches.	Severe: Slope
Benson loam, 1 to 8 percent slopes.	Severe: Bedrock at depth of 10 to 20 inches.	Severe: Bedrock at depth of 10 to 20 inches.	Severe: Bedrock at depth of 10 to 20 inches.
Benson loam, 8 to 14 percent slopes. Benson very rocky loam, 2 to 20 percent slopes.	Severe: Bedrock at depth of 10 to 20 inches; slope.	Severe: Bedrock at depth of 10 to 20 inches.	Severe: Bedrock at depth of 10 to 20 inches; slope.
Brockport and Lockport silty clay loams, 2 to 6 percent slopes.	Severe: Slow permeability; bedrock at depth of 20 to 40 inches; seasonal wetness.	Severe: Seasonal wetness; bedrock at depth of 20 to 40 inches.	Moderate: Seasonal wetness; bedrock at depth of 20 to 40 inches.
Camillus silt loam, 2 to 6 percent slopes.	Moderate: Rippable bedrock at depth of 24 to 40 inches.	Moderate: Rippable bedrock at depth of 24 to 40 inches.	Moderate: Slope; rippable bedrock at depth of 24 to 40 inches.
Camillus silt loam, 6 to 12 percent slopes, eroded.	Moderate: Rippable bedrock at depth of 24 to 40 inches; slope.	Moderate: Rippable bedrock at depth of 24 to 40 inches; slope.	Moderate: Slope; rippable bedrock at depth of 24 to 40 inches.
Cazenovia silt loam, 2 to 8 percent slopes.	Severe: Slow permeability.	Moderate: Seasonal wetness.	Moderate: Slope; seasonal wetness.
Cazenovia silt loam, 8 to 14 percent slopes.	Severe: Slow permeability; slope.	Moderate: Seasonal wetness; slope.	Severe: Slope

for selected nonfarm uses of the soils—Continued

Sanitary land fill	Lawns and fairways	Athletic fields	Paths and trails	Campsites	Picnic areas and play areas
Severe: Bedrock at depth of 10 to 20 inches; slope.	Severe: Bedrock at depth of 10 to 20 inches; slope.	Severe: Slope; bedrock at depth of 10 to 20 inches; sandstone fragments.	Moderate: Slope; severe on slopes of more than 25 percent.	Severe: Bedrock at depth of 10 to 20 inches; slope.	Severe: Bedrock at depth of 10 to 20 inches; slope.
Severe: Slow permeability; bedrock at depth of 20 to 40 inches.	Moderate: Bedrock at depth of 20 to 40 inches.	Severe: Slow permeability.	Slight	Severe: Slow permeability.	Slight.
Severe: Slow permeability; bedrock at depth of 20 to 40 inches.	Moderate: Bedrock at depth of 20 to 40 inches; slope.	Severe: Slope; slow permeability.	Slight	Severe: Slow permeability.	Moderate: Slope.
Severe: Slope; slow permeability; bedrock at depth of 20 to 40 inches.	Severe: Slope	Severe: Slope; slow permeability.	Moderate: Slope; severe on slopes of more than 18 percent.	Severe: Slow permeability; slope.	Severe: Slope.
Severe: Slow permeability; bedrock at depth of 20 to 40 inches.	Moderate: Bedrock at depth of 20 to 40 inches.	Severe: Bedrock at depth of 20 to 40 inches.	Slight	Severe: Slow permeability.	Slight.
Severe: Bedrock at depth of 10 to 40 inches; variable permeability; slope.	Severe: Slope; bedrock at depth of 10 to 40 inches.	Severe: Slope; bedrock at depth of 10 to 40 inches.	Moderate: Slope	Severe: Slope; variable permeability.	Severe: Slope.
Severe: Slope; bedrock at depth of 10 to 40 inches; variable permeability.	Severe: Slope; bedrock at depth of 10 to 40 inches.	Severe: Slope; bedrock at depth of 10 to 40 inches.	Severe: Slope	Severe: Slope; variable permeability.	Severe: Slope.
Severe: Bedrock at depth of 10 to 20 inches.	Severe: Bedrock at depth of 10 to 20 inches.	Severe: Bedrock at depth of 10 to 20 inches.	Slight	Severe: Bedrock at depth of 10 to 20 inches.	Severe: Bedrock at depth of 10 to 20 inches.
Severe: Bedrock at depth of 10 to 20 inches.	Severe: Bedrock at depth of 10 to 20 inches.	Severe: Bedrock at depth of 10 to 20 inches; slope.	Slight: Moderate on slopes of more than 14 percent; some areas rocky.	Severe: Bedrock at depth of 10 to 20 inches.	Severe: Bedrock at depth of 10 to 20 inches.
Severe: Slow permeability; seasonal wetness; bedrock at depth of 20 to 40 inches; clay or silty clay subsoil.	Moderate: Seasonal wetness; bedrock at depth of 20 to 40 inches; silty clay loam surface layer.	Severe: Slow permeability; seasonal wetness.	Moderate: Seasonal wetness; silty clay loam surface layer.	Severe: Seasonal wetness; slow permeability.	Severe: Silty clay loam surface layer.
Severe: Rippable bedrock at depth of 24 to 40 inches; porosity.	Moderate: Rippable bedrock at depth of 24 to 40 inches.	Moderate: Slope; rippable bedrock at depth of 24 to 40 inches.	Slight	Slight	Slight.
Severe: Slope; rippable bedrock at depth of 24 to 40 inches; porosity.	Moderate: Slope; rippable bedrock at depth of 24 to 40 inches.	Severe: Slope	Slight	Moderate: Slope	Moderate: Slope.
Severe: Slow permeability.	Slight	Severe: Slow permeability.	Slight	Severe: Slow permeability.	Slight.
Severe: Slow permeability.	Moderate: Slope	Severe: Slope; slow permeability.	Slight	Severe: Slow permeability.	Moderate: Slope.

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

Soil	Septic-tank effluent disposal	Homesites	Streets and parking lots
Cazenovia silt loam, 5 to 14 percent slopes, eroded. Cazenovia silt loam, rolling.	Severe: Slow permeability; slope.	Moderate: Seasonal wetness; slope.	Severe: Slope
Cazenovia silt loam, 12 to 20 percent slopes. Cazenovia and Schoharie soils, 20 to 40 percent slopes.	Severe: Slow permeability; slope.	Severe: Slope	Severe: Slope
Collamer silt loam, 0 to 2 percent slopes. Collamer silt loam, 2 to 6 percent slopes.	Moderate: Seasonal wetness; variable permeability.	Moderate: Seasonal wetness.	Moderate: Seasonal wetness; slopes up to 6 percent.
Colonie loamy fine sand, 1 to 6 percent slopes.	Slight	Slight	Moderate: Slope
Colonie loamy fine sand, 6 to 12 percent slopes.	Moderate: Slope	Moderate: Slope	Severe: Slope
Colonie fine sandy loam, 1 to 6 percent slopes.	Slight	Slight	Moderate: Slope
Colonie and Arkport soils, 12 to 22 percent slopes.	Severe: Slope	Severe: Slope	Severe: Slope
Conesus gravelly silt loam, 0 to 3 percent slopes. Conesus gravelly silt loam, 3 to 8 percent slopes.	Severe: Moderately slow or slow permeability.	Moderate: Seasonal wetness.	Moderate: Seasonal wetness; slopes up to 8 percent.
Dunkirk silt loam, 1 to 6 percent slopes.	Moderate: Variable permeability; seasonal wetness.	Moderate: Seasonal wetness.	Moderate: Slope
Dunkirk silt loam, 6 to 12 percent slopes, eroded.	Moderate: Slope; variable permeability; seasonal wetness.	Moderate: Slope; seasonal wetness.	Severe: Slope
Dunkirk silt loam, 12 to 18 percent slopes, eroded. Dunkirk soils, 18 to 35 percent slopes.	Severe: Slope	Severe: Slope	Severe: Slope
Edwards muck.	Severe: Prolonged wetness.	Severe: Prolonged wetness.	Severe: Prolonged wetness.
Eel silt loam.	Severe: Flooding	Severe: Flooding	Severe: Flooding
Eel silt loam, high bottom.	Severe: Flooding	Severe: Flooding	Severe: Flooding
Ellery and Alden silt loams, 3 to 8 percent slopes.	Severe: Prolonged wetness; slow permeability.	Severe: Prolonged wetness.	Severe: Prolonged wetness.
Erie channery silt loam, 0 to 3 percent slopes. Erie channery silt loam, 3 to 8 percent slopes.	Severe: Seasonal wetness; slow permeability.	Severe: Seasonal wetness.	Severe: Seasonal wetness.

for selected nonfarm uses of the soils—Continued

Sanitary land fill	Lawns and fairways	Athletic fields	Paths and trails	Campsites	Picnic areas and play areas
Severe: Slow permeability.	Moderate: Slope	Severe: Slope; slow permeability.	Slight	Severe: Slow permeability.	Moderate: Slope.
Severe: Slow permeability; slope.	Severe: Slope	Severe: Slope; slow permeability.	Moderate: Slope; severe on slopes of more than 20 percent.	Severe: Slope; slow permeability.	Severe: Slope.
Severe: Seasonal wetness.	Slight	Moderate: Seasonal wetness; slopes up to 6 percent.	Slight	Moderate: Seasonal wetness.	Slight.
Severe: Rapid permeability below depth of 3 feet.	Severe: Loamy fine sand surface layer and subsoil.	Moderate: Slope; loamy fine sand surface layer and subsoil.	Slight	Slight	Moderate: Loamy fine sand surface layer and subsoil.
Severe: Rapid permeability below depth of 3 feet.	Severe: Loamy fine sand surface layer and subsoil.	Severe: Slope	Slight	Moderate: Slope	Moderate: Slope; loamy fine sand surface layer and subsoil.
Severe: Rapid permeability below depth of 3 feet.	Moderate: Loamy fine sand subsoil.	Moderate: Slope; loamy fine sand subsoil.	Slight	Slight	Slight.
Severe: Slope; rapid permeability below depth of 3 feet.	Severe: Slope; loamy fine sand surface layer.	Severe: Slope	Moderate: Slope	Severe: Slope	Severe: Slope.
Severe: Moderately slow or slow permeability.	Moderate: Gravel	Severe: Moderately slow or slow permeability; gravel; slopes up to 8 percent.	Slight	Moderate: Seasonal wetness; moderately slow or slow permeability; gravel.	Slight.
Moderate: Variable permeability; seasonal wetness.	Slight	Moderate: Slope	Slight	Slight	Slight.
Moderate: Slope; variable permeability; seasonal wetness.	Moderate: Slope	Severe: Slope	Slight	Moderate: Slope	Moderate: Slope.
Severe: Slope	Severe: Slope	Severe: Slope	Moderate: Slope; severe on slopes of more than 18 percent.	Severe: Slope	Severe: Slope.
Severe: Prolonged wetness; mucky soil material.	Severe: Prolonged wetness; mucky soil material.	Severe: Prolonged wetness; mucky soil material.	Severe: Prolonged wetness; mucky soil material.	Severe: Prolonged wetness; mucky soil material.	Severe: Prolonged wetness; mucky soil material.
Severe: Flooding	Moderate: Flooding.	Moderate: Flooding.	Slight	Moderate: Flooding; seasonal wetness.	Slight.
Severe: Flooding	Slight	Slight	Slight	Moderate: Seasonal wetness.	Slight.
Severe: Prolonged wetness; slow permeability.	Severe: Prolonged wetness.	Severe: Prolonged wetness; slow permeability.	Severe: Prolonged wetness.	Severe: Prolonged wetness; slow permeability.	Severe: Prolonged wetness.
Severe: Seasonal wetness; slow permeability.	Moderate: Seasonal wetness; sandstone fragments.	Severe: Seasonal wetness; slow permeability; sandstone fragments.	Moderate: Seasonal wetness.	Severe: Seasonal wetness; slow permeability.	Moderate: Seasonal wetness.

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

Soil	Septic-tank effluent disposal	Homesites	Streets and parking lots
Erie channery silt loam, moderately shallow variant, 0 to 3 percent slopes. Erie channery silt loam, moderately shallow variant, 3 to 8 percent slopes.	Severe: Seasonal wetness; slow permeability; bedrock at depth of 20 to 40 inches.	Severe: Seasonal wetness; bedrock at depth of 20 to 40 inches.	Severe: Bedrock at depth of 20 to 40 inches; seasonal wetness.
Farmington shaly silt loam, 1 to 12 percent slopes.	Severe: Bedrock at depth of 10 to 20 inches.	Severe: Bedrock at depth of 10 to 20 inches.	Severe: Bedrock at depth of 10 to 20 inches.
Fonda mucky silt loam.	Severe: Prolonged wetness; slow permeability.	Severe: Prolonged wetness.	Severe: Prolonged wetness.
Fredon loam.	Severe: Seasonal wetness.	Severe: Seasonal wetness.	Moderate: Seasonal wetness.
Fresh water marsh.	Severe: Prolonged wetness; flooding.	Severe: Prolonged wetness; flooding.	Severe: Prolonged wetness; flooding.
Galen fine sandy loam, 0 to 2 percent slopes. Galen fine sandy loam, 2 to 6 percent slopes.	Moderate: Seasonal wetness.	Moderate: Seasonal wetness.	Moderate: Seasonal wetness; slopes up to 6 percent.
Genesee silt loam.	Severe: Flooding	Severe: Flooding	Severe: Flooding
Genesee silt loam, high bottom.	Severe: Flooding	Severe: Flooding	Severe: Flooding
Genesee gravelly loam, fan.	Severe: Flooding	Severe: Flooding	Severe: Flooding
Hilton loam, 0 to 3 percent slopes. Hilton loam, 3 to 8 percent slopes.	Severe: Moderately slow or slow permeability.	Moderate: Seasonal wetness.	Moderate: Seasonal wetness; some slopes up to 8 percent.
Honeoye silt loam, 2 to 8 percent slopes.	Moderate: Moderately slow or slow permeability below depth of 30 inches.	Slight	Moderate: Slope
Honeoye silt loam, 8 to 14 percent slopes. Honeoye silt loam, 8 to 14 percent slopes, eroded. Honeoye soils, rolling.	Moderate to severe: Moderately slow or slow permeability below depth of 30 inches; slope.	Moderate: Slope	Severe: Slope
Honeoye and Lansing gravelly silt loams, 14 to 20 percent slopes.	Severe: Moderately slow or slow permeability; slope.	Severe: Slope	Severe: Slope
Howard gravelly loam, 0 to 3 percent slopes. Howard gravelly loam, 3 to 8 percent slopes.	Slight	Slight	Slight; moderate on slopes of more than 3 percent.
Howard gravelly loam, 8 to 15 percent slopes.	Moderate: Slope	Moderate: Slope	Severe: Slope
Ira gravelly loam, 0 to 3 percent slopes. Ira gravelly loam, 3 to 8 percent slopes.	Severe: Moderately slow permeability.	Moderate: Seasonal wetness.	Moderate: Seasonal wetness; some slopes up to 8 percent.

for selected nonfarm uses of the soils—Continued

Sanitary land fill	Lawns and fairways	Athletic fields	Paths and trails	Campsites	Picnic areas and play areas
Severe: Bedrock at depth of 20 to 40 inches; seasonal wetness; slow permeability.	Moderate: Seasonal wetness; sandstone fragments; bedrock at depth of 20 to 40 inches.	Severe: Seasonal wetness; slow permeability; bedrock at depth of 20 to 40 inches; sandstone fragments.	Moderate: Seasonal wetness.	Severe: Seasonal wetness; slow permeability.	Moderate: Seasonal wetness.
Severe: Bedrock at depth of 10 to 20 inches.	Severe: Bedrock at depth of 10 to 20 inches.	Severe: Bedrock at depth of 10 to 20 inches; slope; stone fragments.	Slight	Severe: Bedrock at depth of 10 to 20 inches.	Severe: Bedrock at depth of 10 to 20 inches.
Severe: Prolonged wetness; slow permeability; silty clay or clay subsoil.	Severe: Prolonged wetness.	Severe: Prolonged wetness; slow permeability.	Severe: Prolonged wetness.	Severe: Prolonged wetness; slow permeability.	Severe: Prolonged wetness.
Severe: Seasonal wetness.	Moderate: Seasonal wetness.	Severe: Seasonal wetness.	Moderate: Seasonal wetness.	Severe: Seasonal wetness.	Moderate: Seasonal wetness.
Severe: Prolonged wetness; flooding.	Severe: Prolonged wetness; mucky soil material.	Severe: Prolonged wetness; mucky soil material.	Severe: Prolonged wetness; mucky soil material.	Severe: Prolonged wetness; flooding.	Severe: Prolonged wetness; flooding; mucky soil material.
Severe: Seasonal wetness; rapid permeability.	Slight	Moderate: Seasonal wetness; slopes of more than 2 percent.	Slight	Moderate: Seasonal wetness.	Slight.
Severe: Flooding	Moderate: Flooding.	Moderate: Flooding.	Slight	Moderate: Flooding.	Slight.
Severe: Flooding	Slight	Slight	Slight	Slight	Slight.
Severe: Flooding	Moderate: Gravel	Severe: Gravel	Slight	Moderate: Gravel	Slight.
Severe: Seasonal wetness; firmness; moderately slow or slow permeability.	Slight	Moderate: Moderately slow or slow permeability; gravel; some slopes up to 8 percent.	Slight	Moderate: Seasonal wetness; moderately slow or slow permeability.	Slight.
Moderate: Firmness; moderately slow or slow permeability.	Slight	Moderate: Moderately slow or slow permeability; slope; gravel.	Slight	Moderate: Moderately slow or slow permeability.	Slight.
Moderate: Firmness; moderately slow or slow permeability; slope.	Moderate: Slope	Severe: Slope	Slight	Moderate: Slope; moderately slow or slow permeability.	Moderate: Slope.
Severe: Slope	Severe: Slope	Severe: Slope; gravel.	Moderate: Slope	Severe: Slope	Severe: Slope.
Severe: Rapid permeability.	Moderate: Gravel	Severe: Gravel	Slight	Moderate: Gravel	Slight.
Severe: Rapid permeability.	Moderate: Gravel; slope.	Severe: Gravel; slope.	Slight	Moderate: Slope; gravel.	Moderate: Slope
Severe: Moderately slow permeability; seasonal wetness.	Moderate: Gravel	Severe: Gravel	Slight	Severe: Moderately slow permeability.	Slight.

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

Soil	Septic-tank effluent disposal	Homesites	Streets and parking lots
Ira and Sodus very stony loams, 2 to 20 percent slopes.	Severe: Moderately slow permeability; slope.	Moderate: Slope; seasonal wetness.	Severe: Slope; seasonal wetness.
Kendaia silt loam, 3 to 8 percent slopes.	Severe: Seasonal wetness; moderately slow or slow permeability.	Severe: Seasonal wetness.	Moderate: Seasonal wetness; slope.
Kendaia and Lyons silt loams, 0 to 3 percent slopes.	Severe: Prolonged wetness; moderately slow or slow permeability.	Severe: Prolonged wetness.	Severe: Prolonged wetness.
Lake beaches.	Severe: Flooding	Severe: Flooding	Severe: Flooding
Lakemont silty clay loam.	Severe: Prolonged wetness; slow permeability.	Severe: Prolonged wetness.	Severe: Prolonged wetness.
Lamson fine sandy loam. Lamson mucky fine sandy loam.	Severe: Prolonged wetness.	Severe: Prolonged wetness.	Severe: Prolonged wetness.
Langford channery silt loam, 2 to 8 percent slopes.	Severe: Slow permeability.	Moderate: Seasonal wetness.	Moderate: Seasonal wetness; slope.
Langford channery silt loam, 8 to 15 percent slopes. Langford channery silt loam, rolling.	Severe: Slow permeability.	Moderate: Slope; seasonal wetness.	Severe: Slope
Langford channery silt loam, 15 to 25 percent slopes.	Severe: Slow permeability; slope.	Severe: Slope	Severe: Slope
Langford-Howard gravelly loams, 2 to 8 percent slopes.	Severe: Variable permeability.	Slight	Moderate: Slope
Langford-Howard gravelly loams, 8 to 15 percent slopes.	Severe: Variable permeability.	Moderate: Slope	Severe: Slope
Langford-Howard gravelly loams, 15 to 25 percent slopes. Langford-Howard gravelly loams, 25 to 45 percent slopes.	Severe: Variable permeability; slope.	Severe: Slope	Severe: Slope
Langford channery silt loam, moderately shallow variant, 2 to 8 percent slopes.	Severe: Slow permeability; bedrock at depth of 20 to 40 inches.	Severe: Bedrock at depth of 20 to 40 inches.	Severe: Bedrock at depth of 20 to 40 inches.
Lansing gravelly silt loam, 2 to 8 percent slopes.	Moderate: Moderately slow or slow permeability below depth of 30 inches.	Slight	Moderate: Slope
Lansing gravelly silt loam, 8 to 14 percent slopes. Lansing gravelly silt loam, 8 to 14 percent slopes, eroded. Lansing gravelly silt loam, rolling.	Moderate or severe: Moderately slow or slow permeability below depth of 30 inches; slope.	Moderate: Slope	Severe: Slope

for selected nonfarm uses of the soils—Continued

Sanitary land fill	Lawns and fairways	Athletic fields	Paths and trails	Campsites	Picnic areas and play areas
Severe: Moderately slow permeability; slope.	Severe: Stones	Severe: Gravel and stones; slope.	Moderate: Stones; slope.	Severe: Slope; moderately slow permeability; stones.	Severe: Stones.
Severe: Seasonal wetness; moderately slow or slow permeability.	Moderate: Seasonal wetness.	Severe: Seasonal wetness.	Moderate: Seasonal wetness.	Severe: Seasonal wetness; moderately slow or slow permeability.	Moderate: Seasonal wetness.
Severe: Prolonged wetness; moderately slow or slow permeability.	Severe: Prolonged wetness.	Severe: Prolonged wetness.	Severe: Prolonged wetness.	Severe: Prolonged wetness; moderately slow or slow permeability.	Severe: Prolonged wetness.
Severe: Flooding	Severe: Flooding; washed sand and gravel.	Severe: Flooding; washed sand and gravel.	Severe: Flooding	Severe: Flooding	Severe: Flooding; washed sand and gravel.
Severe: Prolonged wetness; slow permeability; silty clay subsoil.	Severe: Prolonged wetness.	Severe: Prolonged wetness; slow permeability.	Severe: Prolonged wetness; silty clay loam surface layer.	Severe: Prolonged wetness; slow permeability.	Severe: Prolonged wetness.
Severe: Prolonged wetness.	Severe: Prolonged wetness.	Severe: Prolonged wetness.	Severe: Prolonged wetness.	Severe: Prolonged wetness.	Severe: Prolonged wetness.
Severe: Slow permeability.	Moderate: Sandstone fragments.	Severe: Sandstone fragments; slow permeability.	Slight	Severe: Slow permeability.	Slight.
Severe: Slow permeability.	Moderate: Sandstone fragments; slope.	Severe: Sandstone fragments; slope.	Slight	Severe: Slow permeability.	Moderate: Slope.
Severe: Slope; slow permeability.	Severe: Slope	Severe: Slope; sandstone fragments.	Moderate: Slope	Severe: Slope; slow permeability.	Severe: Slope.
Severe: Variable permeability.	Moderate: Gravel and sandstone fragments.	Severe: Gravel and sandstone fragments.	Slight	Moderate: Gravel; variable permeability.	Slight.
Severe: Variable permeability.	Moderate: Gravel and sandstone fragments; slope.	Severe: Gravel and sandstone fragments; slope.	Slight	Moderate: Slope; variable permeability; gravel.	Moderate: Slope.
Severe: Variable permeability; slope.	Severe: Slope	Severe: Slope; gravel and sandstone fragments.	Moderate: Slope; severe on slopes of more than 25 percent.	Severe: Slope	Severe: Slope.
Severe: Bedrock at depth of 20 to 40 inches; slow permeability.	Moderate: Sandstone fragments; bedrock at depth of 20 to 40 inches.	Severe: Bedrock at depth of 20 to 40 inches; sandstone fragments.	Slight	Severe: Slow permeability.	Slight.
Moderate: Firmness; moderately slow or slow permeability.	Moderate: Gravel and sandstone fragments.	Severe: Gravel and sandstone fragments.	Slight	Moderate: Moderately slow or slow permeability; gravel and sandstone fragments.	Slight.
Moderate: Firmness; moderately slow or slow permeability; slope.	Moderate: Gravel and sandstone fragments; slope.	Severe: Gravel and sandstone fragments; slope.	Slight	Moderate: Slope; moderately slow or slow permeability; gravel and sandstone fragments.	Moderate: Slope.

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

Soil	Septic-tank effluent disposal	Homesites	Streets and parking lots
Lima silt loam, 0 to 3 percent slopes. Lima silt loam, 3 to 8 percent slopes.	Severe: Moderately slow or slow permeability.	Moderate: Seasonal wetness.	Moderate: Seasonal wetness; some slopes up to 8 percent.
Lordstown channery silt loam, 2 to 8 percent slopes.	Severe: Bedrock at depth of 20 to 40 inches.	Severe: Bedrock at depth of 20 to 40 inches.	Severe: Bedrock at depth of 20 to 40 inches.
Lordstown channery silt loam, 8 to 15 percent slopes.	Severe: Bedrock at depth of 20 to 40 inches.	Severe: Bedrock at depth of 20 to 40 inches.	Severe: Bedrock at depth of 20 to 40 inches; slope.
Madalin silt loam. Madalin silt loam, sandy subsoil variant.	Severe: Prolonged wetness; slow permeability.	Severe: Prolonged wetness.	Severe: Prolonged wetness.
Minoa fine sandy loam.	Severe: Seasonal wetness.	Severe: Seasonal wetness.	Moderate: Seasonal wetness.
Muck, deep. Muck, shallow.	Severe: Prolonged wetness.	Severe: Prolonged wetness.	Severe: Prolonged wetness.
Niagara fine sandy loam.	Severe: Seasonal wetness.	Severe: Seasonal wetness.	Moderate: Seasonal wetness.
Niagara and Canandaigua silt loams.	Severe: Prolonged wetness; variable permeability.	Severe: Prolonged wetness.	Severe: Prolonged wetness.
Odessa silt loam, 0 to 2 percent slopes. Odessa silt loam, 2 to 6 percent slopes.	Severe: Seasonal wetness; slow permeability.	Severe: Seasonal wetness.	Severe: Seasonal wetness.
Ontario fine sandy loam, 2 to 8 percent slopes.	Moderate: Moderately slow or slow permeability below depth of 30 inches.	Slight	Moderate: Slope
Ontario fine sandy loam, 8 to 14 percent slopes. Ontario fine sandy loam, rolling.	Moderate: Moderately slow or slow permeability below depth of 30 inches; slope.	Moderate: Slope	Severe: Slope
Ontario loam, 2 to 8 percent slopes.	Moderate: Moderately slow or slow permeability below depth of 30 inches.	Slight	Moderate: Slope
Ontario loam, 8 to 14 percent slopes. Ontario loam, 8 to 14 percent slopes, eroded. Ontario loam, rolling.	Moderate or severe: Moderately slow or slow permeability below depth of 30 inches; slope.	Moderate: Slope	Severe: Slope
Ontario loam, 14 to 20 percent slopes. Ontario loam, 14 to 20 percent slopes, eroded.	Severe: Slope; moderately slow or slow permeability.	Severe: Slope	Severe: Slope
Ontario silt loam, moderately shallow variant, 0 to 3 percent slopes. Ontario silt loam, moderately shallow variant, 3 to 8 percent slopes.	Severe: Bedrock at depth of 20 to 40 inches.	Severe: Bedrock at depth of 20 to 40 inches.	Severe: Bedrock at depth of 20 to 40 inches.

for selected nonfarm uses of the soils—Continued

Sanitary land fill	Lawns and fairways	Athletic fields	Paths and trails	Campsites	Picnic areas and play areas
Severe: Seasonal wetness; moderately slow or slow permeability.	Slight	Moderate: Gravel and stones; some slopes up to 8 percent.	Slight	Moderate: Seasonal wetness; moderately slow or slow permeability.	Slight.
Severe: Bedrock at depth of 20 to 40 inches.	Moderate: Sandstone fragments; bedrock at depth of 20 to 40 inches.	Severe: Bedrock at depth of 20 to 40 inches; sandstone fragments.	Slight	Moderate: Sandstone fragments.	Slight.
Severe: Bedrock at depth of 20 to 40 inches.	Moderate: Sandstone fragments; slope; bedrock at depth of 20 to 40 inches.	Severe: Bedrock at depth of 20 to 40 inches; sandstone fragments; slope.	Slight	Moderate: Slope; sandstone fragments.	Moderate: Slope.
Severe: Prolonged wetness; slow permeability; silty clay subsoil.	Severe: Prolonged wetness.	Severe: Prolonged wetness; slow permeability.	Severe: Prolonged wetness.	Severe: Prolonged wetness; slow permeability.	Severe: Prolonged wetness.
Severe: Seasonal wetness.	Moderate: Seasonal wetness.	Severe: Seasonal wetness.	Moderate: Seasonal wetness.	Severe: Seasonal wetness.	Moderate: Seasonal wetness.
Severe: Prolonged wetness.	Severe: Prolonged wetness; mucky soil material.	Severe: Prolonged wetness; mucky soil material.	Severe: Prolonged wetness; mucky soil material.	Severe: Prolonged wetness; mucky soil material.	Severe: Prolonged wetness; mucky soil material.
Severe: Seasonal wetness.	Moderate: Seasonal wetness.	Severe: Seasonal wetness.	Moderate: Seasonal wetness.	Severe: Seasonal wetness.	Moderate: Seasonal wetness.
Severe: Prolonged wetness.	Severe: Prolonged wetness.	Severe: Prolonged wetness.	Severe: Prolonged wetness.	Severe: Prolonged wetness.	Severe: Prolonged wetness.
Severe: Seasonal wetness; slow permeability; silty clay subsoil.	Moderate: Seasonal wetness.	Severe: Seasonal wetness; slow permeability.	Moderate: Seasonal wetness.	Severe: Seasonal wetness; slow permeability.	Moderate: Seasonal wetness.
Moderate: Moderately slow or slow permeability; firmness.	Slight	Moderate: Slope; moderately slow or slow permeability; gravel.	Slight	Moderate: Moderately slow or slow permeability.	Slight.
Moderate: Moderately slow or slow permeability; firmness; slope.	Moderate: Slope	Severe: Slope	Slight	Moderate: Slope; moderately slow or slow permeability.	Moderate: Slope.
Moderate: Firmness; moderately slow or slow permeability.	Slight	Moderate: Slope; moderately slow or slow permeability; gravel.	Slight	Moderate: Moderately slow or slow permeability.	Slight.
Moderate: Slope; firmness; moderately slow or slow permeability.	Moderate: Slope	Severe: Slope	Slight	Moderate: Slope; moderately slow or slow permeability.	Moderate: Slope.
Severe: Slope	Severe: Slope	Severe: Slope	Moderate: Slope	Severe: Slope	Severe: Slope.
Severe: Bedrock at depth of 20 to 40 inches.	Moderate: Bedrock at depth of 20 to 40 inches.	Severe: Bedrock at depth of 20 to 40 inches.	Slight	Slight	Slight.

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

Soil	Septic-tank effluent disposal	Homesites	Streets and parking lots
Ontario silt loam, moderately shallow variant, 8 to 14 percent slopes.	Severe: Bedrock at depth of 20 to 40 inches.	Severe: Bedrock at depth of 20 to 40 inches.	Severe: Bedrock at depth of 20 to 40 inches; slope.
Ontario, Honeoye and Lansing soils, 20 to 35 percent slopes. Ontario, Honeoye and Lansing soils, 35 to 50 percent slopes.	Severe: Slope; moderately slow or slow permeability.	Severe: Slope	Severe: Slope
Ovid silt loam, 0 to 2 percent slopes. Ovid silt loam, 2 to 6 percent slopes.	Severe: Seasonal wetness; moderately slow permeability.	Severe: Seasonal wetness.	Severe: Seasonal wetness.
Palmyra gravelly sandy loam, 3 to 8 percent slopes.	Slight	Slight	Moderate: Slope
Palmyra gravelly sandy loam, 8 to 15 percent slopes.	Moderate: Slope	Moderate: Slope	Severe: Slope
Palmyra gravelly loam, 0 to 3 percent slopes. Palmyra gravelly loam, 3 to 8 percent slopes.	Slight	Slight	Slight; moderate on slopes or more than 3 percent.
Palmyra gravelly loam, 8 to 15 percent slopes.	Moderate: Slope	Moderate: Slope	Severe: Slope
Palmyra soils, 15 to 25 percent slopes. Palmyra, Howard and Alton soils, 25 to 40 percent slopes.	Severe: Slope	Severe: Slope	Severe: Slope
Peat and Muck.	Severe: Prolonged wetness.	Severe: Prolonged wetness.	Severe: Prolonged wetness.
Phelps gravelly silt loam.	Moderate: Seasonal wetness.	Moderate: Seasonal wetness.	Moderate: Seasonal wetness.
Riga and Lairdsville silt loams, 2 to 6 percent slopes.	Severe: Slow permeability; bedrock at depth of 20 to 40 inches.	Severe: Bedrock at depth of 20 to 40 inches.	Severe: Bedrock at depth of 20 to 40 inches.
Riga and Lairdsville silty clay loams, 6 to 12 percent slopes, eroded.	Severe: Slow permeability; bedrock at depth of 20 to 40 inches.	Severe: Bedrock at depth of 20 to 40 inches.	Severe: Slope; bedrock at depth of 20 to 40 inches.
Romulus silty clay loam.	Severe: Slow permeability; prolonged wetness.	Severe: Prolonged wetness.	Severe: Prolonged wetness.
Schoharie silt loam, 2 to 6 percent slopes.	Severe: Slow permeability.	Moderate: Seasonal wetness.	Moderate: Seasonal wetness; slope.
Schoharie silty clay loam, 6 to 12 percent slopes.	Severe: Slow permeability.	Moderate: Seasonal wetness; slope.	Severe: Slope
Schoharie silty clay loam, 12 to 20 percent slopes.	Severe: Slow permeability; slope.	Severe: Slope	Severe: Slope

for selected nonfarm uses of the soils—Continued

Sanitary land fill	Lawns and fairways	Athletic fields	Paths and trails	Campsites	Picnic areas and play areas
Severe: Bedrock at depth of 20 to 40 inches.	Moderate: Bedrock at depth of 20 to 40 inches; slope.	Severe: Bedrock at depth of 20 to 40 inches; slope.	Slight	Moderate: Slope	Moderate: Slope.
Severe: Slope	Severe: Slope	Severe: Slope	Severe: Slope	Severe: Slope	Severe: Slope.
Severe: Seasonal wetness; moderately slow permeability.	Moderate: Seasonal wetness.	Severe: Seasonal wetness; moderately slow permeability.	Moderate: Seasonal wetness.	Severe: Seasonal wetness; moderately slow permeability.	Moderate: Seasonal wetness.
Severe: Rapid permeability.	Moderate: Gravel	Severe: Gravel	Slight	Moderate: Gravel	Slight.
Severe: Rapid permeability.	Moderate: Slope; gravel.	Severe: Gravel; slope.	Slight	Moderate: Slope; gravel.	Moderate: Slope.
Severe: Rapid permeability.	Moderate: Gravel	Severe: Gravel	Slight	Moderate: Gravel	Slight.
Severe: Rapid permeability.	Moderate: Slope; gravel.	Severe: Gravel; slope.	Slight	Moderate: Slope; gravel.	Moderate: Slope.
Severe: Slope; rapid permeability.	Severe: Slope	Severe: Slope; gravel.	Moderate: Slope; severe on slopes of more than 25 percent.	Severe: Slope	Severe: Slope.
Severe: Prolonged wetness.	Severe: Prolonged wetness; mucky soil material.	Severe: Prolonged wetness; mucky soil material.	Severe: Prolonged wetness; mucky soil material.	Severe: Prolonged wetness; mucky soil material.	Severe: Prolonged wetness; mucky soil material.
Severe: Seasonal wetness; rapid permeability.	Moderate: Gravel	Severe: Gravel	Slight	Moderate: Seasonal wetness; gravel.	Slight.
Severe: Seasonal wetness; slow permeability; bedrock at depth of 20 to 40 inches; clay or silty clay subsoil.	Moderate: Bedrock at depth of 20 to 40 inches.	Severe: Slow permeability.	Slight	Severe: Slow permeability.	Slight.
Severe: Slow permeability; bedrock at depth of 20 to 40 inches; silty clay or clay subsoil.	Moderate: Slope; bedrock at depth of 20 to 40 inches; silty clay loam surface layer.	Severe: Slow permeability; slope.	Moderate: Silty clay loam surface layer.	Severe: Slow permeability.	Moderate: Silty clay loam surface layer; slope.
Severe: Prolonged wetness; slow permeability.	Severe: Prolonged wetness.	Severe: Prolonged wetness; slow permeability.	Severe: Prolonged wetness.	Severe: Prolonged wetness; slow permeability.	Severe: Prolonged wetness.
Severe: Slow permeability; silty clay subsoil.	Slight	Severe: Slow permeability.	Slight	Severe: Slow permeability.	Slight.
Severe: Slow permeability; silty clay subsoil.	Moderate: Slope; silty clay loam surface layer.	Severe: Slow permeability; slope.	Moderate: Silty clay loam surface layer.	Severe: Slow permeability.	Moderate: Silty clay loam surface layer; slope.
Severe: Slope; slow permeability; silty clay subsoil.	Severe: Slope	Severe: Slope; slow permeability.	Moderate: Slope; silty clay loam surface layer.	Severe: Slope; slow permeability.	Severe: Slope.

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

Soil	Septic-tank effluent disposal	Homesites	Streets and parking lots
Scriba gravelly loam.	Severe: Slow permeability; seasonal wetness.	Severe: Seasonal wetness.	Moderate: Seasonal wetness.
Scriba very stony loam.	Severe: Slow permeability; seasonal wetness.	Severe: Seasonal wetness.	Moderate: Seasonal wetness.
Sloan silt loam.	Severe: Flooding; prolonged wetness.	Severe: Flooding; prolonged wetness.	Severe: Flooding; prolonged wetness.
Sodus gravelly loam, 2 to 8 percent slopes.	Severe: Moderately slow or slow permeability.	Slight	Moderate: Slope
Sodus gravelly loam, 8 to 14 percent slopes. Sodus gravelly loam, 8 to 14 percent slopes, eroded. Sodus gravelly loam, rolling.	Severe: Moderately slow or slow permeability.	Moderate: Slope	Severe: Slope
Sodus gravelly loam, 14 to 20 percent slopes. Sodus gravelly loam, 20 to 40 percent slopes.	Severe: Slope; moderately slow or slow permeability.	Severe: Slope	Severe: Slope
Stafford fine sandy loam.	Severe: Seasonal wetness.	Severe: Seasonal wetness.	Moderate: Seasonal wetness.
Tuller channery silt loam, 1 to 8 percent slopes.	Severe: Bedrock at depth of 10 to 20 inches; seasonal wetness.	Severe: Bedrock at depth of 10 to 20 inches; seasonal wetness.	Severe: Bedrock at depth of 10 to 20 inches; seasonal wetness.
Varick silt loam.	Severe: Prolonged wetness; bedrock at depth of 20 to 40 inches; slow permeability.	Severe: Bedrock at depth of 20 to 40 inches; prolonged wetness.	Severe: Bedrock at depth of 20 to 40 inches; prolonged wetness.
Wampsville gravelly silt loam, 0 to 3 percent slopes. Wampsville gravelly silt loam, 3 to 8 percent slopes.	Slight	Slight	Slight; moderate on slopes of more than 3 percent.
Warners loam.	Severe: Prolonged wetness; flooding; variable permeability.	Severe: Prolonged wetness; flooding.	Severe: Prolonged wetness; flooding.
Warners loam, fan.	Severe: Seasonal wetness; flooding; variable permeability.	Severe: Seasonal wetness; flooding.	Severe: Seasonal wetness; flooding.
Williamson silt loam, 0 to 2 percent slopes. Williamson silt loam, 2 to 6 percent slopes.	Severe: Moderately slow or slow permeability.	Moderate: Seasonal wetness.	Moderate: Seasonal wetness.
Williamson silt loam, 6 to 12 percent slopes. Williamson silt loam, 6 to 12 percent slopes, eroded.	Severe: Moderately slow or slow permeability.	Moderate: Seasonal wetness; slope.	Severe: Slope

for selected nonfarm uses of the soils—Continued

Sanitary land fill	Lawns and fairways	Athletic fields	Paths and trails	Campsites	Picnic areas and play areas
Severe: Seasonal wetness; slow permeability.	Moderate: Seasonal wetness; gravel.	Severe: Seasonal wetness; slow permeability; gravel.	Moderate: Seasonal wetness.	Severe: Slow permeability; seasonal wetness.	Moderate: Seasonal wetness.
Severe: Seasonal wetness; slow permeability.	Severe: Stones	Severe: Seasonal wetness; stones; slow permeability.	Moderate: Seasonal wetness; stones.	Severe: Stones; slow permeability; seasonal wetness.	Severe: Stones.
Severe: Flooding; prolonged wetness.	Severe: Flooding; prolonged wetness.	Severe: Flooding; prolonged wetness.	Severe: Prolonged wetness.	Severe: Flooding; prolonged wetness.	Severe: Flooding; prolonged wetness.
Moderate: Firmness; moderately slow or slow permeability.	Moderate: Gravel	Severe: Gravel	Slight	Moderate: Moderately slow or slow permeability; gravel.	Slight.
Moderate: Firmness; moderately slow or slow permeability; slope.	Moderate: Slope; gravel.	Severe: Slope; gravel.	Slight	Moderate: Slope; moderately slow or slow permeability; gravel.	Moderate: Slope.
Severe: Slope	Severe: Slope	Severe: Slope; gravel.	Moderate: Slope; severe on slopes of more than 20 percent.	Severe: Slope	Severe: Slope.
Severe: Seasonal wetness.	Moderate: Seasonal wetness.	Severe: Seasonal wetness.	Moderate: Seasonal wetness.	Severe: Seasonal wetness.	Moderate: Seasonal wetness.
Severe: Bedrock at depth of 10 to 20 inches; seasonal wetness.	Severe: Bedrock at depth of 10 to 20 inches.	Severe: Bedrock at depth of 10 to 20 inches; seasonal wetness.	Moderate: Seasonal wetness.	Severe: Bedrock at depth of 10 to 20 inches; seasonal wetness.	Severe: Bedrock at depth of 10 to 20 inches.
Severe: Bedrock at depth of 20 to 40 inches; prolonged wetness.	Severe: Prolonged wetness.	Severe: Bedrock at depth of 20 to 40 inches; prolonged wetness.	Severe: Prolonged wetness.	Severe: Prolonged wetness; slow permeability.	Severe: Prolonged wetness.
Severe: Rapid permeability below depth of 30 inches.	Moderate: Gravel.	Severe: Gravel	Slight	Moderate: Gravel; slopes up to 8 percent.	Slight.
Severe: Prolonged wetness; flooding.	Severe: Prolonged wetness; flooding.	Severe: Prolonged wetness; flooding.	Severe: Prolonged wetness; flooding.	Severe: Prolonged wetness; flooding; marl in subsoil.	Severe: Prolonged wetness; flooding.
Severe: Seasonal wetness; flooding.	Moderate: Seasonal wetness; flooding; marl in surface layer and subsoil.	Moderate: Seasonal wetness; flooding; marl in surface layer and subsoil.	Moderate: Seasonal wetness.	Severe: Seasonal wetness; flooding; marl in surface layer and subsoil.	Moderate: Seasonal wetness; flooding.
Severe: Moderately slow or slow permeability; seasonal wetness.	Slight	Moderate: Seasonal wetness; moderately slow or slow permeability; slopes up to 6 percent.	Slight	Moderate: Seasonal wetness; moderately slow or slow permeability; slopes up to 6 percent.	Slight.
Severe: Moderately slow or slow permeability; seasonal wetness; slope.	Moderate: Slope	Severe: Slope	Slight	Severe: Slope	Moderate: Slope.

content of gravel. The Genesee and Eel soils are similar to the Howard and Palmyra soils, but they are occasionally flooded. Thus, they have moderate or severe limitations for many of the uses shown in table 7.

Some upland soils, such as the Angola, Benson, Cazenovia, Honeoye, Langford, and Lordstown, have moderate or severe limitations for homesites because of stoniness, depth of bedrock, or a slowly permeable fragipan or till. The slowly permeable fraigpan or till encountered in some of the deeper soils severely limits their use for septic tank fields and for structures with basements. In the Arnot and Benson soils, intensive measures are needed to overcome the limitations caused by shallowness to bedrock.

Clayey soils that formed in glacial lake sediments, such as the Schoharie and Odessa, generally are slowly permeable, lack stability, and have high shrink-swell potential. Foundation failures are common if structures are built on these soils, and walls and ceilings are likely to crack. Because of the weight of these soils when saturated, slippage is common on slopes of 25 percent or more. Building on or near the steep Schoharie soils can be hazardous.

Limiting Factors

Following are some of the limiting factors that, singly or in combination with others, commonly affect the use of a soil for nonfarm purposes.

Flooding.—Soils subject to flooding are considered to have severe limitations for use as septic tank fields, homesites, streets or parking lots, and sites for sanitary land fill. Thus, they should not be used for these purposes unless protected by dikes, levees, or other structures. Even then, flooding may be a hazard. Other uses that may be affected by flooding are campsites; landscaped areas, such as golf courses; paths and trails; and intensive play and picnic areas. These uses, however, may be affected to only a slight or moderate degree because flooding commonly is infrequent during the season of use. Flooding is an important limitation to consider on the Genesee and Eel soils, which are extensive on bottom lands along the Seneca River, Owasco Inlet, and other large streams.

Prolonged and seasonal wetness.—Soils that are wet most of the year, though not necessarily flooded, have severe limitations for most uses. Among these are the Alden, Canandaigua, Ellery, Fonda, Lakemont, Lyons, Madalin, and Warners soils and Peat and Muck. These soils, for the most part, occur in depressions throughout the county.

Some soils are wet only part of the year. These have a water table that is seasonally perched on a restricting layer or that fluctuates without reaching the surface. They include all of the somewhat poorly drained soils in the county, among which are the Erie, Kendaia, Odessa, Minoa, and Scriba. These soils have moderate to severe limitations for many uses.

Surface texture.—Surface texture affects trafficability, infiltration, the length of drying time after rains, and the ease of establishing and maintaining a grass cover.

The presence of gravel and stone fragments on the soil surface is most critical in athletic fields used for baseball and football. Consequently, if gravel, cobblestones, or fragments of less than 10 inches make up 15 percent or more of the volume, the soil is given a rating of severe. Except for most soils on flood plains, such as the Eel and Genesee, and lacustrine soils, such as the Colonie, Dunkirk, and Schoharie, there are few soils in the county that are completely free of coarse fragments.

Depth to bedrock.—Depth to bedrock affects many uses, especially those where excavating or grading is needed. Among the uses most affected are septic tank fields, homesites, streets or parking lots, and campsites. Vegetation generally is difficult to establish on shallow soils.

Soils that are underlain by bedrock at a depth of 10 to 20 inches are considered shallow, and those that are underlain by bedrock at a depth of 20 to 40 inches are considered moderately deep. Such soils are extensive throughout the county.

Slope.—Soil slope affects most uses. Where it is significant, it is expressed in percent in the soil name. Nearly level and gently sloping soils that have no other undesirable properties have slight limitations for most uses; moderately sloping soils, exclusive of other soil properties, have moderate limitations; and steep soils have severe limitations.

Erosion is an ever-present hazard on sloping soils. The erosion hazard should be considered particularly in developing paths and trails, in landscaping, and in selecting intensive-use picnic areas. The Schoharie, Dunkirk, Odessa, and Williamson soils are among those where erosion hazard is serious.

Stoniness or rockiness.—Large stones or rock outcrops limit the use of the soils for some purposes. The soil name generally indicates the soils that have sufficient stones to interfere with land use. Commonly, these very stony soils occur as small areas on lake plains or near outcrops of bedrock. The Ira, Scriba, Sodus, and Benson soils are the most extensive soils in the county that are very stony or rocky. These soils have moderate to severe limitations for most uses.

Permeability.—Permeability is the quality that enables a soil to transmit water or air. This soil property is closely related to the depth to a fragipan or to the clay or dense till that is commonly encountered in most of the deeper upland soils in the county and in the clayey soils in valleys and on lake plains. It is of considerable importance in rating soils for septic-tank effluent disposal. Soils that have rapid permeability generally have slight limitations for such use, and those that have slow or moderately slow permeability have severe limitations.

Although soils with rapid permeability commonly have slight limitations for septic-tank effluent disposal, a contamination hazard exists if there are shallow wells, streams, ponds, lakes, or water courses nearby.

Stability.—Stability is a soil property relating to the presumptive bearing capacity of the soil or its ability to support a static load and its relative ability to stand in cuts. The most critical period occurs when the soil is saturated with water.

Although this property has not been considered in table 7, the hazards involved should be considered if unstable soils are used for the purposes specified. The soils in the county that exhibit the most unstable characteristics are those that formed in glacio-lacustrine deposits.

Among these are the Alden, Canandaigua, Collamer, Dunkirk, Galen, Lakemont, Lamson, Madalin, Minoa, Niagara, Odessa, and Schoharie. Other soils that may exhibit unstable characteristics to a lesser degree are the Cazenovia, Ovid, and Romulus. These soils were derived from clayey glacial till that contains a fair amount of reworked lake-laid clay.

Stability is an important property to consider in planning any use that requires the support of heavy loads. Engineering investigations are needed if large structures are to be built, especially on soils that formed in water-deposited sediments. Such soils include the Alton, Colonie, Genesee, Palmyra, and Schoharie. These soils may have subsurface layers not suitable for some types of loads.

Fragipan, clay, or dense till.—With few exceptions, most of the deeper upland soils and the lacustrine, clayey soils in the county have a fragipan or a layer of clay or dense till within 1½ to 4 feet of the surface. The main exceptions are the soils that formed in glacial outwash and on bottom lands. Among these are the Alton, Arkport, Genesee, and Palmyra soils.

The presence of a fragipan or layer of clay or dense till within 3 feet of the surface is one of the primary reasons why many of the soils in the county have been given a rating of severe if used as disposal fields for septic tanks.

If soils that have a fragipan or dense layer are used as homesites, basements should be waterproofed and measures should be taken to control subsurface water. Paved streets and parking lots are likely to be affected by freezing and thawing, especially if the soils contain a large amount of clay.

Selected Uses

Following are explanations of the selected nonfarm uses shown in table 7 and the features considered in evaluating the limitations of the soils for such use.

Septic-tank effluent disposal.—It is assumed that septic-tank systems will be properly designed (*10*) and that the minimum size of the lot will be one-half acre. The main features considered are permeability, depth to a seasonal or prolonged high water table, depth to bedrock, slope, and flood hazard.

Homesites.—These are sites for year-round homes or other buildings of three stories or less, with basements averaging 5 feet in depth below the undisturbed ground level. The main features considered are depth to a seasonal or prolonged high water table, slope, depth to bedrock, flood hazard, and surface stoniness or rockiness.

Streets and parking lots.—These are streets in subdivisions and all-weather parking lots. (Also see the section "Engineering Applications.") The features considered are slope, depth to a seasonal or prolonged high water table (wetness), depth to bedrock, and flood hazard.

Sanitary land fill.—A sanitary land fill is a waste-disposal area for trash and garbage. It is assumed that the trench method of sanitary land fill will be used and that the trench will have a minimum depth of 6 feet and will be underlain by 2 to 3 feet of soil material. The risk of free flow of pollutants to ground water is considered. The main features considered are depth to a seasonal or prolonged high water table, permeability, slope, depth to bedrock, consistence of moist substratum, texture of surface and subsurface layers, and flood hazard.

Lawns and fairways.—These are areas subjected to moderate traffic and to frequent mowing. It is assumed that the soil material at the site will be used and that there will be no importation of fill or topsoil. Traps or roughs are not considered as part of the golf fairway. The main features considered are depth to a seasonal or prolonged high water table (wetness), slope, depth to bedrock, surface stoniness (stones 10 inches or more in diameter), texture of the surface and subsurface layers, and flood hazard.

Athletic fields.—These are mainly areas used for organized sports, such as baseball and football, but they also apply to playgrounds. These uses generally require a nearly level, firm surface that is free of gravel and stones; good drainage; and a cover of vegetation. The main features considered are depth to a seasonal or prolonged high water table (wetness), flood hazard, soil texture, stoniness, slope, permeability, and depth to bedrock.

Paths and trails.—These are areas used for trails, cross-country hiking, bridle paths, and the random movement of people. It is assumed that the areas are to be used as they occur and that little grading is needed. Bridle paths require more extensive preparation and maintenance than foot trails. The main features considered are depth to a seasonal or prolonged high water table, slope, soil texture, and stoniness or rockiness.

Campsites.—These are areas used as sites for tents or camp trailers. Frequent use during the camping season and heavy foot and vehicular traffic are assumed. The main features considered are depth to a seasonal or prolonged high water table, permeability, slope, depth to bedrock, soil texture, stoniness, and flood hazard.

Picnic areas and play areas.—These are play areas used largely by children and areas provided with tables and fireplaces for the use of a large number of people. The main features considered are depth to a seasonal or prolonged high water table, slope, depth to bedrock, soil texture, stoniness, and flood hazard.

Descriptions of the Soils

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

The procedure is first to describe each soil series, and then to describe the mapping units in that series. Thus, to get full information on any one mapping unit, it is necessary to read the description of that unit and the description of the soil series to which it belongs.

Following the name of each mapping unit, there is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit are the capability unit and woodland group in which the mapping unit has been placed. The page on which each capability unit is described can be found by referring to the "Guide to Mapping Units" at the back of this survey. The colors described are for moist soil, unless otherwise stated.

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

Soil	Area	Extent
	Acres	*Percent*
Alden mucky silt loam	2,686	0.6
Alden mucky silt loam, till substratum	7,163	1.6
Alluvial land	3,568	.8
Alton cobbly loam, 0 to 3 percent slopes	764	.2
Alton cobbly loam, 3 to 8 percent slopes	619	.1
Alton gravelly sandy loam, 0 to 3 percent slopes	790	.2
Alton gravelly sandy loam, 3 to 8 percent slopes	2,556	.6
Alton gravelly sandy loam, 8 to 15 percent slopes	980	.2
Alton and Howard soils, 15 to 25 percent slopes	1,050	.2
Angola silt loam, 1 to 6 percent slopes	2,709	.6
Angola silt loam, 6 to 12 percent slopes	306	.1
Appleton and Lyons loams, 0 to 5 percent slopes	1,042	.2
Arkport fine sandy loam, 1 to 6 percent slopes	802	.2
Arkport fine sandy loam, 6 to 12 percent slopes	554	.1
Arnot channery silt loam, 3 to 15 percent slopes	571	.1
Arnot channery silt loam, 15 to 25 percent slopes	395	.1
Arnot soils, 25 to 45 percent slopes	658	.1
Aurora silt loam, 2 to 6 percent slopes	2,384	.5
Aurora silt loam, 6 to 12 percent slopes	421	.1
Aurora silt loam, 6 to 12 percent slopes, eroded	1,144	.3
Aurora silt loam, 12 to 18 percent slopes, eroded	1,100	.2
Aurora silt loam, 18 to 30 percent slopes	799	.2
Aurora silt loam, limestone substratum, 2 to 8 percent slopes	635	.1
Aurora and Farmington shaly silt loams, 12 to 18 percent slopes	423	.1
Aurora and Farmington shaly silt loams, 18 to 40 percent slopes	1,788	.4
Aurora, Farmington and Benson very rocky soils, 20 to 70 percent slopes	2,709	.6
Benson loam, 1 to 8 percent slopes	807	.2
Benson loam, 8 to 14 percent slopes	245	.1
Benson very rocky loam, 2 to 20 percent slopes	353	.1
Brockport and Lockport silty clay loams, 2 to 6 percent slopes	529	.1
Camillus silt loam, 2 to 6 percent slopes	635	.1
Camillus silt loam, 6 to 12 percent slopes, eroded	669	.1
Cazenovia silt loam, 2 to 8 percent slopes	11,034	2.5
Cazenovia silt loam, 8 to 14 percent slopes	773	.2
Cazenovia silt loam, 5 to 14 percent slopes, eroded	2,475	.6
Cazenovia silt loam, rolling	1,163	.3
Cazenovia silt loam, 12 to 20 percent slopes	1,126	.3
Cazenovia and Schoharie soils, 20 to 40 percent slopes	768	.2
Collamer silt loam, 0 to 2 percent slopes	2,035	.5
Collamer silt loam, 2 to 6 percent slopes	3,072	.7
Colonie loamy fine sand, 1 to 6 percent slopes	1,219	.3
Colonie loamy fine sand, 6 to 12 percent slopes	1,120	.2
Colonie fine sandy loam, 1 to 6 percent slopes	736	.2
Colonie and Arkport soils, 12 to 22 percent slopes	472	.1
Conesus gravelly silt loam, 0 to 3 percent slopes	766	.2
Conesus gravelly silt loam, 3 to 8 percent slopes	3,677	.8
Dunkirk silt loam, 1 to 6 percent slopes	1,257	.3
Dunkirk silt loam, 6 to 12 percent slopes, eroded	629	.1
Dunkirk silt loam, 12 to 18 percent slopes, eroded	233	.1
Dunkirk soils, 18 to 35 percent slopes	177	(1)
Edwards muck	1,883	.4
Eel silt loam	2,665	.6
Eel silt loam, high bottom	1,149	.3
Ellery and Alden silt loams, 3 to 8 percent slopes	829	.2
Erie channery silt loam, 0 to 3 percent slopes	3,856	.9
Erie channery silt loam, 3 to 8 percent slopes	7,723	1.7
Erie channery silt loam, moderately shallow variant, 0 to 3 percent slopes	296	.1
Erie channery silt loam, moderately shallow variant, 3 to 8 percent slopes	585	.1
Farmington shaly silt loam, 1 to 12 percent slopes	1,223	.3
Fonda mucky silt loam	3,272	.7
Fredon loam	611	.1
Fresh water marsh	1,153	.3
Galen fine sandy loam, 0 to 2 percent slopes	471	.1
Galen fine sandy loam, 2 to 6 percent slopes	2,352	.5
Genesee silt loam	698	.2
Genesee silt loam, high bottom	558	.1
Genesee gravelly silt loam, fan	2,312	.5
Hilton loam, 0 to 3 percent slopes	1,111	.2
Hilton loam, 3 to 8 percent slopes	4,526	1.0
Honeoye silt loam, 2 to 8 percent slopes	44,941	10.0
Honeoye silt loam, 8 to 14 percent slopes	1,666	.4
Honeoye silt loam, 8 to 14 percent slopes, eroded	6,245	1.4
Honeoye soils, rolling	1,868	.4
Honeoye and Lansing gravelly silt loams, 14 to 20 percent slopes	3,062	.7
Howard gravelly loam, 0 to 3 percent slopes	530	.1
Howard gravelly loam, 3 to 8 percent slopes	1,425	.3
Howard gravelly loam, 8 to 15 percent slopes	654	.1
Ira gravelly loam, 0 to 3 percent slopes	1,761	.4
Ira gravelly loam, 3 to 8 percent slopes	4,816	1.1
Ira and Sodus very stony loams, 2 to 20 percent slopes	851	.2
Kendaia silt loam, 3 to 8 percent slopes	916	.2
Kendaia and Lyons silt loams, 0 to 3 percent slopes	11,346	2.5
Lake beaches	59	(1)
Lakemont silty clay loam	1,896	.4
Lamson fine sandy loam	467	.1
Lamson mucky fine sandy loam	1,738	.4
Langford channery silt loam, 2 to 8 percent slopes	29,502	6.6
Langford channery silt loam, 8 to 15 percent slopes	5,747	1.3
Langford channery silt loam, rolling	2,631	.6
Langford channery silt loam, 15 to 25 percent slopes	2,973	.7
Langford-Howard gravelly loams, 2 to 8 percent slopes	842	.2
Langford-Howard gravelly loams, 8 to 15 percent slopes	1,763	.4
Langford-Howard gravelly loams, 15 to 25 percent slopes	989	.2
Langford-Howard gravelly loams, 25 to 45 percent slopes	1,567	.3
Langford channery silt loam, moderately shallow variant, 2 to 8 percent slopes	838	.2
Lansing gravelly silt loam, 2 to 8 percent slopes	5,463	1.2
Lansing gravelly silt loam, 8 to 14 percent slopes	827	.2
Lansing gravelly silt loam, 8 to 14 percent slopes, eroded	2,420	.5
Lansing gravelly silt loam, rolling	901	.2
Lima silt loam, 0 to 3 percent slopes	22,615	5.1
Lima silt loam, 3 to 8 percent slopes	18,896	4.2
Lordstown channery silt loam, 2 to 8 percent slopes	969	.2
Lordstown channery silt loam, 8 to 15 percent slopes	464	.1
Madalin silt loam	3,245	.7
Madalin silt loam, sandy subsoil variant	2,518	.6
Made land, sanitary land fill	178	(1)
Made land, tillable	610	.1
Minoa fine sandy loam	970	.2

See footnote at end of table.

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

Soil	Area	Extent	Soil	Area	Extent
	Acres	*Percent*		*Acres*	*Percent*
Muck, deep	9, 866	2. 2	Riga and Lairdsville silty clay loams, 6 to 12 percent slopes, eroded	506	0. 1
Muck, shallow	3, 489	. 8	Romulus silty clay loam	934	. 2
Niagara fine sandy loam	4, 010	. 9	Schoharie silt loam, 2 to 6 percent slopes	2, 966	. 7
Niagara and Canandaigua silt loams	5, 583	1. 2	Schoharie silty clay loam, 6 to 12 percent slopes	905	. 2
Odessa silt loam, 0 to 2 percent slopes	1, 673	. 4	Schoharie silty clay loam, 12 to 20 percent slopes	726	. 2
Odessa silt loam, 2 to 6 percent slopes	2, 035	. 5	Scriba gravelly loam	1, 625	. 4
Ontario fine sandy loam, 2 to 8 percent slopes	2, 544	. 6	Scriba very stony loam	622	. 1
Ontario fine sandy loam, 8 to 14 percent slopes	1, 247	. 3	Sloan silt loam	6, 527	1. 5
Ontario fine sandy loam, rolling	504	. 1	Sodus gravelly loam, 2 to 8 percent slopes	3, 450	. 8
Ontario loam, 2 to 8 percent slopes	14, 717	3. 3	Sodus gravelly loam, 8 to 14 percent slopes	1, 144	. 3
Ontario loam, 8 to 14 percent slopes	2, 702	. 6	Sodus gravelly loam, 8 to 14 percent slopes, eroded	1, 097	. 2
Ontario loam, 8 to 14 percent slopes, eroded	8, 979	2. 0	Sodus gravelly loam, rolling	1, 272	. 3
Ontario loam, rolling	1, 827	. 4	Sodus gravelly loam, 14 to 20 percent slopes	1, 402	. 3
Ontario loam, 14 to 20 percent slopes	658	. 1	Sodus gravelly loam, 20 to 40 percent slopes	811	. 2
Ontario loam, 14 to 20 percent slopes, eroded	6, 271	1. 4	Stafford fine sandy loam	970	. 2
Ontario silt loam, moderately shallow variant, 0 to 3 percent slopes	684	. 2	Tuller channery silt loam, 1 to 8 percent slopes	249	. 1
Ontario silt loam, moderately shallow variant, 3 to 8 percent slopes	2, 078	. 5	Varick silt loam	388	. 1
Ontario silt loam, moderately shallow variant, 8 to 14 percent slopes	459	. 1	Wampsville gravelly silt loam, 0 to 3 percent slopes	356	. 1
Ontario, Honeoye and Lansing soils, 20 to 35 percent slopes	7, 662	1. 7	Wampsville gravelly silt loam, 3 to 8 percent slopes	949	. 2
Ontario, Honeoye and Lansing soils, 35 to 50 percent slopes	2, 048	. 5	Warners loam	3, 072	. 7
Ovid silt loam, 0 to 2 percent slopes	4, 837	1. 1	Warners loam, fan	275	. 1
Ovid silt loam, 2 to 6 percent slopes	5, 431	1. 2	Williamson silt loam, 0 to 2 percent slopes	437	. 1
Palmyra gravelly sandy loam, 3 to 8 percent slopes	1, 312	. 3	Williamson silt loam, 2 to 6 percent slopes	4, 534	1. 0
Palmyra gravelly sandy loam, 8 to 15 percent slopes	1, 212	. 3	Williamson silt loam, 6 to 12 percent slopes	167	(1)
Palmyra gravelly loam, 0 to 3 percent slopes	757	. 2	Williamson silt loam, 6 to 12 percent slopes, eroded	2, 201	. 5
Palmyra gravelly loam, 3 to 8 percent slopes	3, 601	. 8	Gravel pits	532	. 1
Palmyra gravelly loam, 8 to 15 percent slopes	2, 235	. 5	Quarries	185	(1)
Palmyra soils, 15 to 25 percent slopes	1, 395	. 3	Borrow pits and clay pits	116	(1)
Palmyra, Howard and Alton soils, 25 to 40 percent slopes	1, 161	. 3	Cemeteries	41	(1)
Peat and Muck	188	(1)	Water (in impoundments less than 40 acres in size)	2, 460	. 5
Phelps gravelly silt loam	1, 118	. 2	Industrial areas	530	. 1
Riga and Lairdsville silt loams, 2 to 6 percent slopes	600	. 1	Total	447, 360	100. 0

[1] Less than 0.05 percent.

Alden Series

The Alden series consists of very poorly drained soils that developed in deep, slightly acid to calcareous silty sediments. These soils are in low, level areas or nearly level depressions, mainly in lake plains. Some of the depressions are silt filled or ponded and are in uplands.

In a cultivated area, a typical profile has a very dark brown, very friable mucky silt loam plow layer about 9 inches thick. Just below this is the subsoil, which extends to a depth of 21 inches. The upper part of the subsoil is gray to dark-gray, friable silt loam that is faintly mottled and grades to more distinctly mottled, friable to firm loam as depth increases. The substratum is brown to dark-brown, friable to firm loam and silt loam that are distinctly mottled and calcareous. The reaction of the solum is neutral.

Typical profile of Alden mucky silt loam, in an idle, formerly cultivated field:

Ap—0 to 9 inches, very dark brown (10YR 2/2) mucky silt loam; many, fine, dark reddish-brown (5YR 3/2–3/4) root mottles; strong, fine and medium, granular structure; very friable when moist, slightly sticky when wet; abundant fine roots; neutral; clear, wavy boundary. 6 to 10 inches thick.

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 when moist, slightly sticky when wet; common fine roots; neutral; abrupt, wavy boundary. 2 to 6 inches thick.

IIB22g—12 to 14 inches, gray (10YR 5/1) loam, high in coarse silt and very fine and fine sand; common, fine, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium and coarse, subangular blocky structure; slightly firm when moist, slightly sticky when wet; few fine roots; few fine pores; no clay skins on ped faces and in pores; neutral; clear, wavy boundary. 1 to 8 inches thick.

IIB23g—14 to 21 inches, gray (5YR 5/1) loam, high in coarse silt and very fine 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 when moist, slightly sticky when wet; few fine roots; few fine pores; few pockets of very fine sand 1 to 2 inches in diameter; prism faces gray (5YR 5/1) without mottles or clay skins; neutral; clear, wavy boundary. 5 to 16 inches thick.

IIC1g—21 to 32 inches, brown (7.5YR 5/2) loam high in 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 when moist, slightly sticky when wet; very few fine roots; very few fine pores; prism faces brown (7.5YR 5/2) without mottles or clay skins; calcareous; abrupt, wavy boundary. 10 to 12 inches thick.

IIIC2g—32 to 40 inches, dark-brown (7.5YR 4/4) fine 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 separated by very thin seams of coarse silt; firm; sticky; very few fine roots; calcareous.

The thickness of the solum ranges from 20 to 40 inches. The depth to carbonates ranges from 18 to more than 40 inches.

The Ap horizon ranges from black to very dark gray or very dark brown in color. It ranges from very fine sandy loam to silt loam in texture and contains from 10 to 20 percent organic matter. The structure is granular to fine blocky. The reaction ranges from slightly acid to mildly alkaline.

The color of the B horizon, to a depth of at least 20 inches, ranges from 5Y to 5YR in hue and from 4 to 6 in value. The dominant chroma is 0, 1, or 2. The mottles range from few to common, and those that have a chroma higher than 2 are distinct to prominent. The texture is very fine sandy loam, loam, silt loam, or coarse silty clay loam, and the clay content is 18 to 35 percent. The structure is massive to moderate blocky within weak to strong prisms. The structure is most prominent where the clay content is highest. The reaction ranges from mildly acid to calcareous.

The C horizon consists mainly of varved silt, very fine sand, and thin lenses of clay to a depth of more than 40 inches. The reaction ranges from neutral to calcareous.

Most areas of Alden soils are in a drainage sequence with the well drained Dunkirk, the moderately well drained Collamer, the somewhat poorly drained Niagara, and the poorly drained Canandaigua soils. Alden soils have a darker, muckier surface layer and a grayer subsoil than the slightly better drained Canandaigua, Lyons, and Ellery soils. Alden soils have a coarser textured B horizon than Fonda soils. The clay content of the Alden B horizon is 18 to 35 percent, while that of the Fonda B horizon is more than 35 percent.

Alden mucky silt loam (0 to 3 percent slopes) (Ac).—This soil has a profile like the one described as typical of the series. It occurs as low, level areas or depressions in lake plains and is subject to ponding. Only a few areas have slopes that exceed 2 percent. Included in mapping were areas of poorly drained Canandaigua soils on slight rises or knolls and in narrow bands along the borders of the depressions. Also included were small areas of shallow muck in pockets and depressions.

Undrained, this soil is not suitable for crops but can be used for pasture, although the quality of forage is poor. The forested areas are called "swamp woods" and consist mostly of soft maple and elm. This soil is too wet for nonfarm use, except for wildlife marshes and ponds.

Control of water is the main problem. Drainage may be difficult because the silty and sandy layers tend to flow and plug drains. Though total nitrogen is high, it is slowly available; consequently, plants respond to nitrogen fertilization. The supply of potassium and phosphorus is medium. The need for lime ranges from none to moderate. (Capability unit IIIw-8; woodland group 20)

Alden Series, Till Substratum

The Alden series, till substratum, consists of deep, very poorly drained soils that formed in silty deposits over calcareous to alkaline loamy glacial till, in uplands. These soils occupy small depressions that are subject to ponding, and the water table is at or near the surface most of the year. They are limited in extent and occur mostly in the southern half of the county south of Auburn.

A typical profile in a forest has a thin litter of leaves covering a surface layer of very dark gray to black, friable mucky silt loam. This layer is about 9 inches thick. The upper part of the subsoil is gray to white, friable to firm silt loam that has few mottles. This layer, at a depth of 15 inches, merges with the lower part of the subsoil, which is gray, firm heavy silt loam that is distinctly mottled with yellowish brown. The depth to firm, calcareous glacial till is about 24 inches. The upper part of the till is gray silt loam distinctly mottled with shades of brown. A few pebbles occur in the upper part, but as depth increases the till becomes more gravelly and has fewer mottles. Reaction ranges from slightly acid in the surface layer to weakly calcareous in the lower part of the subsoil.

Typical profile of Alden mucky silt loam, till substratum, in a forest:

O—1 inch to 0, forest litter, generally without a raw humus mat; 0 to 1½ inches thick.

A1—0 to 9 inches, very dark gray to black (10YR 3/1–2/1) mucky silt loam; moderate, medium, crumb structure; friable; neutral to slightly acid; numerous fine roots; wavy boundary. 6 to 12 inches thick.

B1g—9 to 15 inches, gray (N 6/0) to white (10YR 8/1) silt loam; rust streaks along old root channels, and a few, medium, distinct, yellowish-brown (10YR 5/4, 5/6) mottles; weak, medium, blocky structure when dry, massive when wet; friable to firm; few fine roots; neutral to slightly alkaline; gradual, wavy boundary. 6 to 8 inches thick.

B2g—15 to 24 inches, gray (N 5/0–6/0 to 10YR 5/1–6/1) heavy silt loam; common, medium, distinct, yellowish-brown (10YR 5/4–5/6) mottles; moderate, coarse, blocky structure when dry, massive when wet; firm when moist, slightly plastic when wet; few large roots; alkaline, becoming mildly calcareous in lower part; clear, wavy boundary. 6 to 15 inches thick.

IIC1g—24 to 40 inches, gray (N 5/0–6/0), calcareous, gritty silt loam; common distinct mottles of varying shades of brown; moderately compact and firm; weak, very thick, platy structure; mottling decreases with depth; contains up to 5 percent gravel or small stone fragments in places. 10 to 20 inches thick.

IIC2—40 to 48 inches, gray (N 6/0–5/1), highly calcareous glacial till of gravelly loam or gravelly silt loam; firm; thick, platy structure; few distinct mottles along cleavage planes decrease with depth; a few semirounded and angular stone fragments up to 10 inches in diameter.

The A1 horizon varies widely in thickness, especially in cultivated areas where material has been washed from surrounding fields. The degree of mottling also varies. The texture ranges from fine sandy loam to coarse silty clay loam and is generally mucky. Coarse fragments on the surface and in the solum range from 0 to 10 percent. The depth to carbonates ranges from 12 to 30 inches.

The B horizon ranges from fine sandy loam to silty clay loam to sandy clay loam, and contains 18 to 35 percent clay. The color ranges from dark gray to gray. Mottles are generally common but in places are lacking.

The texture of the C horizon ranges from loam to fine sandy loam to coarse clay loam. Coarse fragments range from 5 to 15 percent in the upper part of this horizon and in places increase to more than 50 percent with depth.

Alden soils, till substratum, are the very poorly drained associates of upland soils that are derived from medium-textured glacial till containing a varying amount of limestone. They have a siltier surface layer and upper subsoil than the slightly better drained Lyons and Ellery soils, and they have a grayer subsoil. They have a coarser textured subsoil than Fonda soils. They are similar to other Alden soils, but those soils formed in silty deposits more than 40 inches thick.

Alden mucky silt loam, till substratum (0 to 3 percent slopes) (Ad).—This soil has a profile like the one described as typical of the series. It is in uplands, mainly in level areas or slight depressions that are ponded by runoff from adjacent, higher soils. The larger areas are upland swamps. Some small areas occur as seep spots among better drained, moderately sloping soils. Included in mapping were spots of muck in depressions and spots of Lyons, Kendaia, Appleton, Ellery, and Erie soils on slight knolls.

Most of this soil is too wet for cultivation unless it is drained. If drained, it is suited to many crops common to the county, especially annual row crops.

Although systematic drainage, either by open ditch or tile, is rarely applied, removal of excess water from some areas would permit water-tolerant feed and pasture crops to be grown. Some areas are in pasture. They are unproductive unless limed and fertilized, but they do provide feed during dry periods when other pastures are poor. Forested areas support water-tolerant trees.

This soil is too wet for most nonfarm uses, except for ponds and wildlife marshes. (Capability unit IVw–2; woodland group 20)

Alluvial land (0 to 5 percent slopes) (Al) consists mostly of very recent alluvium adjacent to streams. For the most part, these deposits show little or no profile development.

During floods, the soil material is shifted from place to place. Some areas consist of stony or gravelly material, and others are free of coarse fragments. Drainage ranges from good to very poor within short distances. Small areas of soils that show profile development were included in mapping this land.

Most areas of Alluvial land are in the long narrow valleys of secondary streams on the uplands. Other areas are in broader valleys within larger areas of Genesee and Eel soils.

Alluvial land is flooded frequently and is poorly suited to farming. Many areas are wooded with willow, swamp elm, soft maple, sycamore, and other water-tolerant trees. Some cleared areas are in pasture, but most of these areas are reverting to brush and weeds. Flooding and the variable soil properties severely limit the use of this land type for most nonfarm purposes. (Capability unit Vw–1; woodland group 19)

Alton Series

The Alton series consists of deep, well-drained to excessively drained soils that formed in medium-lime glacial outwash and beach deposits derived mainly from sandstone. Much of the sandstone was red; as a result, the solum has a reddish color. These soils are in the northern part of the county. Scattered areas that occur as far south as the Seneca River consist of gravel beach deposits that built up along the edge of postglacial lakes. Many areas occur as narrow bands at the base of drumlins.

In cultivated fields, the plow layer is dark-brown gravelly sandy loam about 7 inches thick. The subsoil extends to a depth of about 63 inches. To a depth of about 28 inches, it is reddish-brown to dark reddish-brown, very friable gravelly sandy loam. Below this depth, it is brown to dark-brown, very friable very gravelly sandy loam to gravelly loamy sand. The subsoil is strongly acid to medium acid. The substratum consists of calcareous, stratified sand and gravel. It is loose in the upper part but is cemented with secondary lime below a depth of 96 inches.

Typical profile of Alton gravelly sandy loam, 3 to 8 percent slopes, in a cultivated field:

Ap—0 to 7 inches, dark-brown (7.5YR 3/4) gravelly sandy loam; moderate, medium and coarse, granular structure; very friable; many fine and medium roots; strongly acid; abrupt, wavy boundary. 6 to 10 inches thick.

B21—7 to 16 inches, reddish-brown (5YR 4/4) to dark reddish-brown (5YR 3/4) gravelly sandy loam; weak, medium, subangular blocky structure; very friable; many fine and medium roots; strongly acid; clear, wavy boundary. 6 to 18 inches thick.

B22—16 to 28 inches, reddish-brown (5YR 4/4) to brown (7.5YR 4/4) gravelly sandy loam; weak, medium and coarse, subangular blocky structure; very friable to friable; many fine and medium roots; faint patches of clay films along cleavage faces and on upper sides of gravel; strongly acid; gradual, wavy lower boundary. 10 to 18 inches thick.

IIB23—28 to 41 inches, brown (7.5YR 5/3) very gravelly sandy loam; weak, medium and coarse, subangular blocky structure; very friable to friable; many fine and medium roots; distinct patches of clay films on top and sides of gravel; some evidence of stratification with increasing depth; strongly acid; clear, wavy boundary. 10 to 18 inches thick.

IIB3—41 to 63 inches, brown to dark-brown (7.5YR 4/2–4/3) very gravelly sandy loam to gravelly loamy sand; single grain to weak, medium and coarse, subangular blocky structure; very friable to friable; common fine and medium roots; some evidence of stratification; medium acid; clear, wavy boundary. 10 to 24 inches thick.

IIIC—63 to 120 inches, dark-brown (7.5YR 4/2), brown (7.5YR 5/2), and pinkish-gray (7.5YR 6/2), individual sand grains in stratified sand, gravelly sand, and gravel; structureless; loose; common roots in upper part grading to few with depth; calcareous; cemented with secondary lime at depth of 96 to 120 inches.

The solum ranges from 40 to 72 inches in thickness. Coarse fragments, dominantly sandstone gravel, make up 15 to 35 percent of the solum.

The Ap horizon is generally dark brown to brown (7.5YR 3/4, 7.5YR 3/2, 10YR 4/3). The A horizon ranges from loamy sand to loam. In content of coarse fragments, it ranges from nearly gravel free to very cobbly. In reaction, it ranges from very strongly acid to medium acid.

The color of the B horizon is commonly reddish brown (5YR 4/4) but ranges in hue from 2.5YR to 7.5YR, in value from 3 to 6, and in chroma from 2 to 6. The B horizon ranges from gravelly sandy loam to very gravelly loam in texture but includes thin strata of gravelly loamy sand. In places there is evidence of clay, iron, or organic matter in the B horizon, but the content is not sufficient to meet the requirements of a horizon of clay accumulation or a horizon of humus and aluminum or iron accumulation. The B horizon is commonly strongly acid in the upper part but generally decreases in acidity with depth. The lower part ranges from medium acid to neutral.

The C horizon consists of structureless, stratified gravel and sand derived principally from sandstone, but it includes some material derived from limestone and shale that has a dominant hue of 7.5YR.

Alton soils are in the drainage sequence that includes the moderately well drained Phelps soils and the somewhat poorly drained Fredon soils. They have a less clayey B horizon than Palmyra, Wampsville, and Howard soils, and they are lower in content of lime than Palmyra and Wampsville soils.

Alton cobbly loam, 0 to 3 percent slopes (AmA).—A profile of this soil is like the one described as typical of the series, except that the surface layer is loam and is high in content of cobblestones 4 to 6 inches in diameter. This soil occurs on terraces and is most commonly associated with the more strongly sloping Alton soils. Included in mapping were small areas of soils that are nearly free of stones and small areas in which stones make up as much as 75 percent of the soil material.

This soil is well suited to crops, pasture, and forest. It can be used for many kinds of vegetables, for fruits, and for common field crops. It is especially well suited to deep-rooted crops. Although the water-holding capacity is limited, the rate of water intake is rapid, and the response to irrigation is good. The stones hinder cultivation.

Maintenance of fertility is the principal management need. A deficiency of lime is the major limitation. Large amounts of nitrogen, phosphate, and potash are needed. The response to treatment is good. This soil has few limitations for nonfarm uses. It provides suitable sites for houses, and it is a good source of gravel. (Capability unit I–1; woodland group 4)

Alton cobbly loam, 3 to 8 percent slopes (AmB).—A profile of this soil is like the one described as typical of the series, except that the surface layer is loam and is high in content of cobblestones 4 to 6 inches in diameter. This soil occurs on beach terraces and is commonly associated with the more nearly level or strongly sloping Alton soils. Included in mapping were small areas of soils that are nearly free of stones and small areas in which stones make up as much as 75 percent of the soil material.

This soil is well suited to crops, pasture, and forest. It can be used for many kinds of vegetables, for fruits, and for common field crops grown as cash crops or in support of dairying. It is especially well suited to deep-rooted crops. Although the water-holding capacity is limited, the rate of water intake is rapid, and the response to irrigation is good. In applying irrigation water, care is needed to avoid causing erosion.

Maintenance of fertility is the principal management need. A deficiency of lime is the major limitation. Large amounts of nitrogen, phosphate, and potash are needed. The response to treatment is good. Control of erosion is a problem, especially in spring when the surface layer thaws and the subsoil remains frozen. This soil has few limitations for nonfarm uses. It provides suitable sites for houses and is a good source of gravel. (Capability unit IIe–3; woodland group 4)

Alton gravelly sandy loam, 0 to 3 percent slopes (AnA).—A profile of this soil is like the one described as typical of the series. Gravel makes up from 15 to 25 percent, by volume, of the surface layer. This soil is on broad beach terraces and on the tops of deltas. It is commonly associated with the more strongly sloping Alton soils. Small depressions in which the wetter Phelps soils occur were included in mapping, and small areas of Colonie soils and of Williamson soils make up as much as 10 percent of some of the areas mapped. Also included in mapping were small areas of soils that are essentially free of gravel, small areas of soils that are very high in gravel content, and some areas of gravelly loamy sand. In the northern part of the county are some fairly large areas of gravelly loamy sand. One of the most extensive areas occurs about 1 mile northwest of Ira Corners.

This soil is well suited to many kinds of crops and to forest. It warms up early in spring and is suited to market garden crops if management includes heavy fertilization and irrigation. It is low in water-holding capacity. Thus, pasture plants tend to dry up early in summer.

A deficiency of lime, nitrogen, and potassium is the major limitation. Phosphate is also needed. The response to treatment is good. Because of the rapid water intake rate and low water-holding capacity, frequent applications of irrigation water are necessary. Some of the sandier areas are subject to moderate wind erosion. This soil has few limitations for nonfarm uses. It provides good sites for houses and is a good source of gravel. (Capability unit IIs–2; woodland group 4)

Alton gravelly sandy loam, 3 to 8 percent slopes (AnB).—This soil has a profile like the one described as typical of the series. It is on beach terraces or outwash plains and deltas. Spots of sandy Colonie and silty Williamson soils were included in mapping. Also included were small areas of nearly gravel-free soils, soils that contain as much as 75 percent gravel, and soils that are gravelly loamy sand. One of the most extensive of these sandier areas is 1 mile northwest of Ira Corners.

This soil is suitable for many kinds of crops and for forest, but it is not so suitable for pasture. The limited water-holding capacity causes pasture to dry up early in summer. It is an early soil, well suited to garden crops if irrigated and heavily fertilized. It is low in natural fertility. Lime, nitrogen, and potassium are the major needs. Phosphorus also is needed. The response to treatment is good. Water intake is rapid, but frequent irrigation is needed because of the limited water-holding capacity.

Control of wind and water erosion is a problem if this soil is intensively cropped, especially early in spring when the surface soil thaws and the subsoil remains frozen.

This soil has few limitations for nonfarm use. It provides suitable sites for housing and is a good source of gravel. (Capability unit IIs–3; woodland group 4)

Alton gravelly sandy loam, 8 to 15 percent slopes (AnC).—This soil has a profile like the one described as typical of the series, except that each layer varies in gravel and sand content. It occurs mainly as slopes around depressions on glacial outwash terraces, as moderately dissected faces of beach terraces, or as rolling areas on outwash terraces. It adjoins the wetter Phelps and Fredon soils, which occupy the deeper depressions, and the more gently sloping Alton soils.

The landform is a series of moderately sloping knolls with short, complex slopes extending in many directions. Consequently, contour tillage is impractical and the use of machinery is moderately difficult. There are a few small areas that can be contoured. From 25 to 35 percent of the acreage is moderately eroded. The eroded spots are on the steeper part of the slopes, and the eroded material has accumulated between the knolls.

This soil can be used for crops, but the complex topography makes intensive cropping and control of erosion difficult. Most of it is better suited to long-term hay crops, especially alfalfa and other deep-rooted legumes, than to row crops. It is not well suited to pasture, because of the limited water-holding capacity. It is well suited to forest.

Natural fertility is low. The supply of potassium is low, and that of phosphorus is moderate. Lime and complete fertilizer are needed.

This soil is a good source of gravel. It is one of the better soils for nonfarm use that requires good drainage. Slope is the main limitation. (Capability unit IVe–12; woodland group 4)

Alton and Howard soils, 15 to 25 percent slopes (AoD).—Some parts of this unit have simple slopes, and some have complex slopes. The surface layer is more variable in texture than that of the less strongly sloping soils of either series, and the clay content in the subsoil generally is less.

Cultivation is difficult, and the hazard of erosion in cultivated areas is serious. Most areas are better suited to hay crops or forest than to row crops. Because much water is lost through runoff during heavy rains, these soils are considerably more droughty than less sloping soils of the same series. Consequently, their use for pasture is extremely limited, and it is important that hay crops include deep-rooted legumes. Lime and fertilizer are needed. Slope is the main limitation for nonfarm uses. This unit is a good source of sand and gravel. (Capability unit IVe–12; woodland group 17b)

Angola Series

The Angola series consists of moderately deep, somewhat poorly drained soils that formed in glacial till derived from dark-gray to black silty shale or in semiresidual material from the underlying shale. The Skaneateles, Ludlowville, Moscow, and Genesee formations crop out or are close to the surface. Angola soils are mostly south of Auburn. They are inextensive and occur as widely scattered areas on uplands, at elevations below 1,400 feet.

In a cultivated field, a typical profile has a surface layer of dark-gray, friable, heavy silt loam about 9 inches thick. The upper part of the subsoil is light brownish-gray, mottled, firm silty clay loam. The lower part is dark grayish-brown, mottled, shaly silty clay loam. At a depth of about 24 inches it is underlain by brittle, very friable, soft, dark shale bedrock that extends to a depth of 40 inches or more. The reaction of the solum above the rock is neutral.

Typical profile of Angola silt loam, 1 to 6 percent slopes, in a cultivated field:

Ap—0 to 9 inches, dark-gray (10YR 4/1) fine silt loam; dark gray (10YR 4/1) to dark grayish brown (10YR 4/2) when crushed; moderate, fine and medium, subangular blocky structure; friable when moist, slightly sticky when wet; many fine and medium roots; few fine shale chips; neutral; abrupt, smooth boundary. 6 to 8 inches thick.

B21tg—9 to 15 inches, light brownish-gray (10YR 6/2) to pale-brown (10YR 6/3) coarse silty clay loam grading to grayish brown (10YR 5/2) with depth; few, fine, distinct, yellowish-brown (10YR 5/6) and light-gray (10YR 7/1) mottles; moderate to strong, coarse, subangular blocky structure; firm when moist, slightly sticky when wet; common fine roots along ped faces; few fine and medium pores; thin, continuous, gray (10YR 5/1) to grayish-brown (10YR 5/2) clay films in pores and along ped faces; common fine chips of partly weathered shale; neutral; clear, wavy boundary. 4 to 7 inches thick.

B22tg—15 to 24 inches, dark grayish-brown (10YR 4/2), shaly coarse silty clay loam; common, fine, distinct, brown (10YR 5/3) and light-gray (10YR 7/1) mottles; moderate to strong, medium, angular and subangular blocky structure; firm when moist, slightly sticky when wet; common fine roots along ped faces; few fine and medium pores; distinct, gray (10YR 5/1) clay films on ped faces, on shale fragments, and in pores; variable weathering of shale fragments; neutral; gradual, wavy boundary. 7 to 15 inches thick.

R—24 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 strata ⅛ to ½ inch thick; few fine roots along shale faces; mildly alkaline, becoming calcareous with depth.

The thickness of the solum ranges from 20 to 30 inches, and the depth to bedrock ranges from 20 to 40 inches. In some places a C horizon is present where the depth to shale bedrock is more than 30 inches. The coarse fragments are dominantly soft shale, but in some areas there are channery sandstone fragments.

The texture of the surface layer is generally silt loam but ranges to coarse silty clay loam and is shaly or channery in places.

The B horizon ranges from fine silt loam to coarse silty clay loam in texture and has a clay content of 18 to 35 percent. This horizon is shaly or channery in places and may be very shaly just above the bedrock.

If a C horizon is present, the texture is similar to that of the B horizon, though more commonly very shaly.

The surface layer ranges from medium acid to neutral, the B horizon from medium acid to mildly alkaline, and the C horizon from slightly acid to calcareous. The underlying shale ranges from slightly acid to calcareous.

Angola soils are in a drainage sequence with moderately well drained Aurora soils and poorly drained Varick soils. They are also associated with Kendaia and Ovid soils, which have similar drainage and reaction but are deeper to bedrock and generally contain a wider assortment of material.

Angola silt loam, 1 to 6 percent slopes (ArB).—This soil has the profile described as typical of the series. It generally occupies fairly broad upland areas over which surface water moves moderately slowly. These areas receive water from adjacent, higher areas and are somewhat poorly drained. Included in mapping were areas of Ovid soils that are more than 40 inches in depth to bedrock and comprise as much as 20 percent of any given area. Also included were small areas of Aurora soils on knolls or rises and Varick soils in depressions or bottoms of drainageways.

Unless this soil is drained, spring planting is delayed and harvesting is difficult in a wet fall. Undrained areas can be used only for short-season crops or forage crops that can tolerate wetness.

Drainage and control of erosion are the major management problems. Diversion of runoff from adjacent areas is beneficial.

This soil has a good supply of potassium and a moderate supply of phosphorus. Nitrogen is commonly deficient in spring but may be adequate in midsummer. Some areas require lime, but many do not.

Wetness, slow permeability, and shallowness to bedrock are the main limitations to most nonfarm uses. (Capability unit IIIw-6; woodland group 11)

Angola silt loam, 6 to 12 percent slopes (ArC).—Because of the steeper slopes, this soil is less wet than the one described as typical of the series. It occupies short side slopes adjacent to and below more nearly level Angola soils. Wetness is caused partly by seepage water and runoff from these higher soils. Most areas are small. They slope in one direction but are crossed by drainageways in slight depressions. Included in mapping were spots of wetter Varick soils, which occur along these drainageways, and spots of Aurora soils, which are marked by slight irregularities of slope that divert water to either side. Also included were some moderately to severely eroded, cultivated areas. Shallow gullies extending 6 to 18 inches into bedrock have formed in some drainageways.

This soil is suited to crops, pasture, and forest. If cultivated, however, it is subject to erosion, and most cultivated areas are moderately to severely eroded. It can be used for corn and small grains if runoff and erosion are controlled. Erosion reduces the capacity to store moisture and thus contributes to droughtiness. Including a high proportion of sod-forming crops in the rotation is desirable. Fertilizing and liming are needed.

Wetness, slope, slow permeability, and shallowness to bedrock are the main limitations to most nonfarm uses. (Capability unit IVe-6; woodland group 11)

Appleton Series

The Appleton series consists of deep, somewhat poorly drained soils that formed in medium-textured, firm, calcareous glacial till derived from sandstone and limestone and some shale. These soils are in shallow depressions or drainageways in the till plain, mainly north of Auburn. Most areas are long and narrow and have a north-south axis.

In a cultivated area, a typical profile has a dark-brown friable loam to very fine sandy loam plow layer. Just below this layer is a leached layer of brown, mottled, friable loam to very fine sandy loam that extends to a depth of 14 inches. This is underlain by a subsoil of brown, friable heavy loam to light sandy clay loam that is mottled. Calcareous loam to sandy loam till is at a depth of about 20 inches. In the upper part, the till is light brownish-gray, mottled, and friable, but below a depth of 24 inches it becomes reddish brown and firm. The reaction of the solum is neutral.

Typical profile of Appleton loam, 0 to 5 percent slopes, in a cultivated field:

Ap—0 to 9 inches, very dark brown (10YR 3/2) loam to very fine sandy loam; moderate, fine and medium, granular structure and fine, moderate, subangular blocky structure; friable; very many fine roots; neutral; abrupt, wavy boundary. 8 to 10 inches thick.

A2—9 to 14 inches, brown (10YR 5/3) loam to very fine sandy loam; many, fine, distinct, strong-brown (7.5YR 5/6) and light-gray (10YR 7/2) mottles; moderate, fine, subangular blocky to coarse granular structure; friable when moist, nonsticky when wet; many fine roots; neutral; clear, wavy boundary. 2 to 8 inches thick.

B2t—14 to 20 inches, brown (10YR 5/3) heavy loam to light sandy clay loam; many, coarse, distinct, yellowish-brown (10YR 5/8), reddish-yellow (7.5YR 6/8), and light-gray (10YR 7/1) mottles; weak, medium and coarse, subangular blocky structure; discontinuous clay films in medium and large pores; friable when moist, slightly sticky when wet; few fine roots; neutral; clear, wavy boundary. 7 to 15 inches thick.

C1—20 to 24 inches, light brownish-gray (2.5Y 6/2) loam to sandy loam; many, coarse, distinct, light olive-brown (2.5Y 5/4) and faint, light-gray (2.5Y 7/2) mottles and thin, white lime seams; weak, very thick, platy structure; friable when moist, nonsticky when wet; very few fine roots; calcareous; gradual, wavy boundary. 3 to 7 inches thick.

C2—24 to 52 inches, reddish-brown (5YR 5/3) loam to fine sandy loam till; weak, thick, platy structure; firm in place, friable when moist; strongly calcareous, 5 to 10 percent gravel by volume.

The thickness of the solum and depth to calcareous material range from 18 to 30 inches. Unplowed areas have an A1 horizon 3 to 8 inches thick. The texture of the A horizon is mainly loam or very fine sandy loam but ranges from fine sandy loam to silt loam or gravelly loam. The texture of the B horizon is mainly fine loam or light sandy clay loam, and the clay content is 18 to 28 percent, but the texture ranges from heavy sandy loam to fine silt loam or gravelly fine loam. The content of coarse fragments is 2 to 20 percent, and there are a few stones.

The color of the Ap horizon ranges from black (10YR 2/1) to dark reddish gray (5YR 4/2), depending on organic-matter content. The color of the A2 horizon ranges from light gray (10YR 7/2) to reddish brown (5YR 5/4). The B horizon color ranges from reddish brown (5YR 5/4) to yellowish brown (10YR 5/4), depending on the proportion of reddish sandstone. Mottles range from common to many and from distinct to prominent.

The B horizon has weak to moderate, blocky structure or weak, thick, platy structure. The consistency of the B horizon is friable to slightly firm. Clay films are prominent in pores in the B horizon and may be present on ped faces.

The reaction of the A horizon ranges from medium acid to neutral, and that of the B horizon from slightly acid to alkaline.

Appleton soils are in a drainage sequence with well drained Ontario, moderately well drained Hilton, poorly drained Lyons, and very poorly drained Alden soils. Appleton soils have a distinct, light-colored A2 horizon and a considerable increase in clay in the B (argillic) horizon, whereas the similar Kendaia soils have a thinner, less pronounced A2 horizon and lack the distinct clay accumulation in the B horizon. Appleton soils have a coarser textured B horizon than Ovid soils. The clay content is 18 to 28 percent, compared to 28 to 35 percent in the Ovid soils. Appleton soils contain more lime than Scriba and Erie soils and do not have a fragipan.

Appleton and Lyons loams, 0 to 5 percent slopes (AsB).—This undifferentiated unit consists of somewhat poorly drained Appleton loam and poorly drained Lyons loam. Each soil has a profile like the one described as typical of its series, except that the Lyons soil has a coarser textured surface layer. Appleton loam makes up 50 to 70 percent of most areas, and Lyons loam 20 to 50 percent. Lyons loam is in depressions surrounded by the higher Appleton loam.

These soils occur as low, slightly concave areas on uplands that receive runoff from adjoining Hilton and Ontario soils. There are a few extensive flat areas. Some water-deposited material over till is evident in most areas. Some areas may also have water-deposited material below the till at a depth of 3 to 5 feet.

Included in mapping were small knolls of Hilton soils and a few small areas that have slopes of more than 5 percent. These latter areas are long, narrow depressions that serve as drainageways and have a north-south axis.

Unless these soils are drained, their use is limited mainly to hay, pasture, or forest. Areas that consist mostly of Appleton soils can be used for late, short-season crops. If drained, these soils are suited to a number of crops, including vegetables.

The major need is drainage. Tile and surface drainage are feasible in many areas. Wetness can be reduced in some areas by diverting the runoff from adjacent higher soils. Phosphorus and potassium are needed, and nitrogen is needed early in spring but may be adequate for most crops by midsummer. Only a few areas need lime.

These soils are suitable sites for ponds and wildlife marshes. Wetness and moderately slow or slow permeability make them unsuitable for most nonfarm uses. (Capability unit IIIw-2; woodland group 11)

Arkport Series

The Arkport series consists of deep, moderately coarse textured, well-drained to excessively drained soils that formed in sandy deposits. These soils have gently undulating to strongly rolling, convex slopes. They extend from the north end of Owasco Lake to the Seneca River.

In a cultivated area, a typical profile has a plow layer of dark-brown to brown fine sandy loam about 7 inches thick. This layer is underlain by a thin, brown, leached layer of fine to very fine sandy loam to a depth of 9 inches. The subsoil below consists of loose, brown loamy fine sand or very fine sand through which there are ½- to 2-inch bands of firm, reddish-brown fine to very fine sandy loam. The bands are roughly horizontal, but in some places they are 8 to 10 inches apart, and in other places they merge. The substratum is dark-brown to very dark grayish-brown, loose sand and some gravel. It is at a depth of about 48 inches. The reaction of the subsoil and substratum is neutral.

Typical profile of Arkport fine sandy loam, 1 to 6 percent slopes, in a cultivated field:

Ap—0 to 7 inches, dark-brown to brown (7.5YR 4/2) fine sandy loam; massive to weak, coarse, subangular blocky structure breaking to very weak, fine, subangular blocky structure; very friable; few fine roots; neutral; abrupt, wavy boundary. 6 to 9 inches thick.

A2—7 to 9 inches, brown (7.5YR to 10YR 5/3) fine to very fine sandy loam; weak, coarse, platy structure (plow pan) breaking to weak, very fine to fine, subangular blocky structure; very friable; neutral; few fine roots; abrupt, wavy boundary. 1 to 3 inches thick.

B2&B2t—9 to 48 inches, brown (7.5YR 5/2-5/4) loamy fine sand to very fine sand; horizontal, reddish-brown (5YR 4/3) fine to very fine sandy loam lamellae ½ inch to 2 inches thick and totaling 12 inches in thickness; weak, medium, subangular blocky structure; tendency toward thick, platy structure in the lamellae and weak, fine, granular or single-grain structure between the lamellae; lamellae are friable when removed and firm in place and have clay bridges and coats; very friable or loose between the lamellae; few fine roots to a depth of 38 inches; neutral to slightly acid; abrupt, wavy boundary. 28 to 48 inches thick.

IIC—48 to 55 inches, dark-brown (7.5YR 3/2) to very dark grayish-brown (10YR 3/2), medium and coarse, water-rounded sand; common fine gravel; single grain; loose; neutral.

The thickness of the solum ranges from 40 to 60 inches. Colors below the plow layer range from 10YR to 5YR, the silty bands generally having redder hues. The texture is dominantly fine and very fine sandy loam. In places there are a few thin strata of medium sand. Thin bands of silt occur in places, but these do not exceed 30 percent of the B horizon. Also, in a few places there are bands of reddish-brown clay up to ½ inch thick, but the total thickness is less than 6 inches of the B horizon or upper 36 inches of the profile. The reaction of the A and B horizons ranges from strongly acid to mildly alkaline. The lime content increases with depth, and the profile is calcareous below a depth of 40 inches.

Arkport soils are in a drainage sequence with moderately well drained Galen, somewhat poorly drained Minoa, and poorly drained to very poorly drained Lamson soils. Arkport soils have a higher sand and lower silt and clay content than Dunkirk soils, and they lack the continuous B horizon characteristic of those soils. They are not so sandy as Colonie soils, which have a loamy fine sand to very fine sand profile. Also, Colonie soils have less than 6 inches of bands of fine or very fine sandy loam in the B horizon to a depth of 36 inches. Arkport soils are higher in lime content than Colonie soils.

Arkport fine sandy loam, 1 to 6 percent slopes (AtB).—This soil has the profile described as typical of the series. Most areas are undulating. Included in mapping were Galen and Minoa soils in small depressions or along drainageways. These wetter soils make up as much as 10 percent of some areas. Also included were spots of the siltier Dunkirk soils and the gravelly Palmyra and Alton soils.

This soil is suited to crops, pasture, or forest. Most of it is cleared and farmed. It is low to moderately low in moisture-holding capacity, moderate in fertility, and moderate in lime content. It is used for most crops common to the county and is especially well suited to early truck and garden crops.

Control of water erosion and, in places, wind erosion is a moderate problem. Fertilization is needed. Specialized truck crops and garden crops show a good response to heavy fertilization and to irrigation.

This soil has slight to moderate limitations for most nonfarm uses that require good drainage. (Capability unit IIe-4; woodland group 6a)

Arkport fine sandy loam, 6 to 12 percent slopes (AtC).—Most areas of this soil have rolling or undulating, short, complex slopes. Only a few small areas have smooth, simple slopes. Included in mapping were spots of silty Dunkirk soils and spots of gravelly Palmyra or Alton soils, any one of which occupies as much as 10 percent of some areas. Other inclusions were wet spots of Galen and Minoa soils in the bottoms of small depressions or along drainageways.

This soil is used for crops, pasture, or forest. Some of it is idle. It is a somewhat droughty soil that has moderately low moisture-holding capacity and low fertility. It is subject to severe water erosion and, in places, it is eroded by wind. Because of the undulating or rolling topography, erosion control measures needed for row crops are difficult or impractical to apply. There is a potential for land smoothing. Fertilization, erosion control, and irrigation are needed, and crops respond well to these practices. Deep-rooted legumes are suitable hay and pasture crops.

Slope is the main limitation of this soil to most nonfarm uses that require good drainage. (Capability unit IVe-11; woodland group 6a)

Arnot Series

The Arnot series consists of shallow, well drained and moderately well drained soils that formed in semi-residual material or frost-fractured material derived from underlying, acid, fine-grained sandstone. These soils show little or no glacial till influence. They are inextensive and occur on the crests of the highest hills in the southern part of the county.

In a cultivated area, a typical profile has a dark grayish-brown channery silt loam plow layer about 7 inches thick. Just below is a friable, yellowish-brown to light olive-brown channery silt loam subsoil. The depth to gray sandstone bedrock is about 17 inches. There are a few mottles in the subsoil just above the bedrock. The solum is strongly acid.

Typical profile of Arnot channery silt loam, 3 to 15 percent slopes, in a formerly cultivated field:

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. 4 to 8 inches thick.

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 lowest 2 inches; weak, very fine, fine, and medium, subangular blocky structure; friable when moist, nonsticky when wet; strongly acid; many fine and medium roots; abrupt, wavy boundary. 2 to 16 inches thick.

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

The thickness of the solum and depth to bedrock range from 10 to 20 inches. The A1 or Ap horizon ranges from very dark grayish brown to dark brown in color and from silt loam to loam in texture. The content of flat, angular stone fragments is 10 to 35 percent. The subsoil, or B2 horizon, has colors ranging from 7.5YR to 5Y in hue, 4 to 6 in value, and 3 to 6 in chroma. Some areas have high-chroma mottles in the 2 or 3 inches above bedrock. The reaction ranges from strongly to very strongly acid. The coarse fragments range from 10 to 35 percent in volume and consist mainly of angular, flat stones. The underlying bedrock is gray, fine-grained sandstone or brittle, acid shale.

Arnot soils are in a drainage sequence with somewhat poorly drained Tuller soils. They occur with the deeper Langford, Lordstown, Erie, and Ellery soils, but they lack the fragipan that is characteristic of the Langford soils.

Arnot channery silt loam, 3 to 15 percent slopes (AuC).—This soil has a profile that is typical of the series. It is on the crests of the highest hills in the county, and there are occasional outcrops of gray sandstone bedrock. Included in mapping were areas of Lordstown or Langford soils, which are more than 20 inches in depth to bedrock. Also included were a few small wet spots of Tuller soils.

Shallowness and low water-holding capacity limit the use of this soil. Some areas are used for pasture. Many cleared areas are idle and are reverting to woods or are being reforested. Crop yields are limited by drought and a short growing season. Although erosion is generally slight, it should be controlled because of the shallowness.

This soil should be kept in vegetation in order to control erosion. It generally produces low yields of cultivated and forage crops, even though lime and fertilizer have been liberally applied.

Shallowness and slope are the main limitations to most nonfarm uses. (Capability unit IVe-4; woodland group 14a)

Arnot channery silt loam, 15 to 25 percent slopes (AuD).—Most slopes of this soil are moderately short. Included in mapping were areas of Lordstown soils, which are more than 20 inches in depth to bedrock. These inclusions make up as much as 20 percent of some areas but have little effect on management. Included also were some areas less than 10 inches in depth to bedrock, areas of rock outcrop or ledges, and areas that have been cleared and are severely eroded.

Use of this soil is limited by shallowness to rock and steepness of slope. Most of the acreage that has been cleared is now in scrubby timber or is idle. Very little is used for pasture or crops. Yields are low, even if lime and fertilizer are liberally applied. Some areas are covered with brush, which provides good food and cover for wildlife.

Runoff is rapid, and erosion is a hazard. This soil should be kept in vegetation as a protection against erosion. (Capability unit VIe-2; woodland group 14b)

Arnot soils, 25 to 45 percent slopes (AvE).—These soils lack the mottles that are typical of the series. They commonly are 10 to 20 inches in depth to bedrock, but the depth varies considerably. In places there are outcrops of bedrock on the surface, but within 10 to 15 feet of the outcrops, the depth to bedrock is more than 40 inches. Included in mapping were Lordstown soils and moderately shallow Langford soils that are 20 to 40 inches deep and account for as much as 25 percent of some areas. Also included were some areas that have been cropped and are moderately to severely eroded.

Most areas are forested, and most areas that have been cropped are now idle or are used for pasture. The idle areas are in brush that provides food and cover for wildlife. The slopes are so steep that they limit or prohibit the use of farm machinery. The pastures are too steep to manage; consequently, forage yields are low. Runoff is rapid, and erosion is a serious hazard unless a good vegetative cover is maintained.

Slope and shallowness to bedrock are the main limitations to nonfarm use. (Capability unit VIIs-1; woodland group 14b)

Aurora Series

The Aurora series consists of moderately deep, moderately well drained to well drained soils that formed in glacial till and in residuum from alkaline to calcareous, dark-gray to black silty shale. These soils are commonly intermingled with Honeoye soils. Most areas are south of Auburn and are below an elevation of 1,400 feet.

In a cultivated area, a typical profile has a dark-gray silt loam plow layer about 8 inches thick. This layer is underlain by leached, friable, brown silt loam that extends to a depth of 13 inches. Below this is the upper part of the subsoil, which is friable to firm, dark-brown to very dark grayish-brown, coarse, mottled silty clay loam. At a depth of 25 inches this merges with a lower layer of the subsoil or with the substratum, either of which consists of friable shaly silt loam or shaly silty clay loam. This material is mottled with dark grayish brown, brown, light olive brown, and olive brown. It is underlain at a depth of 32 inches by thinly bedded, very dark gray and dark gray shale bedrock. The shale is alkaline to weakly calcareous. The reaction of the subsoil or substratum is neutral.

Typical profile of Aurora silt loam, 2 to 6 percent slopes, in a cultivated field:

Ap—0 to 8 inches, dark-gray (10YR 4/1) silt loam; dark grayish brown (10YR 4/2) when rubbed, strong, medium and coarse, granular structure; friable when moist, nonsticky when wet; neutral; abrupt, smooth boundary. 7 to 9 inches thick.

A2—8 to 13 inches, brown (10YR 5/3) silt loam; brown to yellowish brown (10YR 5/3-5/4) when rubbed; moderate, fine and medium, subangular blocky structure; friable when moist, nonsticky when wet; slightly acid; clear, wavy boundary. 4 to 6 inches thick.

B2t—13 to 25 inches, dark-brown (10YR 3/3) to very dark grayish-brown (10YR 3/2) coarse silty clay loam; common, medium, distinct, yellowish-brown (10YR 5/6) and light-gray (10YR 7/2) mottles; some shale fragments; moderate, medium and coarse, angular blocky and subangular blocky structure; friable to firm when moist, slightly sticky when wet; distinct, dark-brown (10YR 3/3) clay films on ped faces and in pores; neutral; clear, wavy boundary. 5 to 17 inches thick.

B3 or C—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 coarse silty clay loam to shaly fine silt loam; common, fine and medium, distinct, yellowish-brown, light olive-brown, and light-gray mottles; moderate, fine and medium, angular blocky and subangular blocky structure; friable when moist, slightly sticky when wet; thin clay films in pores and on vertical ped faces; neutral; clear, wavy boundary. 4 to 8 inches thick.

R—32 to 40 inches, black (10YR 2/1), very dark gray (10YR 3/1), and dark-gray (10YR 4/1), fissile shale bedrock, thinly bedded; alkaline to weakly calcareous.

The thickness of the solum and depth to bedrock range from 20 to 40 inches. Depth to mottling ranges from 12 to 24 inches, and in the more steeply sloping areas, mottling occurs in the 2- to 3-inch zone just above bedrock.

The surface layer in most uneroded areas is silt loam and contains only a minor amount of shale fragments. The texture ranges from loam to light silty clay loam, however, and some areas are very shaly. The reaction in unlimed areas is very strongly acid to neutral.

The B horizon ranges from heavy silt loam to coarse silty clay loam in texture and from 18 to 35 percent in clay content. The colors are mainly dark brown (10YR 4/3 to 3/3) and olive brown (2.5Y 4/4), but where the reaction is more acid, the color is brown (10YR 5/3 to 7.5YR 5/4). The reaction ranges from strongly acid to mildly alkaline. Some areas are calcareous below a depth of 30 inches.

The shale bedrock is commonly soft and weathered in the upper 12 inches.

Aurora soils are in a drainage sequence with somewhat poorly drained Angola soils and poorly drained Varick soils. They are deeper than Farmington soils. They have a higher lime content than Lordstown soils and a higher clay content in the B horizon.

Aurora silt loam, 2 to 6 percent slopes (AwB).—This soil has a profile typical of the series. It has convex slopes that receive little or no runoff from higher areas. Included in mapping were somewhat poorly drained Angola soils in depressions or along bottoms of drainageways. These wetter soils, though not extensive, delay field operations in spring and during wet periods. Also included were small areas of Honeoye, Cazenovia, and Lima soils, which are more than 40 inches in depth to bedrock, and small areas of Farmington soils, which are less than 20 inches in depth to bedrock. The shallower soils are droughty spots in cultivated fields.

This soil is well suited to crops, pasture, and forest. Most of it is used for corn, small grains, hay, and vegetables.

Removal of excess water and control of erosion are needed. Random drainage of the wet spots is desirable in many fields. Lime requirements range from none to moderate. The nitrogen supply is deficient in spring. Potassium and phosphorus are needed. The response to fertilizer is good.

Slow permeability and the 20- to 40-inch depth to bedrock are the main limitations for nonfarm use. (Capability unit IIe-10; woodland group 6a)

Aurora silt loam, 6 to 12 percent slopes (AwC).—This soil has convex slopes that, in places, receive a moderate amount of runoff from higher areas. Included in mapping were Honeoye, Cazenovia, and Lima soils, which are more than 40 inches in depth to bedrock, and small areas of Farmington soils, which are less than 20 inches to bedrock. The wetter Angola soils are minor inclusions along the bottom of narrow drainageways or in seep spots.

This soil is well suited to crops, pasture, or forest. Some of it is used for crops, but most of it is still forested or used for pasture. Suitable crops are corn, small grains, hay, and vegetables.

Control of erosion is important because runoff is moderate to rapid. Random drainage of the few wet spots is desirable in some fields. Lime requirements range from none to moderate, and a complete fertilizer is needed. This soil is productive if well managed.

Slope, variable depth to bedrock, and slow permeability are the main limitations for nonfarm use. (Capability unit IIIe-6; woodland group 6a)

Aurora silt loam, 6 to 12 percent slopes, eroded (AwC3).—This soil is similar to Aurora silt loam, 6 to 12 percent slopes, but about 75 percent or more of the area is eroded. Included in mapping were small areas of Honeoye, Cazenovia, and Lima soils, which are more than 40 inches in depth to bedrock, and small areas of Farmington soils, which are less than 20 inches deep to bedrock. Spots of the wetter Angola soils occur along the bottoms of narrow drainageways and in seep spots. Also included were a few areas where gullies have cut into the shale bedrock, some areas that have lost little or no soil, and other areas where eroded soil material has accumulated, as along fences or hedges.

In most of the eroded places, the plow layer includes some of the more clayey subsoil. In the most severely eroded places, the plow layer consists mainly of subsoil material. The plow layer is more shaly than that of the uneroded Aurora soils because fine material has been removed by erosion. It also is lower in organic-matter content, absorbs water more slowly, and has less water-holding capacity. Consequently, it is droughty. The depth to the underlying shale bedrock is 4 to 12 inches less than in the uneroded soils. Also, runoff is more rapid, and continuing erosion is a greater hazard.

This soil is suited to crops, pasture, or forest. All of it has been cleared and cultivated. It is better suited to legumes and other sod-forming crops, but corn, small grains, and vegetables are grown.

Runoff is rapid, and control of erosion is the most important management problem. Random drainage of the wet spots is desirable in many fields.

This soil is lower in potassium and phosphorus and much lower in nitrogen than uneroded Aurora soils. The response is moderately good if the soil is heavily fertilized and otherwise well managed.

Slope, depth to bedrock, and slow permeability are the main limitations for nonfarm use. (Capability unit IVe–10; woodland suitability group 6b)

Aurora silt loam, 12 to 18 percent slopes, eroded (AwD3).—A profile of this soil is like the one described for the series, except that it contains fewer gray mottles. Most of the acreage has been cultivated and is severely eroded. From 6 to 12 inches of soil has been lost on 75 percent or more of any area. Included in mapping were some areas in which gullies have cut into the shale bedrock and a few uneroded areas that are still in woods or pasture. Also included were small areas of Farmington soils that are less than 20 inches in depth to bedrock and small areas of Cazenovia and Honeoye soils that are more than 40 inches in depth.

Because of the slope, the hazard of continuing erosion is severe. Most areas are better suited to hay, pasture, or forest.

This soil loses much runoff during heavy rains and is considerably more droughty than the less sloping Aurora soils. Lime requirements range from none to moderate. Fertilization is required for hay and pasture.

Steepness of slope, depth to bedrock, and slow permeability are the main limitations for most nonfarm uses. (Capability unit VIe–1; woodland group 6c)

Aurora silt loam, 18 to 30 percent slopes (AwE).—A profile of this soil is similar to the one described for the series but has fewer gray mottles. Included in mapping were areas of shallow Farmington soils, in which there are occasional rock outcrops. These inclusions make up as much as 20 percent of any given area. Also included were a few small areas of Honeoye and Cazenovia soils, which are more than 40 inches in depth to bedrock.

This soil is used mainly for forest or pasture. Most of the pasture is unimproved and brushy because the slope makes improvement difficult. Erosion is a very serious hazard if this soil is cultivated, and most of the acreage is too steep to be cultivated safely. Cultivated areas are severely eroded.

Steepness of slope, shallowness, and slow permeability are the main limitations to most nonfarm uses. (Capability unit VIe–1; woodland group 6c)

Aurora silt loam, limestone substratum, 2 to 8 percent slopes (AxB).—A profile of this soil differs from the one described for the series in being underlain by limestone instead of shale. In addition it lacks the gray mottles of the typical profile because fissures in the limestone allow good internal drainage. It also is generally redder in color. The slopes are mainly smooth, but there are short, sharp breaks along narrow rock escarpments. Included in mapping were areas of Benson soils, which are less than 20 inches to bedrock, and areas or spots of Cazenovia soils, which are more than 40 inches to bedrock.

This soil occurs mostly at elevations below 800 feet and is suitable for growing the longer season crops adapted to the county. It is well suited to crops, pasture, and forest, and it can be used for some vegetable crops. The occasional limestone outcrops hinder tillage. Most areas are used for corn, small grains, hay, and forage crops in support of dairying.

This soil is moderately susceptible to erosion. Some areas need lime for legumes, and all areas need complete fertilizer.

Some areas are in urban use. Bedrock and slow permeability are the main limitations for most nonfarm uses. (Capability unit IIe–10; woodland group 2a)

Aurora and Farmington shaly silt loams, 12 to 18 percent slopes (AyD).—The soils of this undifferentiated unit have a profile similar to the one described for their respective series. This unit occurs as scattered areas on valley sides in the southern part of the county. The bedrock forms a series of steps that are covered by a mantle of soil mostly 10 to 40 inches deep, although the depth ranges from none to as much as 4 or 5 feet within short distances. In most places the surface layer contains a high percentage of shale fragments.

The degree of erosion varies. Many areas that have been cultivated are severely eroded and have gullies that cut as much as a foot into the shale bedrock.

This unit can be used for crops, pasture, or forest but is better suited to hay and forage crops. Tillage is difficult because of the many rock outcrops and the steepness of slope. The response to lime and fertilizer is only moderate. Much of this unit is forested or idle, and many of the severely eroded idle areas are slowly reverting to forest. The pasture is generally of low quality, and growth is good only during the early part of the season.

Because of severe erosion hazard, these soils should be used for crops only when necessary. Hay crops should be limed and fertilized to maintain a good vegetative cover.

Bedrock, slope, and variable permeability are the main limitations for most nonfarm uses. (Capability unit IVe–4; woodland group 9b)

Aurora and Farmington shaly silt loams, 18 to 40 percent slopes (AyE).—Each soil of this undifferentiated unit has a profile similar to the one described for its series. This unit is fairly extensive and occurs on valley sides in the southern half of the county. The largest areas are on the west side of Owasco Valley northwest of Moravia, and on the west side of Skaneateles Lake.

The underlying bedrock forms a series of steps that are covered by a mantle of soil mostly 10 to 40 inches deep, although the depth ranges from none to as much as 4 or 5 feet within short distances. In most places the soil contains a high percentage of shale and flat sandstone fragments of varying sizes.

The degree of erosion varies. Most areas are still forested and uneroded. The few areas that have been cleared and cropped are severely eroded. Most of these are now idle and are reverting to brush and forest. A few produce pasture of low quality.

These soils are better suited to forest and to wildlife habitat than to pasture. They are too steep for the use of farm machinery, and their yields of hay and pasture are low even if they are limed and fertilized. The growth of timber is good despite the steep slopes.

Steepness of slope, shallowness to bedrock, and variable permeability are the main limitations to nonfarm use. (Capability unit VIe–2; woodland group 9c)

Aurora, Farmington and Benson very rocky soils, 20 to 70 percent slopes (AzF).—Each soil of this unit has a profile similar to the one described for its series, but there are more bedrock ledges and outcrops. These soils are in deep gorges formed by streams that cut into bedrock of different kinds. Most of the streams flow into Cayuga, Owasco, and Skaneateles Lakes. In these gorges the bedrock is shale and interbedded limestone. In a few gorges at higher elevations, the bedrock is shale and sandstone and is more acid in reaction. Some of the rock outcrops form bluffs along the lake shores.

Ledges of Onondaga limestone crop out near Auburn. Between the ledges are small pockets of moderately shallow Ontario soils.

The thickness of soil in the gorges ranges from none to pockets of deep soil. Most areas have enough soil and receive enough seepage water to support a fair to good growth of vegetation, mainly trees.

These soils can be used for forest, wildlife habitat, or recreation sites. If logging operations are performed, special measures are required to control erosion. The gorges vary so in their potential for recreation sites that onsite investigation is needed. Many of the large gorges have scenic waterfalls. (Capability unit VIIs–1; woodland group 16)

Benson Series

The Benson series consists of well-drained to excessively drained soils that are shallow over limestone bedrock. These soils formed in residuum weathered from limestone or in a very thin smear of glacial till derived from limestone. They are mostly near Auburn where there are outcrops of the Onondaga limestone. A few small areas occur where there are outcrops of Lockport dolomite and Tully limestone.

In a cultivated area, a typical profile has a brown loam plow layer 7 inches thick. This layer is underlain by brown and dark-brown loam that is friable to very friable. The depth to gray or bluish-gray limestone bedrock is about 18 inches. The reaction of the subsoil is slightly acid to mildly alkaline.

Typical profile of Benson loam, 1 to 8 percent slopes, in a formerly cultivated field:

Ap—0 to 7 inches, very dark grayish-brown (10YR 3/2) loam; moderate, fine, granular structure; friable to very friable when moist, nonsticky when wet; very numerous fine and medium roots; neutral; gradual, wavy boundary. 6 to 8 inches thick.

B21—7 to 16 inches, brown to dark-brown (7.5YR 4/4) loam; moderate, fine and medium, subangular blocky structure breaking to moderate, fine granules; very numerous medium pores in peds; vertical faces of peds in upper 2 inches have organic stains from overlying horizon; many large worm channels lined with very dark grayish-brown (10YR 3/2) silt films; friable to very friable when moist, nonsticky when wet; many fine roots; slightly acid; gradual, broken boundary. 4 to 12 inches thick.

B22—16 to 18 inches, dark-brown (7.5YR 4/2) loam; moderate, fine and medium, subangular blocky structure breaking to weak, fine granules; numerous medium pores in peds; thin, discontinuous clay films on ped faces and in largest pores; many large wormholes; many fine roots; friable when moist, nonsticky when wet; mildly alkaline; abrupt, broken boundary. 0 to 4 inches thick.

R—18 to 60 inches +, limestone bedrock, gray to bluish gray in color; upper 2 feet highly shattered and partly weathered; silt loam in many of the cracks and larger fissures; many fine roots in silt loam; below the shattered rock the limestone is massive and is stratified with layers 4 to 10 inches thick; vertical cracks and fissures are at intervals of 2 to 6 feet.

The thickness of the solum and depth to bedrock range from 10 to 20 inches. The texture of the Ap horizon is mainly loam but ranges from fine sandy loam to silt loam. The texture of the B horizon ranges from fine sandy loam to heavy silt loam, and the maximum clay content is 35 percent. Chert, channers, and flags make up 5 to 36 percent of the solum by volume. The color of the Ap horizon ranges from dark brown (7.5YR 3/2) to brown (10YR 4/3), and that of the B horizon ranges from reddish brown (5YR 4/3) to pale brown (10YR 6/3). The reaction is slightly acid to calcareous.

Benson soils occur with deeper Ontario, Cazenovia, and Honeoye soils but lack the distinct clay increase in the B horizon that is characteristic of those soils. Benson soils contain more lime than the shallow Arnot and Farmington soils, which are derived from shale and fine-grained sandstone.

Benson loam, 1 to 8 percent slopes (BeB).—This soil has the profile described as typical of the series. Most areas are gently sloping or undulating, although some fairly large areas are nearly level. The drainage is generally good because of subsurface drainage through fissures in the limestone. The depth to bedrock is 10 to 20 inches. Included in mapping were areas in which the depth is less than 10 inches and areas of moderately shallow Ontario silt loam in which the depth is more than 20 inches. Rock outcrops are few to common and occupy as much as 2 percent of an area.

This soil is suited to crops, pasture, and forest. Because of the limited water-holding capacity, it is better suited to early, short-season crops and pasture than to late-maturing crops. The shallowness to bedrock interferes with tillage. Erosion is only a minor hazard.

The response to fertilization and other management is only moderate. Lime requirements are none or very low.

Shallowness to bedrock is the main limitation to nearly all nonfarm uses. (Capability unit IIIs-2; woodland group 10a)

Benson loam, 8 to 14 percent slopes (BeC).—A profile of this soil is similar to the one described as typical of the series. The depth to bedrock is generally less than 20 inches. Included in mapping were areas of moderately shallow Ontario soils and areas of Aurora soils that are more than 20 inches deep to limestone bedrock. These deeper soils occupy as much as 20 percent of some areas but have little effect on management. Rock outcrops are common to many and occupy from 2 to 10 percent of some areas. Drainage is good because of subsurface drainage through fissures in the bedrock.

This soil is too droughty and shallow for most crops. It is suited to hay, pasture, and forest. The pasture is good early in spring but usually becomes short early in summer. Erosion is a hazard if this soil is tilled. The lime requirement is none to low. (Capability unit IVe-4; woodland group 10a)

Benson very rocky loam, 2 to 20 percent slopes (BkD).—This soil is predominantly shallow, and it is broken by many outcrops of limestone bedrock. The outcrops occupy 10 to 25 percent of most areas and as much as 90 percent of some small areas. In most areas bedrock is at a depth of less than 20 inches. There are a few spots that are deeper and less rocky.

This soil occurs within areas of Benson loam, moderately shallow Ontario silt loam, and Aurora silt loam over limestone. Most of the larger areas are long and narrow and are along the sides and tops of bedrock escarpments.

This soil is suited to forest or to wildlife habitat. The pasture is brushy, of poor quality, and too rocky to manage. Shallowness to bedrock and steepness of slope are the main limitations to most nonfarm uses. (Capability unit VIs-3; woodland group 10b)

Brockport Series

The Brockport series consists of moderately deep, somewhat poorly drained soils that formed in congeliturbate or residuum weathered from soft Salina shale. The shale is alkaline and calcareous. These soils have inherited the color and texture of the greenish-gray and olive-gray, fine-textured shale.

In a cultivated area, a typical profile has a gray to grayish-brown silty clay loam plow layer about 8 inches thick. The upper part of the subsoil is extremely firm, greenish-gray to dark greenish-gray clay to silty clay, prominently mottled. At a depth of about 17 inches it overlies extremely firm to hard silty clay that has inherited strong, platy structure from the weathered underlying bedrock. The silty clay is pale yellow in the upper part and grades to prominently mottled greenish gray in the lower part. At a depth of about 28 inches is partly weathered clay shale that is light yellowish brown, olive gray, and greenish gray. The reaction of the subsoil ranges from neutral to weakly calcareous.

Typical profile of Brockport silty clay loam, 2 to 6 percent slopes, in a cultivated field:

Ap—0 to 8 inches, gray (10YR 5/1) to grayish-brown (10YR 5/2) silty clay loam; moderate, medium and coarse, subangular blocky and angular blocky structure; firm when moist, slightly sticky when wet; slightly acid; abrupt, wavy boundary. 7 to 9 inches thick.

B2tg—8 to 17 inches, greenish-gray (5GY 5/1) to dark greenish-gray (5GY 4/1) clay to silty clay; common, medium, prominent, olive (5Y 5/6), light olive-brown (2.5Y 5/6), dark-brown (7.5YR 3/2), and dark reddish-brown (5YR 3/2) mottles; strong, coarse, prismatic structure breaking to moderate, platy structure and coarse blocky structure; prominent, olive-gray (5Y 5/2) clay films on vertical block and prism faces; extremely firm when moist, very sticky and plastic when wet; neutral; abrupt, wavy boundary. 6 to 16 inches thick.

B31—17 to 19 inches, pale-yellow (2.5Y 8/4–7/4) silty clay from nearly completely weathered bedrock; strong, very thick, platy structure; extremely firm when moist, nonsticky when wet; weakly calcareous. (Appears to be a thin layer of slightly more resistant rock than the horizon below.) Discontinuous to as much as 3 inches thick.

B32 or C2—19 to 28 inches, greenish-gray (5GY 5/1) silty clay; common, fine, prominent, olive (5Y 5/6), light olive-brown (2.5Y 5/6), dark-brown (7.5YR 3/2), dark reddish-brown (5YR 3/2), and yellowish-red (5YR 4/8) mottles; strong, coarse, prismatic structure breaking to strong, thick and very thick, platy structure, further breaking to moderate, coarse, blocky structure; greenish-gray (5GY 5/1) clay films on vertical faces of peds; extremely firm to hard; weakly calcareous; abrupt, wavy boundary. 7 to 12 inches thick. (Appears to be highly weathered bedrock with coarse and very coarse, prismatic structure as a result of vertical cracks 5 to 12 inches apart.)

R—28 to 60 inches, interbedded layer of light yellowish-brown to yellow (2.5Y 6/4 to 7/6), olive-gray (5Y 5/2), and greenish-gray (5GY 5/1 and 5G 5/1) soft shale bedrock that ranges from clay to silty clay and varies in degree of weathering and oxidation; weakly calcareous; gradually hardens with depth.

The thickness of the solum ranges from 20 to 40 inches. The texture of the Ap horizon normally ranges from silty clay loam to clay loam, but there are some areas of silt loam in which there is a thin smear of medium-textured till or lacustrine material. The texture of the B horizon ranges from silty clay to clay, and the content of clay is 35 to 55 percent. The hue ranges from 2.5Y to 5G.

The depth to shale bedrock generally is 20 to 40 inches, but in places it is as much as 48 inches, and the upper 1 to 3 feet of shale is soft and highly weathered. The reaction of the Ap horizon ranges from medium acid to neutral; that of the B horizon from slightly acid to calcareous.

Brockport soils are in a drainage sequence with well drained and moderately well drained Riga soils. Brockport soils are finer textured than Angola soils and have a distinct olive-gray and greenish-gray B horizon. They differ from Lockport soils, their most common associates, in having a gray color instead of red.

Brockport and Lockport silty clay loams, 2 to 6 percent slopes (BlB).—Each of these soils has a profile typical of its series. These soils adjoin slightly higher, more strongly sloping Riga and Lairdsville soils, from which they receive considerable runoff. Areas of poorly drained Lakemont soils along drainageways and in shallow depressions were included in mapping. Small areas of Riga and Lairdsville soils on slight knolls and rises were also included.

These are very slowly permeable soils because of their high clay content. Consequently, the steeper the slope, the better drained these soils are, as they are dependent on surface drainage. Erosion is a severe hazard on the steeper slopes.

These soils can be used for crops, pasture, and forest.

They are better suited to hay and forage crops that can stand moderate wetness. They are cold, late soils, very difficult to work. They have been called "sledge hammer" soils because one man plowed, and another followed with a sledge to "bust" the clods.

Slow permeability, seasonal wetness, and shallowness to bedrock are the main limitations to most nonfarm uses. (Capability unit IIIw-7; woodland group 11)

Camillus Series

The Camillus series consists of moderately deep, well-drained soils that formed in semiresidual material weathered from soft, silty shale and influenced to a limited extent by glacial till. The shale generally weathers rapidly, but there are variations in the rate. As a result, some profiles have layers of highly weathered soil material alternating with layers of less weathered material to a depth of 60 inches or more. The shale is weakly calcareous and has a high content of gypsum. It is porous and thus allows moderate to rapid internal drainage. Camillus soils occur mainly in a narrow, east-west belt south of Seneca and extending through Weedsport and Port Byron. They are gently undulating to hilly.

In a cultivated area, a typical profile consists of friable silt loam underlain by bedrock at a depth of 36 inches. The plow layer is dark grayish brown and about 10 inches thick. The subsoil grades from yellowish brown through brown to gray with depth. Below 16 inches it contains a few partly weathered shale fragments. It has a slightly acid to neutral reaction. At a depth of 22 inches is the dark, grayish-brown substratum, which contains a noticeable amount of shale fragments. It has a platy structure inherited from the underlying silty shale. The bedrock is grayish-brown, calcareous shale.

Typical profile of Camillus silt loam, 2 to 6 percent slopes, in a cultivated field:

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) silt loam; brown to dark brown (10YR 4/3) when rubbed; moderate, medium and coarse, subangular blocky structure breaking to moderate, medium and fine, granular structure; friable when moist, slightly sticky when wet; many fine and medium roots; many medium and large pores; neutral; abrupt, wavy boundary. 7 to 10 inches thick.

B2—10 to 16 inches, yellowish-brown (10YR 5/4) silt loam; light grayish brown (10YR 6/2) when dry; moderate, medium and coarse, subangular blocky structure breaking to weak, fine and medium, granular structure; friable when moist, slightly sticky when wet; many fine roots; many medium and large pores; no clay film observed in pores; slightly acid; clear, wavy boundary. 3 to 10 inches thick.

B3—16 to 22 inches, brown (10YR 5/3) silt loam, grading to gray (10YR 5/1) in the lower part; very weak, thick, platy structure breaking to fine and medium, angular and subangular blocky structure; friable when moist, slightly sticky when wet; many fine roots; many medium and large pores; few partly weathered fine shale fragments; neutral; clear, wavy boundary. 5 to 10 inches thick.

C—22 to 36 inches, dark grayish-brown (10YR 4/2) silt loam grading to grayish brown (10YR 5/2) with depth; common partly weathered fine shale fragments; residual platiness that breaks to weak, medium and coarse, subangular blocky structure; friable when moist, slightly sticky when wet; many fine roots to a depth of 24 inches, and common fine roots to a depth of 24 to 36 inches; many large pores; weakly calcareous. 6 to 18 inches thick.

R—36 inches +, grayish-brown (10YR 5/2), soft, partly disintegrated, calcareous silty shale bedrock.

The thickness of the solum ranges from 18 to 30 inches, and the depth to soft shale bedrock from 20 to 40 inches. Fine, partly weathered shale fragments are common in the lower B horizon and the C horizon. The clay content is 18 to 24 percent, and the content of the soil material coarser than very fine sand, including coarse fragments, is 15 to 20 percent.

The color of the Ap horizon ranges from very dark gray to grayish brown in hues of 10YR and 2.5Y. The texture is dominantly silt loam but ranges to loam and very fine sandy loam. The structure ranges from moderate, coarse, subangular blocky to moderate, fine, granular.

The color of the B horizon ranges from yellowish brown to grayish brown in hues of 10YR and 2.5Y. In some places, a few strong-brown (7.5YR 5/6) and yellowish-brown (10YR 5/6) mottles are present below a depth of 15 inches. The texture is silt loam, and there are few to common shale fragments in the lower part. The structure is dominantly moderate, medium and coarse, subangular blocky. The consistence is friable to very friable. The reaction ranges from medium acid to neutral.

The color of the C horizon ranges from dark grayish brown (10YR 4/2) to dark yellowish brown (10YR 4/4) and brown (7.5YR 4/4). The texture is silt loam, and there are common fine shale fragments. The reaction ranges from neutral to weakly calcareous. The bedrock is soft, weakly calcareous shale, weathered to a depth of 6 to 8 feet.

Camillus soils have no drainage associates in this county. There are moderately well drained or somewhat poorly drained soils that occur in depressions among the Camillus soils, but they are in a drainage sequence with Lima and Kendaia soils.

Camillus silt loam, 2 to 6 percent slopes (CaB).—This soil has the profile described as typical of the series. It commonly occurs as gently undulating landforms with short, convex slopes between drumlins. Only a few areas have uniform slopes. Included in mapping were Ontario soils, which make up as much as 20 percent of any given area. Also included were Riga and Lairdsville soils, which occur as small clay spots, and Lima and Kendaia soils which are occasional wet spots.

This soil is well suited to crops, pasture, and trees, and most of it is used for crops. It is one of the better soils for alfalfa and can be used for corn, small grains, hay, and vegetables. The degree of erosion ranges from slight to moderate.

Control of erosion is the major problem. Fertilizer is needed. The supply of potassium and phosphorus is moderate, and that of nitrogen is low. The lime requirement is none to moderate.

Slope and shallowness to bedrock are the main limitations to most nonfarm uses requiring good drainage. (Capability unit IIe-1; woodland group 1a)

Camillus silt loam, 6 to 12 percent slopes, eroded (CaC3).—A profile of this soil is like the one described for the series, except that much of this soil is severely eroded. It commonly occurs as small areas surrounded by more nearly level Camillus soils. Only a few areas have uniform slopes. The degree of erosion varies. The short, convex slopes are severely eroded; the small, nearly level hilltops are slightly eroded; and the narrow depressions and sags contain deposits of the eroded soil. Gray, soft silty shale fragments are common on the surface of eroded areas. Areas of Ontario soil were included in mapping. Also included were a few, small, uneroded areas, mainly in woods. Drainage is generally good. There are only a few small wet spots in the deeper depressions.

This soil is suited to crops, pasture, and forest. It is better suited to long-term forage crops than to row crops. Most of it is used for corn, small grains, hay, and vegetables. It is one of the better soils for alfalfa. Erosion is a severe hazard.

Control of erosion is the major problem. Contour tillage is impractical in most areas. Fertilization is needed for all crops. The lime requirement ranges from none to moderate.

Slope and shallowness to bedrock are the main limitations to nonfarm use requiring good drainage. (Capability unit IVe–2; woodland group 1a)

Canandaigua Series

The Canandaigua series consists of poorly drained, medium-textured soils that formed in lake-deposited, calcareous to alkaline silt and very fine sand. These soils occur as level or depressional landforms in the lake plains. They are scattered over the northern half of Cayuga County and in a few low depressions in the till plain in the southern half, mainly with soils of the Honeoye drainage sequence.

A typical profile in a cultivated area has a very dark gray to black silt loam plow layer about 9 inches thick. This layer is underlain by a 3-inch leached layer of very friable, light-gray silt loam that is mottled. The upper part of the subsoil is friable, light brownish-gray, mottled silt loam. At a depth of 19 inches, it merges with light-brown, mottled, friable silt loam. The reaction of the subsoil ranges from neutral in the upper part to weakly calcareous in the lower part. The substratum of calcareous, stratified silt and very fine sand is at a depth of about 27 inches.

Typical profile of Canandaigua silt loam in a cultivated field:

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; friable; many fine roots; neutral; abrupt, smooth boundary. 7 to 10 inches thick.

B21g—9 to 12 inches, light-gray (10YR 7/2) coarse 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) ped faces; very friable; many fine roots; neutral; clear, irregular boundary. 1 to 7 inches thick.

B22g—12 to 19 inches, light brownish-gray (10YR 6/2) silt loam; many (30 percent), medium, distinct, light-gray (10YR 7/2) and strong-brown (7.5YR 5/6) mottles; moderate, fine and medium, blocky structure within weak, very coarse prisms that have light-gray (10YR 7/2) silty faces; friable; few fine and medium roots; neutral; clear, wavy boundary. 5 to 10 inches thick.

B3g—19 to 27 inches, light-brown (7.5YR 6/4) coarse silt loam; common, medium, distinct, light-gray (10YR 7/2) and strong-brown (7.5YR 5/6) mottles; moderate, medium and thick, platy structure breaking to weak, fine and medium, subangular blocky structure within weak, very coarse prisms that have light-gray (10YR 7/2) silty faces; block faces, pale-brown (10YR 6/3) grading with depth to light brown (7.5YR 6/4); friable; few fine and medium roots; slightly calcareous; gradual, irregular boundary. 7 to 13 inches thick.

C—27 to 43 inches, light-brown (7.5YR 6/4) lenses and strata of silt loam and very fine sandy loam, gradually fading with depth to light grayish brown (7.5YR 6/2); common, medium, distinct, yellowish-brown (7.5YR 5/8), reddish-yellow (7.5YR 6/6), and light-gray (10YR 7/1) mottles; weak, thin, medium and thick platy structure that varies horizontally; friable; few fine roots; strongly calcareous.

The thickness of the solum ranges from 20 to 40 inches. The depth to carbonates ranges from 18 to more than 40 inches.

The A1 or Ap horizon ranges from black to dark grayish brown in color, from very fine sandy loam to silt loam in texture, and from granular to blocky in structure. The reaction is slightly acid to mildly alkaline.

The B horizon ranges from a hue of 5YR to 5Y that has a value of 4 to 6 and a predominant chroma of 1 to 4. Mottles in the B horizon range from few to many and from distinct to prominent in chromas of 2 and higher. The texture is very fine sandy loam, silt loam, or coarse silty clay loam, and the clay content is 18 to 35 percent. The structure is massive to moderate blocky within weak to strong prisms, and is most prominent at the higher clay content. The reaction ranges from mildly acid to calcareous.

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

Canandaigua soils are in a drainage sequence with well drained Dunkirk, moderately well drained Collamer, somewhat poorly drained Niagara, and very poorly drained Alden soils. They are associated also with Madalin and Lakemont soils. Canandaigua soils are higher in silt content than Lamson soils and lack the fine sandy B horizon common to those soils. They have less clayey B and C horizons than Madalin and Lakemont soils. The clay content ranges from 18 to 35 percent, whereas that of Madalin and Lakemont soils ranges from 35 to 50 percent. In this county, Canandaigua soils are mapped only as an undifferentiated unit with Niagara soils.

Cazenovia Series

The Cazenovia series consists of moderately well drained and well drained soils that formed in calcareous, reddish glacial till of moderately fine texture. These soils are mostly in two general locations. The largest acreage is near Auburn, in close relationship with the Onondaga Limestone escarpment, and on slopes bordering Cayuga and Owasco Lakes. These Cazenovia soils formed in reddish till that is a mixture of limestone, shale, and reworked red lacustrine clay. Most of the rest is near the villages of Cato, Meridian, Weedsport, and Port Byron and around Cross and Otter Lakes. These soils formed in reddish till that is a mixture of limestone and red Vernon shale till. In the northern part of the county near Ira and Westbury are small, scattered areas of grayer or browner Cazenovia soil that formed in glacial till having a high content of gray clayey shale.

A typical profile in a cultivated area has an 8-inch plow layer of brown to dark grayish-brown silt loam. The upper part of the subsoil is firm, reddish-brown coarse silty clay loam that extends to a depth of 12 inches. It has blocky structure, and leached reddish-gray silty coatings surround the blocks. The lower part of the subsoil is very firm, reddish-brown coarse silty clay loam to clay loam to a depth of about 36 inches. The reaction of the subsoil ranges from neutral in the upper part to calcareous in the lower part. The substratum is calcareous, dark reddish-gray to reddish-brown coarse silty clay loam till.

Typical profile of Cazenovia silt loam, 2 to 8 percent slopes, in a cultivated field:

Ap—0 to 8 inches, brown to dark-brown (7.5YR 4/2) to dark grayish-brown (10YR 4/2) silt loam; moderate, fine and medium, subangular blocky structure; slightly firm when moist, slightly sticky when wet; neutral; abrupt, smooth boundary. 7 to 9 inches thick.

B&A—8 to 12 inches, reddish-brown (5YR 5/3–4/3) coarse silty clay loam; moderate, medium and coarse, subangular blocky and blocky structure; firm when moist; peds have reddish-gray (5YR 5/2) to dark reddish-gray (5YR 4/2) silt coatings up to ¼ inch thick, decreasing in thickness with depth; many pores in peds; neutral; abrupt, wavy boundary. 2 to 5 inches thick.

B2t—12 to 22 inches, reddish-brown (5YR 4/3) coarse silty clay loam to coarse clay loam; strong, medium and coarse prisms breaking to moderate, coarse, blocky structure; very firm when moist, sticky when wet; dark reddish-gray (5YR 4/2) to reddish-gray (5YR 5/2), prominent clay films on ped faces, becoming more prominent with depth; mildly alkaline; many fine pores in peds; fine roots extend downward along prisms and across faces of peds but rarely penetrate ped interiors; clear, wavy boundary. 8 to 12 inches thick.

B3t—22 to 36 inches, reddish-brown (5YR 5/3) coarse silty clay loam to coarse clay loam; strong, medium and coarse prisms breaking to moderate, blocky structure; very firm when moist, sticky when wet; dark reddish-gray (5YR 4/2) to reddish-gray (5YR 5/2), very prominent clay films on ped faces; many fine pores on faces of peds; lime nodules occur below a depth of 30 inches and increase in number with depth; calcareous; clear, wavy boundary. 3 to 14 inches thick.

C—36 to 65 inches, dark reddish-gray (5YR 4/2) to reddish-brown (5YR 4/3) coarse silty clay loam till; moderate, medium and coarse, blocky structure; no prisms; firm; very strongly calcareous.

The thickness of the solum ranges from 20 to 40 inches. The content of coarse fragments in the A and B horizons ranges from 0 to 15 percent. The depth to carbonates ranges from 15 to 40 inches.

The Ap horizon ranges from very dark grayish brown to brown in color, from very fine sandy loam to coarse silty clay loam in texture, and from granular to blocky in structure. The reaction is medium acid to mildly alkaline. The A1 horizon in forested areas ranges from 2 to 6 inches in thickness, from black to dark reddish brown in color, and from granular to fine, blocky in structure. A silt loam A2 horizon that ranges up to 4 inches in thickness is present in some areas. It interfingers around peds in the underlying B&A horizon, The color of the A2 horizon ranges from dark reddish gray to pale brown.

The B horizon ranges from coarse silty clay loam to clay loam and has a clay content of 28 to 35 percent. The hue is generally 5YR or 7.5YR but ranges from 2.5YR to 10YR. The value ranges from 4 to 6, and the chroma from 2 to 4. In some places there are mottles of high chroma above a depth of 20 inches and mottles of low chroma below this depth.

The C horizon ranges from gravelly or stony loam to coarse silty clay loam glacial till.

Cazenovia soils are in a drainage sequence with somewhat poorly drained Ovid, poorly drained Romulus, and very poorly drained Alden soils. They are redder than Honeoye and in most places are redder than Ontario soils. They have a clay content of 28 to 35 percent in the B horizon, whereas Honeoye and Ontario soils have only 18 to 28 percent. Cazenovia soils generally have less than 35 percent clay in the B horizon, whereas Schoharie soils, which formed in red lacustrine clay, have more than 35 percent clay in the B horizon.

Cazenovia silt loam, 2 to 8 percent slopes (CeB).—This soil has the profile described as typical of the series. It has convex slopes and is on hilltops that receive little or no runoff from higher areas. The dominant inclusions in mapping were the somewhat poorly drained Ovid soils in depressions and along drainageways. Also included were spots of poorly drained Romulus soils in the deeper depressions and drainageways. These wetter soils, though not extensive, commonly delay tillage of entire fields in the spring.

This soil is well suited to crops, pasture, and forest and to some vegetables. It occurs mostly at an elevation below 800 feet, which favors the longer season crops. Most areas are used for corn, small grains, and forage in support of dairying. Some areas are in urban use.

Management needs are moderate. This soil is moderately susceptible to erosion. It clods readily and becomes cloddy after two successive years of intertilled crops. The supply of nitrogen is sometimes deficient in spring, but it is adequate for moderate yields later in the season. The supply of phosphorus is moderate, and that of potassium is high. Lime is needed for legumes in some areas. A complete fertilizer is needed in all areas. Many fields can be improved by artificial drainage of the wet spots.

Slow permeability, seasonal wetness, and slope are the main limitations to many nonfarm uses. (Capability unit IIe–10; woodland group 2a)

Cazenovia silt loam, 8 to 14 percent slopes (CeC).—The slopes of this soil are convex and do not accumulate water. The dominant inclusions in mapping were small areas of somewhat poorly drained Ovid soils. Also included were spots of Romulus soils in wet areas or drainageways.

This soil is suited to crops, pasture, and forest. Much of the acreage is still forested or used for pasture. The management needs are moderately demanding, but the soil is productive if these needs are met.

Runoff is moderately rapid, and erosion is a problem if row crops are grown intensively. Rotations that include a high percentage of sod-forming crops help to control erosion, maintain good structure, and supply organic matter. The supply of potassium is good, and that of phosphorus is moderate. Nitrogen is commonly deficient in spring but may be adequate for moderate yields later in the season. A complete fertilizer is needed. The lime requirement ranges from none to moderate.

Slow permeability, slope, and seasonal wetness are the main limitations to most nonfarm uses. (Capability unit IIIe–6; woodland group 2a)

Cazenovia silt loam, 5 to 14 percent slopes, eroded (CeC3).—This soil has a profile like the one described as typical of the series, except that it has lost much of the surface layer through erosion. It has convex slopes that do not accumulate water. Most of the slopes are uniform, but a few are rolling. Erosion has removed enough of the original surface soil so that some of the more clayey subsoil has been mixed with the plow layer. In severely eroded areas the surface layer consists mostly of subsoil material and has a silty clay loam texture. Included in mapping were some spots that have little or no erosion. Also, there are a few small depressions and narrow drainageways in which deposits of the eroded soil overlie inclusions of the wetter Ovid and Romulus soils.

This soil can be used for crops, pasture, and forest. It is better suited to hay and pasture than to row crops, however, because of the moderately rapid runoff and consequent loss of water, the continuing erosion, and the relatively poor condition of the plow layer.

Intensive management is needed to control runoff and erosion and to maintain fertility and structure, especially if row crops are grown frequently. Limited tillage is desirable. Complete fertilizer is needed for even moderate yields. Nitrogen, particularly, is deficient. Some of the shallow waterways need drainage to eliminate wet spots.

Slope, slow permeability, and seasonal wetness are the main limitations to nonfarm use. (Capability unit IVe-10; woodland group 2a)

Cazenovia silt loam, rolling (8 to 14 percent slopes) (CeCK).—This soil is in uplands and has short, complex slopes that are convex in shape. Most of the cropped areas are eroded to a varying degree. The stronger slopes are severely eroded and have clayey bald spots. The more nearly level hilltops are slightly to moderately eroded. The drainageways in some places are gullied and in other places contain deposits of eroded soil. The uncropped areas, mostly still forested or used for pasture, have little or no erosion. Included in mapping were areas of wetter Ovid and Romulus soils along the many small drainageways and depressions. Also included were small areas of Ontario, Honeoye, and Aurora soils.

This soil can be used for crops, pasture, and forest. It is better suited to hay and forage crops than to row crops because the short, complex slopes make contour tillage impractical.

A complete fertilizer is needed. The supply of nitrogen is deficient in eroded areas. The supply of potassium is good, and that of phosphorus is moderate. The lime requirement ranges from none to moderate.

Slope, slow permeability, and seasonal wetness are the main limitations to most nonfarm uses. (Capability unit IVe-9; woodland group 2a)

Cazenovia silt loam, 12 to 20 percent slopes (CeD).—This soil is mostly on valley sides that are dissected by closely spaced drainageways. Only a few areas have fairly long, smooth slopes. Included in mapping were areas of Aurora soils that are 20 to 40 inches deep over shale bedrock. Cropped areas are, for the most part, severely eroded; areas that are still in woods have little or no erosion.

Because of slope and the severe erosion hazard, this soil is poorly suited to most cultivated crops. It can be used for hay, pasture, or forest. If it is plowed, strips of sod should be left to control runoff. It needs complete fertilizer. The lime requirement ranges from none to slight.

Slope and slow permeability are the main limitations to most nonfarm uses. (Capability unit IVe-9; woodland group 2a)

Cazenovia and Schoharie soils, 20 to 40 percent slopes (ChE).—These soils have a profile like the one described as typical of their series. They are mostly on steep valley sides dissected by drainageways. Any one area consists of the slightly stony Cazenovia soil or the more clayey, stone-free Schoharie soil, but only a few areas consist of both. Areas of equally steep Honeoye, Ontario, and Aurora soils were included in mapping. The soils of the unit range from uneroded to severely eroded.

Drainage is good, water-holding capacity is moderately good, and fertility is moderate. Little or no lime is needed. Slope is the main limitation. Because of steepness of slope, these soils are better suited to forest or to wildlife habitat than to crops. Slope and slow permeability are the main limitations to most nonfarm uses. (Capability unit VIe-1; woodland group 2b)

Collamer Series

The Collamer series consists of deep, moderately well drained, medium-textured soils that formed in deep, alkaline to calcareous silty deposits. These are nearly level to gently sloping soils in small areas scattered among drumlins on the lake plains. They are in the northern part of the county, mainly south of outcrops of the Lockport dolomite formation. A few areas are north of these outcrops.

In a cultivated area, a typical profile has an 8-inch plow layer of very dark grayish-brown to dark grayish-brown silt loam. This layer is underlain by a leached layer of brown, friable very fine sandy loam or coarse silt loam that is mottled. It extends to a depth of 10 inches. Just below is a firm, brown, heavy very fine sandy loam subsoil that grades to fine sandy loam in the lower part. It is distinctly mottled throughout. The substratum is at a depth of about 27 inches. It consists of brown to light brownish-gray fine sandy loam and thin layers of sandy clay loam. The reaction of the subsoil is neutral, and that of the substratum is neutral to mildly alkaline.

Typical profile of Collamer silt loam, 2 to 6 percent slopes, in a cultivated field:

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) to dark grayish-brown (10YR 4/2) silt loam; dark grayish brown (10YR 4/2) when crushed and rubbed; weak to moderate, fine and medium, subangular blocky structure; friable; medium acid; abrupt, smooth boundary. 7 to 9 inches thick.

A2—8 to 10 inches, brown (10YR 5/3) very fine sandy loam to coarse silt loam; common, medium, distinct, yellowish-brown and dark yellowish-brown (10YR 5/6, 4/4) mottles; weak, fine and medium, platy structure breaking to weak, fine, blocky structure; friable; medium acid; discontinuous to abrupt, wavy boundary; fingers, ⅛ to ¼ inch thick and 1 to 4 inches apart, extend 1 to 3 inches into the underlying horizon. 0 to 4 inches thick.

B21t—10 to 21 inches, brown (7.5YR 5/3), heavy very fine sandy loam to light very fine sandy clay loam; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, coarse, subangular blocky and blocky structure; firm in place, friable to slightly firm when removed; brown (7.5YR 5/3), distinct clay films on ped faces and in larger pores; neutral; gradual, wavy boundary. 10 to 16 inches thick.

B22t—21 to 27 inches, brown (7.5YR 5/3) heavy very fine sandy loam to fine sandy loam; common, large, distinct, light brownish-gray and yellowish-brown (10YR 6/2 and 5/6) mottles; massive to weak, medium and coarse, blocky structure; firm in place, friable when removed; distinct clay linings in larger pores; neutral; clear, wavy boundary. 5 to 11 inches thick.

C—27 to 40 inches, brown (10YR 5/3) fine sandy loam, grading to light brownish gray (10YR 6/2) with depth; thin ¼- to 1-inch lenses or layers of fine sandy clay loam; friable to firm; neutral, grading to mildly alkaline below a depth of 36 inches.

The thickness of the solum ranges from 22 to 40 inches. The depth to carbonates ranges from 20 inches to 6 feet.

The Ap horizon has a hue of 7.5YR to 10YR, a value of 3 to 5, and a chroma of 2 or 3. It ranges from fine sandy loam to silt loam in texture. The A2 horizon has a hue of 5YR to 2.5Y, a value of 4 to 6, and a chroma of 2 or 3. The mottles are none to common in number and are high in chroma. The texture is very fine sandy loam to coarse silt loam. The reaction of the A horizon ranges from strongly acid to neutral.

The B horizon color ranges from a hue of 5YR to 2.5Y, a value of 4 to 6, and a chroma of 2 to 4 and higher. There are a few to many mottles of high chroma. The texture ranges from very fine sandy loam to coarse silty clay loam, and the clay content is 18 to 35 percent. The reaction ranges from medium acid to calcareous.

The C horizon, to a depth of 40 inches, consists of varved silt loam to fine sandy loam with or without thin bands of silty clay. The reaction is neutral to calcareous.

Collamer soils are in a drainage sequence with well-drained Dunkirk, somewhat poorly drained Niagara, poorly drained Canandaigua, and very poorly drained Alden soils. Collamer soils have a finer textured B horizon and a higher lime content than Williamson soils and lack the distinct fragipan common to those soils. They have a finer textured B horizon, a higher silt content, and lower sand content than Galen soils. The clay content of the B horizon is 18 to 25 percent; that of Williamson and Galen soils is less than 18 percent. Collamer soils are coarser textured than Schoharie soils, which have more than 35 percent clay in the B horizon.

Collamer silt loam, 0 to 2 percent slopes (ClA).—This soil receives little or no runoff from higher areas. Included in mapping were areas of somewhat poorly drained Niagara soils in shallow depressions and along narrow drainageways and a few wet spots of poorly drained Canandaigua soils in the lowest parts of the drainageways. These wetter soils, though inextensive, delay tillage in spring. Dunkirk soils on minor knolls were also included in mapping.

This soil is well suited to crops, pasture, or forest. Much of it is used intensively for row crops. Maintenance of fertility and good structure are important. Drainage of the wet spots, mostly by tiling, is needed in some areas. The lime requirement ranges from moderate to none. The nitrogen supply is deficient in spring, and the supply of phosphorus and potassium is moderate. Complete fertilizer is needed. Erosion is generally not a problem if good soil structure and organic-matter content are maintained.

Seasonal wetness and variable permeability are the main limitations to most nonfarm uses. (Capability unit IIw–2; woodland group 6a)

Collamer silt loam, 2 to 6 percent slopes (ClB).—This soil has the profile described as typical of the series. It receives little or no runoff from higher areas. Most areas are gently undulating and are dissected by somewhat closely spaced, shallow drainageways. Included in mapping were areas of Niagara soils along narrow drainageways or in shallow depressions. Also included were a few wet spots of Canandaigua soils in the lowest parts of the drainageways. These wetter soils, though inextensive, delay tillage in spring. Other inclusions were Dunkirk soils on minor knolls.

This soil is well suited to crops, pasture, or forest. Much of the acreage is used intensively for row crops. Maintenance of fertility and good structure are important. Erosion is a hazard, even on the gentler slopes. Drainage of wet spots is needed in some areas. The lime requirement is moderate to none. The supply of nitrogen is deficient, and the supply of phosphorus and potassium is moderate. Complete fertilizer is needed.

Seasonal wetness, variable permeability, and slope are the main limitations to most nonfarm uses. (Capability unit IIe–7; woodland group 6a)

Colonie Series

The Colonie series consists of deep, well-drained to excessively drained soils derived from sandy deposits laid down by water, wind, or both. Many areas of these soils are on glaciofluvial terraces where, it is believed, sands deposited by fresh water were rearranged by wind. As a result the relief is rolling and undulating. Most areas are north of the Seneca River, but a few are as far south as the north end of Owasco Lake.

In a cultivated area, a typical profile has a 9-inch plow layer of brown to dark-brown loamy fine sand. The subsoil extends to a depth of 36 inches and consists of loose loamy fine sand that is mostly light yellowish brown to yellowish brown but has thin bands of strong brown. The bands are roughly horizontal in an intricate pattern. They alternate in color and are as much as 8 inches apart in some places, but they merge in other places. The substratum is strongly acid, very loose, light yellowish-brown loamy fine sand.

Typical profile of Colonie loamy fine sand, 1 to 6 percent slopes, in a cultivated field:

Ap—0 to 9 inches, brown to dark-brown (10YR 4/3) loamy fine sand; single grain to very weak, fine and medium, subangular blocky structure; loose; strongly acid; abrupt, smooth boundary. 8 to 10 inches thick.

B21—9 to 14 inches, reddish-yellow (7.5YR 6/6) to brownish-yellow (10YR 6/6) loamy fine sand; single grain to very weak, fine and medium, subangular blocky structure; loose; strongly acid; abrupt, wavy boundary. 4 to 6 inches thick.

B22—14 to 15 inches, strong-brown (7.5YR 5/6) to yellowish-red (5YR 5/6), heavy loamy fine sand; very weak, medium and coarse, subangular blocky structure to single grain; loose to very friable when moist; nonsticky to slightly sticky when wet, indicating a very slight clay accumulation; strongly acid; abrupt, wavy boundary. Discontinuous to 2 inches thick.

B23—15 to 21 inches, light yellowish-brown to yellowish-brown (10YR 6/4–5/4) loamy fine sand with scattered strong-brown (7.5YR 5/6), light fine sandy loam nodules ¼ inch to ½ inch in diameter; single grain to very weak, medium and coarse, subangular blocky structure; loose; strongly acid; abrupt, wavy boundary. 4 to 8 inches thick.

B24—21 to 23 inches, strong-brown to brown (7.5YR 5/6–5/4), heavy loamy fine sand; single grain to very weak, coarse, blocky structure; appears to have a very faint clay accumulation; loose; strongly acid; abrupt, wavy boundary. 1 to 3 inches thick.

B25—23 to 36 inches, light yellowish-brown to yellowish-brown (10YR 6/4–5/4) loamy fine sand; single grain to very weak, medium and coarse, blocky structure; very loose; strongly acid; abrupt, wavy boundary. 8 to 10 inches thick.

B26—36 to 40 inches +, light yellowish-brown (10YR 6/4) loamy fine sand that becomes paler and grayer with depth; structureless; very loose; strongly acid.

The thickness of the solum ranges from 30 inches to many feet.

The color of the Ap horizon ranges from brown to dark grayish brown, depending on the amount of organic matter. The texture is mostly loamy fine sand but includes fine sandy loam that borders on loamy sand. Areas south of the Seneca River contain a high percentage of particles the size of very fine sand. In a few areas in the northern part of the county, the texture is loamy sand. Where the soil is ranging toward Alton, a small amount of gravel is present. The reaction ranges from very strongly acid to medium acid.

The color of the B horizon ranges from a hue of 2.5Y to 5YR, a value of 4 to 6, and a chroma of 4 to 8. Slightly redder bands are present below a depth of 18 inches. The texture ranges from loamy fine sand to loamy sand to very light fine sandy loam. The reaction ranges from very strongly acid to medium acid.

In places the lime content gradually increases below a depth of 4 feet. In places gravel strata occur below a depth of 40 inches.

Colonie soils are in a drainage sequence with moderately well drained Galen, somewhat poorly drained Stafford, and poorly or very poorly drained Lamson soils. They generally are coarser textured and more acid than Arkport soils, and they lack the bands or lamellas of clay in the subsoil that are typical of Arkport soils, though color bands are present.

Colonie loamy fine sand, 1 to 6 percent slopes (CmB).—This soil has the profile described as typical of the series. Most areas are undulating; only a few areas have smooth slopes. Included in mapping were Alton soils on gravelly knolls and Galen soils along narrow drainageways and in depressions.

This soil is suited to crops, pasture, or forest. A considerable part of it is idle. It is low in moisture-holding capacity, natural fertility, and lime content. It is well suited to early truck crops if irrigated and heavily fertilized. It is too droughty for pasture.

The hazard of wind erosion is severe, and that of water erosion is moderate. Lime and fertilizer are needed. This soil is well suited to land smoothing.

Slope and texture are the main limitations to most nonfarm uses that require good drainage. (Capability unit IIIs–1; woodland group 17a)

Colonie loamy fine sand, 6 to 12 percent slopes (CmC).—Most areas of this soil have rolling, short, complex slopes; only a few areas have smooth, simple slopes. Included in mapping were areas of gravelly Alton soils and a few small areas of Galen soils in the deeper depressions and drainageways.

This soil is used for crops, pasture, and forest. Much of the acreage is idle. It is a very droughty soil, low in water-holding capacity, fertility, and lime content. Wind and water erosion are severe hazards. This soil is well suited to land smoothing. It is too droughty for pasture, and intensive management is needed for even moderate production of crops.

Slope and texture are the main limitations to most nonfarm uses that require good drainage. (Capability unit IVs–1; woodland group 17a)

Colonie fine sandy loam, 1 to 6 percent slopes (CnB).—A profile of this soil is like the one described as typical of the series, except that this soil has a slightly greater moisture-holding capacity. Most areas have gently undulating slopes, but some have gentle, smooth slopes. Galen soils in slight depressions and drainageways were included in mapping.

This soil is suited to crops, pasture, or forest. It is well suited to early truck crops if irrigated and intensively fertilized. It is too droughty for pasture.

Lime and fertilizer are needed, as this soil is low in all nutrients. Erosion by wind and water is a slight to moderate hazard. Land smoothing is suitable.

Slope and texture are the main limitations to most nonfarm uses that require good drainage. (Capability unit IIs–3; woodland group 17a)

Colonie and Arkport soils, 12 to 22 percent slopes (CpD).—This undifferentiated unit consists of sandy soils. Each has a profile like the one described as typical of its series, except that the Arkport soil is thinner to the C horizon and contains fewer and thinner sandy loam bands.

These are extremely droughty soils. They are too droughty for good hay and forage, even if they are limed and fertilized. They are better suited to forest. Much of the acreage is now idle. Where the vegetation is sparse, these soils are subject to wind and water erosion. The steepness of slope makes operation of farm machinery very difficult.

Slope and texture are the main limitations to most nonfarm uses that require good drainage. (Capability unit VIs–2; woodland group 17b)

Conesus Series

The Conesus series consists of deep, moderately well drained, medium-lime soils derived from calcareous till. The till is derived mainly from calcareous, gray shale and from gray, fine-grained sandstone and small quantities of limestone. These soils are in the south-central and southeastern parts of the county, at an elevation of 900 to 1,400 feet.

A typical profile in a cultivated area has a 9-inch plow layer of dark grayish-brown gravelly silt loam. This layer is underlain by layers of partly leached, pale-brown and brown, firm gravelly silt loam that has common to many mottles. The subsoil is at a depth of about 19 inches and is firm gravelly silt loam. The upper part is brown to olive brown mottled with yellowish brown. The lower part is olive brown mottled with light olive brown and grayish brown. The reaction of the subsoil is medium acid to slightly acid. The till is at a depth of 36 inches and consists of grayish-brown, very firm gravelly loam mottled with yellowish brown. It is calcareous.

Typical profile of Conesus gravelly silt loam, 3 to 8 percent slopes, in a cultivated field:

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) gravelly silt loam; weak, medium and fine, granular structure; friable when moist, slightly plastic when wet; many fine roots; 20 percent gravel and small angular stones; slightly acid in limed areas; abrupt, smooth boundary. 6 to 10 inches thick.

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 blocks; slightly firm when moist, slightly plastic when wet; common fine roots; many fine pores; ped interiors constituting 5 to 40 percent of the mass are brown (10YR 5/3) and slightly more plastic with common, fine, yellowish-brown (10YR 5/4) mottles; 15 percent gravel and small angular stones; medium acid; gradual, wavy boundary. 4 to 6 inches thick.

B&A—14 to 19 inches, brown (10YR 5/3) gravelly silt loam; many, medium and fine, yellowish-brown (10YR 5/4–5/6) mottles; moderate, medium, subangular blocky structure; firm when moist, slightly plastic when wet; few fine roots; many fine pores; 20 percent coarse fragments; ped exteriors are pale-brown (10YR 6/3) silt and very fine sand, 1/8 inch thick at top and grading to thin films at bottom; prominent clay linings in pores; strongly acid; gradual, wavy boundary. 3 to 6 inches thick.

B21t—19 to 25 inches, brown (10YR 5/3) to olive-brown (2.5Y 4/4) gravelly silt loam; many, fine and medium, yellowish-brown (10YR 5/4–5/6) mottles; strong, medium, subangular blocky structure; firm when moist, plastic when wet; few fine roots; common fine pores; 5 to 20 percent of ped faces and all of pores have thin clay films; 20 percent coarse fragments; medium acid; diffuse boundary. 4 to 9 inches thick.

B22t—25 to 36 inches, olive-brown (2.5Y 4/4) gravelly silt loam; common, medium and fine, light olive-brown (2.5Y 5/4 to 5/6) mottles and common, fine, grayish-brown (2.5Y 5/2) mottles; strong, coarse, subangular blocky structure; firm when moist; plastic when wet; no roots; common fine pores; olive-brown (2.5Y 4/4) to olive (5Y 5/3) clay skins on 15 to 30 percent of ped faces and in all pores; 25 percent coarse fragments; slightly acid; clear, wavy boundary. 8 to 15 inches thick.

C—36 to 42 inches, grayish-brown (2.5Y 5/2) gravelly loam; many, medium, yellowish-brown (10YR 5/4) mottles; moderate, thick, lenslike overlapping plates; very firm when moist, slightly plastic when wet; few pores; 30 to 50 percent gravel and stones; calcareous.

The thickness of the solum ranges from 30 to 45 inches. The depth to calcareous material ranges from 30 to 50 inches.

Colors of the Ap horizon range from dark grayish brown to brown. The A2 horizon, where present, is mostly grayish brown to yellowish brown. It is 4 to 12 inches thick. The texture of the Ap and A2 horizons is mostly gravelly silt loam but includes gravelly loam and gravelly very fine sandy loam. Coarse fragments, which consist mostly of semirounded gravel and flat stones, make up from 5 to 25 percent of the volume. The reaction in unlimed areas ranges from strongly acid to medium acid.

The color of the B horizon is generally a hue of 10YR or 2.5Y, a value of 3 to 5, and a chroma of 3 or 4. The color ranges from a hue of 7.5YR to 5Y, however, and mottles occur below a depth of 15 inches. The texture is silt loam to fine loam, and the content of clay is 18 to 28 percent. Generally this horizon is gravelly. The coarse fragment content ranges from 5 to 35 percent. The reaction ranges from medium acid in the upper part to alkaline in the lower part.

The C horizon is glacial till. It ranges from grayish brown to gray in color and from gravelly or stony loam to gritty silt loam in texture. The reaction is alkaline to calcareous above a depth of 48 inches and calcareous below this depth.

Conesus soils are in a drainage sequence with well-drained Lansing, somewhat poorly drained Kendaia, poorly drained Lyons, and very poorly drained Alden soils. Conesus soils are intermediate in lime content between Lima soils, which are moderately well drained and high in lime, and Langford soils, which are also moderately well drained but low in lime. They differ from Lima soils also in having a thicker, more strongly expressed A2 horizon and a thicker B2 horizon with slightly stronger structure. They lack the yellowish-brown color of the B horizon and distinct fragipan characteristic of the Langford soils. They are grayer and siltier than Hilton soils.

Conesus gravelly silt loam, 0 to 3 percent slopes (CsA).—This soil has a darker colored surface layer and a more strongly mottled subsoil than is typical of the series. It is inextensive and occurs mainly as small or moderate-sized areas that receive little or no runoff. The dominant inclusions in mapping were Kendaia soils in shallow depressions and drainageways. These wetter Kendaia soils, though inextensive, sometimes delay tillage in spring. Lansing soils on slight knolls and Lyons and Alden soils in wet spots also were included in mapping.

This soil is well suited to crops, pasture, or forest. Much of it is used intensively for row crops. It can also be used for vegetables. Maintenance of fertility and soil structure and correction of acidity are important. Erosion is not a serious problem. Drainage of the wet spots improves most fields.

Moderately slow and slow permeability, seasonal wetness, and gravel are the main limitations to most nonfarm uses. (Capability unit IIw–6; woodland group 6a)

Conesus gravelly silt loam, 3 to 8 percent slopes (CsB).—This soil has the profile described as typical of the series. The slopes are mostly 3 to 5 percent and are slightly convex to smooth in shape. The larger areas are broad, gently sloping hilltops. The small areas are adjacent to higher, more strongly sloping Lansing soils. Runoff is slow to moderate, and some runoff is received from the higher areas. Included in mapping were Lansing soils on knolls, and narrow strips of Kendaia, Lyons, and Alden soils along drainageways or in depressions. These wetter soils, though of minor extent, delay tillage in spring.

This soil is well suited to crops, pasture, or forest. Much of it is used for row crops. It can also be used for vegetables. Maintenance of fertility and control of acidity are important. The erosion hazard is moderate. Random drainage of the wet spots improves many fields.

Moderately slow and slow permeability, seasonal wetness, gravel, and slope are the main limitations to most nonfarm uses. (Capability unit IIe–6; woodland group 6a)

Dunkirk Series

The Dunkirk series consists of deep, well-drained soils that formed in medium-textured lacustrine deposits of calcareous silt and very fine sand. These soils occur as rolling or dissected areas scattered on the lake plain, mainly in the northern half of the county.

A typical profile in a cultivated area has a dark-brown to brown silt loam plow layer about 9 inches thick. This layer is underlain by a leached layer of friable, light yellowish-brown to light-brown silt loam to a depth of about 16 inches. Just below is the upper part of the subsoil, which is friable, reddish-brown heavy silt loam. At a depth of about 24 inches this merges with the lower part of the subsoil, which is transitional to the substratum. The lower subsoil consists of layers of reddish-brown silty clay loam separated by thinner layers of brown very fine sandy loam and silt loam. The substratum is at a depth of about 30 inches. It consists mostly of layers of silt loam and very fine sandy loam separated by thinner layers of silty clay loam. The subsoil is medium acid. The substratum ranges from medium acid in the upper part to calcareous in the lower part.

Typical profile of Dunkirk silt loam, 1 to 6 percent slopes, in a cultivated field:

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 breaking to weak, fine, granular structure; friable; slightly acid; many fine roots; abrupt, smooth boundary. 8 to 10 inches thick.

A2—9 to 16 inches, light yellowish-brown (10YR 6/4) to light-brown (7.5YR 6/4) coarse silt loam; weak to moderate, medium, subangular blocky structure; friable; medium acid; many fine roots; abrupt, wavy boundary with fingers, 1/8 to 1/4 inch thick and 2 to 4 inches apart, extending 1 to 3 inches into the underlying horizon. 5 to 12 inches thick.

B2t—16 to 24 inches, reddish-brown (5YR 4/3) fine silt loam; moderate to strong, thin, medium, and thick platy structure breaking to weak, very fine to medium, blocky structure; reddish-brown (5YR 5/3) ped faces; discontinuous clay film on ped faces and in pores; common fine roots; friable; medium acid; clear, wavy boundary. 6 to 14 inches thick.

B3t—24 to 30 inches, reddish-brown (5YR 4/3) coarse silty clay loam, 1 to 2 inches thick, separated by 1/4-inch to 1/2-inch layers of brown (7.5YR 5/4) very fine sandy loam and silt loam; moderate, thick, platy structure breaking to weak, fine and very fine, subangular blocky structure; distinct clay film on ped faces and in pores; common fine roots; medium acid; abrupt, wavy boundary. 4 to 9 inches thick.

C—30 to 48 inches, reddish-brown (5YR 4/3) coarse silty clay loam, 1/2 to 1 1/2 inches thick; strong, thick, platy structure; firm; separated by layers of brown (7.5YR 5/4) silt loam or very fine sandy loam, 1/2 inch to 3 inches thick; weak, platy structure; few fine roots; friable; medium acid in upper part, becoming calcareous at a depth of 42 inches.

The thickness of the solum ranges from 20 to 45 inches and corresponds to the depth to unaltered stratification. The depth to carbonates ranges from 2 to 5 feet.

The color of the Ap horizon ranges from 10YR to 7.5YR in hue, 3 to 5 in value, and 2 to 4 in chroma. The color of the A2 horizon ranges from 5YR to 2.5Y in hue, 4 to 6 in value, and 2 to 4 in chroma. The texture of the A horizon is predominantly silt loam but ranges to very fine sandy loam. The reaction ranges from strongly acid to neutral.

The B horizon ranges from 5YR to 2.5Y in hue, 4 to 6 in value, and 2 to 4 in chroma. In places it contains a few high-chroma mottles below a depth of 20 inches. The texture ranges from heavy fine sandy loam to coarse silty clay loam, and the clay content is 18 to 35 percent. The reaction ranges from strongly acid to mildly alkaline.

The C horizon, to a depth of 40 inches, is predominantly stratified silt and very fine sand, and there are occasional thin layers of silty clay loam or silty clay. The reaction above a depth of 40 inches ranges from medium acid to calcareous. It is calcareous below a depth of 5 feet.

Dunkirk soils are in a drainage sequence with moderately well drained Collamer, somewhat poorly drained Niagara, poorly drained Canandaigua, and very poorly drained Alden soils. Dunkirk soils differ from Arkport soils in being finer textured or in having a continuous very fine sandy loam B horizon rather than a banded one. They have a coarser textured B horizon than Schoharie soils.

Dunkirk silt loam, 1 to 6 percent slopes (DuB).—This soil has the profile described as typical of the series. Some areas have undulating, short, convex slopes and shallow drainageways or depressions; other areas have smoother, longer, convex slopes. Little or no runoff water is received from adjacent areas.

Included in mapping were Collamer soils in the shallow depressions and along the sides of irregular-shaped drainageways in undulating areas. In the smoother areas the Collamer soils are on nearly level or faintly depressional hilltops and along the sides of shallow, nearly straight drainageways. Where the slopes are undulating, these inclusions are as much as 20 percent of any mapped area; where the slopes are smoother, the inclusions are as much as 15 percent. Included also were Niagara and Canandaigua soils, which occur as wet spots in the lowest parts of depressions and drainageways. A few small areas of Schoharie soils occur as clay spots, and Arkport soils occur as sandy spots.

This soil is well suited to crops, pasture, or forest. Most of it is cropped, and a high percentage is used intensively for row crops.

Control of erosion and maintenance of good soil structure are needed. The silty surface soil flows readily when saturated, so that erosion is a hazard, even on short gentle slopes. The supply of nitrogen is low, and that of phosphorus and potassium is moderate. Complete fertilizer is needed. Drainage of the wet spots is beneficial.

Variable permeability, slope, and texture are the main limitations to nonfarm uses that require good drainage. (Capability unit IIe–9; woodland group 6a)

Dunkirk silt loam, 6 to 12 percent slopes, eroded (DuC3).—This soil has a profile like the one described for the series, except that much of this soil is severely eroded. It occurs mostly as short side slopes of drainageways or as shallow, dissected areas on the lake plain. Most of the slopes are convex, and only a few are smooth enough to be easily contoured. This soil commonly occurs below more nearly level Dunkirk soils from which it receives some runoff water.

Most of the acreage is eroded, but the degree of erosion is highly variable within short distances. The steeper slopes are severely eroded. The flatter tops of the knolls are slightly or moderately eroded, and the bottoms of the depressions and drainageways may contain deposits of eroded material. Included in mapping were areas of Collamer soils in the bottom of depressions or drainageways. A few uneroded forested or pastured areas that have never been cultivated were also included. The severely eroded spots have a raw appearance and distinctly redder or browner colors than normal. The crop growth also varies; the more severely eroded areas are bald spots in the field.

This soil can be used for crops, pasture, or forest. The complex slopes, the moderate to rapid runoff, the hazard of continued erosion, and the poor condition of the plow layer in eroded spots make this soil more suitable for hay and pasture than for row crops.

Intensive management is needed to control runoff and to maintain fertility, especially if row crops are grown frequently. Limited tillage is desirable. Complete fertilization is needed. Nitrogen, particularly, is deficient. The lime requirement ranges from none to moderate.

Slope, variable permeability, and texture are the main limitations to most nonfarm uses that require good drainage. (Capability unit IVe–8; woodland group 6a)

Dunkirk silt loam, 12 to 18 percent slopes, eroded (DuD3).—A profile of this soil is like the one described as typical of the series, except that most of this soil is severely eroded. This soil generally occurs as short, complex slopes on the sides of deep drainageways or as strongly dissected landforms. Most of the slopes are so short and complex that contour tillage is difficult. Areas that have been cleared and cultivated are so eroded that the heavier subsoil is exposed. Included in mapping were narrow areas of Collamer soils along the bottom of drainageways and depressions. Some uneroded areas, mostly forested, were also included.

This soil can be used for pasture and other sod-forming crops or for forest. It is subject to continuing erosion. It is also droughty, for it loses much water by runoff. If properly managed, it is fairly well suited to hay and pasture. Special controls are needed if row crops are grown. The lime requirement ranges from none to moderate. Phosphorus and potassium are needed for legumes; in addition, nitrogen is needed for other crops.

Slope is the main limitation to most nonfarm uses. (Capability unit VIe-1; woodland group 6b)

Dunkirk soils, 18 to 35 percent slopes (DvE).—These soils have a profile like the one described as typical of the series, except that the surface layer and subsoil are thinner and more variable in texture. They occur mainly as short, steep side slopes along the larger streams that dissect the lake plains in the county. Most cleared areas are moderately or severely eroded. In places the soils are being undercut by streams, and masses of soil material have slipped downslope. Included in mapping were gravelly spots of Alton and Palmyra soils or clay spots of Schoharie soils.

These soils are suited to pasture, forest, or wildlife habitat. Pastures need fertilizer, and some areas need lime. Lime and fertilizer are difficult to apply on such steep slopes; consequently, most pastures are unimproved.

Slope is the main limitation to most nonfarm uses. (Capability unit VIe-1; woodland group 6c)

Edwards Series

The Edwards series consists of soils that formed in a mixture of woody, grassy, and sedgy organic material overlying white, gray, or light-brown, calcareous marl at a depth of 12 to 40 inches. These soils are in depressions or former shallow lakes that received water highly charged with lime. Most areas are in the north-central part of the county, from Auburn to just north of the Seneca River.

A typical profile in a cultivated area has a black muck surface layer about 9 inches thick. The layer just below is also well decomposed, black muck. It extends to a depth of about 16 inches and is underlain by layers of very dark brown to black muck containing dark-brown wood fragments and partly disintegrated wood and sedge material. White to very pale brown, calcareous marl is at a depth of about 33 inches. The reaction of the muck above the marl is neutral to slightly acid.

Typical profile of Edwards muck in a drained, cultivated area:

1—0 to 9 inches, black (10YR 2/1) muck; moderate to strong, fine and medium, granular structure; very friable; neutral; clear, wavy boundary. 8 to 10 inches thick.

2—9 to 16 inches, black (10YR 2/1) muck; moderate to strong, coarse, blocky and subangular blocky structure; very friable; neutral; clear, wavy boundary. 4 to 8 inches thick.

3—16 to 26 inches, very dark brown (10YR 2/2) muck containing partly disintegrated, brown to dark-brown wood fragments; moderate, coarse, blocky and subangular blocky structure; friable; slightly acid; clear, wavy boundary. 0 to 12 inches thick.

4—26 to 33 inches, black (10YR 2/1) to very dark brown (10YR 2/2) muck containing brown to dark-brown flakes of partly disintegrated wood and sedge material; moderate, coarse, blocky structure; friable; neutral; gradual, wavy boundary. 0 to 10 inches thick.

5—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.

The depth of the organic material over marl ranges from 12 to 40 inches. The shallower the organic material, the higher the mineral content. The upper 12 to 24 inches ranges from black to dark brown and from fine, granular structure in undrained areas to nearly massive in drained areas that have been compacted by machinery. The browner colors generally occur in undrained areas. The reaction of the upper part is medium acid to calcareous. Below a depth of 24 inches, the organic material is more fibrous and is brown to reddish brown. Peat layers are present at this depth in some areas. The reaction of this lower part ranges from medium acid to neutral. The purity and color of the marl are quite variable.

Edwards muck differs from Muck, deep, in having less than 40 inches of organic material over calcareous marl. It differs from Muck, shallow, in being underlain by calcareous marl instead of strongly acid to calcareous mineral soil material. Edwards muck differs from Warners soils in having organic material rather than mineral material over the marl.

Edwards muck (0 to 1 percent slopes) (Ed).—This soil occurs in low, level areas or depressions. Most areas are subject to ponding during winter and early in spring, and those along the Seneca River are subject to slackwater flooding. Included in mapping were areas of muck more than 40 inches deep and other areas less than 12 inches deep over marl. Also included were a few small areas of Warners loam.

Some areas are drained and used for crops. They are well suited to crops that can stand a high reaction. Along drainage ditches, marl dug up in ditching is commonly mixed with the muck. Undrained areas are best suited to woods or to wildlife habitat, though some produce low-quality pasture.

If this soil is drained, measures are needed to control wind erosion and to regulate water so that the rate of subsidence and oxidation will be reduced. A high rate of fertilization is needed for most "muck" crops.

Prolonged wetness and texture are the main limitations to most nonfarm uses. (Capability unit IVw-5; woodland group 20)

Eel Series

The Eel series consists of deep, moderately well drained soils that formed in alluvium derived from glacial drift. This drift material is high to medium in content of lime. Most areas of Eel soils are on flood plains and are flooded annually, usually early in spring and infrequently at other times of the year, but crops are only occasionally damaged by floods. Some areas are on high bottoms and are flooded only once every 5 to 10 years. The water table is moderately high during the wet seasons.

In a cultivated area, a typical profile has a very dark gray to very dark grayish-brown silt loam surface layer about 14 inches thick. The next layer extends to a depth of 40 inches or more and consists of dark-gray, friable silt loam to very fine sandy loam mottled with various colors. The reaction is neutral throughout the profile. The Eel soil on high bottoms is developing a color B horizon that has distinct structure but no noticeable increase in clay content.

Typical profile of Eel silt loam in a cultivated field:

1—0 to 14 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 breaking readily to moderate, medium and coarse, granular structure; friable when moist, nonsticky when wet; very numerous fine roots; neutral; clear, wavy boundary. 10 to 20 inches thick.

2—14 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), and strong-brown (7.5YR 5/6) mottles and fine, distinct, light-gray (10YR 6/1) mottles; weak, coarse, subangular blocky structure breaking to weak, fine, subangular blocky structure and weak, coarse, granular structure; friable when moist, nonsticky when wet; numerous fine roots; neutral; clear, wavy boundary. 10 to 20 inches thick.

3—28 to 40 inches, dark-gray (N 4/0 to 10YR 4/1) silt loam to very fine sandy loam; few, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak to very weak, thick, platy structure breaking to very weak, medium and coarse, blocky structure; friable when moist, nonsticky when wet; many fine roots; neutral.

The surface horizon in the profile described is thicker than normal for the series in other survey areas. The texture of the surface layer ranges from silt loam to very fine sandy loam. In places a few thin strata or lenses of silty clay or sand occur below a depth of 12 to 18 inches. The surface layer generally has a hue of 10YR, a value of 3 or 4, and a chroma of 1 or 2. Where the alluvium is derived from redder material, the hue ranges to 7.5YR and has a value of 3 or 4 and a chroma of 1 or 2.

The color of the subsurface layer is similar to that of the surface layer or ranges toward brown, yellowish brown, or reddish brown, with a value as high as 6 and a chroma as high as 4. Mottling generally occurs at a depth of 10 to 24 inches.

The silt or very fine sandy loam alluvial material ranges from 24 to 60 inches or more in thickness where it 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. The pH ranges from 6.5 to calcareous.

Eel soils are in a drainage sequence with well-drained Genesee soils and poorly and very poorly drained Sloan soils. They differ from Genesee soils in being mottled above a depth of 30 inches and from Sloan soils in not being mottled above a depth of 10 inches. Eel soils on high bottoms lack the clay accumulation in the B horizon that Collamer and Galen soils have.

Eel silt loam (0 to 3 percent slopes) (Ee).—This soil has the profile described as typical of the series. It is on first bottoms. Included in mapping were areas of slightly wetter soil that is faintly mottled immediately below the plow layer. This inclusion makes up as much as 20 percent of some areas. Included also were spots of well-drained Genesee soils on slight rises and poorly drained Sloan soils in shallow depressions.

This soil is suited to crops, pasture, or forest. Though moderately wet, it is suited to vegetables and to field crops.

Random drainage of the wetter spots improves some areas. In some places special practices are needed to control streambank erosion. Only a few areas need lime. The fertility level is moderate to high, and the response to fertilizer is good.

Flooding and seasonal wetness are the main limitations to most nonfarm uses. (Capability unit IIw–5; woodland group 1a)

Eel silt loam, high bottom (0 to 3 percent slopes) (Eh).—A profile of this soil is similar to the one described as typical of the series. Because of less frequent flooding, however, this soil has browner colors below the plow layer. It is flooded only about once in 5 to 10 years. The dominant inclusions in mapping were the well-drained Genesee soils on slight rises and the poorly drained Sloan soils in shallow depressions.

This soil is well suited to pasture, forest, and all crops, including vegetables.

Draining the occasional wet spots improves some areas. In places special control of streambank erosion is needed. Only a few areas need lime. The fertility level is moderate to high, and the response to fertilizer is good.

Flooding and seasonal wetness are the main limitations to most nonfarm uses. (Capability unit IIw–3; woodland group 1a)

Ellery Series

The Ellery series consists of medium-textured, poorly drained, low-lime soils that have a fragipan. These soils formed in firm, alkaline to weakly calcareous silt loam till derived from gray, fine-grained sandstone and silty shale. A small amount of limestone is present in some places.

A typical profile in a cultivated area has a very dark grayish-brown channery silt loam plow layer. The next layer consists of leached, gray, friable silt loam that is mottled and extends to a depth of 10 inches. It is underlain by a very firm to hard, dense fragipan. The fragipan is dark olive-brown, mottled channery silt loam in the upper part and grades to dark-gray, mottled channery loam to silt loam in the lower part. The reaction is slightly acid in the upper 10 inches of the profile and neutral in the fragipan. The substratum is firm and dense and consists of gray to dark-gray channery loam to silt loam till. It is at a depth of about 36 inches and is calcareous.

Typical profile of Ellery silt loam, 3 to 8 percent slopes, in a formerly cultivated field:

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) silt loam; common, medium, prominent, strong-brown (7.5YR 5/8) and yellowish-red (5YR 4/8) root mottles; moderate, coarse, granular structure; friable; very numerous fine and medium roots; slightly acid; abrupt, wavy boundary. 6 to 9 inches thick.

A2g—8 to 10 inches, gray (5Y 5/1) silt loam, light gray (5Y 7/1) when dry; common, medium, distinct, light olive-brown (2.5Y 5/4) and yellowish-brown (10YR 5/4) mottles; weak, thick, platy structure breaking to weak, coarse, subangular blocky structure; friable when moist, nonsticky when wet; 5 percent coarse fragments; many fine roots; slightly acid; abrupt, wavy boundary. 0 to 9 inches thick.

IIBx1g—10 to 21 inches, dark grayish-brown (2.5YR 4/2), channery, gritty silt loam; many, medium and coarse, distinct, yellowish - brown, dark yellowish - brown (10YR 5/6 and 4/4), and gray (5Y 5/1) mottles; weak, very thick, platy structure within weak, very coarse prisms 10 to 15 inches across; very firm to hard in place, fragile to crush when removed; nonsticky when wet; prisms separated by ½- to 1-inch streaks of gray (5Y 5/1), friable silt loam with common, medium, distinct, yellowish-brown and light olive-brown mottles; 20 percent coarse fragments; many fine roots extending to a depth of 18 inches, and a few roots to a depth of 21 inches; no roots inside prisms; neutral; diffuse boundary. 8 to 17 inches thick.

IIBx2g—21 to 36 inches, dark-gray (5Y 4/1) channery loam to channery gritty silt loam; common, coarse, distinct, light olive-brown (2.5Y 5/4) and olive-brown (2.5Y 4/4) mottles and few, fine, faint, gray (N 5/0) mottles that decrease in size and number with depth; weak, very thick, platy structure breaking to weak, medium, blocky structure within weak, very coarse prisms; thin, gray (5Y 5/1), patchy clay skins on some prisms, blocks, and plates; very firm in place, fragile to crush when removed; no roots; 25 to 30 percent coarse fragments; common fine pores with clay linings; neutral; diffuse boundary. 10 to 25 inches thick.

IICx—36 to 48 inches, gray to dark-gray (5Y 5/1–4/1) channery loam to gritty silt loam; few, fine, olive-brown and light olive-brown (2.5Y 4/4 and 5/4) mottles; weak, thick, platy structure; very firm; no roots; 30 to 35 percent coarse fragments; mildly calcareous.

The thickness of the solum ranges from 30 to 60 inches. The depth to carbonates ranges from 30 to 80 inches, and the depth to bedrock ranges from 40 inches to more than 20 feet.

The color of the Ap horizon ranges from very dark gray to dark grayish brown in a hue of 10YR to 2.5Y, a value of 2 or 3, and a chroma of 1 or 2. The A2g horizon ranges from 10YR to 5Y in hue, 4 to 6 in value, and 0 to 2 in chroma. There are a few to many mottles of higher chroma. The A horizon ranges from silt loam to loam in texture, and the content of coarse fragments is 0 to 25 percent. The reaction is strongly acid to neutral.

The depth to the fragipan ranges from 10 to 16 inches. This horizon ranges from 5Y to 10YR in hue, 3 to 5 in value, and 1 to 3 in chroma. The mottles are few to many and are faint to distinct. The texture of the fragipan ranges from silt loam to loam. The content of clay is 18 to 28 percent, and that of coarse fragments is 15 to more than 50 percent. The reaction is medium acid to neutral. The consistence is very firm to firm.

The C horizon ranges from 5Y to 10YR in hue, from 3 to 5 in value, and from 1 to 2 in chroma. The texture is loam to silt loam, and the content of coarse fragments is 30 to more than 50 percent. The reaction is neutral to moderately calcareous.

Ellery soils are in a drainage sequence with moderately well drained Langford, somewhat poorly drained Erie, and very poorly drained Alden soils. Ellery soils differ from Lyons soils in containing less lime and more stone fragments and in having a fragipan.

Ellery and Alden silt loams, 3 to 8 percent slopes (EIB).—These soils are on uplands in the southeastern corner of the county, at an elevation about 1,200 feet. They generally occur as small seep areas among the better drained, moderately sloping Erie and Langford soils. The range of slope is commonly 3 to 5 percent.

Any area of this undifferentiated unit may consist of one or both soils. The Ellery soil has the profile described as typical of its series. It is poorly drained and has a mineral surface layer. The Alden soil is very poorly drained and has a profile similar to that of Alden mucky silt loam, till substratum.

These soils are too wet for cultivation unless they are drained. They are generally not systematically drained, but some form of drainage might improve them enough for water-tolerant hay and pasture. Some areas are in permanent pasture. Although not productive unless limed and fertilized, they provide feed during dry periods. Water-tolerant trees are predominant in the woods.

Prolonged wetness and slow permeability are the main limitations to nonfarm uses except ponds. (Capability unit IVw-2; woodland group 20)

Erie Series

The Erie series consists of deep, medium-textured, somewhat poorly drained soils that formed in firm silt loam or loam till derived from gray, fine-grained sandstone and silty shale. The till is neutral to weakly calcareous because of small amounts of limestone with the sandstone and shale. These soils are low in lime and have a strongly expressed fragipan. They are at an elevation above 1,200 feet in the southeastern third of the county.

A typical profile in a cultivated area has a dark grayish-brown channery silt loam plow layer about 8 inches thick. Next is a leached layer of friable to firm, olive channery silt loam that is mottled and extends to a depth of 13 inches. At this depth is a very firm, dense fragipan of dark grayish-brown, mottled channery silt loam. Equally firm, dense till is at a depth of 30 inches. It is dark-gray, mottled channery silt loam or channery loam. The reaction of the surface layer is medium acid, and that of the fragipan is medium acid in the upper part to neutral in the lower part. The till grades from neutral in the upper part to calcareous at a depth of 40 inches.

Typical profile of Erie channery silt loam, 3 to 8 percent slopes, in a cultivated field:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) channery silt loam; brown (10YR 4/3–5/3) when rubbed; moderate, fine and medium, granular structure; friable; medium acid; many fine and medium roots; abrupt, smooth boundary. 7 to 10 inches thick.

A2—8 to 13 inches, olive (5Y 5/4) channery silt loam; common, medium, distinct, yellowish-brown (10YR 5/6 and 10YR 5/4) mottles and common, fine, faint, olive-gray (5Y 5/2) mottles; weak, medium and coarse, angular and subangular blocky structure; thin, discontinuous olive-gray (5Y 5/2) silt coating on ped faces; friable to firm when moist, nonsticky when wet; medium acid; common fine roots; abrupt, wavy boundary. 3 to 10 inches thick.

IIBx—13 to 30 inches, dark grayish-brown (2.5Y 4/2), gritty, channery silt loam to channery loam; more stone fragments than in above horizons; few, fine, distinct, light olive-brown (2.5Y 5/4) mottles; massive to very weak, very thick, platy structure breaking to weak, medium and coarse, blocky structure within weak, very coarse prisms 10 to 18 inches across; thin, discontinuous, grayish-brown (2.5Y 5/2) silt coating on ped faces; few prominent clay coats on ped faces and in large pores; very firm in place, fragile when removed, slightly sticky when wet; no roots in interior of prisms; prisms separated by ½- to ¾-inch streaks of grayish-brown (2.5Y 5/2), friable silt loam; common, medium, distinct, yellowish-brown (10YR 5/6 and 5/4) mottles; common fine roots along prism faces extending to a depth of 28 inches; medium acid in upper part grading to neutral at a depth of 28 inches; diffuse boundary. 12 to 40 inches thick.

IICx—30 to 48 inches, dark-gray (5Y 4/1), gritty, 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 with depth; very weak, thick and very thick, platy structure; very firm in place, fragile to crush when removed; no roots; calcareous at a depth of 40 inches.

The thickness of the solum ranges from 30 to 60 inches. The depth to carbonates ranges from 30 to 80 inches, and the depth to bedrock ranges from 40 inches to more than 20 feet.

The texture of the A horizon is mostly channery silt loam, although it ranges to fine sandy loam. The color of the A horizon ranges from very dark gray to grayish brown, depending on the organic-matter content. The content of small, angular stones ranges from 5 to 25 percent. The color of the A2 horizon ranges from 10YR to 5Y in hue, 4 to 6 in value, and 3 to 4 in chroma. The mottles are common to many and are distinct. The reaction of the A horizon ranges from strongly acid to medium acid.

The fragipan is at a depth of 12 to 18 inches and ranges from 12 to 40 inches in thickness. The color ranges from 10YR to 5Y in hue, 3 to 5 in value, and 2 to 4 in chroma. The silt streaks that separate the 10-inch to 18-inch prisms are ¼ to 1 inch thick and have a color ranging from 10YR to 5Y in hue, 4 to 6 in value, and 1 to 3 in chroma. Mottles are most common in the center of the streaks and are mostly yellowish brown or olive brown but are also strong brown. The reaction of the fragipan ranges from medium acid to neutral in the upper part and is nearly always neutral in lower part. The stone content of the fragipan and underlying till ranges from 20 to more than 50 percent, by volume, and consists mostly of small and medium, flat, angular stone fragments.

Erie soils are in a drainage sequence with moderately well drained Langford, poorly drained Ellery, and very poorly drained Alden soils. Erie soils differ from Kendaia and Appleton soils in having a fragipan and a lower lime content. They are finer textured than Scriba soils.

Erie channery silt loam, 0 to 3 percent slopes (ErA).—This soil has a profile like the one described for the series, except for a slightly darker colored surface layer and a more highly mottled subsoil. The range of slope is commonly 2 to 3 percent.

The predominant inclusions in mapping were poorly drained Ellery soils that occur mostly as flat areas, as small shallow depressions, and as long narrow strips along shallow drainageways. These inclusions are as much as 20 percent of some areas. A few small knolls of Langford soils were also included.

This soil is used for crops, pasture, or forest. Without artificial drainage it is better suited to water-tolerant grasses and legumes than to other crops. Woodlands consist mostly of water-tolerant trees.

Water control is the main problem. Systematic drainage requires very close spacing because of the impervious fragipan. Random drainage of the wetter Ellery soils improves areas for hay and forage crops. As this soil receives runoff from adjacent soils, structures that divert runoff are beneficial. Selecting crops that tolerate wetness is important. Liming and complete fertilization are needed, and the response is only moderate.

Seasonal wetness, slow permeability, and stone fragments are the main limitations to most nonfarm uses except ponds and wildlife marshes. (Capability unit IIIw-3; woodland group 15)

Erie channery silt loam, 3 to 8 percent slopes (ErB).—This soil has the profile described as typical of the series. It receives runoff from higher soils but has enough slope to remove some of the excess water. Slopes commonly are smooth. A few are slightly undulating. Included in mapping were areas of poorly drained Ellery soils along shallow, narrow drainageways and in slight depressions. These soils make up as much as 15 percent of some areas and commonly delay planting in spring. Areas of moderately well drained Langford soils on slight rises or knolls also were included and make up as much as 10 percent of some areas.

This soil is used for crops, pasture, or forest. Under good management it is fairly well suited to common field crops.

Control of excess water is the main problem. Many fields can be improved by diversion of runoff from higher soils and by random drainage of the included Ellery soils. If water is controlled, this soil is fairly well suited to corn and other field crops, but it is probably better suited to water-tolerant grasses and legumes. Winter wheat is grown successfully, but spring grains are adversely affected by wet weather in spring. The response to lime and fertilizer is only moderate, and yields vary from year to year because of spring wetness and midsummer drought. Erosion is a moderate hazard on the longer slopes.

Seasonal wetness, slow permeability, stone fragments, and slope are the main limitations to most nonfarm uses. (Capability unit IIIw-9; woodland group 15)

Erie Series, Moderately Shallow Variant

This series consists of moderately shallow, somewhat poorly drained, low-lime soils that have a strongly expressed fragipan. These soils formed in firm silt loam or loam till derived from local, gray, fine-grained sandstone and silty shale. Bedrock is at a depth of 20 to 40 inches and commonly contains small amounts of lime. These soils are in the southeastern part of the county, at an elevation above 1,200 feet.

A typical profile in a cultivated area has a dark grayish-brown channery silt loam plow layer about 7 inches thick. This layer is underlain by a friable to firm, leached layer of mottled, olive to light olive-brown channery silt loam that extends to a depth of 13 inches. Just below it is a fragipan of very firm, dense, mottled, dark grayish-brown channery loam to channery silt loam. The reaction above the fragipan is medium acid. The reaction of the fragipan grades from medium acid in the upper part to slightly acid in the lower part. Gray and dark-gray, fractured sandstone and hard shale bedrock are at a depth of about 28 inches.

Typical profile of Erie channery silt loam, moderately shallow variant, 3 to 8 percent slopes, in a cultivated field:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) channery silt loam; brown (10YR 4/3-5/3) when rubbed; moderate, fine and medium, granular structure; friable; many fine and medium roots; medium acid; abrupt, smooth boundary. 6 to 10 inches thick.

A2—7 to 13 inches, olive (5Y 5/4) to light olive-brown (2.5Y 5/4) channery silt loam; common, medium, distinct mottles of yellowish brown (10YR 5/6 and 5/4), light olive brown (2.5Y 5/6), and light gray (2.5Y 7/2); weak, medium and coarse, angular and subangular blocky structure; friable to firm when moist, nonsticky when wet; thin, discontinuous, olive-gray (5Y 5/2) silt coating on ped faces; common fine roots; medium acid; abrupt, wavy boundary. 3 to 10 inches thick.

IIBx—13 to 28 inches, dark grayish-brown (2.5Y 4/2), channery, gritty loam to channery gritty silt loam; few, fine, distinct mottles of light olive brown (2.5Y 5/6 and 5/4) and yellowish brown (10YR 5/6 and 5/4); massive to very weak, very thick, platy structure breaking to weak, medium and coarse, blocky structure within weak, very coarse prisms 10 to 18 inches across; very firm in place, fragile when removed, slightly sticky when wet; few discontinuous clay coats on blocks and plate faces and common clay linings in large pores; no roots in interior of prisms; prisms separated by ½- to ¾-inch streaks of grayish-brown (2.5Y 5/2), friable silt loam; common, medium, distinct mottles of yellowish brown (10YR 5/6 and 5/4) and light olive brown (2.5Y 5/6); common fine roots along prism faces; distinctly more stone fragments than in horizon above; medium acid grading to slightly acid at a depth of 25 inches; abrupt, wavy boundary. 5 to 20 inches thick.

R—28 to 40 inches +, gray and dark-gray (10YR 5/1 and 4/1), fine-grained sandstone and hard shale bedrock with cleavages ½ inch to 2 inches wide. Upper 6 inches has thin, grayish-brown (2.5Y 5/2) silt coating on horizontal rock faces.

The depth of the solum ranges from 20 to 40 inches and corresponds to the depth to bedrock.

The texture of the A horizon ranges from silt loam to very fine sandy loam, and the stone content is 10 to 35 percent. The color of the A1 and Ap horizons ranges from very dark gray to grayish brown. The A2 horizon has a hue of 10YR to 5Y, a chroma of 3 to 5, and a value of 4 to 6, and there are common to many distinct mottles. The reaction in unlimed areas ranges from strongly acid to medium acid.

The depth to the fragipan ranges from 12 to 18 inches. The thickness of the pan ranges from 2 inches, where bedrock is at a depth of 20 inches, to 24 inches, where bedrock is at a depth of 40 inches. The texture of the pan ranges from channery to very channery gritty loam to coarse silty clay loam, and the clay content is 18 to 28 percent. The content of coarse fragments ranges from 20 to more than 50 percent. The color ranges from 10YR to 5Y in hue, 3 to 5 in value, and 2 to 4 in chroma. Mottles range from few to common in prisms. The prisms are 8 to 24 inches across. They are separated by silt streaks ⅛ to 1 inch wide. The color of the silt streaks ranges from 10YR to 5Y in hue, 4 to 6 in value, and 1 to 3 in chroma. Mottles of high chroma range from common to many. The fragipan is firm to very firm in place and fragile and brittle when removed. The reaction ranges from medium acid to neutral.

A thin Cx horizon is commonly present where the depth to rock is 30 to 40 inches. It has a texture of gritty loam to silt loam and an angular stone content of 20 to more than 50 percent. The color ranges from 10YR to 5Y in hue, 4 to 6 in value, and 1 to 4 in chroma. There are a few to common high-chroma mottles. The material is very firm to firm in place and brittle and fragile when removed. The reaction ranges from medium acid to slightly alkaline.

Moderately shallow Erie soils are in a drainage sequence with moderately well drained, moderately shallow Langford soils. They are also associated with deeper Erie and Langford soils, moderately deep Lordstown soils, and shallow Arnot and Tuller soils. They differ from Angola soils in having a fragipan and a lower lime content.

Erie channery silt loam, moderately shallow variant, 0 to 3 percent slopes (EsA).—A profile of this soil is like the one described as typical of the moderately shallow variant, except that it has a slightly darker colored surface layer and a more highly mottled subsoil. The range of slope is commonly 2 to 3 percent. Included in mapping were poorly drained soils that are 20 to 40 inches in depth to bedrock. They are in small flat areas, small shallow depressions, or long narrow strips along shallow drainageways. These wetter soils occupy as much as 20 percent of some areas. Their surface layer is very dark gray in cultivated fields and nearly black in wooded areas. Though inextensive, these inclusions are important because they commonly delay fieldwork in spring or following heavy rains.

This soil is suited to crops, pasture, or forest. Without artificial drainage, it is better suited to water-tolerant grasses and legumes than to row crops. Woodlands consist mostly of water-tolerant trees.

Water control is the main problem. Systematic drainage requires very close spacing because of the impervious fragipan. Random drainage of wet spots improves areas for hay and forage crops. Structures that divert runoff from higher soils are also beneficial. Selecting crops that tolerate wetness is important. Liming and complete fertilization are needed, and the response is only moderate.

Moderate shallowness to bedrock, seasonal wetness, slow permeability, and stone fragments are limitations to most nonfarm uses (Capability unit IIIw-3; woodland group 15)

Erie channery silt loam, moderately shallow variant, 3 to 8 percent slopes (EsB).—This soil has the profile described as typical of the moderately shallow variant. Most areas are smoothly sloping; a few are slightly undulating. Runoff is received from higher soils, but there is enough slope to remove some of the excess water. Included in mapping were Erie soils that are more than 40 inches in depth to bedrock. These deeper soils are as much as 20 percent of some areas but have little effect on management. Also included were poorly drained soils, 20 to 40 inches in depth to bedrock. These soils occur along narrow, shallow drainageways or in slight depressions. They are as much as 10 percent of some areas. Though inextensive, they delay planting in spring. Spots of moderately well drained Langford soils on slight rises or knolls were also included.

This soil is suited to crops, pasture, or forest. Control of excess water is the main problem. Many fields can be improved by diversion of runoff from higher soils and by random drainage of the wet spots. If water is controlled, this soil is fairly well suited to corn and other field crops, but it is probably better suited to water-tolerant grasses and legumes. Winter wheat is grown successfully, but spring grains are adversely affected by wet weather in spring. The response to lime and fertilizer is only moderate, and yields vary from year to year on account of spring wetness and midsummer drought. Erosion is a moderate hazard on the longer slopes.

Moderate shallowness to bedrock, seasonal wetness, slow permeability, stone fragments, and slope are limitations to most nonfarm uses. (Capability unit IIIw-9; woodland group 15)

Farmington Series

The Farmington series consists of shallow, well-drained soils that formed in residuum from gray silty shale. The shale is medium acid to weakly calcareous. These soils are only 10 to 20 inches in depth to bedrock. They are in the southern half of the county. The largest areas are on steep valley sides that slope down to the Finger Lakes and to Owasco Lake.

A typical profile in a cultivated area has a very dark grayish-brown to dark-brown shaly silt loam plow layer. Just below this layer is the friable, brown shaly silt loam subsoil. The reaction of the subsoil is medium acid. Partly weathered and fractured, dark-gray shale bedrock is at a depth of 12 inches. The bedrock is consolidated at a depth of about 42 inches.

Typical profile of Farmington shaly silt loam, 1 to 12 percent slopes, in a cultivated field:

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) to dark-brown (10YR 3/3) shaly silt loam; strong, medium, granular structure; friable to very friable; many roots; medium acid; clear, wavy boundary. 8 to 9 inches thick.

B2—8 to 12 inches, brown (10YR 5/3) shaly silt loam; moderate, medium, granular structure; friable; numerous roots; medium acid; clear, smooth boundary. 2 to 12 inches thick.

R1—12 to 42 inches, dark-gray (10YR 4/1), soft, weathered shale, broken into fragments 1 to 4 inches long and ½ to 1 inch thick; some roots along vertical cracks; medium to slightly acid.

R2—42 inches +, dark-gray, brittle, unweathered shale; very dark gray interiors; alkaline to weakly calcareous.

The color of the surface layer ranges from very dark gray to dark brown. That of the subsoil ranges from brown to yellowish brown, the more acid areas being yellowish brown. The reaction ranges from medium acid to slightly acid. The depth to shale bedrock ranges from 10 to 20 inches. Thin strata of harder fine-grained sandstone commonly occur in the bedrock. In some of the less sloping areas, a thin layer of soil with faint mottling occurs just above bedrock. There are a few small areas where the soil is 10 to 20 percent fine-grained sandstone fragments (channers).

Farmington soils are similar to Arnot soils but are derived from moderately soft silty shale containing some limestone, whereas Arnot soils are derived from fairly hard, fine-grained, gray sandstone and are more acid.

Farmington shaly silt loam, 1 to 12 percent slopes (FaC).—This soil has the profile described as typical of the series. It generally occurs as small, scattered areas among deeper Aurora soils, in the southern half of the county. Most areas are on gently sloping hilltops or sloping valley sides, and the slopes are convex in shape. On the gentler slopes, the depth of the soil is more uniform; it is mostly 10 to 20 inches. On the stronger slopes, the depth is more variable. In most areas the depth is less than 20 inches. In places, because of the steplike bedrock, there are bare outcrops of rock on the surface, but within short distances the depth to bedrock is several feet. These small areas of deeper soil were the dominant inclusions in mapping, but they have little effect on management. Other inclusions were occasional wet spots of somewhat poorly drained Angola or Tuller soils in small depressions.

The degree of erosion ranges from little or none in unplowed pasture or woods to severe in the more strongly sloping, cropped areas. Erosion varies highly within fields. In parts of fields, gullies extend into the softer shale bedrock. The loss of only a few inches of soil is critical for many crops.

This soil can be used for crops, pasture, or forest, but it is better suited to drought-resistant hay and forage crops. The response to lime and fertilizer is only moderate. Yields of row crops are reduced by moderately dry periods.

Bedrock and slope are the main limitations to most nonfarm uses. (Capability unit IIIe–1; woodland group 9a)

Fonda Series

The Fonda series consists of deep, very poorly drained, fine-textured soils that developed in lacustrine deposits of calcareous, reddish-gray and brown clay in which there are a few bands of silt or very fine sand. These soils occupy low places and depressions in the lake plain and are subject to ponding. They are mostly north of Auburn. A few areas are on the till plain south of Auburn where sufficient clay sediment was deposited in shallow, post glacial lakes or ponds.

A typical profile in a pasture has a very dark brown to very dark gray, heavy silt loam surface layer about 5 inches thick. The next layer extends to a depth of 13 inches. The upper inch of it is firm, very dark gray to light-gray silt loam. The rest is firm silt loam to silty clay loam or very fine sandy clay loam that is light gray to gray and distinctly mottled. Just below this is a firm subsoil, the upper part of which is brown, mottled silty clay loam. The lower part is dark reddish-gray silty clay or silty clay loam that is distinctly mottled. It extends to the substratum, which is at a depth of about 25 inches. The substratum consists of very firm, reddish-gray, mottled, heavy silty clay loam that contains thin layers of silt. The subsoil and substratum are calcareous. The surface layer and subsurface layers are neutral in reaction.

Typical profile of Fonda mucky silt loam in a pasture:

A1—0 to 5 inches, very dark brown (10YR 2/2) to very dark gray (10YR 3/1), mucky fine silt loam; moderate, fine and medium, granular structure; friable when moist, slightly sticky when wet; many fine roots; neutral; clear, wavy boundary. 4 to 9 inches thick.

A21g—5 to 6 inches, variegated, very dark gray (N 3/0) to light-gray (N 6/0) silt loam; strong, coarse, subangular blocky and blocky structure; firm when moist, slightly plastic when wet; very dark gray to black (10YR 3/1–2/1) organic film on ped faces; many fine roots; neutral; clear, wavy boundary. 0 to 2 inches thick.

A22g—6 to 9 inches, light-gray (10YR 6/1 to 7/1) fine silt loam; common, large, distinct, yellowish-brown (10YR 5/4–5/6) mottles; strong, coarse, subangular blocky and blocky structure; firm when moist, slightly plastic when wet; very dark gray (10YR 3/1) to black (10YR 2/1) organic film on ped faces; many fine roots along ped faces; neutral; clear, wavy boundary. 0 to 4 inches thick.

A23g—9 to 13 inches, light-gray to gray (10YR 6/1), coarse silty clay loam to very fine sandy clay loam; many, large, distinct, light-gray (10YR 7/1), yellowish-brown (10YR 5/4 and 5/6), and brownish-yellow (10YR 6/6) mottles; moderate, coarse, blocky structure; firm when moist, slightly plastic when wet; light-gray (10YR 6/1 to 7/1) silt film on ped faces; common fine roots along ped faces; neutral; clear, wavy boundary. 0 to 5 inches thick.

B21g—13 to 16 inches, brown (7.5YR 4/2 to 5/2) fine silty clay loam; common, medium, distinct, light-gray (5YR 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 when moist, plastic when wet; pinkish-gray (7.5YR 6/2 to 7/2), prominent, silty lime film on prism and ped faces; few fine roots along ped faces; slightly calcareous; clear, wavy boundary. 2 to 9 inches thick.

B22g—16 to 25 inches, dark reddish-gray (5YR 4/2) silty clay to fine 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 when moist, plastic when wet; light-gray (N 6.5/0), thin, silt lime film on prism and ped faces; very few fine roots; strongly calcareous; abrupt, wavy boundary. 8 to 11 inches thick.

Cg—25 to 60 inches, reddish-gray (5YR 5/2) fine silty clay loam; common, coarse, distinct, yellowish-brown (10YR 5/6) and grayish-brown (10YR 5/2) mottles that decrease in size and number with depth; strong, thick, platy structure separated by thin, light-gray to pinkish-gray (7.5YR 6/0 to 6/2) silty laminations; very firm; strongly calcareous.

The thickness of the solum ranges from 15 to 40 inches. The A1 horizon ranges from black mucky silty clay loam in the wettest areas to gray silt loam in the better drained areas. An A22g horizon is generally present, but in places it is mixed with the surface layer and is discontinuous. In the wettest areas the A2g horizon extends to a depth of 15 inches.

The B horizon is generally silty clay but ranges from fine silty clay loam to clay. Thin lenses of silt or fine sand are present above a depth of 24 inches but seldom exceed 6 inches in total thickness. The profile is usually calcareous at a depth of 12 to 30 inches but, in places, is calcareous at a depth of 40 inches.

Fonda soils are in a drainage sequence with well drained and moderately well drained Schoharie, somewhat poorly drained Odessa, and poorly drained Lakemont and Madalin soils. Fonda soils are finer textured than Alden soils. They have an average clay content of 35 to 55 percent in the control section, whereas Alden soils have an average of 13 to 35 percent.

Fonda mucky silt loam (0 to 3 percent slopes) (Fo).—In forest this soil commonly has 2 to 6 inches of muck over moderately dark colored mineral soil. In pasture the muck has been mixed with the mineral soil, and the surface layer is nearly black mucky silt loam. In cropped areas the plow layer is lighter colored; it is dark gray because the content of organic matter has been reduced by cultivation.

This soil is in the lowest depressions on the landscape. Undrained depressions commonly have water standing at or near the surface for 8 to 10 months of the year. Included in mapping were small areas of muck in the lowest depressions and poorly drained Madalin or Lakemont soils on slight rises. These inclusions make up as much as 20 percent of any area but have little effect on management.

If undrained, this soil is suited mainly to forest or wetland pasture. If drained, it can be used for crops, although it is slowly or very slowly permeable and clods readily. Drains should be closely spaced. Drained areas need little or no lime but a moderate amount of phosphorus and a small amount of potassium. The supply of nitrogen is noticeably deficient in spring but may be abundant by midsummer.

Some areas are excellent wildlife marshes, and some are good pond sites. Prolonged wetness and slow permeability are the main limitations to most other nonfarm uses. (Capability unit IVw-1; woodland group 20)

Fredon Series

The Fredon series consists of deep, somewhat poorly drained soils that formed in calcareous glacial outwash from limestone, sandstone, and shale. These soils are in small depressions in outwash areas throughout the county.

A typical profile in a cultivated area has a very dark gray loam plow layer about 9 inches thick. Underlying the plow layer is the upper part of the subsoil, which is dark grayish-brown to brown, mottled, friable loam that contains some gravel. This layer extends to a depth of 15 inches where it merges with the lower part of the subsoil, which is very friable to loose, gray, mottled gravelly loam to gravelly sandy loam. The reaction of the subsoil ranges from neutral in the upper part to calcareous in the lower part. The substratum is at a depth of about 30 inches. It consists of stratified, gray, calcareous sand and gravel.

Typical profile of Fredon loam in a cultivated field:

Ap—0 to 9 inches, very dark gray (10YR 3/1) loam, 2 to 10 percent gravel; moderate, fine and medium, granular structure; friable when moist, nonsticky when wet; very numerous fine roots; neutral; abrupt, wavy boundary. 7 to 10 inches thick.

B2g—9 to 15 inches, dark grayish-brown (10YR 4/2) to brown (10YR 5/3) loam, 2 to 10 percent gravel; many fine, distinct, yellowish-brown (10YR 5/6) and light-gray (10YR 7/1) mottles; moderate, fine and medium, subangular blocky structure; friable when moist, slightly sticky when wet; dark-gray (10YR 4/1), thin organic stains on ped faces; few fine roots; neutral; clear, wavy boundary. 4 to 10 inches thick.

IIB3g—15 to 30 inches, gray (10YR 5/1) gravelly loam to gravelly sandy loam; few, medium, distinct, yellowish-brown (10YR 5/6) mottles in upper 6 to 8 inches; weak, medium and coarse, subangular blocky structure grading to single grain with depth; very friable to loose; no roots; calcareous; diffuse, wavy boundary. 4 to 20 inches thick.

IIC—30 to 40 inches, stratified, gray (10YR 5/1), calcareous sand and gravel.

The thickness of the solum ranges from 15 to 40 inches, and the depth to carbonates from 12 to 40 inches. The A horizon ranges from fine sandy loam to silt loam and contains 0 to 50 percent or more gravel by volume. The B horizon ranges from sandy loam to fine silt loam to light sandy clay loam. The color of the A horizon ranges from nearly black to gray, depending on organic content. The color of the B horizon ranges from 5YR to 2.5Y in hue, 4 to 5 in value, and 1 to 3 in chroma. Distinct mottles range from few to many and fine to coarse. The texture of the C horizon is variable and ranges from stratified fine sand to coarse gravel.

Fredon soils are in a drainage sequence with well drained Palmyra and moderately well drained Phelps soils. They are also associated with well-drained Alton, Howard, and Wampsville soils. They differ from Niagara and Minoa soils in containing gravel and larger sand particles. They are coarser textured than Kendaia and Appleton soils, which formed in glacial till.

Fredon loam (0 to 3 percent slopes) (Fr).—This soil has the profile described as typical of the series. Included in mapping were small, very poorly drained spots with a black mucky surface layer. These are in the lowest depressions or where the seep is most active. Also included were areas in which the slope is as much as 8 percent, generally where seepage occurs much of the year.

This soil is suited to crops, pasture, or forest. Undrained areas are used mainly for hay or pasture. Drained areas are suitable for intensive cropping.

Control of wetness is needed. Where outlets are available, this soil can readily be drained by tile or by open ditches. Special measures are needed to prevent plugging of drains where there are sandy layers that flow when wet. Complete fertilizer is needed, and the response is good in drained areas. Most areas need little or no lime.

Seasonal wetness is the main limitation to many nonfarm uses. Some areas are suitable for marshes, dugout ponds, or wildlife habitats. (Capability unit IIIw-2; woodland group 11)

Fresh water marsh (0 to 1 percent slopes) (Fw).—This

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is a miscellaneous land type consisting of shallow, inundated areas around lakes and of shallow, ponded areas in uplands. The most extensive areas are in the northern part of the county bordering Lake Ontario. Some of the ponded areas are natural, some are manmade, and some have formed as a result of beaver dams. They are covered with water most of the year and commonly are too wet to support trees, except along the edges where the soil builds up, but they support a dense growth of coarse marsh plants. In many areas the growth is mostly cattail flags; in others it is low, water-loving shrubs.

These marshes are good habitat for muskrat, other aquatic animals, and waterfowl. Some of the cattail flags are harvested for caulking material. The harvesting operations, properly managed, open up the areas and benefit wildlife. (Capability unit VIIIw-1; woodland group 20)

Galen Series

The Galen series consists of deep, moderately well drained, medium-lime and low-lime soils that formed in sandy deposits.

A typical profile in a cultivated area has a very dark grayish-brown fine sandy loam plow layer about 8 inches thick. Next is a leached layer of very friable, yellowish-brown to brown fine sandy loam to loamy fine sand that extends to a depth of 14 inches. It is underlain by the upper part of the subsoil, which consists of very friable to loose loamy fine sand, and contains ½- to 1-inch bands of very fine sandy loam. The bands are roughly horizontal and are spaced 2 to 6 inches apart. The color of the loamy fine sand is strong brown in the upper part and fades to yellowish brown with depth. The bands of very fine sandy loam are reddish brown. The subsoil is mottled below a depth of 22 inches. The lower part of the subsoil is at a depth of 32 inches. It is similar to the upper part, but the texture of the bands is loamy fine sand. The subsoil is neutral in reaction.

Typical profile of Galen fine sandy loam, 0 to 2 percent slopes, in a cultivated field:

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) fine sandy loam, high in very fine sand; gray (10YR 5/1) when dry; weak, medium and coarse, granular structure and fine and medium, subangular blocky structure; very friable; very numerous fine roots; slightly acid; abrupt, wavy boundary. 7 to 9 inches thick.

A2—8 to 14 inches, yellowish-brown (10YR 5/4) to brown (7.5YR 5/4) fine sandy loam to loamy fine sand; very weak, medium and coarse, subangular blocky structure breaking to weak, fine and medium, granular structure; very friable; numerous fine roots; neutral; clear, wavy boundary. 3 to 7 inches thick.

B21—14 to 22 inches, strong-brown (7.5YR 5/8 fading with depth to 7.5YR 5/6) loamy fine sand; roughly horizontal bands, ½ to 1 inch thick and 2 to 4 inches apart, of reddish-brown (5YR 4/3) very fine sandy loam with thin clay bridges; very weak, medium and coarse, subangular blocky structure; very friable to loose; numerous fine roots; neutral; gradual, wavy boundary. 6 to 10 inches thick.

B22—22 to 28 inches, brown (7.5YR 5/4) loamy fine sand; few, medium, distinct, yellowish-red (5YR 5/6, 5/8, and 4/6) mottles and few, fine, distinct pinkish-gray (7.5YR 7/2) mottles; roughly horizontal bands, ½ to 1 inch thick and 2 to 6 inches apart, of reddish-brown (5YR 4/3) fine to very fine sandy loam with thin clay bridges; few, medium, distinct, yellowish-red (5YR 5/6 and 5/8) mottles; very weak, medium and coarse, subangular blocky structure; very friable to loose; few fine roots; neutral; gradual, wavy boundary. 4 to 8 inches thick.

B23—28 to 32 inches, yellowish-brown (10YR 5/4) loamy fine sand; few, fine, faint, yellowish-brown (10YR 5/6) and light brownish-gray (10YR 6/2) mottles; roughly horizontal bands, ½ to 1 inch thick and 2 to 6 inches apart, of reddish-brown (5YR 4/3) very fine sandy loam with thin clay bridges; few, medium, distinct, yellowish-red (5YR 5/6 and 5/8) mottles; single grain; loose; few fine roots; neutral; clear, wavy boundary. 3 to 5 inches thick.

B3—32 to 43 inches, brown (10YR to 7.5YR 5/3) loamy fine sand; few ½-inch bands of reddish brown (5YR 4/3), slightly heavier loamy fine sand; fine and medium, distinct, strong-brown (7.5YR 5/6) and pinkish-gray (7.5YR 6/2) mottles; single grain; loose; neutral.

The thickness of the solum ranges from 24 to 60 inches, and the depth to carbonates from 26 to 80 inches.

The texture of the surface layer is dominantly fine and very fine sandy loam but ranges to loamy fine sand.

The texture of the B horizon ranges from fine sandy loam to loamy very fine sand. The fine sandy loam is slightly firm and brittle where the reaction is more acid. Thin bands of silt are present in places but average less than 30 percent of the B horizon to a depth of 40 inches. There are also occasional thin clay bands up to ½ inch thick. The average clay content of the B horizon, to a depth of 40 inches, is less than 18 percent. The color of the B horizon ranges from 10YR to 5YR. The reaction of the surface layer ranges from 5.5 to 7.0. At a depth of 36 inches the reaction is 6.0 to calcareous.

Galen soils are in a drainage sequence with well-drained and excessively drained Arkport, somewhat poorly drained Minoa, and poorly drained to very poorly drained Lamson soils. Galen soils are sandier than Collamer soils and contain less silt and clay in the B horizon. They are sandier than Williamson soils, they lack the distinct fragipan, and they contain slightly more lime than those soils.

Galen fine sandy loam, 0 to 2 percent slopes (GaA).—This soil has the profile described as typical of the series. It is on the level tops of lake plains or sandy deltas and receives little or no runoff. Most areas are scattered throughout the northern half of the county. One of the largest areas is along Short Cut Road immediately northeast of Muskrat Creek, in the town of Cato. Included in mapping were somewhat poorly drained Minoa, Stafford, and Niagara soils in slight depressions or along narrow drainageways. These wetter soils are not extensive, but they delay tillage in spring.

This soil is suited to crops, pasture, or forest. It has low natural fertility but is well suited to special crops under intensive management. Some areas are irrigated and used for market garden crops.

Lime and liberal applications of fertilizer high in potash and nitrogen are neeeded for most crops. Water erosion is generally not a hazard, but some of the sandier areas are subject to wind erosion. Random drainage of the wet spots is beneficial in some fields.

Seasonal wetness is the main limitation to most nonfarm uses. (Capability unit IIw-2; woodland group 6a)

Galen fine sandy loam, 2 to 6 percent slopes (GaB).—Most areas of this soil are north of Auburn. One of the largest areas is northeast of Muskrat Creek along Short Cut Road in the town of Cato. The slopes are generally short, and the smoother areas have shallow drainageways spaced from 200 to 400 feet apart. The undulating areas have drainageways spaced less than 200 feet apart. Included in mapping were areas of somewhat poorly drained Minoa soils in slight depressions or drainageways. These wetter soils are not extensive, but they delay tillage in spring.

This soil is suited to crops, pasture, or forest. Though it has low natural fertility, it is well suited to special crops if intensively managed. Some areas are irrigated and used for market garden crops.

For most crops, lime and liberal applications of fertilizer high in potash and nitrogen are needed. Erosion is a moderate hazard, and the sandier areas are subject to some wind erosion. Random drainage of the wet spots is beneficial in many fields.

Seasonal wetness and slope are the main limitations to most nonfarm uses (Capability unit IIw–7; woodland group 6a)

Genesee Series

The Genesee series consists of deep, well-drained soils that formed in alluvium derived from glacial drift that is high to medium in lime content. These soils are on first bottoms, high bottoms, and alluvial fans. Those on first bottoms are flooded annually, usually early in spring and occasionally at other times, but crops are seldom damaged. Those on high bottoms are flooded only once in 5 to 15 years. Some soils on alluvial fans are flooded annually; others are flooded as infrequently as once in 5 to 10 years. The soils on alluvial fans are gravelly, shaly, or channery.

A typical profile in a cultivated area has a very dark gray silt loam surface layer about 18 inches thick. Just below this layer is a friable, dark grayish-brown silt loam subsoil, which extends to a depth of about 36 inches. The underlying substratum is dark grayish-brown, friable silt loam to very fine sandy loam. The reaction of the entire profile is neutral.

Typical profile of Genesee silt loam in a cultivated field:

A1—0 to 18 inches, very dark gray (10YR 3/1) silt loam; very dark grayish brown (10YR 3/2) to dark grayish brown (10YR 4/2) when crushed and rubbed; moderate, medium and coarse, granular structure; friable when moist, nonsticky when wet; very numerous fine roots; neutral; gradual, wavy boundary. 7 to 25 inches thick.

B2—18 to 36 inches, dark grayish-brown (10YR 4/2) silt loam; dark brown to brown (10YR 4/3) when crushed and rubbed; moderate, coarse and very coarse, subangular blocky structure; friable when moist, nonsticky when wet; numerous fine roots; faint pressure film or sheen on ped faces; neutral; gradual, wavy boundary. 12 to 24 inches thick.

C—36 to 40 inches, dark grayish-brown (10YR 4/2) silt loam to very fine sandy loam; weak, thick and very thick, platy structure breaking to weak, coarse, subangular blocky structure; friable when moist, nonsticky when wet; numerous fine roots; neutral.

The texture of the surface layer ranges from silt loam to very fine sandy loam. In places a few thin strata or lenses of silty clay or sand occur below a depth of 12 to 18 inches.

The color of the surface layer is generally a hue of 10YR, a value of 3 to 5, and a chroma of 1 to 2. Where alluvium is derived from redder material, the hue ranges from 10YR to 7.5YR, the value from 4 to 5, and the chroma from 1 to 2.

The colors of the subsurface layers are like those of the surface layer or range toward brown, yellowish brown, or reddish brown and have a value as high as 6 and chroma as high as 4.

The alluvial silt loam or very fine sandy loam is 18 to 60 inches thick or more where it is underlain by stratified sand and gravel or by stream rubble. In places, however, it is underlain by lacustrine silt, sand, or clay or by firm basal glacial till. The reaction ranges from 6.5 to calcareous.

Genesee soils are in a drainage sequence with moderately well drained Eel and poorly drained and very poorly drained Sloan soils. Unlike Eel soils they are free of mottling above a depth of 30 inches. The Genesee high-bottom soils lack the clay accumulation in the B horizon that is common in lacustrine Dunkirk soils. Unlike Arkport soils, Genesee high-bottom soils lack the banded, clayey material in the B horizon and are silt in texture rather than fine sandy loam.

Genesee silt loam (0 to 3 percent slopes) (Gn).—This soil has the profile described as typical of the series. It occurs mainly along the borders of streams and is flooded annually. On the broader bottom land it grades to the moderately well drained Eel soils. Most areas are level. Some slightly higher areas are natural levees built up by higher rates of deposition along the stream channel. Included in mapping were small areas of Eel soils in slight depressions or nearly filled old channels. Also included were spots of wetter Sloan soils in the deeper old channels or sloughs.

This soil is well suited to pasture, forest, and many crops, including vegetables and small fruits. A few areas are subject to scouring if flooded when they are bare or are used for row crops. Special structures are needed in some areas to control streambank cutting. Although fertility is generally high, crops are responsive to fertilization because of the high water-holding capacity.

Flooding is the main limitation to most nonfarm uses. This soil is one of the best sources of topsoil in the county. (Capability unit IIw–4; woodland group 1a)

Genesee silt loam, high bottom (0 to 3 percent slopes) (Go).—A profile of this soil is like the one described as typical of the series, except that the surface layer is thinner and lighter colored. Commonly, this layer is a plow layer. Also, the subsurface layers are browner and have a stronger structure. Flooding occurs once in 5 to 10 years, usually in spring. It rarely occurs during the growing season and then is of such short duration that crops are seldom damaged. Included in mapping were areas of Eel soil, high bottom, in shallow depressions or in remnants of old stream channels.

This soil is well suited to many crops, including vegetables and small fruits, and to pasture and forest. Special structures are needed in a few areas to control streambank cutting. Fertility is generally high, but crops are responsive to fertilization because of the large amount of water available.

The occasional flooding is the main limitation to most nonfarm uses. The plow layer is good topsoil but is too thin to be a good commercial source. (Capability unit I–2; woodland group 1a)

Genessee gravelly loam, fan (0 to 8 percent slopes) (Gv).—A profile of this soil is like the one described as typical of the series, except that it is gravelly or very gravelly throughout. Much of the gravel consists of flat, angular fragments only slightly rounded by water. The dominant inclusions in mapping were small areas of rubble deposited by streams. Other inclusions were areas of shale rather than gravel and areas of Genesee or Eel silt loam at the base of fans.

Most areas of this soil are in medium to broad valleys or along the Finger Lakes where side streams deposit coarse fragments during periods of high water. Some areas are flooded annually, usually early in spring, and some are flooded only once in 5 to 10 years. Floods rarely occur during the growing season, and most are of short duration.

This soil is well suited to pasture and forest and to a number of crops, including small fruits and early vegetables. The gravel hinders tillage somewhat and limits the use for special truck crops and root crops. Most areas are subject to streambank cutting and to deposition of rubble. Special structures are needed to control these hazards. Although fertility is high, crops are responsive to fertilization because of the large amount of water available to plants.

The occasional flooding and the gravel are the main limitations to most nonfarm uses. Most areas along the lakes are used as sites for cottages or summer homes. (Capability unit IIe–5; woodland group 1a)

Hilton Series

The Hilton series consists of deep, medium-textured, moderately well drained soils that formed in strongly calcareous, firm till of medium texture. The till was derived mainly from sandstone, limestone, and some shale and is reddish in hue because of the red sandstone and shale. These soils occur as nearly level or gently sloping areas on the till plain or at the base of drumlins. They are mostly in the north-central part of the county and extend southward to the Barge Canal, which is also the southern boundary of the more acid Ontario soils.

A typical profile in a cultivated area has a very dark grayish-brown to dark-brown loam plow layer about 9 inches thick. This layer is underlain by friable, brown, leached loam that extends to a depth of about 15 inches. Just below this is the subsoil of firm, brown to dark yellowish-brown, mottled heavy loam to light sandy clay loam. The reaction of the solum ranges from neutral in the upper part to mildly alkaline above the till substratum. Firm, calcareous till is at a depth of about 31 inches. It consists of light reddish-brown to reddish-brown loam to fine sandy loam.

Typical profile of Hilton loam, 3 to 8 percent slopes, in a cultivated field:

Ap—0 to 9 inches, very dark grayish-brown (10YR 3/2) to dark-brown (10YR 3/3) loam; dark brown (10YR 3/3) when rubbed; moderate, medium and fine, subangular blocky structure and medium, granular structure; friable when moist, nonsticky when wet; numerous fine and common medium roots; neutral; abrupt, smooth boundary. 7 to 10 inches thick.

A2—9 to 15 inches, brown (7.5YR 5/4) loam; brown (7.5YR 5/4) to dark brown (7.5YR 4/4) when rubbed; weak to moderate, medium, subangular blocky structure; friable when moist, nonsticky when wet; numerous fine and common medium roots; common worm channels coated with dark-brown worm casts; neutral; clear, wavy boundary with fine interfingering extending into upper 2 inches of underlying horizon. 5 to 7 inches thick.

B21t—15 to 20 inches, brown (7.5YR 5/4–4/4) fine loam to coarse sandy clay loam; few, fine, distinct, strong-brown (7.5YR 5/8) and yellowish-brown (10YR 5/6) mottles; weak to moderate, coarse, angular and subangular blocky structure; friable to firm; discontinuous, thin clay coats on ped faces and continuous clay coats in pores; numerous fine roots; common worm channels coated with dark-brown worm casts; mildly alkaline; gradual, wavy boundary. 3 to 7 inches thick.

B22t—20 to 23 inches, brown (7.5YR 4/4) to dark yellowish-brown (10YR 4/4) fine loam to coarse sandy clay loam; common, coarse, prominent, red (2.5YR 5/8) mottles; moderate, fine and medium, angular blocky structure within very weak, thick, platy structure; slightly firm when moist, slightly sticky when wet; discontinuous clay coats on block faces and in pores; few fine roots in pores and worm channels; few worm channels coated with dark-brown worm casts; mildly alkaline; clear, wavy boundary. 2 to 7 inches thick.

B23t—23 to 31 inches, brown (7.5YR 4/4) loam to fine loam; common, fine, prominent, brownish-yellow (10YR 6/8), yellowish-red (5YR 5/8), and red (2.5YR 5/8) mottles; weak, coarse, angular blocky structure; slightly firm when moist, slightly sticky when wet; discontinuous, thin clay coats on block faces and in pores; few fine roots and worm channels; mildly alkaline; abrupt, wavy boundary. 6 to 10 inches thick.

C—31 to 40 inches, light reddish-brown to reddish-brown (5YR 6/3–5/3) loam to fine sandy loam; weak to moderate, thick, platy structure; firm when moist, nonsticky when wet; few fine roots; calcareous.

The thickness of the solum ranges from 24 to 40 inches.

The texture of the surface layer is dominantly loam but ranges from silt loam to fine sandy loam. The gravel content ranges from none to 25 percent by volume. The color of the A2 horizon ranges from light yellowish brown to brown to reddish brown. The thickness of this horizon ranges from 2 inches, where eroded, to 12 inches. The reaction is medium acid to neutral.

The texture of the B horizon ranges from fine sandy loam to coarse clay loam. There is a distinct clay increase in this horizon; the clay content ranges from 18 to 28 percent. The color ranges from 7.5YR to 2.5YR in hue, 4 to 6 in value, and 4 to 6 in chroma. Mottling occurs in the lower part of the thick A2 horizon in the wettest areas and in the lower part of the B horizon in the driest areas. The reaction of the B horizon ranges from mildly acid to mildly alkaline. The depth to free lime ranges from 30 to 40 inches, and is commonly associated with the depth to the underlying firm loamy glacial till.

Hilton soils are in a drainage sequence with well-drained Ontario, somewhat poorly drained Appleton, poorly drained Lyons, and very poorly drained Alden soils. Hilton soils have a distinctive, moderately expressed, light-colored A2 horizon that contrasts with a firm, panlike B horizon; whereas Lima soils are moderately well drained and have weakly expressed A2 and B horizons. Hilton soils are reddish colored and have a loam or fine sandy texture, whereas Conesus soils are gray and have a silt loam texture. Hilton soils lack the well-developed fragipan of Ira soils and are coarser textured than Cazenovia soils.

Hilton loam, 0 to 3 percent slopes (HlA).—A profile of this soil is like the one described as typical of the series, except that the surface layer is slightly darker colored and in places faint mottles occur in the upper part of the subsoil. Also, the surface layer is thicker in many places where there are deposits of eroded material from adjacent areas.

This soil occurs on the till plain as small to medium-sized areas, only a few of which exceed 20 acres in size. The medium-sized areas are nearly level or gently sloping and receive no runoff or only a slight amount. The small areas are long and narrow in a north-south direction.

They are slightly concave and occur as slight depressions between more strongly sloping areas of Ontario soils, from which they receive some runoff. Included in mapping were somewhat poorly drained Appleton soils in slight depressions or along shallow, narrow drainageways. These wetter areas make up no more than 10 percent of any mapped area, but they delay tillage in spring unless drained. Also included were Ontario soils on slight rises or knolls.

This soil is suited to pasture, forest, and most crops, including vegetables. Water-sensitive crops are sometimes damaged in the wet spots.

Regularly spaced drainage generally is not needed, but random drainage of the wet spots is important. The supply of phosphorus and potassium is moderate, and the supply of nitrogen is usually deficient early in spring. Crops respond well to fertilization. Some areas need lime. There is almost no erosion hazard under good management.

Moderately slow and slow permeability and seasonal wetness are the main limitations to nonfarm uses. Some areas are good sites for ponds or shallow water impoundments. (Capability unit IIw-6; woodland group 1a)

Hilton loam, 3 to 8 percent slopes (HlB).—This soil has the profile described as typical of the series. The slopes are predominantly smooth and are mostly 3 to 5 percent.

Most areas are small to medium in size; only a few exceed 30 acres. The small areas are generally long and narrow. They are slightly concave and have narrow intermittent drainageways in the center. The larger areas are smoothly sloping, and some are slightly convex. Included in mapping were somewhat poorly drained Appleton soils in the slight depressions or in narrow areas along drainageways. Although these wetter soils are inextensive, they delay tillage in spring unless artificially drained. Also included were well-drained Ontario soils on slight rises or knolls.

This soil is suited to pasture and forest and to most crops, including vegetables. Drainage and control of erosion are moderate problems. On some slopes erosion control and structures that divert runoff are needed. Random drainage of wet spots is effective in many fields. The fertility level is moderate, and crops respond to good management and fertilization. Some areas need lime.

Moderately slow and slow permeability, seasonal wetness, and slope are the main limitations to most nonfarm uses. Many areas are suitable for ponds. (Capability unit IIe-6; woodland group 1a)

Honeoye Series

The Honeoye series consists of deep, well-drained, high-lime soils that formed in strongly calcareous, firm glacial till of medium texture. The till was derived mostly from gray limestone and from gray, alkaline and calcareous shale. These are the most extensive soils in the county. They are in the central and southwestern parts, generally at an elevation below 1,200 feet.

A typical profile in a cultivated area has a dark grayish-brown silt loam plow layer about 8 inches thick. This layer is underlain by a leached layer of friable, brown silt loam about 1 inch thick. Just below it is the dark-brown to yellowish-brown subsoil of heavy silt loam or heavy loam. Underlying the subsoil at a depth of 30 inches is firm, calcareous grayish-brown to dark grayish-brown loam till. The reaction of the subsoil ranges from neutral in the upper part to weakly calcareous in the lower part.

Typical profile of Honeoye silt loam, 2 to 8 percent slopes, in a cultivated field:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; dark brown (10YR 4/3) when rubbed; moderate, fine and medium, subangular blocky structure breaking to moderate, fine and medium, granular structure; friable; many fine roots; slightly acid; abrupt, smooth boundary. 7 to 9 inches thick.

A2—8 to 10 inches, brown (10YR 5/3) silt loam; moderate, fine and medium, subangular blocky structure; friable; many fine roots; slightly acid; abrupt, wavy boundary with fingers ¼ to ½ inch thick and 2 to 4 inches apart extending 1 to 3 inches into the underlying horizon. 0 to 3 inches thick.

B21t—10 to 15 inches, brown to dark-brown (10YR 4/3) fine silt loam, moderate, medium and coarse, angular and subangular blocky structure; slightly firm when moist, slightly sticky when wet; thin clay film on vertical ped faces and in larger pores; common fine roots; neutral; clear, wavy boundary. 3 to 7 inches thick.

IIB22t—15 to 27 inches, dark-brown (10YR 3/3) to dark yellowish-brown (10YR 3/4), gritty fine silt loam to fine loam; moderate, medium and coarse, subangular and angular blocky structure; slightly firm when moist, slightly sticky when wet; distinct clay film on vertical ped faces; faint clay film on horizontal faces and in pores; numerous, small, black, rotted shale fragments; common fine roots; mildly alkaline; gradual, wavy boundary. 4 to 15 inches thick.

IIB3—27 to 30 inches, dark-brown (10YR 4/3) to dark yellowish-brown (10YR 3/3), gritty fine silt loam to fine loam; weak to moderate, medium and coarse, blocky structure; friable when moist, nonsticky when wet; very thin clayey or silty film on ped faces and in pores; many partly weathered shale fragments; common fine roots; weakly calcareous; clear, wavy boundary. 0 to 4 inches thick.

IIC1—30 to 60 inches, grayish-brown (10YR 5/2) to dark grayish-brown (10YR 4/2), gritty loam; weak, medium, platy structure breaking to weak, fine, blocky structure; slightly firm in place, gradually becoming firmer with depth; friable when crushed; few fine roots; 5 to 15 percent coarse fragments; calcareous; diffuse, wavy boundary. 18 to 40 inches thick.

IIC2—60 to 72 inches, grayish-brown (10YR 5/2), gritty loam; weak, medium, platy structure; firm in place; brittle when crushed; very few fine roots along major cracks; 15 to 25 percent coarse fragments, ranging from gravel to boulders, mostly limestone; very strongly calcareous.

The thickness of the solum ranges from 15 to 32 inches and roughly parallels the depth to free carbonates. The texture of the A horizon is dominantly silt loam or loam but ranges to fine sandy loam. The content of coarse fragments ranges from 2 to 25 percent or more by volume but is mostly 2 to 5 percent. The coarse fragments range from fine gravel to boulders, but there are only a few boulders. The color of the A1 or Ap horizon ranges from very dark gray to dark brown. The A2 horizon ranges from light brown to olive brown. The reaction ranges from medium acid to neutral.

The texture of the B horizon is mostly fine silt loam or fine loam but ranges to heavy fine sandy loam, and the clay content ranges from 18 to 28 percent. The color ranges from olive brown to brown. A few mottles of high chroma are in the lower part in some places. The reaction ranges from slightly acid to weakly calcareous. The thickness of the B horizon ranges from 5 to 20 inches.

Honeoye soils are in a drainage sequence with moderately well drained Lima, somewhat poorly drained Kendaia, poorly drained Lyons, and very poorly drained Alden soils. They are also commonly associated with Ontario, Cazenovia, Lansing, and Palmyra soils. They have a thinner A2 horizon than Ontario soils and are gray rather than red as a result of the different color and origin of till. Honeoye soils are grayer and coarser textured than Cazenovia soils. They have a higher lime content than Lansing soils and thinner A and B horizons. They are less strongly developed than Lansing soils, which formed in glacial till derived from gray, fine-grained sandstone and shale and some limestone. Palmyra soils formed in glacial outwash.

Honeoye silt loam, 2 to 8 percent slopes (HnB).—This soil has the profile described as typical of the series. In places it has a higher clay content where it ranges toward the more clayey Cazenovia soils, and a thicker subsoil where it ranges toward the Ontario or Lansing soils. Included in mapping were moderately well drained Lima soils in shallow drainageways or near the center of hilltops.

Many areas of this soil are gently sloping, convex hilltops separated by an occasional shallow drainageway. These smoothly sloping areas are well suited to the use of large farm equipment, and they are easily farmed on the contour or across the slope. Other areas have gently undulating, convex slopes interspersed with shallow drainageways.

This soil is the most extensive in the county, and it is well suited to crops, pasture, and forest. Control of erosion and water are only minor problems. Random drainage of the few wet spots is beneficial. Crops respond to increasing amounts of fertilizer. A few areas need lime occasionally. Practices that control erosion, maintain good tilth, and increase fertility have a lasting effect on this soil.

Slope and the moderately slow to slow permeability below a depth of 30 inches are the main limitations to most nonfarm uses. (Capability unit IIe–1; woodland group 1a)

Honeoye silt loam, 8 to 14 percent slopes (HnC).—The profile of this soil is 2 to 6 inches thinner to the calcareous substratum than is typical of the series. The slopes are generally short and convex, but they are smooth and easy to contour. Many areas are on the sides of moderately deep drainageways. Included in mapping were moderately well drained Lima soils in the bottom of drainageways.

This soil is well suited to crops, pasture, or forest. It is subject to erosion if cultivated and not protected. The cultivated areas are only slightly to moderately eroded; the uncultivated, wooded areas are uneroded. Crops give a good response to fertilization. Lime is needed occasionally in a few areas.

Moderate slope and moderately slow to slow permeability below a depth of 30 inches are the main limitations to most nonfarm uses. (Capability unit IIIe–2; woodland group 1a)

Honeoye silt loam, 8 to 14 percent slopes, eroded (HnC3).—This soil has lost 8 to 12 inches of the original surface layer through erosion on more than 75 percent of its area. In eroded areas the plow layer consists of the upper part of the former subsoil. In more severely eroded areas it consists of the somewhat clayey lower part, and in a few areas it rests on the calcareous material. The plow layer is generally lighter in color than the original surface layer because of loss of organic matter. It commonly contains more gravel and, in places, more clay, depending on the amount of lower subsoil incorporated. Included in mapping were small uneroded areas, as well as small depositional areas, generally at the base of slopes, in low spots, and along the upper side of fence rows.

This soil is suited to crops, pasture, and forest. It is well suited to deep-rooted legumes. It crusts readily because erosion has slightly increased the proportion of clay and reduced the organic matter. This crusting hampers seedling emergence. It also increases runoff, and a large proportion of rainfall is lost. The loss of up to a foot of soil reduces by 2 to 3 inches the amount of water available to plants. Consequently, plants wilt sooner during dry spells.

All of this soil has been cultivated. The areas range from small to moderately large. Those with the longest slopes are on valley sides along Salmon Creek, Little Salmon Creek, and other major streams. Intensive erosion control is needed on the longer slopes if they are used for row crops. The lime requirement is generally low, but additions of nitrogen, phosphate, and potash are needed to replace the loss through erosion. Suitable crop rotations are those that improve tilth and increase organic matter in the surface layer. Drainage is not a problem, except for random drainage of the few small wet spots.

Slope and moderately slow to slow permeability below a depth of 24 inches are the main limitations to most nonfarm uses. (Capability unit IVe–2; woodland group 1a)

Honeoye soils, rolling (8 to 14 percent slopes) (HoCK).—A profile of these soils is like the one described as typical of the series, except that the silt loam surface layer is gravelly in places. These soils are on uplands or on hillsides cut by closely spaced, moderately deep, intermittent drainageways. The slopes are too irregular for contour tillage. They are steep enough to cause moderately rapid to rapid runoff. Individual slopes are short. They are convex at the crest and grade to concave at the bottom, where they form the side of an irregularly shaped drainageway. Included in mapping were small areas of moderately well drained Lima soils in low spots and along drainageways.

Most areas have been cleared and farmed and have a variable erosion pattern. The erosion ranges from slight to severe, and there are deposits of eroded material in low spots and drainageways. The sharper crests are generally severely eroded and appear as bald spots in fields.

These soils are suited to crops, pasture, or forest. They are better suited to alfalfa and other deep-rooted hay crops than to row crops. They should be used for row crops only occasionally, and then special measures are needed to control runoff and erosion. Drainage is not a problem, except for random drainage of wet spots in a few areas. Many of the smaller areas are in fields with less strongly sloping soils and are used in the same way as those soils.

Rolling topography and moderately slow to slow permeability below a depth of 24 to 30 inches are the main limitations to most nonfarm uses. (Capability unit IVe–1; woodland group 1a)

Honeoye and Lansing gravelly silt loams, 14 to 20 percent slopes (HsD).—The soils of this undifferentiated unit occur either as moderately steep areas that have simple slopes or as hilly areas that have complex slopes. Consequently, contour tillage is extremely difficult and dangerous. Any given area generally consists of Honeoye soils, which are predominant, or of Lansing soils. They rarely occur together.

Each soil has a profile like the one described as typical of its series, except for a higher content of gravel and small stone fragments in the surface layer and less depth to calcareous material.

The moderately steep slopes generally form part of valley sides along with other Honeoye or Lansing soils. These slopes are convex in shape, and most of them face in one direction. In a few places, the valley sides are dissected by closely spaced drainageways, which form complex slopes facing in several directions. There are also a few hilly upland areas where the slopes are complex.

Most areas that have been cultivated are severely eroded and have a thinner, lighter colored surface layer and much less organic matter than uneroded areas. They also have a higher content of gravel and small stone fragments. The texture commonly is gravelly silt loam, but in some places it is gravelly loam, and in other places it is silt loam or loam. Included in mapping were less strongly sloping Honeoye and Lansing soils. Also included were small, wet spots of Lima, Conesus, and Kendaia soils, but these are inextensive.

Cultivation is possible but very difficult. Most areas are better suited to hay, pasture, or forest. Much water is lost through runoff during heavy rains. Because of this and a thinner surface layer and subsoil, these soils are considerably more droughty that most Honeoye or Lansing soils. It is important, therefore, that deep-rooted legumes be included in the cropping system. It is advisable to keep these soils in permanent cover as much of the time as possible. If plowing is necessary to re-establish hay crops, plowing should be across the slope, if possible, and strips of grass should be left to retard runoff. Random drainage of the wet spots is generally the only drainage needed to improve the hilly areas. Fertilization is needed for hay and pasture, and the response is only moderate. Lime requirements are generally low.

Slope and moderately slow to slow permeability below a depth of 24 to 30 inches are the main limitations to most nonfarm uses. (Capability unit IVe-1; woodland group 1b)

Howard Series

The Howard series consists of deep, well-drained, medium-textured soils that formed in gravelly outwash material of medium to low lime content. The gravel is mostly gray sandstone and hard shale. These soils are in the southeastern part of the county, generally at an elevation above 1,000 feet.

A typical profile in a forested area has a dark-gray to dark grayish-brown gravelly loam surface layer about 10 inches thick. This layer is underlain by a leached layer of yellowish-brown to light yellowish-brown, friable gravelly loam that has some slightly sticky spots in the lower part. At a depth of 29 inches this layer merges with the subsoil, which is brown to dark yellowish-brown, friable very gravelly loam that is slightly sticky when moist. The reaction of the subsurface layer is medium acid. The subsoil is medium acid in the upper part and becomes neutral over the calcareous substratum. At a depth of about 62 inches the subsoil is underlain by the calcareous substratum of stratified sand and gravel.

Typical profile of Howard gravelly loam, 3 to 8 percent slopes, in a forested area:

A11—0 to 5 inches, dark-gray (10YR 4/1) gravelly loam; moderate to strong, coarse, granular structure; friable; very many fine and medium roots; neutral; clear, wavy boundary. 4 to 6 inches thick.

A12—5 to 10 inches, dark grayish-brown (10YR 4/2) gravelly loam; moderate to strong, medium and coarse, granular structure; friable; very many fine and medium roots; neutral; clear, wavy boundary. 3 to 6 inches thick.

A21—10 to 12 inches, yellowish-brown (10YR 5/4) gravelly loam; weak to moderate, fine and medium, subangular blocky structure; friable; many fine and medium roots; medium acid; gradual, wavy boundary. 1 to 3 inches thick.

A22—12 to 17 inches, light yellowish-brown (10YR 6/4) gravelly loam; weak to moderate, fine and medium, subangular blocky structure; friable; many fine and medium roots; medium acid; gradual, wavy boundary. 4 to 8 inches thick.

A&B—17 to 29 inches, light yellowish-brown (10YR 6/4) gravelly loam surrounding brown to yellowish-brown (10YR 5/3-5/4) gravelly loam that has distinctly more clay; weak to moderate, coarse, subangular blocky structure; friable when moist, slightly sticky when wet; many fine and medium roots; medium acid; gradual, wavy boundary. 5 to 14 inches thick.

IIB21t—29 to 41 inches, brown to yellowish-brown (10YR 5/3 to 5/4) very gravelly loam; weak, medium and coarse, subangular blocky structure; friable when moist, slightly sticky when wet; distinct clay bridges between sand grains; many fine roots; medium acid; gradual boundary. 10 to 14 inches thick.

IIB22t—41 to 54 inches, dark yellowish-brown (10YR 4/4) very gravelly fine loam; strong, coarse, granular structure; friable when moist, slightly sticky and plastic when wet; distinct clay bridges between sand grains; many fine roots; neutral; clear, wavy boundary. 10 to 16 inches thick.

IIB3&C1—54 to 62 inches, yellowish-brown to dark yellowish-brown (10YR 4.5/4) very gravelly loam; clay films or coats on gravel decreasing with depth; many fine roots; neutral; gradual, wavy boundary. 6 to 10 inches thick.

IIIC2—62 to 120 inches, stratified sand and gravel; sand is white and dark gray (salt and pepper); gravel consists mostly of gray sandstone, shale, and some limestone; calcareous, becoming cemented with secondary lime below a depth of 96 inches.

The thickness of the solum ranges from 40 to 65 inches, depending on the depth to carbonates. The texture of the A horizon is gravelly loam to gravelly sandy loam, and there are a few small areas of gravelly silt loam. The gravel content ranges from 15 to 50 percent by volume. The color of the A1 and Ap horizons ranges from very dark gray to brown. The thickness of the A2 horizon ranges from 5 to 20 inches. The color ranges from 7.5YR to 2.5Y in hue, 5 to 7 in value, and 3 to 6 in chroma. The reaction is very strongly acid to slightly acid.

The texture of the B2 horizon ranges from fine (heavy) sandy loam to coarse (light) clay loam, and the gravel content is more than 35 percent by volume. Clay films are evident in the form of clay bridges in the B horizon. The color ranges from 7.5YR to 2.5Y in hue, 3 to 5 in value, and 3 to 6 in chroma. The thickness of the B2 horizon ranges from 12 to 30 inches or more. The reaction is strongly acid to neutral.

Howard soils are in a drainage sequence with moderately well drained Phelps and somewhat poorly drained Fredon soils. Howard soils contain less lime than Palmyra soils, have calcareous material at a lower depth, and have thicker, more distinct A2 and B2 horizons. They differ from Alton soils in having a distinct clay increase in the B2 horizon.

Howard gravelly loam, 0 to 3 percent slopes (HwA).—This soil is on valley terraces and deltas. Included in mapping were moderately well drained Phelps soils in shallow depressions.

This soil can be farmed early. It is well suited to pasture, forest, and crops, including fruits and vegetables. It is especially well suited to deep-rooted crops.

Nitrogen, phosphorus, and potassium are needed, and the response to fertilization is good. Lime is needed in most areas. Some areas can be improved by draining the wet spots. Under good management erosion is not a problem.

This soil is a good source of gravel. The gravel content, however, is a limitation to some nonfarm uses. (Capability unit I–1; woodland group 4)

Howard gravelly loam, 3 to 8 percent slopes (HwB).—This soil has the profile described as typical of the series. It is on gently undulating valley terraces and on gently sloping valley deltas. Included in mapping were other Howard soils and a few gravel-free spots of sandy Arkport, silty Dunkirk, and clayey Schoharie soils. Also included were moderately well drained Phelps soils in the deeper depressions on the lower terraces. These latter inclusions do not exceed 10 percent of any area but may delay operations in spring.

This soil can be plowed early in spring. It is well suited to pasture, forest, and crops, including vegetables. It is especially well suited to deep-rooted crops.

Maintaining fertility on the longer slopes is important. Lime and fertilizer are needed, and the response is good. Runoff and erosion should be controlled, especially late in winter and early in spring. Random drainage of the wet spots improves some fields.

Slope and the content of gravel are limitations to some nonfarm uses. This soil is a good source of gravel. (Capability unit IIe–3; woodland group 4)

Howard gravelly loam, 8 to 15 percent slopes (HwC).—This soil differs from the typical soil because of variations in the sand and gravel content of layers that have been exposed as a result of erosion. It occurs as slopes around depressions, as dissected terraces in valleys, and as rolling areas on uplands. Most areas are rolling, although a few are smoothly sloping.

The landscape is typically a series of knolls that slope in many directions. Consequently, contour tillage is impractical, and the use of farm machinery is moderately difficult. From 25 to 40 percent of the cropped acreage is moderately or severely eroded. The erosion is on the steeper slopes, and the eroded material has accumulated in the depressions between the knolls. Included in mapping were the wetter Phelps and Fredon soils in depressions. They rarely exceed 5 percent of any area.

Intensive cropping and control of erosion are difficult. Consequently, this soil is better suited to deep-rooted, sod-forming crops or to forest. Lime is needed for most crops. Phosphate and potash are needed, but the response is only moderate. Nitrogen is deficient except for legumes. Draining the few wet spots is beneficial.

Slope and the content of gravel are limitations to some nonfarm uses. This soil is a good source of gravel. (Capability unit IVe–12; woodland group 4)

Ira Series

The Ira series consists of deep, moderately well drained, low-lime soils that have a fragipan. These soils formed in medium-textured, neutral to weakly calcareous till, derived mainly from sandstone. Much of the sandstone is red (Medina and Oswego sandstone) and imparts a reddish hue to the soil. A minor amount of limestone or lime-bearing strata of sandstone has contributed a small quantity of lime, yet limestone fragments and gravel are rarely found. There is a conspicuous amount of quartzite, gneiss, granite, and other kinds of gravel and stones.

Ira soils are in the extreme northern part of the county. Their southern boundary is an east-west line running through Ira Hill to Westbury. Along this line there are outcrops of Lockport dolomite (limestone), and the till abruptly increases in lime content. As a result there is an abrupt change from the acid Ira soils to the high-lime Hilton soils. About a mile north of this line, Ira soils take on a slightly higher clay content, apparently from the Rochester shale, which outcrops in this area.

A typical profile in a cultivated area has a very dark grayish-brown to dark-brown gravelly loam plow layer about 7 inches thick. The next layer is the upper part of the subsoil. It is about 10 inches thick and consists of yellowish-brown to brown, very friable gravelly loam that is faintly mottled in the lower part. Just below is a 4-inch leached layer of very pale brown, mottled gravelly fine sandy loam that is very friable. It is underlain by the lower part of the subsoil, which is a very firm, dense fragipan. The upper part of the fragipan is brown to dark-brown, mottled gravelly loam. The lower part, below a depth of 34 inches, is brown, mottled gravelly sandy loam. The reaction is medium acid above the fragipan. The fragipan is medium acid to neutral.

Typical profile of Ira gravelly loam, 3 to 8 percent slopes, in a cultivated field:

Ap—0 to 7 inches, very dark grayish-brown (10YR 3/2) to dark-brown (10YR 3/3) gravelly loam; weak, fine to medium, granular structure; very friable; many fine and medium roots; medium acid; abrupt, wavy boundary. 6 to 8 inches thick.

B2—7 to 17 inches, yellowish-brown (10YR 5/4) gravelly loam that grades to brown (10YR 5/3) with depth; common, medium, faint, yellowish-brown (10YR 5/8, 5/6) and pale-brown (10YR 6/3) mottles in lower part; weak, medium and coarse, subangular blocks breaking readily to fine, granular peds; very friable; common fine and medium roots; medium acid; clear, wavy boundary. 4 to 14 inches thick.

A'2—17 to 21 inches, very pale brown (10YR 7/3–7/4) gravelly fine sandy loam; common, medium, distinct, yellowish-brown (10YR 5/8) mottles; weak, medium and fine, subangular blocky structure; very friable; common fine and medium roots; medium acid; abrupt, irregular boundary. 3 to 6 inches thick.

B'x1—21 to 34 inches, brown (7.5YR 5/4) to dark-brown (7.5YR 4/4) gravelly loam; common, medium, distinct, light-gray (10YR 7/2) and yellowish-brown (10YR 5/8) mottles; arranged in prisms 6 to 10 inches in diameter; prisms break to weak, medium, platy structure; prisms are separated by ½- to 2-inch streaks of friable gravelly fine sandy loam to loamy fine sand, ranging in color from very pale brown (10YR 7/3) to pink (7.5YR 7/2–7/4); common, medium, distinct, white (10YR 8/1) and yellowish-brown (10YR 5/8) mottles; few fine roots between prisms, none in prisms; firm to very firm in place, brittle when removed; thin, discontinuous clay film in larger pores in prisms; medium acid at a depth of 24 inches; neutral at a depth of 34 inches; clear, wavy boundary. 10 to 20 inches thick.

B x2—34 to 48 inches, brown (7.5YR 5/2) gravelly fine sandy loam; common, coarse, distinct, pinkish-gray (7.5YR 7/2), reddish-yellow (7.5YR 6/8), strong-brown (7.5YR 5/8), and yellowish-brown (10YR 5/8) mottles; arranged in less prominent prisms 4 to 6 inches in diameter; prisms break to weak, thick, platy structure; firm in place, brittle when removed; prisms separated by ½-inch to 1-inch streaks of very pale brown (10YR 7/3) to pink (7.5YR 7/2–7/4), very friable loamy fine sand that has common, medium, distinct, white (10YR 8/1) and yellowish-brown (10YR 5/8) mottles; neutral.

The thickness of the solum ranges from 36 to 60 inches. The color ranges from a hue of 10YR to 5YR. Soils that have a hue of 5YR have a less prominently expressed fragipan. The depth to the fragipan ranges from 12 to 24 inches. As the drainage ranges to the lower part of moderately well drained, the depth to the fragipan becomes shallower.

The texture of the A horizon ranges from gravelly loam to gravelly very fine sandy loam, and there are local areas of gravelly silt loam, very stony loam, and very stony fine sandy loam. The prisms of the B'x2 horizon generally have a loam texture but range from fine sandy loam to silt loam. The gravelly silt loam texture is mainly in the southern part of the area where Ira soils occur. It reflects the influence of Rochester shale. In places adjacent to Lake Ontario, thin, silty smears are mixed with the till. The content of coarse fragments in the solum is 10 to 35 percent.

The reaction of the A horizon ranges from strongly acid to medium acid in unlimed areas. The reaction of the B horizon ranges from medium acid to slightly acid. The reaction of the B'x horizon ranges from medium acid in the upper part to calcareous below a depth of 36 inches.

Ira soils are in a drainage sequence with well-drained Sodus, somewhat poorly drained Scriba, poorly drained Lyons, and very poorly drained Alden soils. Ira soils differ from Hilton soils in having a lower lime content, a lower clay content in the B horizon, and a moderately to strongly expressed fragipan. They differ from Langford soils in having a higher content of sand and a redder hue. Langford soils formed in grayer, finer grained sandstone and shale than Ira soils.

Ira gravelly loam, 0 to 3 percent slopes (IrA).—This soil has a profile like the one described for the series, except that it generally has a darker colored surface layer and in many places is mottled within 10 to 12 inches of the surface. It is on uplands and receives little or no runoff from adjacent areas. The range of slope commonly is 1 to 3 percent, and the runoff is slow. The fragipan is only 16 to 18 inches below the surface in most places. It restricts root development and limits moisture-holding capacity.

Included in mapping were somewhat poorly drained Scriba soils in depressions. These wetter soils, though inextensive, delay planting in spring. In places, notably near Lake Ontario, thin smears of silty lake-laid material are mixed with the glacial till, imparting a siltier texture to the soil. In other places, mostly near the southern boundary of Ira soils, there is a higher content of soft shale. This contributes a slightly higher silt and clay content and, consequently, a slightly better moisture-holding capacity.

This soil is suitable for crops, pasture, or forest. The hazard of winter killing of perennial crops is greater than on the more strongly sloping Ira soils.

The limitations to cropping are moderate. The shallowness to the fragipan requires that drains be closely spaced. Random drainage of the wet spots is effective in many fields. Under good management, erosion is not a problem. The moderate to high gravel content limits the choice of crops. The presence of stone fences and stone piles indicates this soil formerly was stony or very stony. Lime and fertilizer are required, and the response is only moderate. The supply of potassium is low to moderate, the supply of phosphorus is moderate, and that of nitrogen is low.

Slow permeability, seasonal wetness, and gravel are the main limitations to most nonfarm uses. (Capability unit IIw–1; woodland group 5a)

Ira gravelly loam, 3 to 8 percent slopes (IrB).—This soil has the profile described as typical of the series. It occurs on hilltops, where runoff is slightly restricted, and on hillsides that receive some runoff from adjacent areas. Most areas are smoothly sloping, but a few small areas are undulating. The fragipan in uneroded areas is at a depth of 18 to 24 inches. It restricts root development and limits the water available to plants.

Included in mapping were Scriba soils in slight depressions or along drainageways. These wetter soils, though inextensive, sometimes delay tillage in spring. Included also were Sodus soils on slight knolls or rises. In places, especially near Lake Ontario, lake-deposited silt is mixed with the glacial till. It contributes a slightly siltier texture but has little effect on management of the soil. In other places, mostly near the southern boundary of Ira soils, this soil contains more soft shale, which imparts a slightly higher silt and clay content and results in a slightly better moisture-holding capacity.

This soil is suitable for crops, pasture, or forest. Its use for perennial crops is slightly limited by wetness.

Runoff and the hazard of erosion are moderate. Erosion control and diversion of runoff are needed on the longer slopes. Random drainage of wet spots is beneficial in many fields. The moderate to high gravel content of the soil limits the choice of crops. The presence of stone fences and stone piles indicates that this soil was once stony or very stony. Lime and complete fertilizer are needed, and the response is only moderate. The supply of potassium is low to moderate, the supply of phosphorus is moderate, and the supply of nitrogen is very low.

Slow permeability, seasonal wetness, slope, and gravel are the main limitations to most nonfarm uses. (Capability unit IIe–11; woodland group 5a)

Ira and Sodus very stony loams, 2 to 20 percent slopes (IsD).—The soils of this undifferentiated unit have a profile like the one described as typical of their respective series, except for the stones on the surface. Stones 1 foot or more in diameter are 5 to 30 feet apart, and in many places they are close enough that one can step from stone to stone. Tillage of crops is impractical.

Most areas have uniform slopes that are mainly within the range of 2 to 8 percent, but some small areas have slopes as steep as 20 percent. Both soils occur in most areas, the Ira soil having mostly smooth slopes of less than 8 percent, and the Sodus soil having convex slopes of more than 5 percent. Included in mapping were somewhat poorly drained Scriba soils in pockets or depressions.

The soils of this unit are suitable for native pasture, forest, recreation, or wildlife. Yields of native pasture, however, are generally low. Clipping and applications of lime and fertilizer are needed for even moderate yields of improved pasture. Most areas are uneroded.

Slow permeability, slope, seasonal wetness, gravel, and stones are the main limitations to most nonfarm uses. (Capability unit VIs–1; woodland group 5b)

Kendaia Series

The Kendaia series consists of deep, somewhat poorly drained, high-lime soils derived from medium-textured, firm, highly calcareous glacial till of limestone and sandstone and some shale. These soils are extensive and are important as farmland. They are south of the Seneca River at an elevation below 1,200 feet.

In a cultivated area, a typical profile of a Kendaia soil has a very dark grayish-brown silt loam plow layer about 8 inches thick. The subsoil extends to a depth of 24 inches. In the upper part it is brown, friable, mottled silt loam. About 12 inches below the surface it is firm grayish-brown to dark grayish-brown, mottled gravelly silt loam. The reaction of the subsoil ranges from slightly acid in the upper part to calcareous just above the till substratum. Underlying the subsoil is firm or very firm, dense, strongly calcareous till that consists of mottled grayish-brown to dark grayish-brown gravelly loam.

Typical profile of Kendaia silt loam, 0 to 3 percent slopes, in a cultivated field:

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, medium and fine, granular structure; friable; many fine roots; slightly acid; 5 percent gravel by volume; abrupt, smooth boundary. 7 to 9 inches thick.

B21—8 to 12 inches, brown (10YR 5/3) silt loam; common, medium, yellowish-brown (10YR 5/4) and grayish-brown (10YR 5/2) mottles; 5 percent gravel by volume; weak, medium, subangular blocky structure; friable; cleavage planes are discontinuous but where present are coated with a film of grayish-brown (10YR 5/2) silt; common fine roots; common fine pores; slightly acid; gradual, wavy boundary. 3 to 9 inches thick.

IIB22—12 to 20 inches, grayish-brown (10YR 5/2) to dark grayish-brown (10YR 4/2) gravelly silt loam; many, medium and fine, yellowish-brown (10YR 5/4) and dark yellowish-brown (10YR 4/4) mottles; weak, medium, subangular blocky structure; slightly firm; common fine roots in upper part, few in lower part; common, fine pores; neutral; abrupt, wavy boundary. 6 to 12 inches thick.

IIIB3—20 to 24 inches, grayish-brown (10YR 5/2) to dark grayish-brown (10YR 4/2) gravelly loam; many, medium, yellowish-brown (10YR 5/4) mottles; weak, medium and fine, angular blocky structure; slightly firm; few fine roots; common fine pores; calcareous; clear, wavy boundary. 2 to 6 inches thick.

C—24 to 40 inches, grayish-brown (10YR 5/2) to dark grayish-brown (10YR 4/2) gravelly loam; moderate, medium, lenticular platy structure; plate faces are grayish brown (10YR 5/2); plate interiors are dark grayish brown (10YR 4/2) with common, medium, yellowish-brown (10YR 5/4) mottles and common, fine, light brownish-gray (10YR 6/2) mottles; firm to very firm; strongly calcareous; lime segregated as silty coats on plate faces and as filaments in plate interiors.

The thickness of the solum and depth to carbonates range from 15 to 36 inches. The depth to bedrock is more than 40 inches and, in most places, is more than 6 feet.

Silt loam is the common texture of the surface layer, but in some places it is fine sandy loam or coarse silty clay loam. The color of the surface layer is dominantly very dark grayish brown (10YR 3/2) but ranges in chroma from 2 to 1, in value from 3 to 4, and in hue from 10YR to 7.5YR. The reaction in unlimed areas ranges from neutral to slightly acid.

The texture of the B horizon is loam or silt loam, and the clay content is 18 to 28 percent. The color hues of the B horizon are dominantly 10YR and 2.5Y but range to 7.5YR and 5YR where the till is influenced by reddish sandstone. The structure of the B horizon ranges from weak to moderate subangular and angular blocky. In the upper part of the B horizon, the reaction ranges from slightly acid to mildly alkaline, and the depth to carbonates ranges from 15 to 30 inches.

As Kendaia soils intergrade to Appleton soils, a weakly expressed A2 horizon is present in some places, and clay films are present in pores but not on ped faces. As these soils intergrade to Ovid soils, the texture of the B horizon approaches 28 percent clay. As they intergrade to Lyons soils, the base chroma of the B21 horizon approaches 2, and mottling is more distinct.

Kendaia soils occur as level or gently sloping areas in a drainage sequence with well drained Honeoye, moderately well drained Lima, poorly drained Lyons, and very poorly drained Alden soils. In some places they are also in a drainage sequence with Lansing and Ontario soils. They are similar to Appleton soils but have a thinner, less pronounced A2 horizon and lack the distinct clay accumulation in the B horizon characteristic of Appleton soils. Kendaia soils are coarser in texture than Ovid soils and lack the fragipan characteristics of Scriba and Erie soils.

Kendaia silt loam, 3 to 8 percent slopes (KeB).—A profile of this soil is like the one described for the series, except that the surface layer is slightly lighter colored.

The range of slope is commonly 3 to 5 percent, and the areas are small to medium. Only a few exceed 10 acres in size. This soil receives considerable runoff from adjacent, more strongly sloping soils, mainly Honeoye and Lima or Lansing and Conesus. It is generally the wettest soil in a field. Included in mapping were small knolls of better drained Lima or Conesus soils, which have little or no effect on use and management.

This soil is suited to crops, pasture, or forest. In areas that lack artificial drainage, the choice of crops is restricted.

Drainage is the main management need. Drainage systems are feasible in many of the larger areas, and random drainage is beneficial in the smaller areas. Because of slope, erosion is a moderate problem, and measures to control erosion and divert runoff are commonly needed. Only a few areas need lime. Phosphate and potash are needed, and nitrogen is deficient early in spring but may be adequate for many crops by midsummer if excess water is removed.

Seasonal wetness, moderately slow permeability, and slope are the main limitations for most nonfarm uses. (Capability unit IIIw–10; woodland group 11)

Kendaia and Lyons silt loams, 0 to 3 percent slopes (KlA).—This undifferentiated unit consists of somewhat poorly drained Kendaia soil and poorly drained Lyons soil. Each soil has a profile like the one described as typical of its series. Kendaia silt loam makes up from 50 to 70 percent of most areas and has a slope of about 2 percent. It surrounds the low, level Lyons silt loam.

This undifferentiated unit is extensive. The larger areas are in uplands and receive runoff from adjoining gently sloping to moderately sloping Honeoye and Lima soils or Lansing and Conesus soils. The smaller areas are depressions or narrow strips along drainageways within larger areas of Honeoye, Lima, Lansing, or Conesus soils.

Where these Kendaia and Lyons soils occur at gradually lower elevations approaching the Finger Lakes, especially Cayuga Lake, they increase in clay content as they grade toward the moderately fine textured Ovid soils. Also, north of Auburn, they have a slightly higher clay content. Sandy spots were included in mapping. These appear to be sand deposited by water in local basins. Some water-deposited material over the till is also evident in most places. The surface is commonly free of stones or contains only a small amount of gravel.

Unless these soils are drained, wetness limits their use mainly to forest or to water-tolerant grass and pasture or hay. Areas that are almost entirely Kendaia soil can be used for other crops, but spring planting is delayed. If artificially drained, these soils are well suited to a number of crops, including vegetables.

The major management need is drainage. Deep drainage is feasible in the more extensive areas. Wetness can be reduced by diverting or intercepting runoff from adjacent slopes. The potassium supply is high; the phosphorus supply is medium. Nitrogen is commonly deficient in spring but may be adequate by midsummer. Only a few areas, mostly at higher elevations, require lime.

Prolonged wetness and moderately slow and slow permeability are the main limitations for most nonfarm uses. Some areas are good sites for ponds and wildlife marshes. (Capability unit IIIw-2; woodland group 11)

Lairdsville Series

The Lairdsville series consists of moderately deep, well drained and moderately well drained soils that have a fine-textured and moderately fine textured subsoil. These soils formed in congeliturbate or residuum of soft, fine-textured, alkaline and calcareous, red shale of the Vernon or Salina formation. They occur in a belt up to 1 mile wide, generally east and west across the county immediately south of the Seneca River, through Weedsport and Port Bryon. There are a few areas north of the river and a few small areas near the village of Cato.

A typical profile in a cultivated area has a dark reddish-gray silt loam plow layer about 7 inches thick. The next layer is the upper part of the subsoil, which is firm, reddish-brown silty clay loam. It extends to a depth of 12 inches. The lower part of the subsoil is very firm, reddish-brown clay or silty clay that becomes weak red in color at a depth of 18 inches. A few partly weathered, olive-colored shale chips are present throughout this lower part. At a depth of 30 inches is weak-red clayey shale bedrock. The reaction of the subsoil is slightly acid to neutral. The underlying shale is mildly alkaline to weakly calcareous.

Typical profile of Lairdsville silt loam, 2 to 6 percent slopes, in a cultivated field:

Ap—0 to 7 inches, dark reddish-gray (5YR 4/2) silt loam; strong, fine and medium, subangular blocky structure; friable; many fine roots; common vertical holes with worm castings; neutral; abrupt, wavy boundary. 6 to 9 inches thick.

IIB1—7 to 12 inches, reddish-brown (5YR 4/3) silty clay loam; strong, coarse, subangular blocky structure; firm; many fine roots on ped faces, few in interiors; common vertical holes; few reddish-brown (5YR 5/3) silt coats on vertical ped faces; neutral; clear, wavy boundary. 3 to 7 inches thick.

IIB21t—12 to 18 inches, reddish-brown (2.5YR 5/4–4/4) clay or silty clay; strong, coarse, blocky structure; very firm when moist, very plastic when wet; common fine roots on ped faces, few in ped interiors; common vertical holes; reddish-brown (2.5YR 5/4) clay coats on distinct vertical and horizontal ped faces; common weathered shale fragments that are light olive gray (5Y 6/2) to pale olive (5Y 6/3) and weak red (2.5YR 4/2 to 5/2); slightly acid; clear, wavy boundary. 3 to 8 inches thick.

IIB22t—18 to 30 inches, weak-red (2.5YR 4/2–5/2) silty clay or silty clay loam; strong, coarse, blocky structure; very firm; few fine roots on ped faces; common fine vertical holes; weak-red (2.5YR 4/2) to reddish-brown (2.5YR 4/4) clay coats are distinct on vertical and horizontal ped faces; common weathered shale fragments that are light olive gray (5Y 6/2) to pale olive (5Y 6/3) and weak red (2.5YR 4/2 and 5/2) and are up to 1 inch in diameter; neutral; gradual, wavy boundary. 8 to 16 inches thick.

R—30 to 60 inches, weak-red (2.5YR 4/2 to 5/2) clayey shale bedrock; mildly alkaline to weakly calcareous. The bedrock can readily be cut with a spade or a mattock.

The depth to bedrock ranges from 20 to 40 inches and commonly corresponds to the thickness of the solum. The content of coarse fragments, mostly shale but including standstone and limestone, ranges from very few to about 35 percent of the solum and commonly increases with depth. Some hard glacial gravel is generally present but is not conspicuous. The hue of the solum is generally 2.5YR, but 10R and 10YR are within the range. Hues of 10YR and 7.5YR are restricted to the A horizon and upper part of the B horizon.

The surface layer ranges in hue from 10YR to 5YR, in value from 3 to 5, and in chroma from 2 to 5. The texture of the surface layer ranges from gravelly loam to silty clay loam, and there are some local very shaly areas. The finer textures are commonly found in areas where clayey shale bedrock is near a 20-inch limit. An A2 horizon is present in undisturbed areas but is absent or occurs as thin remnants in cultivated areas. The color of the A2 ranges from 5YR to 10YR in hue, 5 to 6 in value, and 2 to 4 in chroma. The thickness ranges from 0 to 7 inches.

The color of ped interiors in the B horizon is typically in hues of 2.5YR and 5YR but includes hues of 10R, 7.5YR, and 10YR. Hues of 7.5YR and 10YR are restricted to the upper part of the B horizon. The value ranges from 4 to 7, and the chroma from 2 to 6. Incipient mottling is commonly present in the lower part of the B horizon. The texture is fine clay loam, fine silty clay loam, silty clay, or clay. The average clay content is 35 to 60 percent. Thin, patchy silt coats are present on most peds in the upper part of the B horizon, and distinct clay coats are present on vertical and horizontal ped faces in the lower part. The structure ranges from strong to moderate blocky to strong to moderate prismatic. The reaction ranges from medium acid to weakly calcareous.

The C horizon, if present, is similar to the B horizon but has weak, platy structure that breaks into weak blocks. It is neutral to weakly calcareous. The bedrock is generally neutral to calcareous, interbedded shale that can be readily penetrated with a spade, but in places it is hard sandstone, limestone, or dolomite.

Lairdsville soils are in a drainage sequence with somewhat poorly drained Lockport soils. In this county Lairdsville soils are mapped only in undifferentiated units with Riga soils. They differ from Riga soils in having formed in red shale instead of olive-gray or mixed olive-gray and red shale.

Lake beaches (0 to 5 percent slopes) (Lb) is a miscellaneous land type made up of gravel beaches and bars built up by wave action along the larger lakes. The most extensive areas are along the shores of Lake Ontario. These beaches consist of washed sand and gravel and are subject to overflow by waves during storms. Only a few trees, such as willows, can get a temporary foothold.

Lake beaches are used mainly for recreation or as sources of sand and gravel. A few of the older or higher beaches that are no longer subject to normal wave action are sites for temporary cottages and camping. (Capability unit VIIIs-1; woodland group 20)

Lakemont Series

The Lakemont series consists of deep, poorly drained, moderately fine textured and fine textured soils derived from calcareous, reddish lacustrine clay and silty clay. These soils occur as low level areas, depressions, or narrow drainageways among better drained Odessa and Schoharie soils.

A typical profile in a cultivated area has a very dark brown silty clay loam plow layer about 9 inches thick. The next layer is firm, grayish-brown, prominently mottled silty clay loam. It is a leached layer that extends to a depth of 14 inches. Just below it is the firm, mottled silty clay subsoil that grades from reddish gray in the upper part to weak red and reddish brown below a depth of 19 inches. The leached layer and subsoil are neutral in reaction. The substratum is at a depth of about 26 inches. It consists of very firm, calcareous, dark reddish-brown silty clay.

Typical profile of Lakemont silty clay loam in an area formerly cultivated:

Ap—0 to 9 inches, very dark brown (10YR 2/2) light silty clay loam, high in organic-matter content; medium to strong, fine, subangular blocky structure breaking to fine and medium, granular structure; friable when moist, slightly sticky when wet; abundant fine roots; neutral; clear, wavy boundary. 7 to 9 inches thick.

A2g—9 to 14 inches, grayish-brown (10YR 5/2) silty clay loam; common, coarse, prominent, yellowish-brown (10YR 5/6) and strong-brown (7.5YR 5/6) mottles and few, fine, faint, gray (10YR 5/1) mottles; moderate to strong, medium and coarse, angular blocky structure within strong, coarse, prismatic structure; firm when moist, sticky and plastic when wet; thick, gray to light-gray (10YR 6/1) silt coats on prism and block faces; common fine roots along ped faces; neutral; clear, wavy boundary. 0 to 6 inches thick.

B21tg—14 to 19 inches, reddish-gray (5YR 5/2) silty clay; few, fine to medium, faint, reddish-brown (5YR 5/4) mottles and few, fine, faint, light-gray (5YR 7/1) mottles; strong, coarse and medium, angular blocky structure within strong, coarse, prismatic structure; pinkish-gray (7.5YR 6/2) to light brownish-gray (10YR 6/2) silt coats on prism faces; brown (7.5YR 5/2) clay coats on faces of blocks; firm when moist, sticky and plastic when wet; few fine roots along ped faces; neutral; clear, wavy boundary. 3 to 9 inches thick.

B22tg—19 to 26 inches, weak-red (2.5YR 4/2) to reddish-brown (5YR 4/2) heavy silty clay; many, medium, faint, brown to dark-brown (7.5YR 4/4) mottles and many fine, prominent, gray (5Y 5/1) streaks; strong, coarse and medium, angular blocky structure within strong, coarse, prismatic structure; grayish-brown (10YR 5/2) silt coats on prism faces; reddish-gray (5YR 5/2) clay coats with few, fine, prominent, gray (5YR 5/1) streaks on faces of blocks; very firm when moist, sticky and plastic when wet; few fine roots along ped faces; neutral; gradual, wavy boundary. 2 to 12 inches thick.

Cg—26 to 42 inches, dark reddish-brown (5YR 4/2) heavy silty clay; many, medium, faint, brown to dark-brown (7.5YR 4/4) mottles and many, fine, prominent, gray (5Y 5/1) streaks; weak, thick, platy structure within strong, coarse, prismatic structure; light-gray to gray (5Y 6/1), discontinuous, limy silt coats; very firm when moist, sticky and plastic when wet; very few fine roots in upper 2 inches; calcareous; a few lime nodules.

The thickness of the solum ranges from 12 to 36 inches, depending on the depth to free carbonates.

The texture of the A horizon is generally coarse silty clay loam or heavy silt loam, but in some areas there is a thin smear of soil as coarse as fine sandy loam less than 20 inches thick over the clay. The color of the Ap or A1 horizon ranges from dark gray or dark grayish brown to black. The reaction ranges from neutral to slightly acid.

The color of the B horizon ranges from reddish brown to brown in a hue of 2.5YR to 7.5YR, a value of 3 to 5, and a chroma of 2 to 4. The ped faces have a color value of 4 to 6 and a chroma of 1 to 3. Mottles range from few to common, and from fine to coarse. The texture of the B horizon ranges from silty clay loam to silty clay, and the clay content is 35 to 50 percent. The reaction ranges from slightly acid to mildly alkaline.

The C horizon has a hue redder than 7.5YR. In some places there are a few thin layers of silt and sand in the B and C horizons, but they seldom exceed a total of 6 inches.

Lakemont soils are in a drainage sequence with moderately well drained to well drained Schoharie soils, somewhat poorly drained Odessa soils, and very poorly drained Fonda soils. They are redder than Madalin soils and are finer textured than Canandaigua soils.

Lakemont silty clay loam (0 to 3 percent slopes) (Lc).—This soil occurs mostly as small to medium-sized areas on the lake plain. The larger areas are low and flat and are surrounded by gently sloping Schoharie and Odessa soils or by Cazenovia and Ovid soils. The small areas are generally in depressions or along drainageways between gently or moderately sloping Schoharie and Odessa soils. In many of these small areas there are deposits of eroded material, and the surface layer is as much as 24 inches thick. Near Weedsport and Port Byron a few small areas of Lakemont silty clay loam adjoin Riga, Lairdsville, Brockport, and Lockport soils. These areas have soft, clay shale bedrock within a depth of 30 to 40 inches. Because of the limited acreage and because the shale can be easily excavated with power equipment, this shallower Lakemont soil was included with the deeper Lakemont soil in mapping.

Undrained areas of this mapping unit are used mainly for pasture or woods. The smaller areas in cultivated fields have been drained, but not sufficiently for intensive use. These areas, however, control the timing of work on the better drained soils in spring.

Drainage with closely spaced drains, land shaping to provide uniform movement of water to the drains, and careful management to prevent clodding are needed if this soil is farmed. If these needs are met, this soil can be used for corn, beans, and other annual crops, and it could be one of the better soils in the county for sugar beets. Drained areas need only a little lime, a moderate amount of phosphorus, and a small amount of potassium. The supply of nitrogen is deficient in spring but may be adequate for most crops by midsummer.

Some areas are suitable sites for ponds or wildlife marshes. Prolonged wetness, slow permeability, and texture are the main limitations to most nonfarm uses. (Capability unit IVw–1; woodland group 18)

Lamson Series

The Lamson series consists of deep, poorly drained to very poorly drained soils that formed in fine and very fine sand deposits of glacial lakes. Many of the wettest sites have a mucky fine sandy loam surface layer. These soils are inextensive and occur mostly north of Auburn.

A typical profile in a cultivated area has a black to very dark brown fine sandy loam plow layer about 9 inches thick. The next layer is leached, gray to grayish-brown loamy very fine sand to very fine sandy loam that is faintly mottled. It is very friable and extends to a depth of about 21 inches. The underlying subsoil is 21 inches thick or more. The top 7 inches consists of an irregularly shaped mass of brown, very friable, mottled very fine sandy loam 4 to 6 inches in diameter. This mass is surrounded by pale-brown, loose loamy very fine sand that is faintly mottled. The lower part of the subsoil is yellowish-brown, very friable to loose loamy fine sand to loamy very fine sand that is faintly mottled. The reaction is slightly acid throughout the profile.

Typical profile of Lamson fine sandy loam in an idle area formerly cultivated:

Ap—0 to 9 inches, black (10YR 2/1) to very dark brown (10YR 2/2) fine sandy loam; weak, medium and coarse, granular structure; very friable when moist, nonsticky when wet; very numerous fine roots; slightly acid; abrupt, wavy boundary. 7 to 10 inches thick.

A2g—9 to 21 inches, gray (10YR 6/1) to grayish-brown (10YR 6/2) loamy very fine sand to very fine sandy loam; few, medium, faint, light yellowish-brown (10YR 6/4) mottles; single grain to weak, medium, subangular blocky structure; very friable to loose; scattered fine roots; slightly acid; clear, wavy boundary. 8 to 15 inches thick.

B21g—21 to 28 inches, brown (7.5YR 5/4–4/4) very fine sandy loam arranged in an irregular-shaped mass 4 to 6 inches in diameter; many, coarse, faint, strong-brown (7.5YR 5/6) and pinkish-gray (7.5YR 6/2) mottles; massive to very weak, medium, subangular blocky structure; very friable when moist; the mass is surrounded by ½ to 1½ inches of pale-brown (10YR 6/3) loose loamy very fine sand high in content of fine sand; few, medium, faint, light yellowish-brown (10YR 6/4) and gray (10YR 6/1) mottles; scattered fine roots; slightly acid; clear, wavy boundary. 6 to 8 inches thick.

B22g—28 to 42 inches, yellowish-brown (10YR 5/6) loamy fine sand to loamy very fine sand; many, coarse, faint, yellowish-brown (10YR 5/8) and light brownish-gray (10YR 6/2) mottles; very weak, thick, platy structure breaking to weak, medium, subangular blocky structure; very friable to loose; few fine roots; slightly acid.

The thickness of the solum ranges from 30 to 50 inches. The depth to bedrock or contrasting material is more than 40 inches.

The surface layer consists mostly of fine sandy loam or mucky fine sandy loam that is high in content of fine and very fine sand, but the texture ranges from loamy fine sand to silt loam. The finer textures, loam and silt loam, are generally the result of colluvial deposition from higher areas and are thin smears overlying the subsoil. The color of the surface layer ranges from dark gray to black. The reaction ranges from medium acid to neutral.

The texture of the A2 horizon and B2 horizon generally is loamy fine sand to very fine sandy loam. These layers are very low in clay. In some places there are thin layers of silt up to 3 inches thick but totaling less than 6 inches in the upper 40 inches of the solum. The A2 horizon has hues of 10YR to 5YR, values of 4 to 6, and chromas of 0 to 2. The B2 horizon has hues of 10YR to 5YR, and values and chromas of 3 to 6. The reaction of the A2 horizon ranges from medium acid to neutral. The B2 horizon is slightly acid in the upper part and grades to calcareous at a depth of 24 to 60 inches.

Lamson soils are in a drainage sequence with well drained Arkport, moderately well drained Galen, and somewhat poorly drained Minoa soils. They are also associated with coarser textured Colonie soils. They are coarser textured than Canandaigua soils and lack the prismatic and blocky B horizon common to those soils.

Lamson fine sandy loam (0 to 2 percent slopes) (Le).—This poorly drained soil has the profile described as typical of the series. Most areas are nearly level; only a few areas have slopes greater than 1 percent. The dominant inclusions in mapping were areas of Lamson mucky fine sandy loam in slight depressions or along narrow, shallow drainageways. These inclusions occupy as much as 10 percent of any mapped area. Areas of Minoa and Galen soils on slight rises or knolls were also included, but they have little effect on management.

If this soil is undrained, it is suited to pasture, forest, or wildlife habitat, and only water-tolerant grass and trees grow well on it. If it is drained, it can be used for many kinds of crops.

Control of water is the main problem. The response to artificial drainage is good. The fine sand flows readily when saturated, so special practices are needed to prevent drains from plugging. Nitrogen, phosphorus, and potassium are needed in drained areas, and lime is needed in some areas.

Prolonged wetness is the main limitation to most nonfarm uses. Some areas are suitable sites for ponds and wildlife marshes. (Capability unit IIIw–8; woodland group 12)

Lamson mucky fine sandy loam (0 to 2 percent slopes) (Lf).—Except for a darker, mucky surface layer, this very poorly drained soil has a profile like the one described for the series. It is in depressions that lack natural outlets, and water stands at or on the surface for 8 to 10 months of the year unless the depressions are drained. The dominant inclusions in mapping were areas of Lamson fine sandy loam, mostly around the edges of the depressions, and spots of shallow muck near the center of the larger areas or in slightly lower depressions.

Unless this soil is drained, it is suited only to pasture, forest, or wildlife habitat, and only water-tolerant grasses and trees grow well on it. If drained, it is suited to many kinds of crops.

Control of water is the main problem. The response to artificial drainage is good. The fine sand flows readily when saturated, so special measures are needed to prevent the drains from plugging. Nitrogen, phosphorus, and potassium are needed on areas that have been drained, and lime is needed on some areas.

Prolonged wetness is the main limitation to most nonfarm uses. Some areas are suitable sites for wildlife marshes and ponds. (Capability unit IIIw–8; woodland group 20)

Langford Series

The Langford series consists of deep, moderately well drained, medium-textured soils that have a fragipan. These soils formed in neutral to weakly calcareous till derived from fine-grained, gray sandstone, some gray shale, and a small proportion of limestone. They are in the southeastern third of the county, where they extend through the towns of Moravia, Sempronius, Locke, Summer Hill, and the southern half of Niles to the eastern edge of Venice and Genoa. They are generally at an elevation above 1,200 feet.

A typical profile in a cultivated area has a dark-brown channery silt loam plow layer about 8 inches thick. This layer is underlain by the upper subsoil, which extends to a depth of 18 inches and consists of yellowish-brown very friable channery silt loam. Underlying the upper subsoil is a 3-inch, leached layer of firm, grayish-brown channery loam mottled with yellowish brown. The lower subsoil is a very firm, dense fragipan of dark grayish-brown channery loam that has a few yellowish-brown and light olive-brown mottles. The upper subsoil is strongly acid in reaction; the leached layer is medium acid, and the fragipan grades from medium acid in the upper part to neutral in the lower part. The firm or very firm, weakly calcareous till is at a depth of about 54 inches. It is dark grayish-brown channery silt loam.

Typical profile of Langford channery silt loam, 2 to 8 percent slopes, in a cultivated field:

Ap—0 to 8 inches, dark-brown (10YR 3/3) channery silt loam, light grayish brown (10YR 6/2) when dry; moderate, medium, granular structure; friable; many fine and very fine roots; slightly acid; estimated 5 percent fragments larger than 3 inches; abrupt, smooth boundary. 7 to 9 inches thick.

B2—8 to 18 inches, yellowish-brown (10YR 5/4) channery silt loam, light yellowish brown (10YR 6/4) when dry; very weak, very fine and fine, subangular blocky structure; very friable; many fine roots; strongly acid; estimated 3 percent fragments larger than 3 inches; abrupt, wavy boundary. 6 to 12 inches thick.

IIA'x—18 to 21 inches, grayish-brown (2.5Y 5/2) channery loam, light brownish gray (2.5Y 6/2) when dry; common, medium, distinct, yellowish-brown (10YR 5/4) mottles; moderate, medium and thick, platy structure; firm in place, fragile to brittle if crushed; plate faces have common, fine, washed sand grains; common, fine and medium pores that lack clay films; few fine roots; medium acid; clear, irregular boundary. Mainly 2 to 5 inches thick with tongues 1 to 2 inches wide and 10 to 18 inches apart that extend 8 to 14 inches into the underlying horizon.

IIB'x1—21 to 34 inches, dark grayish-brown (2.5Y 4/3) channery loam; few, fine, distinct, yellowish-brown (10YR 5/4 and 5/6) mottles; arranged in very coarse prisms, 10 to 18 inches wide, centers of which appear to be slightly higher in clay content; prisms separated by tongues of grayish-brown (2.5Y 5/2) slightly more friable loam, 1 to 2 inches wide at top, tapering to streaks at bottom; common, medium, distinct, yellowish-brown (10YR 5/4 and 5/6) mottles in tongues; nearly massive to very weak, prismatic structure breaking to coarse, angular blocky structure; very firm in place, brittle if removed; discontinuous, thin, grayish-brown (2.5Y 5/2) silt coats on some block faces; common fine pores with clay linings in center of prisms; no roots in prisms, few fine roots in tongues; estimated 15 percent fragments larger than 3 inches; medium acid; gradual, wavy boundary. 11 to 15 inches thick.

IIB'x2—34 to 54 inches, dark grayish-brown (2.5Y 4/2) channery heavy loam; few, fine, faint, grayish-brown (2.5Y 5/2) and light olive-brown (2.5Y 5/4) mottles; weak, very coarse prisms, 18 to 30 inches across, that break to weak, coarse, subangular blocks; very firm in place; brittle if crushed; slightly sticky when wet; very thin, nearly continuous clay films on block faces; common fine pores with clay linings; distinct, grayish-brown (2.5Y 5/2) silt films on prism faces; no roots; estimated 15 percent fragments larger than 3 inches; neutral; abrupt, wavy boundary. 14 to 27 inches thick.

IIC—54 to 62 inches, dark grayish-brown (2.5Y 4/2) channery silt loam; weak, medium and thick, platy structure; firm to very firm in place, slightly firm if crushed, slightly sticky when wet; few to common fine pores with clay linings in upper 8 inches; no clay films on plate faces; no roots; estimated 20 percent fragments larger than 3 inches; weakly calcareous.

The thickness of the solum ranges from 40 to 60 inches. The depth to bedrock ranges from 40 inches to many feet, and the depth to the fragipan ranges from 15 to 24 inches.

The color of the A1 or Ap horizon ranges from very dark gray to grayish brown. The texture ranges from loam to silt loam, and the content of gravel and stones is 10 to 30 percent. The reaction is very strongly acid to medium acid in unlimed areas.

The color of the B2 horizon ranges from strong brown to light olive brown, and there generally are high-chroma mottles in the lower part. The texture ranges from silt loam to loam. The content of coarse fragments is 10 to 35 percent, and the fragments are mostly flat, angular stones. The reaction ranges from very strongly acid to medium acid in unlimed areas.

The A' horizon is 2 to 5 inches thick and has a hue of 10YR to 5Y, a value of 5 to 7, and a chroma of 2 or 3. It has common to many, medium and coarse, high-chroma mottles. The texture is loam to very fine sandy loam, and the stone fragment content is 15 to 35 percent. The reaction is strongly acid to medium acid. In some places this horizon is compact enough to be a fragipan.

The texture of the Bx horizon, or fragipan, is loam to heavy silt loam, and the content of stone fragments is 15 to 35 percent. The color is a hue of 10YR to 5Y, a value of 3 to 5, and a chroma of 2 to 4, and there are a few to common, fine and medium mottles. The reaction ranges from medium acid in the upper part to mildly alkaline in the lower part.

The C horizon is alkaline to calcareous. The depth to carbonates ranges from 40 to 72 inches.

Langford soils contain less lime than Conesus soils and have a prominent fragipan. They are similar to Ira soils in profile but differ in location and parent material. Ira soils formed in till derived from gray and red sandstone that is harder, coarser, and more massive than the sandstone from which Langford soils are derived. As a result, Ira soils are sandy and contain semirounded gravel, cobbles, and boulders. They also contain more granitic material.

Langford channery silt loam, 2 to 8 percent slopes (LgB).—This soil has the profile described as typical of the series. It occupies convex hilltops and smooth hillsides where little runoff accumulates. Included in mapping were somewhat poorly drained Erie soils in shallow depressions or along narrow drainageways. These wetter soils occupy no more than 10 percent of any mapped area but are significant because they delay planting in spring.

This is the second most extensive soil in the county. It is suitable for crops, pasture, or forest and is among the better soils on uplands for crops, even though slightly limited by wetness. Alfalfa and other deep-rooted perennials can be grown successfully, but the hazard of winterkill is serious in the wetter spots.

Runoff is moderate to moderately rapid. Consequently, erosion is a hazard and should be controlled, especially on the longer slopes. Random drainage of wet spots is beneficial in many fields. If drainage systems are installed in the wetter, more nearly level areas, the drains should be closely spaced because of the shallow depth to the fragipan. Adequate liming is important in order to get a good response to nitrogen, phosphorus, and potassium. Small, flat stones interfere moderately with cultivation.

Slow permeability, seasonal wetness, slope, and stone fragments are the main limitations to nonfarm use. (Capability unit IIe–11; woodland group 8a)

Langford channery silt loam, 8 to 15 percent slopes (LgC).—This soil occupies smooth, upper slopes on valley sides. Many areas are slightly better drained than is typical of the series. Narrow areas of Erie soils along shallow drainageways were included in mapping. Also included were some small, severely eroded areas. More stone fragments, less organic matter, and a shallower depth to the fragipan are common in these severely eroded areas. Consequently, they are droughty and crop yields are low.

This soil is suited to crops, pasture, and forest. The steeper slopes are somewhat difficult to work with farm machinery. Because runoff is moderately rapid and erosion is a hazard, measures that control erosion are needed in many areas.

Most of the farmed areas are moderately eroded, but the organic-matter content is only slightly lower than in uneroded areas because a large amount of manure has been applied, and a long-term hay rotation has been used. The increased stone content in these eroded areas, however, interferes with cultivation, and the thinner surface layer and subsoil hold less water available to plants. The few severely eroded areas are better suited to long-term hay crops than to tilled crops. Liming is needed in order to get a good response to nitrogen, phosphorus, and potassium.

Slow permeability, slope, stone fragments, and seasonal wetness are the main limitations to most nonfarm uses. (Capability unit IIIe–4; woodland group 8a)

Langford channery silt loam, rolling (8 to 15 percent slopes) (LgCK).—This is a strongly undulating to rolling soil on uplands. The topography of some areas is complex because of the closely spaced drainageways. Many areas are slightly better drained than is typical of the series. Most areas are less than 30 acres in size.

Forested and unplowed cleared areas have little or no erosion, but the degree of erosion ranges from none to severe in areas that have been cultivated, and some of the eroded material has been deposited in depressions and drainageways. Erie soils in small depressions and narrow areas along drainageways were included in mapping.

This Langford soil is used for crops, pasture, and forest, but it is better suited to long-term hay and forage crops than to tilled crops. Contour tillage generally is impractical on the complex slopes. Runoff is rapid, and erosion is a hazard if row crops are grown. Lime and complete fertilizer are needed to obtain even a moderate to good response from hay and forage crops. Nitrogen and lime are especially needed on the severely eroded spots.

Slow permeability, slope, stone fragments, and seasonal wetness are the main limitations to most nonfarm uses. (Capability unit IVe–3; woodland group 8a)

Langford channery silt loam, 15 to 25 percent slopes (LgD).—This soil is drier than is typical of the series. It is on smoothly sloping hillsides or on uplands where the topography is hilly and complex. Intermittent streams or drainageways cross many of the smooth areas at nearly right angles to the contour, and they also occupy the depressions between the knolls. Included in mapping were spots of the wetter Erie soils along the small streams and drainageways.

The degree of erosion varies. Cropped areas are generally moderately eroded, but there are a few severely eroded spots.

This soil can be used for crops, pasture, or forest, but it is better suited to long-term hay and pasture than to tilled crops. Runoff is rapid, and erosion is a hazard. Because of the excessive loss of water, droughtiness in midsummer also is a hazard. If it is necessary to use this soil for row crops, intensive management is needed to control erosion and conserve water. Lime and complete fertilizer are needed for even a moderate response from hay and forage crops.

Slope, slow permeability, and stone fragments are the main limitations to most nonfarm uses. (Capability unit IVe–3; woodland group 8b)

Langford-Howard gravelly loams, 2 to 8 percent slopes (LhB).—Each soil of this complex has a profile typical of its series. The moderately well drained Langford soil formed in low-lime glacial till, and the well drained Howard soil formed in alkaline to calcareous glacial outwash.

These soils are on the sides of valleys and across uplands where the ice front stood for extended periods. Glacial till deposited by the ice is at the surface in some places, but in many places it is overlain by gravel and sand deposited by water flowing from the melted ice. On many of the valley sides, the till moved down from the upper slopes by slow creep or rapid mudflow and overlies the gravel to a depth of 5 to 10 feet. Consequently, these soils occur in a very complex pattern. Most areas are gently undulating. Only a few small areas have simple slopes.

This complex unit adjoins Erie soils and other Langford soils, which formed in glacial till on uplands, and Howard soils, which formed in glacial outwash in valleys. A few small pockets of the somewhat poorly drained Erie soils were included in mapping.

The soils of this complex can be used for crops, pasture, or forest. They are suited to all crops grown in the county, but lime and complete fertilizer are needed for even a moderate response from most crops. Random drainage of the few wet spots improves some fields.

Slope, gravel, stones, and variable permeability are the main limitations to most nonfarm uses. (Capability unit IIe–11; woodland group 7a)

Langford-Howard gravelly loams, 8 to 15 percent slopes (LhC).—This complex mapping unit consists of moderately well drained Langford soil that formed in low-lime glacial till on uplands and well drained Howard soil that formed in alkaline to calcareous glacial outwash in valleys. Most areas are on lower slopes of valleys, but there are some rolling areas on uplands. The slopes are short, convex, and generally strongly undulating or rolling; in only a few areas the slopes are simple. Included with these soils in mapping were a few small wet spots of Erie and Ellery soils in depressions.

The soils of this complex can be used for crops, pasture, or forest. Because of their complex slopes, they are better suited to long-term hay and forage crops than to row crops. They are well suited to deep-rooted legumes. The steeper areas that have been used for row crops are moderately eroded. Contour tillage generally is impractical on the complex slopes. Lime and fertilizer are needed for even a moderate response from crops.

Slope, gravel, stones, and variable permeability are the main limitations to nonfarm use. (Capability unit IVe-3; woodland group 7a)

Langford-Howard gravelly loams, 15 to 25 percent slopes (LhD).—This complex mapping unit consists of moderately well drained Langford soil that formed in low-lime glacial till on uplands and well drained Howard soil that formed in alkaline to calcareous glacial outwash in valleys. Most areas are on lower slopes of valleys. The slopes are short, convex, and generally strongly rolling or hilly. Only a few slopes are simple. Except for the lack of mottles above the fragipan, a profile of the Langford soil is like the one described for the series. The Howard soil is shallower to underlying sand and gravel than the soil described as typical of the Howard series, and it has lower water-holding capacity.

Because of droughtiness and the complex slopes, which are difficult and hazardous to till, these soils are better suited to deep-rooted legumes and other hay and forage crops than to row crops. Lime and complete fertilizer are needed for even a moderate response from hay and forage crops. These soils are well suited to forest.

Slope, gravel, stones, and variable permeability are limitations to most nonfarm use. (Capability unit IVe-3; woodland group 7b)

Langford-Howard gravelly loams, 25 to 45 percent slopes (LhE).—Each of these soils has a profile like the one described for its series, except that the Langford soil lacks the mottles above the fragipan and has a variable depth to the fragipan, and the Howard soil is shallower to the stratified sand and gravel and is more variable in texture. A few areas of Langford soils not in association with Howard soils on steep and very steep upland side slopes were included in mapping.

Although these soils can be used for pasture, they are better suited to forest. They have limited moisture-holding capacity and are somewhat droughty, and they are not productive of pasture, even if limed and fertilized. Because of the complexity and steepness of slope, use of farm machinery is difficult or impossible. (Capability unit VIe-1; woodland group 7b)

Langford Series, Moderately Shallow Variant

The Langford series, moderately shallow variant, consists of moderately well drained, medium-textured soils that have a fragipan. These soils formed in medium-textured glacial till derived mainly from gray, fine-grained sandstone and hard shale bedrock, which is at a depth of 20 to 40 inches. The bedrock contains a small amount of lime in some places.

A typical profile in a cultivated area has a dark grayish-brown channery silt loam plow layer about 8 inches thick. Underlying this layer is the upper subsoil, which extends to a depth of 14 inches and consists of friable, yellowish-brown channery silt loam. Just below it is a thin, leached layer of friable, light brownish-gray channery silt loam mottled with yellowish brown. The lower subsoil is at a depth of about 17 inches. It is a very firm, dense fragipan of dark grayish-brown channery silt loam sparsely mottled with yellowish brown and light gray. The subsoil and leached layer are medium acid. The fragipan is slightly acid. Sandstone and hard shale bedrock are at a depth of about 29 inches. They are commonly fractured in the upper part.

Typical profile of Langford channery silt loam, moderately shallow variant, 2 to 8 percent slopes, in a cultivated field:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) channery silt loam; dark brown (10YR 4/3) if rubbed; weak, medium and coarse, granular structure; friable; numerous fine and medium roots; slightly acid; abrupt, wavy boundary. 7 to 9 inches thick.

B2—8 to 14 inches, yellowish-brown (10YR 5/4) channery silt loam that fades to brown (10YR 5/3) with depth; moderate, fine and medium, subangular blocky structure; friable when moist, nonsticky when wet; numerous fine and medium roots; medium acid; clear, wavy boundary. 5 to 7 inches thick.

A'2g—14 to 17 inches, light brownish-gray (2.5Y 6/2) channery silt loam; common, medium, distinct, yellowish-brown (10YR 5/4, 5/6) and brownish-yellow (10YR 6/6) mottles; weak to moderate, fine, subangular blocky structure within weak, medium, platy structure; friable; common fine roots and few medium roots; medium acid; clear, wavy boundary. 2 to 5 inches thick.

B'x1—17 to 29 inches, dark grayish-brown (2.5Y 4/2), channery gritty 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 blocks in upper 3 inches and grade to very weak, very thick plates with depth; firm to very firm in place, brittle when removed; discontinuous, thin clay film on ped faces; distinct clay lining in a few larger pores; prisms separated by streaks of light brownish-gray (2.5Y 6/2), friable very fine sandy loam or coarse silt loam ½ inch to 1½ inches wide at top, tapering to films with depth; streaks have common, medium, distinct mottles of yellowish brown (10YR 5/6 and 5/4); common fine roots along prism faces; slightly acid; abrupt, wavy boundary. 2 to 20 inches thick.

R—29 to 40 inches +, gray, fine-grained sandstone and hard shale bedrock; upper 6 to 12 inches commonly fractured into ½-inch to 2-inch layers that have light-gray (2.5Y 7/2) silt coats on horizontal faces.

The thickness of the solum ranges from 20 to 40 inches and corresponds to the depth to bedrock.

The color of the A1 or Ap horizon ranges from very dark gray to grayish brown. The texture ranges from very fine sandy loam to silt loam. The coarse fragments range from 10 to 30 percent in volume and consist mostly of flat, angular stones. The reaction in unlimed areas ranges from strongly acid to medium acid.

The color of the B2 horizon ranges from strong brown to light olive brown, and there are commonly high-chroma mottles in the lower part. The texture ranges from very fine sandy loam to silt loam. The coarse fragments range from 10 to 35 percent in volume and consist mostly of flat, angular stones. The reaction ranges from strongly acid to medium acid.

The color of the A'2 horizon ranges from 10YR to 5Y in hue, 5 to 7 in value, and 2 to 3 in chroma. There are common to many, medium and coarse mottles of high chroma. The texture ranges from silt loam to very fine sandy loam. The coarse fragments range from 15 to 50 percent in volume and consist mostly of flat, angular stones. The reaction ranges from strongly acid to medium acid.

The color of the B'x horizon ranges from 10YR to 5Y in hue, 3 to 5 in value, and 2 to 4 in chroma. There are a few to common, fine and medium mottles. The texture ranges from loam to fine silt loam, and the content of coarse fragments is 15 to 35 percent. The reaction ranges from medium acid to mildly alkaline.

A thin Cx horizon is present in places where the depth to bedrock is between 30 and 40 inches. The color and texture of this thin horizon are similar to those of the B'x horizon. The reaction ranges from neutral to alkaline.

The moderately shallow variant of Langford soils is in a drainage sequence with the somewhat poorly drained, moderately shallow variant of Erie soils. Both these soils are commonly associated with the deeper Langford soils at an elevation above 1,200 feet. They differ from Lordstown and Aurora soils in having a fragipan. They are not so well drained as Lordstown soils and are coarser textured and lower in lime content than Aurora soils.

Langford channery silt loam, moderately shallow variant, 2 to 8 percent slopes (LnB).—This soil is on hilltops and upper side slopes. The gentle slopes are smooth and slightly convex. Included with this soil in mapping were Arnot soils, which are less than 20 inches in depth to bedrock, and somewhat poorly drained, moderately shallow Erie soils in shallow depressions and along narrow drainageways. These shallow Arnot soils and wet Erie soils occupy no more than 10 percent of any mapped area but affect management of some fields. Also included were deeper Langford soils, which occupy as much as 25 percent of any mapped area but have little effect on management. Other inclusions were a few small areas that have a slope range of 8 to 15 percent.

This soil is suited to crops, pasture, or forest. The depth to the fragipan determines the root zone and the water-holding capacity. The 20-inch to 40-inch depth to bedrock affects the deep placement of random drains needed to drain some of the wet spots. Because of moderate to moderately rapid runoff, control of erosion is a problem. Liming is needed to obtain a good response to applications of nitrogen, phosphorus, and potassium. The small, flat stones interfere moderately with tillage.

Slow permeability, shallowness to bedrock, stone fragments, and slope are the main limitations to nonfarm uses. (Capability unit IIe–11; woodland group 8a)

Lansing Series

The Lansing series consists of deep, well-drained soils that contain a medium amount of lime. These soils formed in calcareous, medium-textured till derived from calcareous, gray shale and fine-grained sandstone and from limestone. They are moderately extensive and are mostly in the southeastern third of the county, at an elevation between 1,000 and 1,400 feet.

A typical profile in a cultivated area has a dark-gray gravelly silt loam plow layer 6 inches thick. Underlying the plow layer is a 4-inch leached layer of friable, pale-brown gravelly silt loam. Next is the subsoil of dark-brown to dark grayish-brown, firm gravelly silt loam. It is partly leached in the top 2 inches and has some brownish-gray silt coatings around blocks of the darker colored material. The subsoil ranges from medium acid in the upper part to neutral just over the till substratum. The substratum is at a depth of about 37 inches. It consists of firm, gray and brown gravelly silt loam to gravelly loam till that is calcareous.

Typical profile of Lansing gravelly silt loam, 2 to 8 percent slopes, in a cultivated field:

Ap—0 to 6 inches, dark-gray (10YR 4/1) gravelly silt loam, dark grayish brown (10YR 4/2) if rubbed; moderate, fine and medium, subangular blocky structure breaking to moderate, fine and medium, granular structure; friable; many fine and medium roots; slightly acid; abrupt, wavy boundary. 5 to 8 inches thick.

A2—6 to 10 inches, pale-brown (10YR 6/3) gravelly silt loam; moderate, fine and medium, subangular blocky structure breaking to weak, fine and medium, granular structure; friable; faces of larger blocks have very thin, pale-brown to light grayish-brown (10YR 6/3–6/2) silty coats; many fine and medium roots; medium acid; clear, wavy boundary. 3 to 5 inches thick.

B&A—10 to 12 inches, light brownish-gray (10YR 6/2) to grayish-brown (10YR 5/2) gravelly silt loam; vertical fingers, ⅛ to ½ inch wide, separating 1-inch to 3-inch, irregular-shaped blocks of dark-brown (10YR 3/3) to dark grayish-brown (10YR 4/2) fine silt loam; moderate, medium, subangular blocky structure; slightly firm; discontinuous, thin clay film in pores; many fine and medium roots; medium acid; clear, wavy boundary. 1 to 6 inches thick.

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; slightly firm when moist, slightly sticky when wet; dark grayish-brown (10YR 4/2) to grayish-brown (10YR 5/2), thin clay film on block faces and in larger pores; many fine and medium roots; medium acid; gradual, wavy boundary. 4 to 7 inches thick.

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; slightly sticky when wet; dark grayish-brown (10YR 4/2), distinct clay film on block faces and in larger pores; many fine and medium roots; slightly acid; gradual, wavy boundary. 6 to 10 inches thick.

B23&B3—25 to 37 inches, dark-brown (10YR 3/3) to very dark brown (10YR 3/2) gravelly silt loam; moderate, coarse and medium, subangular blocky structure; firm when moist, slightly sticky when wet; dark-brown (10YR 3/3) to dark grayish-brown (10YR 4/2), thin clay film on block faces and in pores; common fine and medium roots; neutral; clear, wavy boundary. 10 to 14 inches thick.

C—37 to 45 inches, variegated gray (10YR 5/1) and brown (10YR 5/3), gravelly gritty silt loam to loam glacial till that becomes grayer with depth; weak, thick, platy structure breaking to weak, fine and medium, blocky structure in upper part; firm in place, friable when crushed; calcareous.

The depth to carbonates or to calcareous material ranges from 32 to 50 inches and corresponds to the thickness of the solum. The depth to bedrock ranges from 40 inches to many feet.

The color of the A1 or Ap horizon ranges from very dark gray to grayish brown. The A2 horizon is light grayish brown to brown. The texture of the A horizon is predominantly silt loam but ranges from silt loam to fine sandy loam. The content of coarse fragments is 5 to 25 percent by volume. The reaction in unlimed areas ranges from strongly acid to slightly acid.

The color of the B horizon ranges from a hue of 10YR to 5Y, a value of 3 to 5, and a chroma of 3 to 5. The texture of this horizon ranges from loam to heavy silt loam, and the clay content is 18 to 28 percent. Coarse fragments range from gravel to boulders and are 5 to 30 percent by volume. The reaction is strongly acid to slightly acid in the upper part and grades to neutral or alkaline in the lower part.

Lansing soils are in a drainage sequence with moderately well drained Conesus, somewhat poorly drained Kendaia, poorly drained Lyons, and very poorly drained Alden soils. They have a more acid and thicker A2 horizon than Honeoye soils and contain less lime, as they are more than 32 inches in depth to carbonates. Lansing soils are grayer than Ontario soils and are grayer and coarser textured than Cazenovia soils. In lime content and in elevation, Lansing soils are intermediate between the high-lime Honeoye and Lima soils at lower elevations and the acid Langford and Erie soils at higher elevations.

Lansing gravelly silt loam, 2 to 8 percent slopes (LsB).—This soil has the profile described as typical of the series. Its slopes are both uniform and undulating, and it receives little or no runoff from adjacent areas, although water accumulates in the shallow depressions and drainageways. In these depressions and drainageways are small areas of moderately well drained Conesus soils and somewhat poorly drained Kendaia soils that were included in mapping. The wetter Kendaia soils, though not extensive, are trouble spots in many fields early in spring.

This Lansing soil is among the best in the county for all crops, including vegetables, and for pasture and forest. The stones hinder tillage in some areas.

Maintaining soil structure and fertility and controlling acidity are the main problems. Controlling runoff and erosion is a problem in some areas, especially on the longer slopes. Random drainage of the wet spots improves some fields.

Slope, gravel, stone fragments, and moderately slow permeability below a depth of 30 inches are the main limitations to most nonfarm uses. (Capability unit IIe–1; woodland group 6a)

Lansing gravelly silt loam, 8 to 14 percent slopes (LsC).—Except for shallowness, this soil has a profile like the one described for the series. Most of the slopes are smooth, short, and convex and are strong enough to cause some difficulty in the use of machinery. Most areas are on side slopes below less strongly sloping Lansing soils, from which some runoff is received. Included in mapping were moderately well drained Conesus soils that occur in more nearly level pockets or along shallow, narrow drainageways.

This soil is suited to crops, pasture, or forest. Much of it is still forested or in unplowed pasture. The cropped areas have been adequately protected against erosion.

Management of tilled crops is exacting. Lime and complete fertilizer are needed. If row crops are grown, erosion is a hazard. Random drainage is needed for the occasional wet spots.

Moderately slow and slow permeability below a depth of 30 inches, steepness of slope, and gravel and stones are limitations to most nonfarm uses. (Capability unit IIIe–2; woodland group 6a)

Lansing gravelly silt loam, 8 to 14 percent slopes, eroded (LsC3).—This soil is on valley side slopes below less strongly sloping Lansing soils, from which it receives some runoff. Seventy-five percent or more of the area is eroded. As a result, the plow layer consists mostly of material that was originally the upper part of the subsoil, and in some spots it consists of the more clayey lower part of the original subsoil. It is generally lighter in color, lower in content of organic matter, and higher in content of gravel and stone than the plow layer of the uneroded Lansing soil.

Many of the slopes are moderately long. Some areas of this soil have shallow drainageways that contain narrow areas of Conesus soils as the dominant inclusion. Also included were uneroded spots and small areas along the upper sides of cross-slope fence rows, where part of the eroded material has been deposited.

This soil is suited to crops, pasture, or forest, and most of it is or has been used for crops. It is better suited to long-term hay and forage than to row crops. If row crops are grown, a high percentage of sod-forming crops should be included in the rotation to maintain soil structure and organic-matter content. In addition, measures are needed to control runoff and erosion. Lime and a complete fertilizer are needed for even a moderate response from crops. The severely eroded spots are especially deficient in nitrogen.

Slope, moderately slow and slow permeability, and gravel and stones are limitations to most nonfarm uses. (Capability unit IVe–2; woodland group 6a)

Lansing gravelly silt loam, rolling (8 to 14 percent slopes) (LsCK).—This soil occupies rolling uplands and undulating sidehills dissected by closely spaced, moderately deep drainageways. The complex slopes are generally short and convex. The degree of erosion has not been differentiated in mapping and is variable in most cropped areas. Erosion is slight to moderate on hilltops and severe on the more strongly sloping sides, and there are deposits of eroded material in depressions and drainageways. Included in mapping were moderately well drained Conesus and somewhat poorly drained Kendaia soils in small depressions and along drainageways.

This soil is suited to crops, pasture, or forest. It is better suited to hay or forage crops than to row crops, because the irregular slopes make contouring impractical. It is well suited to deep-rooted legumes. Lime and fertilizer are needed. If reseeding of pasture is necessary, plowing should be as nearly across the slope as practical, and strips of sod should be left to reduce runoff.

Slope, gravel and stones, and slow or moderately slow permeability below a depth of 30 inches are limitations to most nonfarm uses. (Capability unit IVe–1; woodland group 6a)

Lima Series

The Lima series consists of deep, medium-textured, moderately well drained soils that formed in strongly calcareous, firm glacial till of medium texture. The till is derived from limestone, calcareous shale, and some sandstone. South of the Onondaga limestone formation, which crosses the county near Auburn, the till is gray and is derived from limestone and dark-gray to black, calcareous shale. In an area north of Auburn to the Seneca River, the till is highly calcareous and is derived from Camillus shale, limestone, and some red sandstone or red Vernon shale that imparts a reddish color to the till.

A typical profile in a cultivated area has a dark grayish-brown plow layer about 9 inches thick. The subsoil just below this layer is leached to some extent in the upper part. To a depth of 12 inches it is slightly firm, brown, faintly mottled silt loam. This merges with firm, dark-brown gravelly loam mottled with yellowish brown. The reaction of the subsoil is slightly acid to neutral. The firm till substratum is at a depth of 25 inches. It is grayish-brown, calcareous stony loam that is mottled in the upper part. The number of mottles decreases with depth.

Typical profile of Lima silt loam, 3 to 8 percent slopes, in a cultivated field:

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium and fine, granular structure; friable when moist, slightly plastic when wet, slightly hard when dry; many fine roots; 10 percent gravel; neutral; clear, smooth boundary. 7 to 10 inches thick.

B&A—9 to 12 inches, brown (10YR 5/3) silt loam, pale brown (10YR 6/3) when dry; common, fine, faint, yellowish-brown (10YR 5/4) mottles; moderate, medium, subangular blocky structure; slightly firm when moist, slightly plastic when wet, hard when dry; 15 percent dark grayish-brown (10YR 4/2) material filling earthworm channels; many fine roots; many, fine, cylindrical and spherical pores; ped exteriors are 1/16 to 1/4 inch of brown (10YR 4/5) silt loam that is perceptibly higher in clay and has clay-coated pores; 10 percent gravel; slightly acid; clear, wavy boundary. 0 to 5 inches thick.

IIB21—12 to 16 inches, dark-brown (10YR 4/3) gravelly loam; brown (10YR 5/3) when crushed; common, medium, distinct, yellowish-brown (10YR 5/4) mottles; moderate, medium, subangular blocky structure; firm when moist, slightly plastic when wet, hard when dry; common fine roots; many fine pores; 5 percent earthworm channels filled with dark grayish-brown material; distinct but thin clay coats are on 5 to 15 percent of vertical and horizontal ped faces and line all pores; ped interiors slightly lighter colored than ped faces; slightly acid; gradual, wavy boundary. 3 to 8 inches thick.

IIB22t—16 to 25 inches, dark-brown (10YR 4/3) gravelly loam perceptibly finer than B21 horizon; common, medium, distinct, yellowish-brown (10YR 5/4–5/6) and brown (10YR 5/3) mottles in ped interiors; moderate, medium and coarse, subangular blocky structure; firm when moist, moderately plastic when wet, hard when dry; few fine roots; common, fine, spherical pores; thin to moderately thick clay coats are on 10 to 20 percent of vertical and horizontal ped faces and line all pores; 20 percent gravel and stones; neutral; clear, wavy boundary. 4 to 12 inches thick.

IIIC1—25 to 33 inches, grayish-brown (10YR 5/2) stony loam; common, fine and medium, yellowish-brown (10YR 5/4) mottles and common, light brownish-gray (10YR 6/2) coats of segregated lime on ped faces; weak, medium and thick, lens-shaped plates; firm when moist, slightly plastic when wet, very hard when dry; no roots; 30 to 35 percent gravel and stones; calcareous; diffuse boundary 6 to 12 inches thick.

IIIC2—33 to 40 inches, similar to IIIC1 horizon but yellowish-brown mottles decrease with depth, and plates are moderate and thick; estimated 30 percent to 35 percent gravel and stones that are predominantly limestone.

The thickness of the solum ranges from 18 to 32 inches, and the depth to carbonates ranges from 15 to 32 inches. Most areas are deep to bedrock, but some are as shallow as 40 inches. Silt loam is predominant, but the texture ranges from fine sandy loam to silt loam, and the content of gravel is 0 to 20 percent.

The color of the Ap horizon ranges from very dark grayish brown to brown. That of the A2 horizon ranges from brown to pale brown. The reaction of the A horizon is neutral to medium acid.

The texture of the B horizon is generally fine silt loam or loam, and the clay content is 18 to 28 percent. The color ranges from 2.5Y to 5YR in hue, from 4 to 5 in value, and from 2 to 4 in chroma. The number of high-chroma mottles ranges from few to common, and in places there are gray or low-chroma mottles in the lower part of the B horizon in the wetter areas. The content of gravel and stones ranges from 0 to 30 percent by volume.

The C horizon consists mostly of strongly calcareous glacial till of loam or silt loam texture. The till is generally friable and moderately porous to a depth of 4 feet, where it abruptly becomes dense, firm, platy, and very slowly permeable basal till. The depth to the firm till varies, however, from 2 to 6 feet or more. Below a depth of 4 feet, the till is commonly stony and bouldery and contains 30 to 70 percent coarse fragments by volume.

The Lima soils that formed in gray till south of the Onondaga limestone formation are in a drainage sequence with well-drained Honeoye, somewhat poorly drained Kendaia, and poorly drained Lyons soils. The Lima soils that formed in reddish till north of Auburn to the Seneca River are in a drainage sequence with well-drained Ontario soils and with somewhat poorly drained Appleton and Kendaia soils. Lima soils have a thinner, more weakly expressed A2 horizon than Conesus and Hilton soils and are shallower over calcareous till. They have a coarser textured B horizon than the more clayey Cazenovia soils.

Lima silt loam, 0 to 3 percent slopes (LtA).—This soil commonly has a slightly darker colored, more prominently mottled surface layer than is typical of the series. Faint mottles are common in the upper part of the subsoil, and the lower part is highly mottled. The surface layer is thicker than normal in places where eroded material has been deposited. In most areas there is only a small amount of gravel in the plow layer. The soil is nearly neutral in reaction throughout the profile. The depth to the underlying dense glacial till is commonly greater in this soil than in the gently sloping, uneroded Lima soils.

Most of this soil is nearly level; the predominant slope is between 2 and 3 percent. The slopes are generally smooth and are slightly convex. This soil receives little or no runoff from adjacent areas and has sufficient slope to provide some surface drainage. Many of the areas south of Auburn are large. In a few places they make up entire fields, but in most places they are associated with Kendaia soils, which are in more nearly level areas and depressions and were included in mapping. These wetter inclusions commonly delay field operations in spring.

This soil is suited to forest, pasture, and crops, including alfalfa and most vegetables. During some wet seasons, planting of crops is delayed, and some water-sensitive crops are damaged.

Drainage is important, but regularly spaced drains generally are not needed. The wet spots can be drained at random. Structures or drains that intercept runoff or seepage from higher soils are needed in many areas. Nitrogen is needed early in spring, even more than on the gently sloping Lima soil. There is almost no erosion hazard under good management, except on a few long slopes of 2 to 3 percent that have been used intensively for row crops.

Moderately slow and slow permeability and seasonal wetness are limitations to most nonfarm uses. Some areas are good sites for ponds. (Capability unit IIw–6; woodland group 1a)

Lima silt loam, 3 to 8 percent slopes (LtB).—This soil has the profile described as typical of the series. It occupies slightly convex or smooth slopes that generally have a gradient of 3 to 5 percent.

Many areas of this soil are large. Some make up entire fields, but most are associated with the less strongly sloping Lima and Kendaia soils, which were included in mapping. This soil commonly occurs with Honeoye soils, from which it receives some runoff. Most of the large, uniform areas of this soil are on broad uplands between the major valleys in the southern half of the county.

This soil is well suited to crops, pasture, or forest. Most of it is used for crops, including corn, small grains, hay, and vegetables. Drainage is important, and so is control of runoff and erosion, especially on long slopes. In many places water can be removed by interceptor drains or surface structures and by random drainage of the wet spots.

This is one of the most productive soils in the county. It is fertile, is easy to work, and has moderate to high moisture-holding capacity. It has a moderate supply of phosphorus and potassium. The supply of nitrogen is sometimes deficient during the early part of the growing season but is usually adequate later in the season. The lime requirement is generally low.

Slope, seasonal wetness, and moderately slow and slow permeability are limitations to most nonfarm uses. (Capability unit IIe–6; woodland group 1a)

Lockport Series

The Lockport series consists of moderately deep, somewhat poorly drained, fine-textured soils. These soils formed in congeliturbate or residuum of the underlying soft, fine-textured, alkaline and calcareous, red Vernon shale, from which they received their reddish color. The shale is part of the Salina formation.

A typical profile in a cultivated area has a dark reddish-brown to reddish-brown silty clay loam plow layer about 7 inches thick. The plow layer is underlain by a thin, leached layer of slightly firm silty clay loam that is reddish brown mottled with pinkish gray. The subsoil is at a depth of about 8 inches and is firm to very firm silty clay or clay. It is reddish brown and dark reddish brown with mottles of pinkish gray and strong brown and streaks of greenish gray. The reaction of the subsoil is neutral to mildly alkaline. The depth to soft, red shale is about 28 inches. The shale is mildly alkaline to weakly calcareous.

Typical profile of Lockport silty clay loam, 2 to 6 percent slopes, in a pasture formerly cultivated:

Ap—0 to 7 inches, dark reddish-brown (5YR 3/3) to reddish-brown (5YR 4/3) silty clay loam; dark reddish brown to reddish brown (5YR 3/4–4/4) if rubbed; moderate, fine and medium, subangular and angular blocky structure; slightly firm when moist, slightly sticky when wet; many fine and medium roots; slightly acid; abrupt, wavy boundary. 6 to 9 inches thick.

A2—7 to 8 inches, reddish-brown (5YR 5/3) silty clay loam; common, medium, distinct, pinkish-gray (5YR 6/2) mottles and common, fine, distinct, brown and strong-brown (7.5YR 5/4 and 5/6) mottles; moderate, medium, subangular and angular blocky structure; slightly firm when moist, slightly sticky when wet; common fine and medium roots; slightly acid to neutral; discontinuous and abrupt, wavy boundary. 0 to 2 inches thick.

B2t—8 to 15 inches, reddish-brown (5YR 4/3) silty clay to clay; common, fine, distinct, brown, strong-brown (7.5YR 5/4, 5/6), and pinkish-gray (5YR 6/2) mottles; common, thin, distinct, greenish-gray (5GY 5/1) streaks and faint, reddish-brown (2.5YR 4/4) streaks; strong, coarse, prismatic structure breaking to moderate to strong, coarse, angular blocky structure; firm to very firm when moist, sticky and plastic when wet; distinct, continuous, pinkish-gray (5YR 6/2) clay film on ped faces; prominent clay skins in pores; few fine roots along ped faces; neutral; clear, wavy boundary. 5 to 15 inches thick.

B3—15 to 28 inches, dark reddish-brown (2.5YR 3/4) silty clay to clay; common, fine, distinct, pinkish-gray (5YR 6/2, 7/2) mottles and brown and strong-brown (7.5YR 5/4 and 5/6) mottles; few, fine, distinct, greenish-gray (5GY 5/1) streaks; moderate to strong, coarse, prismatic structure breaking to moderate, very thick, platy structure; very firm when moist, sticky and plastic when wet; distinct, continuous, pinkish-gray (5YR 6/2–7/2) clay film on prisms and horizontal plate faces; prominent clay linings in larger pores; few, weathered, weak-red (2.5YR 4/2) shale fragments, up to 1 inch thick, some of which have weathered to gray (5Y 5/1) and greenish gray (5GY 5/1); few fine roots along prism faces; neutral grading to mildly alkaline in the lower part. 5 to 20 inches thick.

R—28 to 40 inches +, weak-red to dark reddish-brown (2.5YR 4/2–3/4) clay shale bedrock; strong, thick to very thick, platy structure; mildly alkaline to weakly calcareous. Shale can be cut with a spade.

The thickness of the solum ranges from 20 to 40 inches and corresponds to the depth to the soft clay shale bedrock.

The texture of the surface layer commonly is silty clay loam or clay loam but ranges to loam and silt loam where thin, nonconforming smears of glacial till or lake sediments occur. The color of the surface layer is mostly a hue of 2.5YR to 7.5YR but ranges to a hue of 10YR where thin smears of glacial till are present. The color value is 3 to 5, and the chroma is 2 to 4. The reaction ranges from medium acid to neutral.

The texture of the B2t horizon ranges from clay to silty clay. The color of this horizon ranges from a hue of 10YR to 5YR and has a value and chroma of 3 to 5. Prominent clay coats that have a color chroma of 2 or 1 occur on ped faces and in pores. Mottles range from few to common and from fine to medium. The reaction ranges from slightly acid to alkaline.

The texture of the B3 horizon ranges from clay to silty clay. The color ranges from 10R to 5YR in hue, from 3 to 5 in value, and from 2 to 4 in chroma. The reaction ranges from neutral to mildly alkaline.

In places there is a calcareous C horizon similar in color and texture to the B3 horizon. The underlying red clay shale bedrock ranges from neutral to mildly calcareous and weathers rapidly on exposure.

Lockport soils are in a drainage sequence with well drained and moderately well drained Lairdsville soils. In this county Lockport soils are intermingled with Brockport soils and are mapped with them in an undifferentiated unit. They differ from Brockport soils in being red instead of olive gray to greenish gray. Lockport soils are redder and finer textured than Angola soils.

Lordstown Series

The Lordstown series consists of well-drained soils that formed in loose, thin glacial till or congeliturbate derived mainly from underlying hard shale and fine-grained sandstone. These are moderately deep soils over bedrock, and they are strongly acid. They are medium textured and contain many flat fragments, or channers, of sandstone and siltstone. Lordstown soils are at the higher elevations in the southeastern part of the county.

In an area that was formerly cultivated, a typical profile has a channery silt loam plow layer about 8 inches thick. This layer is very dark grayish brown in the upper 2 inches and dark brown below. Underlying it is the upper subsoil, which is friable, yellowish-brown channery silt loam that extends to a depth of 20 inches. The lower subsoil is friable, grayish-brown channery to shaly silt loam. Thinly bedded, hard, gray shale and sandstone are at a depth of 26 inches. The profile is strongly acid.

Typical profile of Lordstown channery silt loam, 2 to 8 percent slopes, in an idle area formerly cultivated:

Ap1—0 to 2 inches, very dark grayish-brown (10YR 3/2) channery silt loam; dark brown (10YR 3/3) if rubbed; weak, fine, granular structure; very friable when moist, nonsticky when wet; very numerous fine and medium roots; very strongly acid; abrupt, wavy boundary. 1 to 3 inches thick.

Ap2—2 to 8 inches, dark-brown (10YR 4/3) channery silt loam; dark yellowish brown (10YR 4/4) if rubbed; weak, fine, granular structure; very friable when moist, nonsticky when wet; very numerous fine and medium roots; strongly acid; abrupt, wavy boundary. 5 to 7 inches thick.

B2—8 to 20 inches, yellowish-brown (10YR 5/6) channery silt loam fading with depth to duller yellowish brown (10YR 5/4); moderate, medium and fine, subangular blocky structure; friable when moist, nonsticky when wet; no evidence of clay coats on ped faces or in pores; many fine roots; strongly acid; clear, wavy boundary. 6 to 12 inches thick.

B3—20 to 26 inches, grayish-brown (2.5Y 5/2) channery to shaly silt loam; moderate, medium, blocky structure; friable to firm when moist, nonsticky when wet; no evidence of clay coats on ped faces or in pores; scattered, fine roots; strongly acid; clear, wavy boundary. 5 to 18 inches thick.

R—26 to 60 inches +, thin-bedded, gray, hard shale and fine-grained sandstone bedrock; strongly acid; few fine roots in upper 8 to 12 inches. Alternate strata of hard shale and fine-grained, gray sandstone exposed in quarry.

The thickness of the solum ranges from 20 to 40 inches and corresponds to the depth to bedrock.

The color of the A1 or Ap horizon ranges from very dark grayish brown to brown. The texture ranges from very fine sandy loam to silt loam, and the coarse fragment content, consisting mostly of small, flat angular stones, is 15 to 30 percent. The reaction ranges from very strongly acid to medium acid unless the area is limed.

The B horizon color ranges from a hue of 7.5YR to 5Y and has a value of 4 to 6. The chroma is 4 to 6 in the upper part and fades to 2 to 4 with depth. In some places high-chroma mottles are in the 2 inches of soil immediately above bedrock. The texture ranges from very fine sandy loam to silt loam, and the clay content is 8 to 18 percent. The coarse fragment content, consisting mostly of small, flat, angular stones, is 15 to 35 percent. The reaction ranges from very strongly acid to medium acid.

Lordstown soils are associated with shallower Arnot soils; with deeper, moderately well drained Langford soils; and with somewhat poorly drained Erie soils. They are less than 40 inches thick over bedrock and lack the distinct fragipan common to Langford soils. They are coarser textured and lower in content of lime than Aurora soils.

Lordstown channery silt loam, 2 to 8 percent slopes (LwB).—This soil has the profile described as typical of the series. It occurs on uniform, convex hilltops that receive little or no runoff from adjacent areas. The depth to bedrock is fairly uniform and generally is 24 to 40 inches. Included in mapping were Arnot soils, which are less than 20 inches in depth to bedrock. Though inextensive, these shallow Arnot soils hinder tillage and are droughty and thereby affect yields. Also included were Langford and Erie soils, which are in more nearly level areas or in slight depressions. The wetter spots of Erie soils delay tillage in spring.

This soil is suited to crops, pasture, or forest. Its high elevation and the subsequent short growing season, plus the high content of angular stone fragments, limit the kinds of crops that can be grown.

This soil is permeable and absorbs water readily, but runoff is rapid enough to make erosion control a moderate problem. Most areas are well suited to contour cultivation and stripcropping. In some areas bedrock interferes with drainage and erosion control structures. The lime requirement is high. Liberal applications of nitrogen, phosphate, and potash are needed.

Bedrock and stone fragments are the main limitations to most nonfarm uses. (Capability unit IIe–2; woodland group 8a)

Lordstown channery silt loam, 8 to 15 percent slopes (LwC).—This soil has a more variable depth to bedrock than is typical of the series. It is on valley sides where the slopes are mostly uniform and are steep enough to provide moderately rapid runoff. It is below the less strongly sloping Lordstown or Langford soils, from which it receives a moderate amount of runoff. Shallower Arnot soils were included in mapping, to the extent of 20 percent of some areas. Also included were deeper Langford soils. This variation in depth is caused by the steplike surface of the bedrock.

The degree of erosion in cropped areas varies considerably. Many spots are moderately to severely eroded and have a higher percentage of angular stone fragments on the surface.

This soil is suited to crops, pasture, or forest. Its high elevation and the subsequent short growing season, plus the content of stone fragments, limit the kinds of crops that can be grown.

Although this soil is permeable, runoff is rapid enough to make erosion a hazard. Most areas can be contoured or stripcropped. Bedrock interferes with the construction of erosion control systems. A liberal amount of lime and a complete fertilizer are needed for even a moderate response from crops.

Bedrock, slope, and stone fragments are the main limitations to most nonfarm uses. (Capability unit IIIe–3; woodland group 8a)

Lyons Series

The Lyons series consists of deep, poorly drained soils that formed in medium-textured glacial till derived from limestone, calcareous shale, and calcareous sandstone. These soils are scattered across the southern part of the county from Westbury and Ira to the Tompkins County line. They are at elevations below 1,400 feet.

A typical profile in a cultivated area has a very dark gray silt loam plow layer about 9 inches thick. This layer is underlain by a friable, leached layer of gray loam mottled with yellowish brown and light olive brown. The subsoil occurs at a depth of about 14 inches. The upper part of it is firm, gray to grayish-brown, mottled silt loam to loam. The part below a depth of 25 inches is light reddish-brown, mottled loam. The till is at a depth of about 30 inches and is firm, light grayish-brown loam. The till and subsoil are calcareous.

Typical profile of Lyons silt loam, 0 to 3 percent slopes, in a cultivated field:

Ap—0 to 9 inches, very dark gray (10YR 3/1) silt loam; very dark grayish brown (10YR 3/2) if crushed and rubbed; moderate, coarse, subangular blocky structure; friable; many fine and medium roots; neutral; abrupt, wavy boundary. 8 to 10 inches thick.

A2g—9 to 14 inches, gray (10YR 5/1) loam to fine sandy 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. 0 to 5 inches thick.

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) mottles; moderate, medium and coarse, blocky structure within moderate, medium and coarse prisms; firm; gray (10YR 5/1) silt film on prism and ped faces; many fine roots along prism and ped faces; calcareous; clear, wavy boundary. 3 to 4 inches thick.

B22g—17 to 25 inches, grayish-brown (10YR 5/2) silt loam to loam; many, coarse, distinct, yellowish-brown (10YR 5/6) mottles and few, medium, faint, light-gray (10YR 6/1) mottles; moderate, coarse, blocky structure within moderate, coarse prisms; firm; gray (10YR 5/1) silt film on ped and prism faces; few fine roots; calcareous; clear, wavy boundary. 7 to 9 inches thick.

B3—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; weak, medium and coarse, blocky structure; firm in place, friable if crushed; discontinuous silt film on ped faces; calcareous; clear, wavy boundary. 5 to 7 inches thick.

C—30 to 48 inches, light grayish-brown (10YR 6/2) gritty loam glacial till; massive; firm in place, friable if crushed; calcareous.

The depth to carbonates ranges from 12 to 36 inches. The 12-inch depth is near the Onondaga limestone escarpment. The 36-inch depth is near the more acid Lansing soils. The content of coarse fragments ranges from 5 to 25 percent in the solum and increases with depth. The color varies in hue, depending upon the parent material. The hue ranges from 2.5YR, in areas associated with Ontario soils, to 5Y in areas associated with Lansing soils.

The texture of the surface layer is generally silt loam but ranges from fine sandy loam to silt loam. The texture of the subsoil ranges from heavy fine sandy loam to silt loam. The reaction of the A horizon ranges from slightly acid to slightly alkaline. The reaction of the B horizon ranges from neutral to calcareous.

Lyons soils occur with Appleton and Kendaia soils and have been mapped with them in undifferentiated units. They are in a drainage sequence with well drained Honeoye, moderately well drained Lima, somewhat poorly drained Kendaia, and very poorly drained Alden soils. They are also in a drainage sequence with well-drained Ontario and Lansing soils. Lyons soils contain more lime than Ellery soils and do not have a fragipan. They are coarser textured than Romulus soils. Lyons soils differ from Canandaigua soils in having formed in well-sorted till material rather than in poorly sorted lacustrine material.

Madalin Series

The Madalin series consists of deep, poorly drained soils that formed in calcareous, gray lacustrine clay and silty clay. These soils occupy low, level or depressional areas, commonly between drumlins, on the lake plain. Most areas are north of Auburn.

A typical profile in a cultivated area has a black to very dark brown heavy silt loam plow layer about 8 inches thick. Just below this layer is the subsoil that extends to a depth of about 36 inches. The upper part of it is firm, grayish-brown to dark grayish-brown, mottled silty clay loam to silty clay. The part below a depth of 30 inches is firm, dark grayish-brown, mottled silty clay loam that contains thin layers of very fine sandy loam. The reaction of the subsoil grades from neutral to weakly calcareous with depth. The substratum consists of very firm, grayish-brown to brown, mottled silty clay loam that contains thin layers of gray very fine sandy loam or coarse silt loam. It is strongly calcareous.

Typical profile of Madalin silt loam in a cultivated field:

Ap—0 to 8 inches, black (10YR 2/1) to very dark brown (10YR 2/2) heavy silt loam; very dark brown (10YR 2/2) if rubbed; moderate to strong, fine, subangular blocky structure and medium and coarse, granular structure; friable when moist, slightly sticky when wet; very numerous fine roots; neutral; clear, wavy boundary. 6 to 10 inches thick.

B21g—8 to 12 inches, grayish-brown (10YR 5/2) silty clay loam to silty clay; many, coarse, distinct, yellowish-brown (10YR 5/6 and 5/8) and light-gray (10YR 7/1) mottles that cover 20 to 30 percent of the interior matrix; strong, coarse, angular blocky structure within strong, coarse prisms; firm when moist, sticky and plastic when wet; very dark gray to very dark brown (10YR 2/1–2/2) organic coating on upper 2 inches of prisms and vertical block faces, grading to prominent, dark-gray (10YR 4/1) to gray (10YR 5/1) clay films; thinner gray (10YR 5/1) clay films on horizontal ped faces; few, large, distinct, yellowish-brown (10YR 5/6) mottles on ped faces in lower part; scattered fine roots along ped faces; no roots inside peds; neutral; clear, wavy boundary. 3 to 6 inches thick.

B22g—12 to 30 inches, grayish-brown (10YR 5/2) to dark grayish-brown (10YR 5/2 to 4/2) heavy silty clay loam to silty clay; occasional thin lenses of very fine sandy loam; many (20 to 30 percent of the interior matrix), large, distinct, dark yellowish-brown (10YR 4/4) and yellowish-brown (10YR 5/6) mottles and common, large, distinct, light-gray (10YR 7/2) mottles; strong, coarse, angular blocky structure within strong, coarse prisms; firm when moist, sticky and plastic when wet; very prominent, gray (10YR 5/1) clay films on prism faces; prominent, gray (10YR 5/1) clay film on block faces with few, medium and coarse, distinct, yellowish-brown (10YR 5/6) mottles; scattered fine roots along ped faces; no roots inside peds; neutral; gradual, wavy boundary. 10 to 24 inches thick.

B3g—30 to 36 inches, dark grayish-brown (10YR 4/2) silty clay loam; thin lenses of very fine sandy loam; many (20 to 30 percent of the interior matrix), large, distinct, dark yellowish-brown (10YR 4/4) and yellowish-brown (10YR 5/6) mottles and common, large, distinct, light-gray (10YR 6/1) mottles; strong, coarse, angular blocky structure within stratified layers; firm when moist, sticky when wet; prominent, gray (10YR 5/1) clay film on ped faces; no roots; neutral grading to weakly calcareous at a depth of 36 inches; gradual, wavy boundary. 4 to 8 inches thick.

C—36 to 40 inches, grayish-brown (10YR 5/2) to brown (7.5YR 5/2), varved silty clay loam; common, large, distinct, yellowish-brown (10YR 5/4) mottles; occasional thin bands of light-gray (N 6/0 to 7.5YR 6/2) very fine sandy loam to coarse silt loam; strong, thick, platy structure; no roots; very firm when moist, sticky when wet; strongly calcareous.

The thickness of the solum and depth to carbonates range from 24 to 48 inches.

The texture of the surface layer is generally heavy silt loam but ranges from very fine sandy loam to silty clay loam. The color of this layer ranges from dark gray to black. The reaction is generally neutral but ranges from strongly acid to mildly alkaline, or a pH of 5.5 to 7.5.

The texture of the B horizon ranges from heavy silty clay loam to silty clay, and the clay content is 35 to 50 percent. Ped interiors of the B horizon generally have a hue of 7.5YR and 10YR, a value of 4 to 6, and a chroma of 1 to 3, but the hue ranges from 5YR to 5Y, depending on the parent material. The reaction at a depth of 36 inches ranges from strongly calcareous to neutral, or to a pH of 7.0.

Madalin soils are in a drainage sequence with very poorly drained Fonda soils. The soils of the Madalin series differ from the sandy subsoil variant of the series in lacking sand strata that are more than 6 inches thick within a depth of 20 to 40 inches. Madalin soils have a finer textured subsoil than Canandaigua soils, and they are grayer than Lakemont soils.

Madalin silt loam (0 to 2 percent slopes) (Ma).—This soil has the profile described as typical of the series. It generally occurs as low, level areas of 10 to 50 acres between drumlins. These areas are in the northern half of the county. The few large areas of this soil are broad flats near the Seneca River. These areas are above the flood stage but are subject to slack-water ponding during high floods. Included in mapping were very poorly drained Fonda soils in shallow depressions or along shallow, narrow drainageways. These wetter soils occupy no more than 10 percent of any area but greatly increase the drainage problem. Also included were many areas in which the surface layer of this Madalin soil is as much as 24 inches thick as a result of deposits of eroded material from strongly sloping uplands.

Undrained areas of this soil are used mainly for pasture or woods. Only a few of the larger areas are artificially drained and used for crops. The smaller areas in cultivated fields have been drained, but generally not enough for intensive use. Consequently, they delay tillage in spring.

Drainage is the main problem if this soil is used for crops. Because of the slow permeability, the drains must be closely spaced. Land shaping is commonly needed to move water to the drains. In addition, careful management is needed to prevent clodding. If these needs are met, this soil can be used for corn, beans, sugar beets, and similar crops. A little lime, a moderate amount of phosphorus, and a small amount of potassium are adequate in drained areas. Nitrogen is deficient in spring but may be adequate for most crops by midsummer.

Prolonged wetness, slow permeability, and texture are the main limitations to most nonfarm uses. Some areas are suitable for ponds or wildlife marshes. (Capability unit IVw-1; woodland group 18)

Madalin Series, Sandy Subsoil Variant

The Madalin series, sandy subsoil variant, consists of poorly drained soils that formed in alkaline or calcareous lacustrine clay or silty clay 20 to 40 inches thick over calcareous, gray lacustrine sand to very fine sand. These soils occur as low, level or depressional areas, generally between drumlins on the lake plain. Most areas are north of Auburn.

In an area formerly cultivated, a typical profile has a very dark brown heavy silt loam plow layer about 7 inches thick. Just below this layer is the firm silty clay to clay subsoil that extends to a depth of about 28 inches. It is grayish brown and distinctly mottled in the upper part and grades to brown with depth. The reaction of the subsoil is neutral to mildly alkaline. The substratum consists of brown, mottled fine sandy loam. It is friable and calcareous.

Typical profile of Madalin silt loam, sandy subsoil variant, in a pasture formerly cultivated:

Ap—0 to 7 inches, very dark brown (10YR 2/2) heavy silt loam; very dark brown (10YR 2/2) to dark brown (10YR 3/2) if rubbed; moderate to strong, fine, subangular blocky structure and coarse, granular structure; friable when moist, slightly sticky when wet; very numerous fine roots and common medium roots; neutral; abrupt, smooth boundary. 6 to 8 inches thick.

B21tg—7 to 10 inches, grayish-brown (10YR 5/2) heavy silty clay loam to silty clay; many (20 to 30 percent of the interior matrix), coarse, distinct mottles of yellowish brown (10YR 5/4 and 5/6), dark yellowish brown (10YR 4/4), and gray (5Y 5/1); strong, coarse, angular blocky structure within strong, coarse prisms; firm when moist, sticky and plastic when wet; very dark brown (10YR 2/2) organic silty stains on vertical prism and block faces grading to dark gray (10YR 4/1) with depth; distinct, thin, gray (10YR 5/1) clay film on horizontal block faces; prominent clay linings in pores; common fine roots along ped faces, no roots inside peds; neutral; clear, wavy boundary. 2 to 4 inches thick.

B22tg—10 to 28 inches, brown (7.5YR 5/2–4/2) coarse silty clay to clay; many (20 to 30 percent of the interior matrix), large, distinct mottles of dark yellowish brown (10YR 4/4), yellowish brown (10YR 5/4 and 5/6), strong brown (7.5YR 5/6), and light gray (10YR 7/1); strong, coarse, angular blocky structure within strong, coarse prisms; firm when moist, sticky and plastic when wet; very prominent, gray (5Y 5/1) clay film on prism faces; prominent, gray (5Y 5/1) clay film on block faces and a few, medium and coarse, distinct mottles of yellowish brown (10YR 5/6) and dark yellowish brown (10YR 4/4); distinct clay lining in pores; scattered fine roots along ped faces, no roots inside peds; neutral to mildly alkaline; abrupt, wavy boundary. 10 to 28 inches thick.

IIC—28 to 40 inches, brown (7.5YR 5/2) fine sandy loam; many, large, distinct mottles of yellowish brown (10YR 5/6, 5/8), strong brown (7.5YR 5/6), and light gray (10YR 7/1); massive to weak, very thick, platy structure; friable when moist, nonsticky when wet; few thin lenses, ½ to 1 inch thick, of brown (7.5YR 5/2) very fine sandy loam to silt loam, and very thin lenses, ¼ to ½ inch thick, of reddish-gray (5Y 5/2) silty clay; few scattered roots in upper part; calcareous.

The thickness of the solum ranges from 20 to 40 inches and corresponds to the depth to calcareous material. The depth to the nonconforming sandy material also ranges from

20 to 40 inches but is not always the same as the thickness of the solum.

The texture of the surface layer is predominantly heavy silt loam but ranges from fine sandy loam to coarse silty clay loam. The color ranges from dark gray to very dark brown to black. The reaction is generally neutral but ranges from medium acid to mildly alkaline.

The texture of the B horizon ranges from heavy silty clay loam to clay, and the clay content is 35 to 50 percent. The color is predominantly a hue of 10YR and 7.5YR but ranges to a hue of 5Y, and in some places there are thin layers that have a hue as red as 5YR. The color value ranges from 4 to 6, and the chroma from 1 to 3. Mottles range from common to many and cover up to 30 percent of the surface. The reaction ranges from weakly acid to calcareous.

The nonconforming material occurs at a depth of 20 to 40 inches and is predominantly fine sandy loam but ranges from coarse silt loam to sand. In places the upper 20 inches of this material contains thin layers of silty clay up to 2 inches thick but totaling less than 6 inches. The reaction ranges from neutral to calcareous.

Madalin soils, sandy subsoil variant, are in a drainage sequence with very poorly drained Fonda soils. They differ from soils of the Madalin series in having a sandy lower subsoil more than 6 inches thick at a depth of 20 to 40 inches. They have a more clayey upper subsoil than Canandaigua soils. They have a sandier lower subsoil and a grayer color than Lakemont soils.

Madalin silt loam, sandy subsoil variant (0 to 2 percent slopes) (Mb).—Because of the sandy and silty substratum, this soil is somewhat easier to drain than Madalin silt loam. Consequently a higher percentage of the acreage is used for crops. Most areas are 10 to 50 acres in size and are in the lower positions between drumlins. There are some fairly large areas near the Seneca River. These are broad flats. They are above the general flood stage but are subject to slack-water ponding during high floods.

Included in mapping were very poorly drained Fonda soils in shallow depressions or along shallow, narrow drainageways. These wetter soils occupy no more than 10 percent of any area, but they greatly increase the drainage problem. Included also were areas in which the surface layer of this Madalin soil is as much as 24 inches thick as a result of deposits of eroded material from adjoining uplands.

Undrained areas of this soil are used mainly for pasture or woods. Only a few of the larger areas are drained and used for crops. The smaller areas in cultivated fields have been drained, but not enough for intensive use. Consequently, they delay tillage in spring.

Drainage is the main problem if this soil is used for crops. Because of the slow permeability, the drains should be closely spaced. The fine sandy loam to fine sand lower subsoil may flow when saturated, and special measures are required to prevent the plugging of drains. Land shaping is commonly needed to move water to the drains. Even after drainage, careful management is needed to prevent clodding. If these needs are met, this soil can be used for corn, beans, sugar beets, and similar crops. A little lime, a moderate amount of phosphorus, and a small amount of potassium are adequate in drained areas. Nitrogen is deficient in spring but may be adequate for most crops by midsummer.

Prolonged wetness, slow permeability, and texture are the main limitations to most nonfarm uses. Some areas are suitable for ponds or wildlife marshes. (Capability unit IVw-1; woodland group 18)

Made land, sanitary land fill (0 to 15 percent slopes) (Mc).—This miscellaneous land type consists of areas that have been filled with different kinds of material that cannot be tilled with farm machinery. Some areas are filled with very stony and rocky spoil. Others have been filled with trash that has been leveled and covered with a thin layer of soil.

Areas of this land generally adjoin cities and villages. The largest area is in the vicinity of the city of Auburn. Most of these areas are filled with trash. They could be used for industrial and recreational development. One large area has been filled with spoil from a quarry and is not level.

Because of the variation in material, onsite investigation is needed to determine how this land can be used. (Not in a capability unit; woodland group 20)

Made land, tillable (0 to 8 percent slopes) (Md).—This miscellaneous land type consists of areas that have been filled with different kinds of material, or areas in which the soil has been extensively disturbed by man. Though no attempt has been made to differentiate the different kinds of material or fill, all of it is considered tillable.

The largest areas are along the Barge Canal and consist of fill material pumped up by dredges in the process of deepening and straightening the canal. This material, though highly variable, can be productive of crops. Other areas of this land type are gravel or borrow pits from which topsoil and subsoil were pushed aside and gravel or borrow material removed for road construction. Following removal of the construction material, the topsoil and subsoil were replaced in a haphazard mixture and leveled. Some of these areas are used for crops. Most of them are around Auburn and north of Auburn to the New York State Thruway.

Because of the variation in material, onsite investigation is needed to determine how this land can be used. (Not in a capability unit; woodland group 20)

Minoa Series

The Minoa series consists of deep, somewhat poorly drained, moderately coarse textured soils that formed in alkaline to calcareous fine sand. In places the sand is stratified with bands or lenses of calcareous silt and very thin bands of clay. The sand was deposited as lacustrine or eolian material or as gravel-free deltaic sand. Minoa soils are in moderately low areas or medium depressions, scattered on the lake plain and between drumlins, mostly north of Auburn.

A typical profile in a cultivated area has a very dark grayish-brown fine sandy loam plow layer about 8 inches thick. This layer is underlain by a very friable, leached layer of light yellowish-brown to brownish-yellow fine sandy loam that is faintly mottled. The subsoil is at a depth of about 12 inches. The upper part of it is very friable, brown to pale-brown, mottled fine sandy loam. The part below a depth of 27 inches is very friable to loose, brown to dark-brown loamy sand or loamy fine sand that is distinctly mottled. The reaction of the subsoil is neutral to mildly alkaline. The substratum is at a depth of 35 inches and consists of light brownish-gray, mottled layers of sand, fine sand, and silt. It is weakly calcareous.

Typical profile of Minoa fine sandy loam in a cultivated field:

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) fine sandy loam; weak, fine and medium, subangular blocky structure breaking to weak, fine, granular structure; many fine and medium roots; very friable; neutral; abrupt, smooth boundary. 6 to 10 inches thick.

A2—8 to 12 inches, light yellowish-brown (10YR 6/4) to brownish-yellow (10YR 6/6) fine sandy loam; few, fine, faint, yellowish-brown (10YR 5/6) and very pale brown (10YR 7/3) mottles; weak, medium and fine, subangular blocky structure; very friable; many fine and medium roots; neutral; clear, wavy boundary. 3 to 5 inches thick.

B21—12 to 17 inches, brown (7.5YR 5/4) fine sandy loam; few, medium, distinct, yellowish-brown (10YR 5/6) and pale-yellow (2.5Y 7/4) mottles; weak, coarse, subangular blocky structure; very friable; many fine and medium roots; neutral; clear, wavy boundary. 4 to 6 inches thick.

B22—17 to 25 inches, brown (7.5YR 5/4) to yellowish-brown (10YR 5/4) fine sandy loam to loamy fine sand; common, large, distinct mottles of strong brown (7.5YR 5/8), yellowish brown (10YR 5/8), light gray (10YR 7/2), and light brownish gray (10YR 6/2); weak, coarse, subangular blocky structure; very friable; common fine roots and few medium roots; neutral; abrupt, wavy boundary. 7 to 12 inches thick.

B23—25 to 27 inches, brown (10YR 5/3) to pale-brown (10YR 6/3) fine sandy loam; common, large, distinct mottles of light gray (10YR 7/2), light brownish gray (10YR 6/2), yellowish brown (10YR 5/8), and strong brown (7.5YR 5/8); weak, coarse, blocky structure; very friable; common fine roots; neutral; abrupt, wavy boundary. 2 to 3 inches thick.

B24—27 to 35 inches, brown (10YR 5/4) to dark-brown (10YR 4/3) loamy sand to loamy fine sand; common, fine, distinct mottles of yellowish brown (10YR 5/6) and light gray (10YR 7/2); single grain to very weak, coarse, blocky structure; very friable to loose; few fine roots; mildly alkaline; clear, wavy boundary. 7 to 14 inches thick.

C—35 to 55 inches, light brownish-gray (10YR 6/2 to 7.5YR 6/2), stratified layers of sand, fine sand, and silt with common, medium, distinct mottles of strong brown (7.5YR 5/8), yellowish brown (10YR 5/8), and light gray (10YR 7/2); these mottles are prominent in the silt layers; loose to very friable; few fine roots; weakly calcareous. This horizon consists mostly of sand strata, 1 to 5 inches thick, interbedded with thin, ½-inch to ¾-inch bands of fine sand, very fine sand, and silt.

The thickness of the solum ranges from 30 to 50 inches. The texture of the A and B horizons ranges from the light side of fine sandy loam or very fine sandy loam to loamy fine sand or loamy very fine sand. In places the B horizon contains thin bands of silt loam. The color throughout the profile ranges from a hue of 10YR to 5YR. The reaction of the surface layer in unlimed areas ranges from a pH of 5.5 to 7.0. At a depth of 36 inches, the reaction ranges from a pH of 6.5 to 8.4. In a few places where the Minoa soils are grading to glacial till soils, the C horizon consists of sandy or loamy till.

Minoa soils are in a drainage sequence with well drained to excessively drained Arkport, moderately well drained Galen, and poorly and very poorly drained Lamson soils. Minoa soils have a coarser textured subsoil than Niagara soils.

Minoa fine sandy loam (0 to 2 percent slopes) (Mf).—The surface layer of this soil is generally fine sandy loam, but areas of loamy fine sand were included in mapping. There is a small amount of gravel in some places, but not enough to affect use. There are also deposits of eroded material in a few small areas.

Included in mapping were Lamson and Canandaigua soils in slight depressions and along shallow, narrow drainageways. These wetter soils occupy no more than 10 percent of any given area, but they delay planting in spring. Also included were small areas of moderately well drained Galen soils on slight rises or low knolls, but they do not affect management.

This soil is suited to crops, pasture, and forest. It is moderately wet because of its low position and a moderately high water table, which in places is supported by an impervious layer at a depth below 4 feet. Drained areas can be used for most row crops and for vegetables. Undrained areas are better suited to hay and forage crops that tolerate wetness.

Drainage and fertilization are the main management problems. Systematic drainage is generally needed. The fine sand flows readily, and special measures are necessary to prevent plugging of open or closed drains. The lime requirement ranges from none to moderate. Nitrogen and potassium are low in supply, and phosphorus is moderate. Crops respond well to fertilization if this soil is drained. Water erosion generally is not a hazard, but wind erosion is a hazard in the sandier areas.

Seasonal wetness is the main limitation to most nonfarm uses. (Capability unit IIIw-2; woodland group 12)

Muck

Muck consists of organic soil forming in mixed woody and grassy or sedgy material. The organic material is generally more than 3 feet thick but is as thin as 1 foot in places. Muck is strongly acid to alkaline.

A typical profile has a very friable, black muck surface layer about 9 inches thick. Next is a layer of very friable, very dark brown muck grading to dark-brown and dark yellowish-brown, fibrous, peaty material. This layer extends to a depth of about 40 inches, and the lower part contains many partly decomposed wood fragments. The mucky layers are neutral in reaction. The mineral substratum is made up of layers of light-gray to white, weakly calcareous clay and silty clay.

Typical profile of Muck, deep:

1—0 to 9 inches, black (10YR 2/1–N 2/0) muck; moderate, fine and medium, blocky structure that readily breaks to moderate, fine and medium, granular structure; very friable and soft; neutral; gradual, wavy boundary. 8 to 12 inches thick.

2—9 to 40 inches, very dark brown (10YR 2/2) muck that grades with depth to variegated, dark-brown (10YR 3/2 and 7.5YR 4/4) and dark yellowish-brown (10YR 4/4), fibrous, peaty material; numerous partly decomposed wood fragments; moderate, medium, thick and very thick, platy structure that breaks to weak, medium, blocky structure; friable and soft; neutral; abrupt, wavy boundary. 30 to 36 inches thick.

IIC—40 to 48 inches, layers of light-gray to white (N 7/0–8/0) clay and silty clay; weak, thick and very thick, platy structure; firm and plastic; weakly calcareous.

Deep muck, undrained, has a granular structure within the upper 24 to 36 inches. The granules are soft when moist. Drained and cultivated muck, however, commonly has a weak, blocky structure. Many of the areas when first drained have a surface color of very dark brown (10YR 2/2) that

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turns, within a few years, to black (10YR 2/1–N 2/0). The reaction of the organic layers normally is a pH of 6.0 to 7.0 but ranges from 5.0 to 7.5. The organic material is 12 to 40 inches thick over mineral material.

Muck differs from Edwards muck in that in areas where the muck is less than 40 inches thick, it generally consists of a more acid mixture of woody and grassy or sedgy material and it is underlain by mineral soil material instead of marl.

Muck, deep (0 to 1 percent slopes) (Mr).—This soil generally has the profile described as typical of muck. The organic material is 40 inches to as much as 17 feet thick. It is underlain by mineral soil material or by white, highly calcareous marl. The mineral soil material is sand, silt, or clay, or a mixture of these. This mineral material is mostly calcareous, but in a few places it is medium acid. The muck is mainly slightly acid to neutral in reaction, but it ranges from strongly acid to mildly alkaline. Included in mapping were areas of Muck, shallow, which generally occurs as narrow bands around muck that is grading to mineral soil.

This mapping unit includes drained and undrained muck. Undrained muck that is 40 to 60 inches thick compresses or subsides about one-third of its thickness within 2 or 3 years after draining, so that most of it will be less than 40 inches thick. Undrained muck is suited to woodland or wildlife use. Drained muck is suited to many crops, especially the intensively managed "muck crops".

If this muck soil is drained, wind erosion should be controlled, and water should be regulated to reduce the rate of subsidence and oxidation. High rates of fertilization are needed for most muck crops.

Prolonged wetness and texture are the main limitations to most nonfarm uses. Some areas are good sites for ponds or wildlife marshes. (Capability unit IIIw–1; woodland group 20)

Muck, shallow (0 to 1 percent slopes) (Ms).—This muck has a profile like the one described as typical, except that the organic material is only 12 to 40 inches thick. This material is underlain by sand, silt, or clay, or a mixture of these. The reaction of the mineral material generally is calcareous but ranges to medium acid. The muck generally is slightly acid to neutral but ranges from strongly acid to mildly alkaline. Included in mapping were deep muck and wet mineral soils. The deep muck is near the center of the muck areas. The mineral soils occur as narrow bands around the muck or as slight rises within the areas.

This mapping unit includes drained and undrained muck. Drained muck compresses or subsides about one-third of its thickness within 2 or 3 years after draining. Consequently, most of it is then less than 24 inches thick. Drained muck is suited to many crops. Yields apparently are related to depth of the organic material, the lowest yields occurring on the shallowest muck. Undrained muck is suited to woodland or wildlife.

If muck is drained, wind erosion should be controlled, and water should be regulated to reduce the rate of subsidence and oxidation. A high rate of fertilization is needed for most muck crops.

Prolonged wetness and texture are the main limitations to most nonfarm uses. Some areas are good sites for ponds or wildlife marshes. (Capability unit IVw–5; woodland group 20)

Niagara Series

The Niagara series consists of deep, somewhat poorly drained silty soils that formed in lake deposits high in content of silt and very fine sand. These soils are nearly level and have little runoff but receive some runoff from adjoining soils.

A typical profile in a cultivated area has a dark-gray to very dark gray silt loam to very fine sandy loam plow layer about 9 inches thick. This layer is underlain by a thin, leached layer of very friable, light brownish-gray to pale-brown very fine sandy loam that is distinctly mottled. The subsoil is at a depth of about 12 inches. It is firm, brown, distinctly mottled silt loam. The reaction grades from neutral in the upper part of the subsoil to weakly calcareous just above the substratum. The substratum is at a depth of about 35 inches and consists of layers of brown silt, very fine sandy loam, and loamy very fine sand that are distinctly mottled. The reaction of the substratum is strongly calcareous.

Typical profile of Niagara silt loam in a cultivated field:

Ap—0 to 9 inches, dark-gray (10YR 4/1) to very dark gray (10YR 3/1) coarse silt loam to very fine sandy loam; dark grayish brown (10YR 4/2) if rubbed; gray (10YR 5/1) when dry; moderate, fine and medium, granular structure; friable; many fine and medium roots; neutral; abrupt, wavy boundary. 7 to 10 inches thick.

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. 0 to 6 inches thick.

B1g—12 to 15 inches, brown (10YR 5/3 to 7.5YR 5/2) coarse silt loam; few, fine, distinct, yellowish-brown mottles; weak, medium, subangular blocky structure; slightly firm when moist, nonsticky when wet; common fine roots; neutral; clear, wavy boundary. 0 to 5 inches thick.

B21t—15 to 23 inches, brown (10YR 5/3 to 7.5YR 5/2) silt loam; common, fine, distinct, yellowish-brown (10YR 5/6) and light-gray (10YR 7/2) mottles; weak, medium and coarse, subangular blocky structure; firm when moist, faintly sticky when wet; thin, discontinuous, grayish-brown (10YR 5/2) clay film on ped faces; prominent clay film in pores; few fine roots; neutral; abrupt, wavy boundary. 5 to 10 inches thick.

B22t—23 to 35 inches, brown (7.5YR 5/2 to 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; firm when moist, slightly sticky when wet; thin, continuous, grayish-brown (10YR 5/2) clay film on ped faces; prominent clay film in pores; few fine roots; mildly alkaline grading to weakly calcareous in the lower part; abrupt, wavy boundary. 8 to 14 inches thick.

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 that decrease in size and number with depth; weak, thick, platy structure; silt and very fine sandy loam layers are firm; loamy fine sand layers are loose; very few roots; strongly calcareous.

The thickness of the solum, or depth to the stratified C horizon, ranges from 20 to 40 inches. The depth to calcareous material ranges from 18 to 60 inches.

The texture of the surface layer or Ap horizon ranges from fine sandy loam to heavy silt loam. The A1 or 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 if not disturbed by plowing. In places this horizon has a few to common, fine to medium mottles of higher chroma than is typical. The reaction ranges from medium acid to neutral.

The B horizon ranges from very fine sandy loam to heavy silt loam in texture and from 18 to 35 percent in clay content. In places the B horizon contains a few thin layers of clay that total less than one-third the thickness of the horizon, and the average clay content is less than 35 percent. The color ranges in hue from 5YR to 2.5Y, in value from 4 to 6, and in chroma from 3 to 4. In places there are a few thin layers that have a chroma of 2. The reaction ranges from slightly acid to mildly alkaline.

Niagara soils are in a drainage sequence with well drained Dunkirk, moderately well drained Collamer, poorly drained Canandaigua, and very poorly drained Alden soils. Niagara soils have a finer textured subsoil than Minoa soils, and a coarser textured subsoil than Odessa soils.

Niagara fine sandy loam (0 to 3 percent slopes) (Na).—Except for the coarser textured surface layer, this soil has a profile like the one described for the series.

The main inclusions in mapping were narrow strips of poorly drained Canandaigua soils along shallow drainageways or in small, shallow depressions. Though inextensive these wetter soils delay tillage in spring. A few small knolls of Collamer soils were also included, but these have little effect on management. Other inclusions were a few areas of Niagara very fine sandy loam, a few narrow areas at the foot of slopes that have deposits of silty or loamy material up to 12 inches thick, and a few small areas that have a slope exceeding 3 percent.

This soil is suited to crops, pasture, and forest. Undrained areas are better suited to hay and forage crops that can tolerate wetness. Drained areas are suited to most crops common to the county, including vegetables.

Drainage and fertilization are the main farming problems. Systematic drainage is generally needed. Because the rounded, fine sand grains flow readily when saturated, special measures are needed to prevent plugging of open or closed drains. The lime requirement ranges from none to moderate. The supply of phosphorus and potassium is moderate. The supply of nitrogen is commonly deficient in spring. Crops respond to fertilization if this soil is drained. Erosion is not a hazard.

Seasonal wetness is a limitation to most nonfarm uses. (Capability unit IIIw–2; woodland group 12)

Niagara and Canandaigua silt loams (0 to 2 percent slopes) (Nc).—This undifferentiated unit consists of somewhat poorly drained Niagara soil and poorly drained Canandaigua soil. Any area may consist of Niagara soil, Canandaigua soil, or both. Most areas have both soils. The Niagara soil comprises 50 to 70 percent of most areas, and the Canandaigua soil 20 to 40 percent. Each soil has the profile described as typical of its series.

The main inclusions in mapping were very poorly drained Alden soils and shallow muck in slight depressions. These wetter soils, though not more than 10 percent of any area, necessitate deeper placement of artificial drains. Other inclusions were small areas of Collamer soils on slight rises or knolls and a few areas that have a slope exceeding 2 percent.

The soils of this unit are suited to crops, pasture, and forest. Undrained areas are better suited to hay and forage crops that can tolerate wetness, and the wettest areas are poorly suited to these. Drained areas are suited to many kinds of crops, including vegetables.

Drainage is the main problem in managing these soils for crops. Systematic drainage, deeply placed, is needed in most areas. Because the rounded fine sand grains flow readily when saturated, special measures are needed to prevent plugging of drains and ditches. If these soils are drained, crops respond well to fertilization. Nitrogen is deficient in spring. Lime is needed in only a few areas. Erosion is not a problem.

Prolonged wetness is the main limitation to most nonfarm uses. Some areas are suitable for ponds or wildlife marshes. (Capability unit IIIw–2; woodland group 12)

Odessa Series

The Odessa series consists of deep, somewhat poorly drained, moderately fine textured soils that formed in calcareous, reddish lacustrine clay and silt. These are nearly level to gently sloping soils on the lake plain, mostly along Cayuga Lake north of Farleys Point and around the northern end of Owasco Lake. There are scattered areas between drumlins south of the Seneca River, but hardly any north of the river.

A typical profile in a cultivated area has a very dark grayish-brown to dark grayish-brown plow layer of heavy silt loam 7 inches thick. This layer overlies a 1-inch, leached layer of firm, light-gray to very pale brown silt loam mottled with strong brown. The upper part of the subsoil is very firm, distinctly mottled silty clay loam. The part below a depth of 14 inches is extremely firm, reddish-brown, mottled silty clay. In this lower part there are many pinkish-white lime spots. White, limy films coat the prism faces. The reaction grades from neutral in the upper part of the profile to calcareous below a depth of 24 inches.

Typical profile of Odessa silt loam, 2 to 6 percent slopes, in a cultivated field:

Ap—0 to 7 inches, very dark grayish-brown (10YR 3/2) to dark grayish-brown (10YR 4/2) heavy silt loam; grayish brown (10YR 5/2) when dry; moderate to strong, fine and medium, subangular blocky structure; firm when moist, slightly sticky when wet; many fine and medium roots; neutral; abrupt, wavy boundary. 6 to 8 inches thick.

A2g—7 to 8 inches, light-gray (10YR 7/2) to very pale brown (10YR 7/3) heavy silt loam; white (10YR 8/2) when dry; common, medium, distinct mottles of brown (7.5YR 5/4) and strong brown (7.5YR 5/6); moderate, fine and medium, subangular blocky structure; firm when moist, slightly sticky when wet; many fine roots; neutral; discontinuous, abrupt, wavy boundary that has ⅛-inch to ¼-inch fingers, 1 to 3 inches apart, extending 1 to 3 inches into the underlying B21tg horizon along prism faces. 0 to 2 inches thick.

B21tg—8 to 14 inches, brown (7.5YR 5/2 to 5/4) heavy silty clay loam; common, medium, distinct mottles of light grayish brown (7.5YR 7/2), strong brown (7.5YR 5/8), and reddish yellow (7.5YR 6/8); strong, coarse, prismatic structure breaking to strong, coarse, blocky structure; very firm when moist, sticky and plastic when wet; common fine roots along prism and ped faces; common fine and medium pores; prominent, light grayish-brown (7.5YR 6/2) clay film in pores and on prism and ped faces; neutral; clear, irregular boundary. 4 to 8 inches thick.

B22t—14 to 19 inches, reddish-brown (5YR 5/4–5/3) coarse silty clay; common, medium, distinct mottles of pinkish gray (5YR 7/2), strong brown (7.5YR 5/8), and reddish yellow (7.5YR 6/8); strong, coarse, prismatic structure breaking to strong, coarse, blocky structure; extremely firm when moist, very sticky and plastic when wet; common fine roots along prism and ped faces; common fine and medium pores; prominent reddish-gray (5YR 5/2) to gray (5YR 5/1) clay film in pores and on prism and ped faces; neutral; clear boundary. 4 to 8 inches thick.

B23t—19 to 24 inches, reddish-brown (5YR 5/3) silty clay; common, medium, distinct mottles of light gray (5YR 7/1), yellowish red (5YR 5/6), reddish yellow (5YR 6/6), and dark reddish brown (5YR 2/2); strong, coarse, prismatic structure breaking to strong, coarse, blocky structure; extremely firm when moist, plastic when wet; few fine roots along prism and ped faces; few fine and medium pores; white (N 8/0) clay film and flow on prisms and larger ped faces; pale red (2.5YR 6/2) to weak red (2.5YR 5/2) in pores and on smaller ped faces; mildly alkaline; clear, wavy boundary. 4 to 6 inches thick.

B3 or C1—24 to 44 inches, reddish-brown (5YR 5/3) silty clay; common, medium, distinct mottles of light gray (5YR 7/1), reddish yellow (7.5YR 6/6), strong brown (7.5YR 5/6), and dark reddish brown (5YR 2/2); strong, coarse, prismatic structure breaking to strong, coarse, blocky structure; extremely firm when moist, very sticky and plastic when wet; very few fine roots along prism and ped faces; few fine and medium pores; light-gray to white (N 7/0–8/0) silty lime film and flow on prism faces; pinkish-gray (5YR 6/2) to reddish-gray (5YR 5/2) film and flow on smaller ped faces; scattered pinkish-white (7.5YR 8/2) lime nodules that increase in number with depth; calcareous.

The thickness of the solum ranges from 20 to 45 inches. The depth to calcareous material ranges from 15 to 36 inches.

The texture of the A horizon generally is heavy silt loam but ranges from very fine sandy loam to silty clay loam. The coarser textures generally occur where there are deposits of nonconforming sand or silt, which are less than 20 inches thick. The A2 horizon is strongly mottled where it is more than 1 inch thick. In unlimed areas the reaction of the surface layer ranges from a pH of 6.0 to 7.2.

The texture of the B horizon generally is silty clay but ranges from heavy silty clay loam to clay. In places there are thin lenses or layers of silt or very fine sand, but the average clay content is more than 35 percent. The color of the B horizon ranges from a hue of 2.5YR to 7.5YR.

The C horizon generally consists of layers of silty clay. These layers may contain thin lenses of silt and fine sand and are varved below a depth of 40 inches. This layered material is generally many feet thick. In places, however, the material below a depth of 40 inches is outwash sand and gravel or glacial till.

Odessa soils are in a drainage sequence with well drained and moderately well drained Schoharie, poorly drained Lakemont, and very poorly drained Fonda soils. The red color of Odessa soils tends to mask the mottling, except in the A2 horizon. Odessa soils have a redder, finer textured subsoil than Niagara soils. They are finer textured than Ovid soils, which formed in well-sorted glacial till rather than poorly sorted lake deposits.

Odessa silt loam, 0 to 2 percent slopes (OdA).—This soil has a slightly darker colored surface layer than is typical of the series. Though runoff is slow, there is little or no surface ponding of water during wet periods, and little or no runoff is received from adjacent soils. The moderately large and large areas of this soil are broad flats on the lake plain. The small areas are commonly along drainageways where they receive runoff from gently sloping Schoharie soils. Included in mapping were Lakemont soils in slight depressions or along the lowest parts of drainageways. These wetter soils occupy no more than 10 percent of any area, but they delay tillage in spring.

This soil is suited to crops, pasture, and forest. Its suitability for crops, however, is limited by wetness and the clayey texture. Undrained areas are better suited to hay and forage crops that can tolerate wetness.

Drainage and maintenance of good soil structure are the main problems in managing this soil for crops. Drainage systems must be very closely spaced. Some fields can be improved by random drainage of the wet spots. Many of the broad, flat areas can be improved by bedding and other drainage practices that remove excess surface water. Rotations should include a high percentage of sod-forming crops, to maintain good soil structure. The supply of phosphorus is deficient, and nitrogen is deficient, especially in spring. Though the reserve supply of potassium is high, the amount that is readily available may be inadequate for some crops. The lime requirement ranges from none to low.

Seasonal wetness, slow permeability, and texture are the main limitations to nonfarm uses. (Capability unit IIIw–5; woodland group 11)

Odessa silt loam, 2 to 6 percent slopes (OdB).—This soil has the profile described as typical of the series. More than 75 percent of the acreage has a slope range of 2 to 4 percent. The slopes are mostly smooth, and runoff is moderately slow. As a result of runoff from adjacent areas, this soil remains wet for moderately long periods following heavy rains. Included in mapping were dark-colored, poorly drained Lakemont soils in depressions or along narrow drainageways. These wetter soils occupy no more than 10 percent of any area, but they commonly delay tillage in spring. Spots of better drained Schoharie soils on slight rises or knolls were also included.

This soil is suited to crops, pasture, or forest. Wetness and the fine texture limit the suitability for cultivated crops. Hay crops are limited mainly to water-tolerant varieties.

Drainage and maintenance of good soil structure are the main problems in managing this soil for crops. Drains should be closely spaced. Some fields can be improved by random drainage of the wet spots. Structures that divert runoff from adjacent areas are effective. Maintaining good soil structure is very difficult, but including a high percentage of sod in the rotation is helpful.

Erosion is a hazard, even on the gentle slopes. Consequently, erosion control measures are needed in many fields. The supply of phosphorus is deficient, and nitrogen is deficient, especially in spring. Though the potassium reserve supply is very high, the amount that is readily available may be deficient for some crops. The lime requirement ranges from none to low.

Seasonal wetness, slow permeability, texture, and slope are limitations to nonfarm use. (Capability unit IIIw–6; woodland group 11)

Ontario Series

The Ontario series consists of deep, well-drained, medium-textured soils that formed in firm, calcareous glacial till. The till is derived mainly from red and gray Medina and Oswego sandstone and from Lockport dolomitic limestone. It also is derived from Rochester, Vernon, and Camillus shale. The till generally contains enough red sandstone and shale to have a pinkish or reddish cast. Ontario soils are nearly level to steeply sloping. They are the dominant soils of the drumlins.

A typical profile in a cultivated area has a dark-brown loam plow layer about 8 inches thick. This layer is underlain by a thick, leached layer of friable, brown loam. The subsoil is at a depth of 15 inches and consists of reddish-brown heavy loam that grades from friable to firm with depth. The reaction of the subsoil grades from neutral in the upper part to mildly alkaline or weakly calcareous just above the till substratum. The till substratum is at a depth of about 34 inches and consists of firm, strongly calcareous, reddish-brown loam to fine sandy loam. There generally are some large stones throughout the profile.

Typical profile of Ontario loam, 2 to 8 percent slopes, in a cultivated field:

Ap—0 to 8 inches, dark-brown (10YR 3/3) loam; weak to moderate, medium, subangular blocky structure breaking to weak to moderate, coarse, granular structure; friable; very numerous fine and medium roots; neutral; abrupt, wavy boundary. 6 to 10 inches thick.

A2—8 to 15 inches, brown (7.5YR 5/4) loam; moderate, medium to coarse, subangular blocky structure; friable; numerous fine and medium roots; numerous wormholes filled with dark-brown casts; neutral; clear, wavy boundary. 4 to 12 inches thick.

B1&A2—15 to 18 inches, reddish-brown (5YR 4/4) heavy loam; moderate, medium and coarse, irregular-shaped blocks, ½ inch to 2 inches across, surrounded by brown (7.5YR 5/4) loam, 1/16 to ¼ inch thick, that decreases in thickness with depth; this horizon appears to be degrading from B1 to A2; discontinuous clay film in pores of B material; friable; many roots; numerous wormholes and casts; neutral; clear, wavy boundary. 2 to 5 inches thick.

B21t—18 to 22 inches, reddish-brown (5YR 4/3) heavy loam; moderate, medium to coarse, subangular blocky structure; friable when moist, slightly sticky when wet; thin clay film on ped faces and in pores; many roots; numerous wormholes and casts; neutral; clear, wavy boundary. 2 to 5 inches thick.

B22t—22 to 30 inches, reddish-brown (5YR 4/3) heavy loam; moderate, coarse, subangular blocky structure; friable to firm when moist, slightly sticky when wet; clay film on ped faces and in pores; many roots; numerous wormholes and casts; areas around large stones are sandier; neutral to mildly alkaline; clear, wavy boundary. 7 to 9 inches thick.

B3—30 to 34 inches, reddish-brown (5YR 4/3) loam to heavy loam; weak, coarse to medium, subangular blocky to blocky structure; very friable; discontinuous clay film on ped faces and in pores; few roots; many wormholes and casts; mildly alkaline to weakly calcareous; not as firm in place as B22 horizon; areas around large stones sandier; clear, wavy boundary. 3 to 5 inches thick.

C—34 to 50 inches, reddish-brown (5YR 4/4–2.5YR 4/4) loam to fine sandy loam; moderate, medium to thick, platy structure becoming thicker with depth; firm in place, very friable if crushed; occasional fine roots; few wormholes; highly calcareous.

The solum is normally 30 to 36 inches thick in uneroded areas, but it is thinner on the steeper slopes.

The texture of the Ap horizon generally is loam or fine sandy loam, but a few areas of gravelly loam and gravelly silt loam were included in mapping. The Ap horizon ranges from 6 to 10 inches in thickness, except where recent deposition has thickened it. In most places it is dark grayish brown (10YR 4/2) to dark brown (7.5YR 3/2), but the color ranges from light brownish gray (10YR 6/2) to dark reddish brown (5YR 3/2). In undisturbed forested areas, there is a mull type A1 horizon, 2 to 8 inches thick and dark grayish brown (10YR 4/2) to black (5YR 2/1). The A2 horizon ranges from 4 to 12 inches in thickness, from fine sandy loam to silt loam in texture, and from light reddish brown (5YR 6/3) to yellowish brown (10YR 5/4) in color. The more acid soils have the thicker A2 horizon, and the more calcareous soils generally have the thinner A2 horizon. The reaction of the A horizon ranges from very strongly acid in a few areas to neutral in most areas.

The B horizon ranges from 8 to 20 inches in thickness. It has a texture of heavy fine sandy loam to heavy silt loam and a clay content of 18 to 28 percent. The color ranges in hue from reddish brown (2.5YR 4/4) to dark yellowish brown (10YR 4/4), but the dominant hues are 7.5YR and 5YR. The structure ranges from moderate, medium, subangular blocky to moderate, coarse, prismatic. The prismatic structure breaks to moderate, angular blocky structure. Clay coats on ped faces and in pores range from faint to prominent. The reaction of the B horizon ranges from strongly acid in a few areas to mildly alkaline in most areas.

The glacial till of the C horizon ranges from fine sandy loam to gravelly silt loam in texture, from pinkish gray (5YR 7/2) to brown (7.5YR 4/4) in color, and from mildly to strongly calcareous in reaction. In structure it ranges from moderately thick, platy to nearly massive. It is loose to firm in place.

Ontario soils are in a drainage sequence with moderately well drained Hilton, somewhat poorly drained Appleton, poorly drained Lyons, and very poorly drained Alden soils. South of the Seneca River, Ontario soils are siltier and contain more lime because the till contains more Camillus shale. Here, the drainage sequence includes moderately well drained Lima and somewhat poorly drained Kendaia soils. Ontario soils have a moderately strongly expressed textural profile. They differ from Honeoye soils in having thicker, more strongly expressed A2 and B horizons and more degradation of the B horizon at its contact with the A2 horizon. They also have a more strongly expressed blocky structure. They have a coarser textured subsoil than Cazenovia soils. They lack the distinct fragipan common to Sodus soils and contain more lime. They are redder than Lansing soils and contain slightly more lime and sand. In addition to soils of the two drainage sequences, Ontario soils occur with Cazenovia, Camillus, Riga, Lairdsville, Palmyra, Alton, Wampsville, Dunkirk, Schoharie, Arkport, Colonie, and Madalin soils.

Ontario fine sandy loam, 2 to 8 percent slopes (OfB).—A profile of this soil has a coarser textured surface layer and subsoil than the one described for the series. The subsoil is fine sandy loam instead of heavy loam. The slopes are smooth or gently undulating. This soil generally receives little or no runoff from higher soils. Most areas are only 2 to 20 acres in size; only a few exceed 50 acres. Included in mapping were Hilton soils and small areas of poorly drained Appleton soils, which are indicated by wet spot symbols. These wetter soils, though not extensive, commonly delay tillage in spring.

This soil is well suited to crops, pasture, and woodland. It can be worked early in spring and is productive of most crops, including fruits and vegetables. It is considered one of the better soils for potatoes. It has a moderate supply of potassium and phosphorus and needs only a moderate amount of lime. The water-holding capacity is moderate to high. Crops respond well to heavy applications of fertilizer.

If this soil is kept in good tilth, only simple erosion control measures are needed. Random drainage of wet spots is beneficial in some fields.

Slope and moderately slow and slow permeability below a depth of 30 inches are the main limitations to most nonfarm uses that require good drainage. (Capability unit IIe–1; woodland group 1a).

Ontario fine sandy loam, 8 to 14 percent slopes (OfC).—A profile of this soil has a coarser textured surface layer and subsoil than the one described as typical of the series. The subsoil is fine sandy loam instead of heavy loam. This soil occupies short, smooth, convex slopes on hillsides below the more nearly level Ontario fine sandy loam, from which it receives some runoff. Most areas are only 2 to 10 acres in size. Included in mapping were narrow areas of Hilton soils at the base of slopes or along drainageways. These wetter soils delay tillage in spring.

Most of this soil has been cleared and used for crops. It is slightly to severely eroded in cropped areas, and the severely eroded spots are redder or lighter colored and have more gravel and small stones on the surface. The woodlands and the unplowed cleared areas are generally only slightly eroded.

This Ontario soil is suited to crops, pasture, and forest. It is suited to most crops common to the county, but control of runoff and erosion is needed if this soil is used for row crops. Random drainage of the occasional wet spots is beneficial in some fields. The supply of phosphorus and potassium is moderate. The supply of nitrogen and the water-holding capacity are also moderate, except in severely eroded areas where they are low. The lime requirement is moderate to low. Crop response to fertilization is good.

Slope and moderately slow and slow permeability below a depth of 30 inches are the main limitations to most nonfarm uses that require good drainage. (Capability unit IIIe–2; woodland group 1a)

Ontario fine sandy loam, rolling (8 to 14 percent slopes) (OfCK).—A profile of this soil has a coarser textured surface layer and subsoil than is typical of the series. The subsoil is fine sandy loam instead of heavy loam. This soil is on a rolling till plain. It has short, irregular, convex slopes and many drainageways and depressions. Most areas are only 2 to 10 acres in size. Included in mapping were Hilton soils in the bottom of depressions or along drainageways and wet spots of Appleton soils in the deepest depressions.

This Ontario soil is suited to crops, pasture, and forest; much of it has been used for crops. Erosion varies considerably in the cropped areas. The hilltops are moderately eroded, the steeper hillsides are severely eroded, and the depressions and drainageways contain deposits of eroded material. The wooded or unplowed cleared areas are mostly uneroded.

Control of runoff and erosion is the main problem if this soil is used for row crops. Erosion control is difficult or impractical, however, on the rolling, irregular slopes. Because of the variable erosion and the wet spots, crops grow and mature at an uneven rate. Random drainage of wet spots is helpful in some fields. Crop response to fertilization is good. The lime requirement is low to moderate.

Slope and moderately slow and slow permeability below a depth of 30 inches are the main limitations to nonfarm uses that require good drainage. (Capability unit IVe–1; woodland group 1a)

Ontario loam, 2 to 8 percent slopes (OnB).—This soil has the profile described as typical of the series. Near Cato and Meridian the till contains clayey shale, and this soil grades toward the Cazenovia soils. In these areas this soil is more clayey and is redder than is typical and generally has a slightly thinner subsurface layer. It also is near the top of the pH range. In these areas Cazenovia soils were included in mapping. Where this Ontario soil is less clayey, moderately well drained Hilton or Lima soils in shallow depressions or narrow drainageways were included in mapping. Also included were wet spots of Appleton, Kendaia, and Lyons soils, all of which are inextensive but delay tillage in spring.

Most areas of this mapping unit are near the top of slopes and receive little or no runoff from adjoining areas. Some areas have single, convex slopes that are easy to contour. Others have gently undulating slopes that are difficult to contour. Although this is the most extensive Ontario soil in the county, most areas are only 2 to 20 acres in size; few exceed 50 acres. The small areas are generally bordered by steeper Ontario soils or by wetter soils, and the use of equipment is hampered. On the large areas, however, are some of the most productive farms in the county.

This soil is well suited to crops, pasture, and forest. It has good moisture-holding capacity and high natural fertility. Crops respond well to heavy applications of fertilizer. The lime requirement is moderate to none. Only simple rotations and measures are needed to control erosion and to maintain tilth and fertility. Random drainage of the few wet spots is helpful.

Slope and moderately slow and slow permeability below a depth of 30 inches are the main limitations to most nonfarm uses. (Capability unit IIe–1; woodland group 1a)

Ontario loam, 8 to 14 percent slopes (OnC).—This soil is 2 to 6 inches thinner over calcareous glacial till than is typical of the series. Most areas are 2 to 10 acres in size; areas larger than 50 acres are rare in this county. The slopes are simple and are generally short and convex. Where this soil is on the sides of moderately deep drainageways, moderately well drained Hilton and Lima soils in the bottom of the drainageways were included in mapping. Wet spots of Appleton and Kendaia soils were also included. These wetter soils, though inextensive, delay tillage in spring.

This soil is suited to pasture and forest and is well suited to most crops, but much of it is still in forest or unplowed pasture. Because the cropped areas are well managed, they are not severely eroded.

Runoff is moderate to rapid on this soil. Consequently, erosion is a hazard, and intensive erosion control is needed if this soil is used for row crops. Random drainage of wet spots is helpful in some fields. The lime requirement is none to moderate. Fertility is moderate, and crops respond well to applications of complete fertilizer.

Slope and moderately slow permeability below a depth of 30 inches are the main limitations to most nonfarm uses that require good drainage. (Capability unit IIIe–2; woodland group 1a)

Ontario loam, 8 to 14 percent slopes, eroded (OnC3).—Erosion has removed all of the original plow layer and 75 percent or more of the underlying layer in most areas of this soil. The present plow layer consists of material from the subsoil mixed with remnants of the upper soil layers. This plow layer has a more clayey texture than that of the uneroded soil and is low in organic-matter content. It is cloddy and difficult to plow. The surface crusts over readily, and seeds have difficulty in sprouting.

Most areas have convex slopes and are 2 to 20 acres in size; only a few are more than 50 acres. Where this soil is on the sides of moderately deep drainageways, moderately well drained Hilton and Lima soils in the bottom of the drainageways were included in mapping. These soils make up no more than 10 percent of any area, but they delay planting in spring. Small areas of Ontario loam, only slightly or moderately eroded, were also included but have little effect on management.

Because of the loss of the original surface layer, much of this soil is only 12 to 18 inches thick over the calcareous glacial till. Consequently, the soil has lost about half of its original water-holding capacity. If row crops are grown, runoff and erosion are difficult to control, and there generally are many bald spots in the field. If adequately fertilized, however, this soil is fairly well suited to deep-rooted legumes and grasses. The lime requirement is generally low. Fertilization and control of grazing are needed on pasture. This soil is very well suited to trees, once they become established, but careful woodland management is needed to control erosion.

Slope and moderately slow and slow permeability are the main limitations to most nonfarm uses that require good drainage. (Capability unit IVe–2; woodland group 1a)

Ontario loam, rolling (8 to 14 percent slopes) (OnCK).—Even in uneroded areas this soil is about 6 inches shallower to the underlying firm, gritty glacial till than is typical of the series.

The dominant inclusions in mapping were moderately well drained Hilton and Lima soils in depressions and drainageways. Poorly drained Appleton and Kendaia soils occur as wet spots in the lowest parts of depressions and drainageways.

The complex or rolling slopes are so irregular that contour tillage is impractical if not impossible. Individual slopes are short and convex and are marked by many depressions and irregular-shaped drainageways. Much of this soil has been used for crops, and much of the cropped area is eroded. The degree of erosion varies considerably within short distances and therefore has not been differentiated in mapping. The tops of knolls are moderately eroded, the sharply breaking and steeper side slopes are severely eroded, and the eroded material has been deposited in depressions and drainageways. There has been little or no erosion in forested and unplowed cleared areas.

This soil is suited to crops, pasture, and forest. Because of the rolling slopes, it is better suited to long-term hay and forage than to other crops. The variable erosion pattern and the spots of wetter soils cause uneven growth and ripening of many crops. Random drainage of the wettest spots is beneficial in some fields. Crops respond well to fertilization. The need for lime ranges from none to moderate.

Slope and moderately slow and slow permeability below a depth of 30 inches are the main limitations to most nonfarm uses that require good drainage. (Capability unit IVe–1; woodland group 1a)

Ontario loam, 14 to 20 percent slopes (OnD).—This soil is 6 to 10 inches thinner over the calcareous glacial till than is typical of the series, and in some areas it has a fine sandy loam texture. It occupies the moderately steep sides of drumlins or the steeply rolling and hilly areas between the drumlins. Some of the slopes are simple; others are complex. They are generally short and convex. Most of the simply sloping areas are long and narrow. The complexly sloping areas vary in shape. Most areas are only 2 to 10 acres in size; few exceed 30 acres.

Included in mapping were moderately well drained Hilton and Lima soils and somewhat poorly drained Appleton and Kendaia soils in the bottom of depressions and drainageways. The wetter soils seldom exceed 10 percent of any area but delay tillage in spring. Also included were spots of clayey Cazenovia and gravelly Palmyra soils.

Most of this Ontario soil is wooded. The cleared areas are used for hay and forage. The few areas that have been plowed have been well managed or not used intensively, as evidenced by the slight to moderate erosion.

This soil is suited to trees and to pasture and hay, but long-term hay is probably the better crop. Machinery is difficult to use on the steep slopes. Because of rapid runoff, erosion is a hazard. Lime and moderate to heavy applications of fertilizer are needed for forage crops. If row crops are grown or plowing is necessary to reseed pasture, intensive control of runoff and erosion is needed.

Slope and moderately slow and slow permeability are the main limitations to housing, roads, and other nonfarm uses that require good drainage. (Capability unit IVe–1; woodland group 1b)

Ontario loam, 14 to 20 percent slopes, eroded (OnD3).—Erosion has removed nearly all of the original plow layer of this soil and, in most places, from 25 to 75 percent of the upper subsoil. There are reddish bald spots where the lower subsoil is exposed. This soil occupies the moderately steep sides of drumlins or the steeply rolling and hilly areas between drumlins. Some of the slopes are simple, some are complex, and nearly all are short and slightly convex. The simply sloping areas are generally long and narrow. The complexly sloping areas vary in shape. Most areas are only 2 to 10 acres in size; few exceed 30 acres.

Included in mapping were moderately well drained Hilton and Lima soils and somewhat poorly drained Appleton and Kendaia soils in the bottom of depressions and drainageways. These wetter soils occupy no more than 10 percent of any area, but they delay tillage in spring. Also included were spots of clayey Cazenovia and gravelly Palmyra soils.

Nearly all of this Ontario soil has been used for crops, but much of it has been abandoned because machinery is difficult to operate on the steep slopes. Pasture and forage crops grow only moderately well but are better suited than other crops. The lower clayey subsoil, which has been exposed by erosion, is cloddy and difficult to work. In addition, the loss of soil has greatly reduced the water-holding capacity, the organic-matter content, and the supply of nitrogen available to plants. Runoff is excessive and difficult to control because the clayey surface sheds water readily.

Lime and heavy applications of fertilizer are needed for even well-established forage crops, and the response is only moderate. If row crops are grown or plowing is necessary to reseed pasture, intensive control of runoff and erosion is necessary.

Slope and moderately slow and slow permeability are the main limitations to most nonfarm uses that require good drainage. (Capability unit VIe-1; woodland group 1b)

Ontario Series, Moderately Shallow Variant

The Ontario series, moderately shallow variant, consists of well-drained, medium-textured soils that are 20 to 40 inches thick over limestone bedrock. These soils are derived mainly from limestone glacial till and from semiresidual material from the underlying, nearly horizontal limestone bedrock. They occur where the three main limestone formations in the county outcrop. The largest area of these soils crosses the county generally from east to west through Auburn, where the Onondaga formation and associated formations occur as an escarpment. This escarpment is higher, or thicker, on the eastern side of the county. Scattered areas occur in the southern half of the county where the Tully limestone outcrops. These areas are generally on the sides of valleys, notably the valley side sloping toward Cayuga Lake west of Kings Ferry, the sides of Owasco Inlet north of Moravia, and the sides of Dutch Hollow Brook valley east of Twelve Corners. There are also scattered areas in an east-west direction through Ira where the Lockport dolomite formation outcrops in the northern part of the county.

A typical profile in a cultivated area has a dark grayish-brown to dark-brown silt loam plow layer about 9 inches thick. This layer is underlain by a leached layer of friable, brown silt loam. The subsoil occurs at a depth of about 13 inches. The upper part of it is friable, yellowish-brown silt loam. Below a depth of 23 inches it is brown to dark-brown, slightly firm heavy silt loam. The reaction of the subsoil is neutral to mildly alkaline. The depth to gray limestone bedrock is about 33 inches.

Typical profile of Ontario silt loam, moderately shallow variant, 3 to 8 percent slopes, in a cultivated field:

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) to dark-brown (10YR 4/3) silt loam; dark brown (10YR 4/3) if rubbed; moderate, medium, thick, platy structure breaking to moderate, fine and medium, subangular blocky structure; friable when moist, nonsticky when wet; numerous large pores 1/32 to 1/16 inch in diameter; numerous worm channels; numerous fine and medium roots; neutral; abrupt, smooth boundary. 8 to 10 inches thick. (The platy structure in the Ap and A2 horizons could be the result of heavy machinery traffic.)

A2—9 to 13 inches, brown (10YR 5/3) silt loam; very pale brown (10YR 7/3) when dry; moderate, medium, thick and very thick, platy structure breaking to moderate, fine and medium, subangular blocky structure; friable when moist, nonsticky when wet; numerous large and medium pores; numerous worm channels and dark-brown worm casts; many fine and medium roots; neutral; abrupt, wavy boundary with thin fingers, 1/8 to 1/4 inch wide and 1 to 3 inches apart, extending 2 to 4 inches into underlying horizon. 3 to 6 inches thick.

B1—13 to 23 inches, yellowish-brown (10YR 5/4) silt loam; pale brown (10YR 7/4) when dry; slightly heavier than the A2 horizon above; weak to moderate, medium and coarse, subangular blocky structure; friable when moist, faintly sticky when wet; thin, discontinuous clay coats on ped faces; numerous large and medium pores with thin clay lining; numerous worm channels with dark-brown worm casts; many fine roots and common medium roots; neutral; clear, wavy boundary. 8 to 12 inches thick.

B2—23 to 33 inches, brown to dark-brown (7.5YR 4/4) heavy silt loam; moderate, medium and coarse, subangular blocky structure; slightly firm when moist, slightly sticky when wet; distinct, continuous, thin clay coats on ped faces; prominent clay linings in numerous large and medium pores; many worm channels with dark-brown worm casts; common fine and medium roots; neutral to mildly alkaline; abrupt, irregular boundary. 0 to 20 inches thick.

R—33 to 72 inches +, gray, strongly fissured limestone bedrock that is shattered and slightly weathered in upper 12 inches; fissures, 2 to 3 feet deep and 5 to 15 feet apart, are 6 to 18 inches wide at the top and taper to cracks with depth; fissures are filled with very dark brown (10YR 2/2) to dark-brown (7.5YR 3/2) coarse silty clay loam; moderate, coarse, subangular blocky structure; firm when moist, slightly sticky when wet; thin, distinct continuous clay coats on ped faces; prominent clay linings in numerous pores; common fine roots and worm channels; mildly alkaline to weakly calcareous.

The thickness of the solum ranges from 20 to 40 inches and corresponds to the depth to bedrock.

The Ap horizon is normally silt loam but ranges from silt loam to fine sandy loam. The color ranges from dark gray to dark brown. The reaction in unlimed areas ranges from a pH of 5.5 to 7.0. The color of the A2 horizon ranges from light yellowish brown to reddish brown.

The B horizon ranges from silt loam to heavy loam but is generally heavy silt loam. The color ranges from yellowish brown through brown to reddish brown in hues of 10YR to 5YR. The stone content ranges from nearly none to 50 percent shattered limestone rock. The reaction of the B horizon ranges from a pH of 6.0 to 7.6.

Because of the porous limestone bedrock, which permits moderate to rapid internal drainage, these moderately shallow Ontario soils are not in a drainage sequence with other soils. They are coarser textured than Aurora soils, limestone substratum phase.

Ontario silt loam, moderately shallow variant, 0 to 3 percent slopes (OrA).—This soil has a profile similar to the one described as typical of the series. Most areas are fairly broad and nearly level. The underlying limestone bedrock is nearly horizontal. Consequently, the depth over the rock is fairly uniform, except where the soil is very gently undulating or where short slope breaks occur. These breaks are quite abrupt due to a rise of 2 to 4 feet in the bedrock. Included in mapping were shallow Benson soils and deep Ontario soils. The Benson soils occur in a narrow band along the slope breaks where rock outcrops are common. The included shallower and deeper soils make up as much as 15 percent of some areas.

This Ontario soil is suited to crops, pasture, or forest. Because of good internal drainage, it can be plowed moderately early. The included shallow areas are droughty, and the rock outcrops interfere with tillage.

There are no erosion or drainage problems in management of this soil. Maintaining good tilth and fertility are the main needs for crops. The need for lime varies from none to moderate. The supplies of phosphorus, potassium, and nitrogen are moderate, and the response to fertilization is good.

Shallowness to bedrock is the main limitation to most nonfarm uses. (Capability unit IIs-1; woodland group 1a)

Ontario silt loam, moderately shallow variant, 3 to 8 percent slopes (OrB).—This soil has the profile described as typical of the series. Most of it is smoothly sloping, but a few small areas are undulating. The larger areas generally are broken by long, narrow limestone escarpments and many limestone outcrops. The shallow Benson soils are the dominant inclusions and occur along these narrow escarpments. Although they occupy no more than 15 percent of any area, their shallowness affects management. Below them are narrow areas of Ontario soils, which are more than 40 inches in depth to bedrock. These inclusions of deeper soils have little effect on management.

This Ontario soil is suited to crops, pasture, and forest. Because of good internal drainage, it can be plowed moderately early. The included shallow areas are droughty, and the rock outcrops interfere with tillage. Control of erosion is only a moderate problem in most areas, but the loss of a few inches of soil from the shallower areas is serious.

Controlling runoff and erosion and maintaining good tilth are important in managing this soil. The need for lime varies from none to moderate. The supplies of phosphorus, potassium, and nitrogen are moderate, and the response to fertilization is good.

Shallowness to bedrock is the main limitation to nonfarm uses. (Capability unit IIe-1; woodland group 1a)

Ontario silt loam, moderately shallow variant, 8 to 14 percent slopes (OrC).—This soil contains more angular limestone fragments than is typical of the series and varies more in depth to bedrock. Most areas are only 2 to 5 acres in size and have simple slopes. Included in mapping were areas of Benson loam, which is less than 20 inches in depth to bedrock. This shallow soil occupies as much as 25 percent of some areas, and in places it is broken by rock outcrops. Also included were areas of a deeper Ontario soil. This deeper soil occupies as much as 20 percent of some areas but has little effect on management.

The soil of this unit can be used for crops, pasture, or forest. Because of the many shallow areas, however, it is better suited to hay and forage than to other crops. Erosion is a serious hazard, and control of it is important if this soil is used for row crops. The need for lime varies from none to moderate. Complete fertilizer is needed for even a moderate response from hay and forage crops.

Slope and shallowness to bedrock are the main limitations to most nonfarm uses. (Capability unit IIIe-2; woodland group 1a)

Ontario, Honeoye and Lansing soils, 20 to 35 percent slopes (OtE).—Each soil of this unit has a profile like the one described for its series, except for a shallower depth to the glacial till. The Ontario soil generally occupies the steep east and west sides of drumlins, and Honeoye and Lansing soils occupy narrow, steep valley walls. Most areas are long and narrow and only 2 to 20 acres in size. Some of the slopes are simple, and some are complex. Many areas have never been cleared. Much of the cleared acreage is severely eroded, especially where it has been cropped. Included in mapping were steeply sloping Aurora, Palmyra, and Cazenovia soils.

The soils of this unit have very rapid runoff and, consequently, are droughty and erodible. They are used mainly for pasture and forest. If the less strongly sloping areas are fertilized and clipped, they produce pasture of fair carrying capacity.

Slope is the main limitation to nonfarm use. (Capability unit VIe-1; woodland group 1b)

Ontario, Honeoye and Lansing soils, 35 to 50 percent slopes (OtF).—Each soil of this unit has a profile like the one described for its series, except for a shallower depth to the glacial till. Ontario soils generally occupy the very steep east and west sides of drumlins. Honeoye and Lansing soils occupy very steep valley walls, gullies, and gorges. Large areas are on the very steep side slopes of Great Gully. Erosion ranges from slight to severe. Included in mapping were very steep areas of Aurora, Palmyra, and Cazenovia soils and narrow bottom-land areas of Alluvial land.

The soils of this unit have very rapid runoff and, consequently, are droughty and erodible. They are better suited to woodland than to anything else. The few pastures are droughty and weedy, and they are too steep to clip and fertilize.

Slope is the main limitation to nonfarm use. (Capability unit VIIe-1; woodland group 1c)

Ovid Series

The Ovid series consists of deep, somewhat poorly drained, moderately fine textured soils that occur with Cazenovia soils. They also occur with Ontario soils in areas between drumlins where there were once shallow lakes that deposited 12 to 18 inches of lacustrine clay. This clay was subsequently mixed with the underlying till similar to that in which Ontario soils formed.

A typical profile in a cultivated area has a dark grayish-brown heavy silt loam plow layer about 9 inches thick. Just below this layer is a thin, leached layer of firm, light-brown silt loam distinctly mottled with strong brown. The surface layer and subsurface layer are neutral in reaction. The subsoil is at a depth of 12 inches and consists of firm, reddish-brown silty clay loam that has a few faint mottles. This layer is calcareous. Firm to very firm, dense, calcareous till is at a depth of about 24 inches. It consists of reddish-brown silty clay loam mottled with pinkish gray and gray.

Typical profile of Ovid silt loam, 0 to 2 percent slopes, in a cultivated field:

Ap—0 to 9 inches, very dark grayish-brown (10YR 3/2) heavy silt loam, light brownish gray (10YR 6/2) when dry; moderate, fine and medium, subangular blocky structure; firm to friable when moist, sticky and slightly plastic when wet; many fine and medium roots; neutral; abrupt boundary. 5 to 10 inches thick.

A2—9 to 12 inches, brown (7.5YR 5/2) heavy silt loam; common, medium, distinct, strong-brown (7.5YR 5/6) mottles; moderate, fine and medium, blocky structure; firm when moist, sticky and slightly plastic when wet; many to few fine roots; neutral; abrupt, wavy boundary. 0 to 6 inches thick.

B2t—12 to 24 inches, reddish-brown (5YR 4/3) silty clay loam; few, faint, light brownish-gray (7.5YR 6/2) mottles; moderate and strong, medium and coarse, blocky structure; firm when moist, sticky when wet; few fine roots along cleavage faces; brown (7.5YR 5/2) and light brownish-gray (7.5YR 6/2) clay films around peds; neutral; clear, wavy boundary. 8 to 26 inches thick.

B3—24 to 28 inches, reddish-brown (5YR 5/3) silty clay loam; few, faint and distinct, reddish-brown (5YR 4/3) and light-gray (10YR 7/2) mottles with brown (7.5YR 5/2) ped coats; moderate and strong, medium and coarse, blocky structure; firm when moist, sticky when wet; calcareous; clear, wavy boundary. 0 to 5 inches thick.

C—28 to 40 inches, reddish-brown (5YR 4/3) silty clay loam; common, medium, distinct, pinkish-gray (5YR 6/2) mottles and light-gray (N 7/0) lime concretions; weak, coarse, blocky structure grading to thick, platy structure; firm to very firm; strongly calcareous.

The thickness of the solum ranges from 20 to 40 inches, and the depth to carbonates from 15 to 36 inches.

The Ap horizon, in uneroded areas, ranges from very fine sandy loam to silty clay loam but is predominantly heavy silt loam to coarse silty clay loam. It is very dark gray to dark brown, and the A2 horizon is light brown to light reddish brown. The reaction of the Ap horizon is a pH of 5.5 to 7.5.

The B horizon is commonly silty clay loam with a clay content of 28 to 35 percent, but there are a few areas in which the texture is very fine sandy clay loam or silty clay. The color is commonly reddish brown to brown, and there are a few to many gray, yellowish-brown, and strong-brown mottles. This horizon is 6.5 to 8.4 in reaction.

The C horizon is most commonly calcareous silty clay loam or loam and contains varying numbers of stones. In areas where this soil is associated with Aurora or Angola soils, the C horizon commonly is shaly loam or shaly silt loam.

Ovid soils are in a drainage sequence with well drained and moderately well drained Cazenovia, poorly drained Romulus, and very poorly drained Fonda or Alden soils. Ovid soils differ from Lima and Hilton soils in having a finer textured B horizon and from Odessa soils in having a coarser textured, well-sorted B horizon.

Ovid silt loam, 0 to 2 percent slopes (OvA).—This soil has the profile described as typical of the series. Most of the small and medium-sized areas and a few of the larger ones receive a moderate amount of runoff, but they have enough gradient to remove excess water so that there is little or no ponding. They remain wet, however, for long periods after excessive rains. Most of the larger areas receive little or no runoff. Many of them are broad, flat, low hilltops.

This soil occurs with Cazenovia soils or more strongly sloping Ovid soils, from which it receives runoff. It merges with Odessa soils where the lake-deposited clay is thickest and with Kendaia or Appleton soils where the deposits are thinnest. Where the dark-gray shale bedrock is closer to the surface, this Ovid soil merges with Angola soils and is generally grayer than normal because of the higher content of shale.

Included in mapping were poorly drained Romulus soils in shallow depressions or along narrow drainageways. These wetter soils occupy no more than 10 percent of any area, but they delay tillage in spring or following heavy rains. Also included were small areas of Cazenovia soils on slight rises or knolls.

This soil is suited to crops, pasture, and forest. Row crops are commonly grown, but wetness and the tendency to clod are limitations.

Control of wetness and maintenance of good soil structure are important. Drainage of the included wet spots is needed in some areas, and structures that hasten the removal of surface water could improve many areas. Erosion is not a problem if good soil structure is maintained. The supply of nitrogen is deficient, especially early in spring, and that of phosphorus is low to medium. The supply of potassium is high, but the amount that is quickly available to plants is inadequate for some crops. Most areas need little or no lime.

Seasonal wetness and slow permeability are the main limitations to most nonfarm uses. (Capability unit IIIw-5; woodland group 11)

Ovid silt loam, 2 to 6 percent slopes (OvB).—This soil generally has uniform slopes with a gradient of 2 to 4 percent. It receives runoff water, which drains off slowly and keeps this soil wet for long periods following excessive rains. Individual areas are small to large. Cropped areas of this soil are only slightly to moderately eroded, except for small spots near the upper limit of the slope range or areas where runoff water concentrates. Depressions and less sloping spots commonly contain deposits of eroded material.

This soil adjoins Cazenovia soils, from which it receives runoff. It merges with Odessa soils where the lake deposits are thickest, and it merges with Kendaia or Appleton soils where the deposits are thinnest. Where the dark-gray shale bedrock is close to the surface, this Ovid soil merges with Angola soils, and it is generally grayer than normal because of a higher content of the shale.

Included in mapping were Cazenovia soils on slight rises or knolls. Also included were poorly drained Romulus soils in shallow depressions or narrow areas along drainageways. These wetter soils occupy no more than 8 percent of any area, but they delay tillage in spring or following heavy rains.

This soil is suited to crops, pasture, and forest. Though row crops can be grown, wetness and the tendency to clod limit cultivation.

Control of wetness and maintenance of good soil structure are the main problems. Draining the included wet spots is needed in some areas, and structures that divert runoff and remove excess water would improve most areas. Control of erosion is needed, especially on the longer slopes, because any loss of soil makes soil structure difficult to maintain. The supply of nitrogen is deficient, especially early in the growing season, and the supply of phosphorus also is deficient. Though the supply of potassium is high, the amount that is readily available to plants is inadequate for some crops. Most areas need little or no lime.

Seasonal wetness, slow permeability, and slope are the main limitations to most nonfarm uses. (Capability unit IIIw–6; woodland group 11)

Palmyra Series

The Palmyra series consists of deep, well-drained soils that formed in calcareous, glaciofluvial gravel and sand derived from limestone, sandstone, and shale. These soils are extensive, especially in the central part of the county. One of the largest areas is a rough rectangle extending south from Port Byron and Weedsport to Auburn and Sennett. South of Auburn, the largest areas are along the larger streams, especially at an elevation below 1,000 feet.

A typical profile in a cultivated area has a very dark brown to dark grayish-brown gravelly loam plow layer about 8 inches thick. Just below the plow layer is a thin, leached layer of friable, brown gravelly loam. The subsoil is at a depth of 11 inches. It is friable to slightly firm and in the upper part consists of dark-brown to brown gravelly loam. Below a depth of 32 inches it is dark-brown very gravelly loam. The reaction of the soil above the substratum is neutral. The substratum of stratified sand and gravel is at a depth of about 34 inches. This layer is calcareous.

Typical profile of Palmyra gravelly loam, 3 to 8 percent slopes, in a cultivated field:

Ap—0 to 8 inches, very dark brown (10YR 2/2) to dark grayish-brown (10YR 3/2) gravelly loam, dark grayish brown (10YR 4/2) to grayish brown (10YR 5/2) when dry; weak, medium and coarse, granular structure; soft when dry, very friable when moist; abundant fine roots and common medium roots; neutral; abrupt, wavy boundary. 6 to 9 inches thick.

A2—8 to 11 inches, brown (10YR 5/3 to 7.5YR 5/2–5/4) gravelly loam; pale brown (10YR 6/3) when dry; weak, fine and medium, subangular blocky structure; soft when dry, friable when moist; common fine and medium roots; many medium and coarse pores; neutral; abrupt, wavy boundary. 1 to 4 inches thick.

B&A—11 to 14 inches, dark-brown to brown (7.5YR 4/4) gravelly loam to gravelly heavy loam; weak, medium, subangular blocky structure surrounded by ⅛-inch to ¼-inch thick coats of brown (10YR 5/3 to 7.5YR 5/2–5/4), slightly coarser loam similar to horizon above; interiors of blocks are friable when moist, slightly sticky when wet; common fine and medium roots; numerous medium and coarse pores; discontinuous clay film in larger pores; neutral; abrupt, wavy boundary. 2 to 4 inches thick.

B21t—14 to 32 inches, dark-brown to brown (7.5YR 4/4) gravelly loam to gravelly heavy loam; moderate, medium, subangular blocky structure; friable to slightly firm when moist, slightly sticky when wet; common fine and medium roots; many medium and large pores, thin clay film in pores, discontinuous clay film on block faces; neutral; abrupt, wavy boundary. 5 to 20 inches thick.

B22t—32 to 34 inches, dark-brown (7.5YR 3/2) very gravelly heavy loam; very weak, fine, subangular blocky structure; friable to slightly firm when moist, slightly sticky when wet; common fine roots; many medium and large pores; distinct clay film in pores, discontinuous clay film on block faces; neutral; clear, irregular boundary. 1 to 4 inches thick between tongues and 5 to 10 inches thick in tongues.

IIC—34 to 60 inches, black (10YR 2/1) to light-gray (10YR 7/1), stratified gravel and sand (appearance like salt and pepper), ranging from pea size to cobbles; estimated 3 percent are larger than 3 inches in diameter; sand size is commonly medium but includes fine and coarse; few medium and fine roots extending beyond 60-inch depth; calcareous.

The thickness of the solum and depth to carbonates range from 15 to 45 inches. The wide range in solum thickness occurs in short distances due to tonguing of B with C. The texture of the surface layer, or Ap horizon, is generally gravelly loam or gravelly sandy loam, but the content of gravel ranges from none to 35 percent by volume. The reaction of this layer, unlimed, ranges from a pH of 5.0 to 7.0.

The B horizon texture ranges from heavy loam to sandy clay loam, and the clay content from 18 to 28 percent. The thickness ranges from 6 to 30 inches, the color from reddish brown to brown, and the gravel content from 5 to 35 percent by volume.

The depth to stratified sand and gravel generally ranges from 15 to 30 inches. Isolated tongues of the B horizon extend to a depth of 45 inches.

Palmyra soils are commonly associated with Ontario, Honeoye, and Lansing soils, all of which formed in glacial till, and with Dunkirk and Arkport soils, which formed in lake-deposited material. They are in a drainage sequence with moderately well drained Phelps and somewhat poorly drained Fredon soils. Palmyra soils contain more lime and more limestone gravel than Alton soils and have a B horizon of clay accumulation. They differ from Howard soils in having a thinner solum that contains more lime and becomes calcareous within a depth of 40 inches. They are coarser textured than Wampsville soils. They differ from Arkport soils in being gravelly.

Palmyra gravelly sandy loam, 3 to 8 percent slopes (PaB).—This soil has a coarser textured surface layer, a thicker, sandier leached layer, and a thinner, less clayey subsoil than is typical of the series. In some places it is also somewhat deeper to calcareous gravel and sand. It occurs mostly as gently sloping or gently undulating terraces and is moderately extensive. The slopes are generally short. About half of them are smooth, and half are complex and undulating. The erosion is generally slight; it is moderate in only a few small patches.

This soil is well suited to crops, pasture, and forest. If irrigated, it is especially well suited to deep-rooted crops and to early truck and garden crops.

Because of the moderately low moisture-holding capacity, maintaining fertility and conserving moisture are the main problems. The need for lime ranges from moderate to none. The supplies of nitrogen and potassium are especially deficient; the supply of phosphorus is moderate. Crops are highly responsive to fertilization if moisture is adequate. Erosion control measures are needed on the longer, smoother slopes and on the strongly undulating slopes.

Slope and gravel are the main limitations to nonfarm uses that require good drainage. This soil is good to excellent as a source of sand and gravel, but lime cementation of the gravel is a problem. (Capability unit IIs–3; woodland group 3a)

Palmyra gravelly sandy loam, 8 to 15 percent slopes (PaC).—This soil has a coarser textured surface layer, a thicker, sandier leached layer, and a less clayey subsoil than is typical of the series. Most areas have short, complex, rolling or strongly undulating slopes. A few small areas that have smooth slopes were included in mapping. Erosion generally ranges from slight to moderate, although where the slopes break sharply, there are a few severely eroded patches. Small sags and depressions contain deposits of eroded material. Small areas of moderately well drained Phelps soils, in the lower depressions, were the dominant inclusions in mapping.

This soil can be used for crops, pasture, and forest, but it is better suited to long-term hay and forage than to other crops. Because of the limited water-holding capacity and rapid permeability, deep-rooted legumes are the better hay and forage crops on this soil. Cultivation is difficult, and contour tillage is impractical or impossible.

Controlling erosion and maintaining fertility are the main management problems. Keeping this soil in long-term hay is one of the best means of controlling erosion. Complete fertilizer that is high in potash is needed for hay crops, and this also aids in controlling erosion by producing a good protective cover. If plowing is necessary in order to reseed, it should be across the slope if possible, and strips of sod should be left to control runoff.

Slope and gravel are the main limitations to nonfarm uses that require good drainage. This soil is good to excellent as a source of sand and gravel, but lime cementation of the gravel is a problem. (Capability unit IVe–12; woodland group 3a)

Palmyra gravelly loam, 0 to 3 percent slopes (PgA).—This soil has a profile similar to the one described for the series. It occupies nearly level terraces in valleys and some nearly level tops of deltas on the sides of valleys. Included in mapping were small areas of level Palmyra gravelly sandy loam. Also included were somewhat poorly drained Phelps and Niagara soils, which are in the lowest depressions and seldom exceed 5 percent of any given area.

This Palmyra soil can be used for many kinds of crops, for pasture, and for forest. It can be plowed early and is especially well suited to deep-rooted crops and to vegetables and fruits.

Maintenance of fertility is the major management problem. Most crops need complete fertilizer, and their response is high. The need for lime ranges from none to moderate. Drainage is not a problem, and erosion is negligible. The infiltration rate is rapid, and the response to irrigation is excellent. The gravel hinders the use of precision farm machinery and may also limit the use of this soil for root crops.

Gravel is the main limitation to most nonfarm uses that require good drainage. As a source of sand and gravel, this soil is good to excellent, but lime cementation of the gravel is a problem. (Capability unit I–1; woodland group 3a)

Palmyra gravelly loam, 3 to 8 percent slopes (PgB).—This soil has the profile described as typical of the series. It occupies gently sloping or gently undulating terraces. The slopes are generally short. Some are smooth and uniform, and some are complex and undulating. Erosion in cropped areas is generally slight; it is moderate in only a few small areas.

This soil can be used for crops, pasture, and forest. It is well suited to most crops, including vegetables and fruit.

Maintenance of fertility is the main management problem. Only a little lime is needed, but complete fertilizer is needed for most crops, and the response is excellent. Practices that conserve moisture are important. Control of erosion generally is needed only on the intensively cropped areas.

Slope and gravel are the main limitations to most nonfarm uses that require good drainage. As a source of sand and gravel, this soil is good to excellent, but lime cementation of the gravel is a problem. (Capability unit IIe–3; woodland group 3a)

Palmyra gravelly loam, 8 to 15 percent slopes (PgC).—This soil is shallower to calcareous gravel and sand than is typical of the series. Most areas have short, complex or irregular slopes. A few small areas that have smooth slopes were included in mapping. Erosion on most cropped areas ranges from slight to severe within short distances, and there are deposits of eroded material in sags and depressions. The lower depressions contain small areas of moderately well drained Phelps soils, which were the dominant inclusions in mapping, but these soils seldom exceed 5 percent of any area.

This soil can be used for crops, pasture, or forest. It is better suited to hay and forage than to other crops and is especially well suited to deep-rooted legumes. Control of erosion is the main management problem. Because contouring is impossible or impractical, erosion is best controlled by keeping this soil in hay or sod crops. Moderately large applications of fertilizer are needed for these crops, and the fertilization aids in controlling erosion by producing a good protective cover. Deep-rooted legumes are responsive to phosphorus and potassium. The need for lime ranges from none to moderate. If plowing is necessary in order to reseed, the plowing should be across the slope if possible, and strips of sod should be left to control runoff and erosion.

Slope and gravel are the main limitations to most nonfarm uses. This soil is good to excellent as a source of sand and gravel, but lime cementation of the gravel is a problem. If used as a source of sand and gravel, this soil can be reclaimed and made productive of many kinds of crops, provided care is taken in removing and replacing the topsoil and subsoil. The gravel should be removed to the level of the water table, and the subsoil and topsoil replaced in the proper order and smoothed. (Capability unit IVe–12; woodland group 3a)

Palmyra soils, 15 to 25 percent slopes (PmD).—Any area of this undifferentiated unit may consist mostly of Palmyra gravelly loam or of Palmyra gravelly sandy loam, but most areas consist of both soils. These soils generally are shallower to calcareous sand and gravel than the soil described as typical of the series. The moderately steep slopes are simple and face in one general direction. The hilly slopes are complex and face in several directions within short distances. The degree of erosion varies considerably. The sharper faces of slopes are severely eroded, and the eroded material has been deposited in depressions and sags.

These soils can be cropped, but they are better suited to pasture or forest. Farm machinery is difficult to use on the steep slopes, and erosion is a severe hazard if these soils are plowed. Deep-rooted legumes are the most suitable hay crops.

Because of rapid permeability, these soils have low moisture-holding capacity and are droughty. Runoff is rapid, especially during periods of alternate freezing and thawing. The supplies of nitrogen and potassium are especially low, and the supply of phosphorus is moderate. Phosphorus and potassium are needed for even a moderate response from legumes. Some lime is needed in places. Plowing to reseed pasture or hay crops should be in strips across slopes wherever possible.

Slope and gravel are the main limitations to most nonfarm uses. These soils are generally a good source of sand and gravel, but lime cementation of the gravel is a problem. (Capability unit IVe-12; woodland group 3b)

Palmyra, Howard and Alton soils, 25 to 40 percent slopes (PnE).—Any area of this undifferentiated unit may consist of any one of these soils or a combination of them. Individual areas, however, generally consist mostly of one soil. The Palmyra soil is the most extensive and is scattered throughout the county. The Howard soil generally occurs at the higher elevations in the southern part of the county. Alton soils are on old gravel bars and beaches of post glacial lakes in the northern third of the county.

Each soil has a profile like the one described for its series, except for a shallower depth to stratified gravel and sand and a thinner, less clayey subsoil. Also, the texture of the surface layer varies more. It is predominantly gravelly loam or gravelly sandy loam, but small, gravel-free areas adjoin small, very gravelly areas. Erosion ranges from slight to severe in plowed areas. The slopes are generally short and complex.

These soils are so steep that the use of farm machinery is difficult or hazardous. They have rapid permeability and limited moisture-holding capacity. Consequently, they are droughty. Runoff is rapid, especially during periods of alternate freezing and thawing. Slope limits the use of these soils. They can be used for pasture but generally are better suited to forest. They are unproductive of pasture unless they are kept in deep-rooted legumes and are limed and fertilized.

Slope and gravel are the main limitations to most nonfarm uses. These soils are good sources of sand and gravel. (Capability unit VIe-1; woodland group 17b)

Peat and Muck

Peat and Muck is a mixture of woody, grassy, and sedgy material that is very strongly acid to alkaline. It is in very low depressions where water stands on or near the surface and limits oxidation. Peat and Muck is inextensive and occurs as scattered areas throughout the northern half of the county.

One of the more common profiles in an area of Peat and Muck:

1—0 to 17 inches, black (N 2/0 to 5YR 2/1) muck containing numerous reed and sedge fragments; moderate, coarse, granular structure; very friable; very numerous fine and medium roots; slightly acid; diffuse, wavy boundary. 12 to 20 inches thick.

2—17 to 30 inches, mixed black (5YR 2/1) muck and reddish-brown (5YR 4/3) peat containing very numerous reed and sedge fragments; weak, coarse, granular structure; very friable; no roots below a depth of 18 inches; slightly acid; diffuse, wavy boundary. 10 to 16 inches thick.

3—30 to 60 inches, very dark gray (5YR 3/1), reddish-gray (5YR 5/2), and reddish-brown (5YR 4/3) peat containing very numerous reed fragments; weak, coarse, granular structure; very friable; no roots; slightly acid.

The depth of the organic material ranges from 24 inches to many feet. There is a surface layer of well-decomposed, mucky material as much as 20 inches thick. Below a depth of 30 inches are fibrous remnants of partly decomposed plants, generally reeds and sedges. The reaction ranges from extremely acid to neutral. The underlying mineral soil is generally sand, but may be silt, clay, or a mixture of these.

Peat and Muck (0 to 1 percent slopes) (Pu).—This undifferentiated unit consists of organic soil, Peat and Muck. Much of the acreage is in such low, wet areas that it is too wet for even water-tolerant trees and supports only water-tolerant shrubs. It is extremely acid to neutral in reaction. Some areas have a very dark colored to black, mucky surface layer up to 20 inches thick. Other areas have strongly acid to very strongly acid muck ranging from 1 foot to many feet in thickness. Where the organic deposit is more than 3 feet thick, it generally has a muck surface layer 12 to 30 inches thick over strongly acid, brown or red, fibrous peat. Some of this muck is underlain by gray, rubbery sedimentary peat. Water-tolerant trees and low-bush and high-bush blueberries grow in these areas.

Peat and Muck is too wet and too acid to be farmed. It is better suited to woods and wildlife. Some areas are good sites for wildlife marshes and ponds, and one small area is a commercial source of peat. (Capability unit VIIw-1; woodland group 20)

Phelps Series

The Phelps series consists of deep, moderately well drained soils that formed in calcareous glacial outwash derived from limestone, sandstone, and shale. These soils are in moderately low, level outwash areas that have a moderately high water table during wet seasons.

A typical profile in a cultivated area has a dark grayish-brown gravelly silt loam plow layer about 9 inches thick. Just below the plow layer is a thin, leached layer of friable, grayish-brown to brown gravelly silt loam to gravelly loam. The subsoil is at a depth of 12 inches. The upper part of it is dark yellowish-brown, friable gravelly heavy silt loam or loam that is mottled. The part below a depth of 20 inches is dark-gray to dark grayish-brown, prominently mottled gravelly sandy loam. The subsoil is neutral in the upper part to weakly calcareous over the substratum. The substratum is at a depth of about 28 inches and consists of calcareous, stratified sand and gravel.

Typical profile of Phelps gravelly silt loam in a cultivated field:

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) gravelly silt loam; moderate, medium and coarse, granular structure; friable when moist, nonsticky when wet; very numerous fine and medium roots; neutral; abrupt, wavy boundary. 7 to 10 inches thick.

A2—9 to 12 inches, grayish-brown (10YR 5/2) to brown (10YR 5/3) gravelly silt loam to gravelly loam;

weak, coarse, granular structure; friable when moist, nonsticky when wet; numerous fine and medium roots; neutral; clear, wavy boundary with thin fingers extending around peds in upper 2 inches of underlying horizon. 2 to 5 inches thick.

B2t—12 to 20 inches, dark yellowish-brown (10YR 4/4) gravelly heavy silt loam or gravelly heavy loam; common, medium, distinct, yellowish-brown (10YR 5/6) and light brownish-gray (10YR 6/2) mottles; moderate, fine and medium, subangular blocky structure; friable when moist, slightly sticky when wet; brown to dark-brown (10YR 4/3) ped faces; discontinuous clay film in pores and on ped faces; many fine and medium roots; many medium and coarse pores; neutral; clear, wavy boundary. 6 to 16 inches thick.

IIB3—20 to 28 inches, dark-gray (10YR 4/1) to dark grayish-brown (10YR 4/2) gravelly sandy loam high in silt and clay; common, large, distinct and prominent mottles of yellowish brown (10YR 5/6), strong brown (7.5YR 5/6), and light gray (10YR 7/1); very weak, medium and coarse, subangular blocky structure; friable when moist, slightly sticky when wet; common fine roots; weakly calcareous; clear, wavy boundary. 5 to 10 inches thick.

IIIC—28 to 48 inches, gray (10YR 5/1) to grayish-brown (10YR 5/2), stratified, water-sorted sand and gravel; single grain; very friable to loose; strongly calcareous.

The thickness of the solum ranges from 20 to 40 inches. The depth to carbonates ranges from 20 to 40 inches or more.

The A horizon ranges from fine sandy loam to gravelly silt loam in texture and has a gravel content ranging from a few pebbles to 35 percent by volume. The gravel ranges from fine to cobble in size. The Ap horizon ranges from nearly black to dark brown in color, depending on organic content and material.

The B2t horizon ranges from fine sandy loam to gravelly coarse silty clay loam in texture, from 18 to 35 percent in clay content, and from 5 to 35 percent in gravel content by volume. The color is predominantly brown to yellowish brown but ranges from reddish brown to light olive brown.

Phelps soils are in a drainage sequence with well-drained Palmyra and somewhat poorly drained Fredon soils. They are also in a drainage sequence with well-drained Alton, Howard, and Wampsville soils. Unlike the well-drained soils, however, Phelps soils are mottled at a depth of 12 to 18 inches. They have a browner, less mottled B horizon than the somewhat poorly drained soils. Phelps soils differ from Collamer and Galen soils in having formed in well-sorted, stratified sand and gravel deposited by flowing water rather than in poorly sorted, lacustrine silt and fine sand deposited by still water. Phelps soils are similar to Lima and Hilton soils, which also formed in glacial till.

Phelps gravelly silt loam (0 to 3 percent slopes) (Pv).—This soil occurs mostly as somewhat low, level areas on gravelly terraces that have a seasonal moderately high water table. Included in mapping were somewhat poorly drained Fredon, Niagara, and Minoa soils in slightly lower depressions or along narrow drainageways. Also included were a few small areas that have a slope of as much as 8 percent, where there is seasonal seepage.

Though this soil is moderately extensive, most areas are small and are widely scattered throughout the county. It is commonly associated with Palmyra, Howard, Alton, and Wampsville soils. The texture is generally gravelly silt loam or gravelly loam, but areas of sandy loam and fine sandy loam were included in mapping. These sandy areas contain more gravel than the sandy, lake-deposited Galen and Minoa soils. Where this Phelps soil occurs with Alton soils, it has a gravelly sandy loam surface layer. Where it occurs with Wampsville soils, it has more clay in the subsoil and more red and greenish clay shale fragments.

This soil is suited to crops, pasture, and forest. It is less well suited to deep-rooted crops than associated well-drained soils, but it produces good yields of corn, beans, and other annual crops. Maintaining fertility is the main management problem. A complete fertilizer is needed for most crops, and they respond well to it. The need for lime ranges from none to moderate. Random drainage of the wet spots improves some fields.

Seasonal wetness and gravel are the main limitations to nonfarm use. The fluctuating water table generally is a limitation to pond sites. (Capability unit IIw–6; woodland group 3a)

Riga Series

The Riga series consists of well drained and moderately well drained soils that are medium textured to moderately fine textured. These soils formed in congeliturbate or residuum of soft, fine-textured, alkaline and calcareous, greenish-gray Salina shale. Riga soils are intermingled with Lairdsville soils in a belt up to a mile wide extending east and west across the county, south of the Seneca River through Weedsport and Port Byron, where the Salina shale outcrops.

A typical profile in a cultivated area has a dark grayish-brown silt loam plow layer about 7 inches thick. This is underlain by a thick, leached layer of friable, brown to yellowish-brown silt loam. The subsoil is at a depth of 14 inches. The upper part of it is firm, brown to dark-brown heavy clay loam or heavy silty clay loam. Below a depth of 17 inches it is light olive-gray to light-gray, firm heavy clay loam that has a few prominent mottles of yellowish brown. The subsoil is neutral in reaction. Soft, gray and reddish-brown shale bedrock is at a depth of about 29 inches. It is mildly alkaline.

Typical profile of Riga silt loam, 2 to 6 percent slopes, in a cultivated field:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine and medium, subangular blocky structure; friable; many fine roots; common worm channels; neutral; clear, wavy boundary. 6 to 8 inches thick.

A2—7 to 14 inches, brown (7.5YR 5/4) to yellowish-brown (10YR 5/4) silt loam; moderate, medium, subangular blocky structure; friable; many fine roots; common worm channels; slightly acid; clear, wavy boundary. 3 to 8 inches thick.

IIB21t—14 to 17 inches, brown to dark-brown (7.5YR 4/4) heavy clay loam to heavy silty clay loam; moderate, thick, platy structure breaking to moderate, medium and coarse, blocky structure; firm when moist, sticky when wet; common roots among ped faces; thin, patchy, brown (7.5YR 5/4) to yellowish-brown (10YR 5/4) silt films on some vertical faces; many light-gray (5Y 7/2) to pale-olive (5Y 6/4), weathered shale fragments; neutral; clear, wavy boundary. 2 to 4 inches thick.

IIB22t—17 to 29 inches, light olive-gray (5Y 6/2) to light-gray (5Y 7/2) heavy clay loam; few, prominent, yellowish-brown (10YR 5/4) mottles; moderate and strong, coarse, blocky structure; firm when moist, sticky when wet; few roots along ped faces; prominent, brown to dark-brown (7.5YR 4/3–10YR 4/3) clay coats on horizontal and vertical ped faces; many weathered shale fragments of light gray to pale olive and few fragments of reddish brown;

neutral; gradual, wavy boundary. 9 to 20 inches thick.

R—29 to 60 inches, beds of light olive-gray (5Y 6/2) to light-gray (5Y 7/2) and reddish-brown (5YR 4/3–2.5YR 4/3) clay shale bedrock; soft and easy to penetrate in upper 24 inches but becomes harder with depth; mildly alkaline.

The thickness of the solum is 20 to 40 inches and generally is the same as the depth to bedrock. The content of coarse fragments, predominantly soft shale but including sandstone and limestone, ranges from a very few to about 35 percent and increases with depth. Some hard glacial gravel is present but is not conspicuous.

The color of the Ap horizon is mostly dark grayish brown but ranges from dark gray to olive gray. The texture ranges from gravelly loam to silty clay loam, and there are some very shaly areas. The color of the A2 horizon ranges from brown to olive gray, and there are a few faint mottles. The reaction is medium acid to mildly alkaline.

The B horizon ranges from dark brown to olive gray in color and from heavy silty clay loam to clay in texture. The clay content is 35 to 60 percent. The reaction is medium acid to mildly calcareous.

A neutral to weakly calcareous C horizon, with color and texture similar to the B horizon, is present in places. The underlying bedrock is soft, gray clay shale or intermixed strata of gray and red clay shale. In places there are thin layers of hard limestone.

Riga soils are similar to Lairdsville soils, which formed in soft, fine-textured, calcareous, red Salina shale and Vernon shale. Riga and Lairdsville soils are mapped in undifferentiated units in this county. Riga soils are in a drainage sequence with somewhat poorly drained Brockport soils.

Riga and Lairdsville silt loams, 2 to 6 percent slopes (RgB).—Most areas of this undifferentiated unit consist of both of these soils, but some areas consist mostly of one or the other. Each of these soils has the profile described as typical of its series. The underlying bedrock generally is made up of stratified, olive-gray and red shale, but in a few areas it consists almost wholly of either gray or red shale.

These soils generally are on gentle, convex knolls and crests that receive little or no runoff from adjacent areas. Most areas are small to medium in size and have uniform slopes; a few areas have gently undulating slopes. Included in mapping were Cazenovia soils, which are more than 40 inches thick over shale bedrock. Also included were Brockport and Lockport soils in small depressions and along bottoms of narrow drainageways. These wetter soils occupy no more than 10 percent of any given area, but they delay field operations in spring. The texture is generally silt loam, but spots of loam with some gravel and spots of clay loam or clay were included in mapping.

These soils are suited to crops, pasture, and forest. They require careful management. The surface soil clods readily, and rotations that include hay crops more than 50 percent of the time are needed to maintain soil structure. Controlling erosion is important because the loss of topsoil exposes the very clayey subsoil, which is difficult to manage. Drainage also is important. Random drainage of the wet spots improves many fields. Complete fertilizer is needed. Nitrogen is usually in short supply early in the season. The supply of potassium is sufficient for moderate yields. The need for lime ranges from none to moderate.

Slow permeability, seasonal wetness, slope, shallowness to bedrock, and texture are limitations to most nonfarm uses. (Capability unit IIe–8; woodland group 2a)

Riga and Lairdsville silty clay loams, 6 to 12 percent slopes, eroded (RlC3).—Most areas of this undifferentiated unit consist of both of these soils, but some areas consist mostly of one or the other. Except for the silty clay loam surface layer, each soil has a profile like the one described for its series. The clay content is one of the highest of the soils in the county. The bedrock generally is composed of stratified, olive-gray and red shale, but in a few areas it is almost entirely one or the other.

These soils occupy short, convex slopes or side slopes and receive considerable runoff from the higher, more nearly level Riga and Lairdsville soils. The erosion is generally severe but is quite variable. It ranges from none or slight in unplowed wooded areas to very severe where gullies extend into the clay shale. Some areas have received deposits of the eroded material. The texture of the surface layer is clay loam or clay in severely eroded areas and silt loam, loam, or coarse silty clay loam in uneroded areas. Included in mapping were Cazenovia soils, which are more than 40 inches thick over bedrock. Also included were small, wet pockets of Brockport and Lockport soils. Though inextensive, these wet soils delay tillage in spring.

These Riga and Lairdsville soils can be used for crops, pasture, and forest. Because of rapid runoff, the hazard of further erosion, and the poor condition of the plow layer, they are better suited to hay and pasture than to tilled crops. Intensive practices are needed to control runoff and erosion and to maintain fertility and structure. Limited tillage is desirable. Complete fertilizer is needed for even a moderate response from crops. Nitrogen, especially, is deficient. The occasional wet spots need drainage.

Slow permeability, slope, texture, shallowness to bedrock, and seasonal wetness are limitations to nonfarm use. (Capability unit IVe–7; woodland group 2a)

Romulus Series

The Romulus series consists of deep, poorly drained, moderately fine textured soils that formed in medium to moderately fine textured till consisting of reddish clay, limestone, and shale.

A typical profile in a cultivated area has a very dark gray coarse silty clay loam plow layer about 9 inches thick. The subsoil extends to a depth of 30 inches and consists of firm to very firm coarse silty clay loam. It is grayish brown in the upper few inches and brown to light brown below. The entire subsoil is distinctly mottled. It is slightly acid to neutral and grades to weakly calcareous just above the substratum. The very firm, dense substratum is calcareous, brown silty clay loam till mottled with pinkish gray.

Typical profile of Romulus silty clay loam, in a cultivated field:

Ap—0 to 9 inches, very dark gray (10YR 3/1) coarse silty clay loam; gray (10YR 5/1) when dry; medium and fine, subangular blocky structure; friable when moist, slightly sticky when wet; many fine roots; slightly acid; abrupt, smooth boundary. 8 to 9 inches thick.

B21tg—9 to 13 inches, grayish-brown (10YR 5/2) coarse silty clay loam; many (30 percent), medium, distinct mottles of light olive brown (2.5Y 5/6) and yellowish brown (10YR 5/6); moderate to strong, fine and medium, blocky structure; firm when moist, plastic when wet; few patchy clay films on light brownish-gray to light-gray (10YR 6/2–6/1) ped faces; common fine roots; slightly acid; clear, wavy boundary. 2 to 5 inches thick.

B22tg—13 to 21 inches, brown (7.5YR 5/2) coarse silty clay loam; common, fine, distinct mottles of brown (7.5YR 5/4), strong brown (7.5YR 5/6), and pinkish gray (7.5YR 6/2); moderate, coarse, prismatic structure breaking to strong, coarse, blocky structure; firm when moist, plastic when wet; light-brown (7.5YR 6/3) to pinkish-gray (7.5YR 6/2) ped faces; few fine roots; 25 percent of ped surface covered by patchy clay film; neutral; clear, wavy boundary. 6 to 12 inches thick.

B23tg—21 to 30 inches, brown (7.5YR 5/2) to light-brown (7.5YR 6/3) coarse silty clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/6), strong brown (7.5YR 5/6), and pinkish gray (5YR 6/2); moderate, coarse, prismatic structure breaking to strong, coarse, blocky structure; very firm; pinkish-gray (7.5YR 6/2) ped faces; 60 percent of ped surface has thin clay film; slightly calcareous below a depth of 28 inches; clear, wavy boundary. 2 to 15 inches thick.

Cg—30 to 50 inches, brown (7.5YR 4/2) silty clay loam; common, medium, distinct, pinkish-gray (7.5YR 6/2) mottles; weak, very thick, platy structure; very firm in place; calcareous.

The thickness of the solum, or the depth to firm platy till without blocky or prismatic structure ranges from 24 to 40 inches. The depth to carbonates is commonly the same as the thickness of the solum, but the lower 2 to 6 inches of the B horizon is calcareous in some pedons. The reaction of the solum is slightly acid to neutral.

The color of the Ap or A1 horizon ranges from black to dark gray, and the texture from silt loam to silty clay loam. The thickness of the A1 horizon in undisturbed areas ranges from 5 to 7 inches.

The color of the B horizon ranges from brown to reddish gray, the texture from light silty clay loam to clay loam, and the clay content from 28 to 35 percent.

Romulus soils are in a drainage sequence with well drained and moderately well drained Cazenovia, somewhat poorly drained Ovid, and very poorly drained Alden soils. Romulus soils have a finer textured Bg horizon than Lyons soils. They differ from Lakemont and Madalin soils in having formed in mixed, clayey glacial till that has a wider distribution of particle size, rather than in pure lacustrine clay or clay and silt.

Romulus silty clay loam (0 to 3 percent slopes) (Ro).—This level or very gently sloping soil adjoins Ovid and Cazenovia soils from which it receives considerable runoff. Only a few small areas have a slope greater than 2 percent. Included in mapping were Ovid soils on slight rises or knolls and small, wet pockets of very poorly drained Alden or Fonda soils. The wetter soils occupy no more than 10 percent of any area, but they delay tillage or require deeper placement of drains.

Undrained, this soil is used mainly for pasture or woods. The wetter areas in cultivated fields have been drained, but not enough for intensive use.

Drainage is the main problem. Drains must be closely spaced in this slowly permeable soil, and land shaping is commonly needed. Even after drainage, careful management is needed to prevent clodding. If these needs are met, this soil is suited to corn, beans, and other annual crops, and it could be suitable for sugar beets. Drained areas need only a little lime, a moderate amount of phosphorus, and a small amount of potassium. Nitrogen is deficient in spring but may be adequate for most crops by midsummer.

Prolonged wetness, slow permeability, and texture are the main limitations to nonfarm uses, except for ponds and wildlife marshes. (Capability unit IVw-1; woodland group 18)

Schoharie Series

The Schoharie series consists of deep, well drained and moderately well drained, fine-textured soils that formed in reddish lacustrine clay and silty clay. These soils are on the lake plain, mainly along Cayuga Lake, from Farleys Point north to the head of the lake, and for several miles north of the lake along the Seneca River. A wide arm of this area extends eastward nearly to Auburn, just north of the Onondaga limestone escarpment. Another large area occurs at the northern end of Owasco Lake and along Owasco Outlet to the vicinity of Throop. Scattered areas are on and just north of the Onondaga limestone escarpment east of Auburn. Other scattered areas, where the color ranges toward gray or brown, are in the valleys of the larger streams in the southern half of the county.

A typical profile in a cultivated area has a very dark gray to dark reddish-brown plow layer of heavy silt loam. This layer extends to a depth of 6 inches and overlies a 1-inch leached layer of pinkish-gray silt loam. This pinkish-gray material fingers around blocks of reddish-brown to brown silty clay loam in the top few inches of the subsoil. Below a depth of 9 inches the subsoil is reddish-brown, firm to very firm clay to silty clay loam. The reaction grades from neutral in the upper part to weakly calcareous just above the substratum. The substratum is at a depth of about 29 inches. It consists of firm, reddish-brown silty clay loam to silty clay and is very strongly calcareous.

Typical profile of Schoharie silt loam, 2 to 6 percent slopes, in a cultivated field:

Ap—0 to 6 inches, very dark gray (5YR 3/1) to dark reddish-brown (5YR 3/2) heavy silt loam; dark brown (7.5YR 3/2) if crushed and rubbed; strong, very fine, fine, and medium, granular structure; friable to firm; neutral; many fine and medium roots; abrupt, wavy boundary. 4 to 9 inches thick.

A2—6 to 7 inches, pinkish-gray (7.5YR 7/2) heavy silt loam; strong, medium and coarse, subangular blocky and blocky structure; firm when moist, slightly sticky when wet; pinkish-gray (7.5YR 6/2–7/2) ped faces; many fine roots along ped faces; common fine and medium pores; neutral; discontinuous horizon with abrupt, wavy boundary and thin tongues extending into horizon below. 0 to 2 inches thick. In places this horizon has been mixed with the plow layer.

B&A—7 to 9 inches, reddish-brown (5YR 5/3) to brown (7.5YR 5/3) silty clay loam with thin interfingers of pinkish-gray (7.5YR 6/2) heavy silt loam (10 percent of cross section); strong, medium and coarse, blocky and subangular blocky structure; firm when moist, sticky when wet; many fine roots along ped faces; common fine and medium pores; discontinuous clay film in larger pores; neutral; discontinuous horizon with wavy boundary. 2 to 8 inches thick. In places part of this horizon has been mixed with the plow layer.

B21t—9 to 18 inches, reddish-brown (5YR 4/3–4/4) clay or silty clay; strong, fine and medium, blocky structure; firm to very firm when moist, sticky and plastic when wet; common fine roots along ped faces; few fine and medium pores; distinct clay film in pores; mildly alkaline; dark reddish-gray (5YR 4/2) to reddish-brown (5YR 4/3) clay film on all ped faces; gradual, wavy boundary. 5 to 10 inches thick.

B22t—18 to 29 inches, reddish-brown (5YR 4/3) heavy silty clay loam to coarse silty clay; strong, coarse, blocky structure breaking to moderate, fine and medium, blocky structure; firm to very firm when moist, sticky and plastic when wet; common fine roots along ped faces; few fine and medium pores; distinct clay film in pores; reddish-brown (5YR 4/3–5/3) clay film on all ped faces; old root channels filled with gray (N 5/0) clay lining; mildly alkaline grading to weakly calcareous in lower part; gradual, wavy boundary. 5 to 12 inches thick.

C—29 to 40 inches, reddish-brown (5YR 4/3) heavy silty clay loam to coarse silty clay; moderate and strong, medium, thick, and very thick, platy structure breaking to weak, fine and medium, blocky structure; firm when moist, sticky and plastic when wet; few fine roots along block and plate faces; dark reddish-gray (5YR 4/2) to reddish-brown (5YR 4/3) clay film and variable white (5YR 8/1), pinkish-white (5YR 8/2), and light-gray (5YR 7/1 and 6/1) lime coating on ped faces; very strongly calcareous. Varving appears with depth.

The thickness of the solum ranges from 20 to 40 inches. The texture of the A horizon is mainly heavy silt loam but ranges from very fine sandy loam to coarse silty clay loam. The coarser texture occurs where there is an overlay of very fine sand or silt. The reaction of the surface layer in unlimed areas ranges from pH of 6.0 to 7.2.

The texture of the B horizon is normally coarse silty clay but ranges from heavy silty clay loam to clay, and in places there are thin layers of silt in the B horizon. The clay content ranges from 35 to 55 percent. The color is reddish brown to dark brown. In the wetter half of the drainage range, the B horizon contains a few to common, faint to distinct, fine to medium mottles of high chroma. The reaction ranges from a pH of 6.5 to 8.4.

The C horizon consists of silty clay and thin layers of silt, but below a depth of 40 inches in places it grades to nonconforming outwash sand and gravel or glacial till.

Schoharie soils are in a drainage sequence with somewhat poorly drained Odessa, poorly drained Lakemont, and very poorly drained Fonda soils. The red color of Schoharie soils masks the mottling that indicates only moderately good drainage. These soils have a finer textured B horizon than Dunkirk and Collamer soils. They also have a finer textured B horizon than Cazenovia soils, which also formed in lacustrine clay intermixed with glacial till.

Schoharie silt loam, 2 to 6 percent slopes (SeB).—This soil has the profile described as typical of the series. The surface layer or plow layer generally is heavy silt loam, but in some areas it is coarser silt loam, and in moderately eroded areas it is coarse silty clay loam.

The more smoothly sloping areas have moderately long to short slopes that are convex at the top and grade to concave in fairly straight drainageways. The undulating areas have short, convex slopes separated by narrow, concave, irregular drainageways and depressions.

Included in mapping were somewhat poorly drained Odessa soils along narrow drainageways or in depressions. These wetter soils occupy no more than 15 percent of any area but delay fieldwork in spring and hamper harvest during a wet fall. Also included were spots of poorly drained Lakemont soils where water ponds in the drainageways. Other common inclusions were spots of silty Dunkirk, Collamer, and Cazenovia soils where the lake-deposited clay is thin over firm glacial till. Many farmed areas are moderately eroded, and the upper part of the more clayey subsoil has been mixed with the plow layer. Small clay spots are common where there is severe erosion, especially on the steeper, undulating slopes. The drainageways and depressions commonly contain deposits of the eroded material.

This soil is suited to crops, pasture, and forest, but it is better suited to hay and pasture than to row crops. Maintaining good structure and controlling erosion are the main problems. Careful management is needed to prevent clodding or severe crusting. Preparing a good seedbed is difficult. Water is absorbed slowly. Consequently, runoff is moderately rapid, and erosion is a continuing hazard. Random drainage improves most fields. The lime requirement is none to slight, but complete fertilizer is needed. Nitrogen is deficient in spring. Though the supply of potassium is high, the amount that is readily available may be deficient for some crops.

Seasonal wetness, slow permeability, and texture are the main limitations to most nonfarm uses. (Capability unit IIe–8; woodland group 2a)

Schoharie silty clay loam, 6 to 12 percent slopes (ShC).—This soil has a profile similar to the one described for the series. Most of the cropped areas are severely eroded. Consequently, the plow layer contains some of the more clayey subsoil material and now has a higher clay content than is typical. Also because of erosion, this soil is shallower to the calcareous material. A few small areas are still wooded or in unplowed pasture. These areas are uneroded or only slightly eroded and have a silt loam or coarse silty clay loam surface layer.

Generally, the slopes are short, convex, and irregular and are separated by narrow, crooked drainageways. Only a few small areas have smooth, simple slopes. Erosion ranges from severe to none and is quite variable in individual fields. 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 are moderately to slightly eroded; and the lowest parts of drainageways and sags commonly contain deposits of the eroded material. Included in mapping were Odessa soils along drainageways and poorly drained Lakemont soils where water ponds in the drainageways. These wetter soils occupy no more than 15 percent of any area but delay fieldwork in spring.

This soil can be used for crops, pasture, and forest. Because of the complex slopes, the continuing erosion hazard, and the poor condition of the surface layer, it is better suited to hay and forage than to row crops.

If this soil is used for row crops, intensive control of runoff and erosion is needed, along with maintenance of good soil structure. Preparing a good seedbed in this soil when the moisture is right requires almost precision timing. Complete fertilizer is needed for even a moderate response from crops. Little or no lime is needed. Random drainage of the wet spots improves some fields.

Slow permeability, slope, texture, and seasonal wetness are limitations to most nonfarm uses. (Capability unit IVe–7; woodland group 2a)

Schoharie silty clay loam, 12 to 20 percent slopes (ShD).—Erosion has removed much of the original surface layer of this soil. Consequently, the plow layer is a mixture of the remaining surface layer and subsoil material, and the texture is now silty clay loam. In some severely eroded spots, the plow layer is silty clay or clay. A few forested and uneroded, cleared spots still have a silt loam surface layer.

This soil is inextensive in Cayuga County. Most of it is on the lower valley sides of Owasco Inlet south of Moravia. Some of it is on the strongly dissected part of the lake plain along Cayuga Lake, between Union Springs and Cayuga. Most areas are cut by many moderately deep to deep drainageways and have very irregular slopes; only a few areas have smooth slopes. This soil receives considerable runoff from less strongly sloping Schoharie soils. Included with it in mapping were somewhat poorly drained Odessa soils along drainageways and poorly drained Lakemont soils where water ponds in the drainageways.

This soil can be used for hay, pasture, and forest. It is well suited to deep-rooted legumes. Continuing erosion is a hazard, and droughtiness is a problem because much water is lost through runoff. If well managed, this soil is moderately productive of hay and forage. If it is plowed for reseeding, plowing should be on the contour, and strips of sod left to control runoff. The need for lime ranges from none to little. Phosphorus and potassium are needed for legumes, and in addition nitrogen is needed for other crops.

Slope, slow permeability, and texture are the main limitations to most nonfarm uses. (Capability unit VIe-1; woodland group 2a)

Scriba Series

The Scriba series consists of deep, medium-textured, somewhat poorly drained soils that have a fragipan. These soils formed in neutral to weakly calcareous, medium-textured till derived mostly from red sandstone of the Medina and Oswego formations. The small content of lime is derived from small amounts of limestone or from lime-bearing strata of the sandstone. Limestone fragments are rare in these soils. There are conspicuous amounts of foreign stones, however, mostly quartzite, gneiss, and granite. Scriba soils are in the extreme northern part of the county.

A typical profile in a cultivated area has a very dark grayish-brown gravelly loam plow layer about 9 inches thick. Just below the plow layer is a slightly firm, leached layer of grayish-brown to brown gravelly fine sandy loam that is distinctly mottled. The subsoil is at a depth of 13 inches. It is a very firm, dense fragipan consisting of brown, distinctly mottled gravelly and stony fine sandy loam. The reaction is slightly acid from the surface layer through the upper part of the fragipan, or to a depth of about 30 inches. The lower part of the fragipan is neutral. The substratum of very firm, dense till is at a depth of 48 inches. It consists of calcareous, brown, faintly mottled gravelly and stony fine sandy loam.

Typical profile of Scriba gravelly loam in a cultivated field:

Ap—0 to 9 inches, very dark grayish-brown (10YR 3/2) gravelly loam; moderate, medium and coarse, granular structure; friable when moist, nonsticky when wet; many fine roots; 15 to 20 percent coarse fragments; slightly acid; abrupt, smooth boundary. 6 to 10 inches thick.

A2—9 to 13 inches, grayish-brown (10YR 5/2) to brown (7.5YR 5/2) gravelly fine sandy loam; many, medium, distinct mottles of yellowish brown (10YR 5/6) to strong brown (7.5YR 5/6); few light-gray (10YR 7/2) mottles in the lower 2 inches; very weak, medium, platy structure; slightly firm when moist, nonplastic when wet; common fine roots; 20 percent coarse fragments; slightly acid; abrupt, irregular boundary. 3 to 8 inches thick.

Bx1—13 to 30 inches, brown (7.5YR 5/3) gravelly fine sandy loam; many, medium, distinct mottles of dark yellowish brown (10YR 4/4) to strong brown (7.5YR 5/6); common, medium and large, distinct mottles of pinkish gray (7.5YR 7/2); strong prisms, 4 to 10 inches across, grading to weak with depth; prisms separated by wedge-shaped fingers of friable, grayish-brown (10YR 5/2) fine sandy loam; fingers are ¼ to 1 inch wide at top and taper to a film at bottom; fingers have a ⅛-inch to ¼-inch border of strong-brown (7.5YR 5/6) to yellowish-brown (10YR 5/6) fine sandy loam; very firm when moist, nonplastic when wet; roots only between prisms; many fine pores with clay lining inside prisms; no clay skin on prism faces; 25 percent coarse fragments; slightly acid; diffuse boundary. 15 to 25 inches thick.

Bx2—30 to 48 inches, brown (7.5YR 5/2) gravelly and stony fine sandy loam similar to that of Bx1 but lacking prismatic structure; common, medium, distinct mottles of yellowish brown (10YR 5/6) and few threadlike mottles of light gray (10YR 7/1); weak, thick, platy structure to massive; very firm; no roots; common fine pores with clay lining; 30 to 35 percent coarse fragments; neutral; clear, wavy boundary. 12 to 30 inches thick.

C—48 to 54 inches, brown (7.5YR 5/2) gravelly and stony fine sandy loam; common, fine and medium, faint to distinct, brown (10YR 5/3–7.5YR 4/4) mottles; moderate, medium, lenslike, overlapping plates; very firm; no roots; 30 to 35 percent coarse fragments; mildly calcareous.

The thickness of the solum and the depth to carbonates range from 36 to 72 inches. The depth to bedrock ranges from 40 inches to many feet and is commonly more than 6 feet. Coarse fragments make up 10 percent to 30 percent of the surface layer and 20 to 35 percent of the substratum.

The texture of the A horizon is mostly gravelly to very stony loam or fine sandy loam. The Ap horizon is very dark gray to dark brown. The A2 horizon is pinkish gray to brown and has many yellowish-brown, strong-brown, and gray mottles. The reaction ranges from slightly acid to strongly acid.

The Bx horizon, or fragipan, ranges from 2 to 5 feet in thickness, from firm to very firm in consistence, and from sandy loam to loam in texture. It is reddish gray to brown and has distinct mottles in the upper part that decrease in number and fade with depth. The reaction ranges from medium acid to neutral.

The C horizon is reddish, firm glacial till of sandy loam to loam texture. It is mildly alkaline to calcareous in reaction.

Scriba soils are in a drainage sequence with well drained Sodus, moderately well drained Ira, poorly drained Lyons, and very poorly drained Alden soils. They are also associated with Williamson, Niagara, and Canandaigua soils, all of which formed in lacustrine deposits and are silty. Scriba soils contain less lime than Appleton soils and have a fragipan. They are similar to Erie and Ellery soils in genetic profile development but are coarser textured because they formed in sandy till that contains much more foreign material than lacustrine deposits.

Scriba gravelly loam (0 to 3 percent slopes) (Sk).—This soil has the profile described as typical of the series. Only a few areas have slopes that exceed 3 percent. The many stone fences and stone piles indicate that this inextensive soil was once stony or very stony.

The large areas are broad, flat uplands on which surface water moves slowly. The small areas are slightly concave and receive runoff from better drained Ira and Sodus soils. Included in mapping were poorly drained Lyons and very poorly drained Alden soils in depressions or along drainageways where water is ponded. These wetter soils occupy no more than 15 percent of any area but delay fieldwork in spring and hamper harvest during a wet fall. Also included were Ira soils on slight rises or knolls.

This Scriba soil can be used for crops, pasture, and forest. Unless it is drained, however, it is better suited to water-tolerant grasses and legumes than to other crops. In wooded areas there is a high percentage of water-tolerant trees. Controlling water is the main problem. Systematic drainage requires very close spacing of drains because of the shallow, impervious fragipan. Random drainage of the wet spots improves some fields for hay crops. Structures that divert runoff from adjoining areas are beneficial. Careful selection of crops is important, for the high gravel content hinders tillage and harvesting of many crops. This soil is deficient in lime. It is especially deficient in nitrogen and potassium and has only a moderate supply of phosphorus. Complete fertilization is necessary for even a moderate response from crops.

Seasonal wetness, slow permeability, and gravel are the main limitations to most nonfarm uses. Most areas are good sites for ponds and wildlife marshes. (Capability unit IIIw–3; woodland group 13)

Scriba very stony loam (0 to 3 percent slopes) (Sm). Except for stoniness, this soil has a profile like the one described for the series. The stones and boulders are 1 to 10 feet apart.

The larger areas of this inextensive soil are broad, flat uplands on which surface water moves slowly. The smaller areas are slightly concave and receive runoff from better drained Ira and Sodus soils. Included in mapping were poorly drained Lyons and very poorly drained Alden soils in shallow depressions or sags where water is ponded. Also included were small spots of Ira soils on slight rises and knolls.

This soil is better suited to forest or to wildlife habitat than to crops. It is too stony for the use of farm equipment. Cleared areas can be used for pasture, but the pasture is brushy and of poor quality, and the stones prevent improvement.

Seasonal wetness, slow permeability, stones, and gravel are the main limitations to nonfarm use, but some areas are good sites for ponds and wildlife marshes. (Capability unit Vs–1; woodland group 13)

Sloan Series

The Sloan series consists of deep, poorly drained and very poorly drained, medium-textured soils that formed in alluvium derived from glacial drift soils, which are high to medium in lime content. These Sloan soils are on bottom lands along the larger streams and are flooded several times a year. They also have a high water table 6 to 10 months of the year.

A typical profile in a pasture has a very dark grayish-brown silt loam surface layer about 6 inches thick, in which there are many, distinct, reddish-brown root stains. The underlying subsoil of friable silt loam extends to a depth of 29 inches. The upper part of it is very dark grayish brown, but below a depth of 14 inches the color grades to very dark gray and is mottled. The substratum is friable to slightly firm, gray to dark-gray silty clay loam that has a few distinct mottles. The profile is neutral in reaction.

Typical profile of Sloan silt loam in a pasture:

A1 or Ap—0 to 6 inches, very dark grayish-brown (10YR 3/2) silt loam; many, fine and medium, distinct, dark reddish-brown (5YR 3/2) mottles in root channels; moderate, fine and medium, granular structure; friable when moist, nonsticky when wet; very numerous fine roots; neutral; abrupt to clear, wavy boundary.

B21g—6 to 14 inches, very dark grayish-brown (10YR 3/2) silt loam; many, fine and medium, distinct, dark reddish-brown (5YR 3/2 and 4/3) mottles in root channels; weak to moderate, coarse prisms breaking to weak to moderate, coarse, subangular blocks, which further break to moderate, fine and medium, subangular blocks; faint, discontinuous silt coats on vertical prism faces; friable when moist, nonsticky when wet; numerous fine roots; neutral; clear to gradual, wavy boundary.

B22g—14 to 29 inches, very dark grayish-brown (10YR 3/2) to very dark gray (10YR 3/1) silt loam; 18 to 25 percent clay; common, very coarse, distinct, light-brown (10YR 6/4) to yellowish-brown (10YR 5/4) leaf remnants; black (10YR 2/1) organic staining; few, fine, distinct, dark reddish-brown (5YR 3/2) mottles in root channels; moderate, coarse prisms breaking to weak, coarse, subangular blocks; friable when moist; very slightly sticky when wet; very dark grayish-brown (10YR 3/2) silt coats on prism faces; numerous fine roots; neutral; abrupt, wavy boundary.

IICg—29 to 40 inches, gray (N 5/0) to dark-gray (N 4/0), coarse silty clay loam, very high in silt; few, fine, distinct, olive-brown (2.5Y 4/4) and dark reddish-brown (5YR 3/4) mottles in root channels; weak to moderate, coarse prisms breaking to very weak, thick plates, which further break to very weak, coarse blocks; friable to slightly firm when moist, slightly sticky when wet; prominent silt coats on prism faces; common fine roots; neutral.

The texture is mainly silt loam, high in organic-matter content, but ranges from light silty clay loam to fine sandy loam. In places a few thin strata or lenses of clay and sand occur at a varying depth. The alluvium is 20 to 48 inches thick or more, and it generally is underlain by sand and gravel, by stream rubble, or by lacustrine sand, silt, or clay. In a few places it is underlain by firm basal till. The soil is strongly mottled from the surface downward.

Sloan soils are in a drainage sequence with well drained Genesee and moderately well drained Eel soils. They have a darker gray surface layer than Eel soils and have mottling above a depth of 10 inches. They lack the profile development of Canandaigua and Alden soils.

Sloan silt loam (0 to 2 percent slopes) (Sn).—This poorly drained or very poorly drained soil occupies the low, level areas or depressions of first bottom lands and is flooded several times a year, much of the time from slack water. Included with it in mapping were narrow areas of Eel and Genesee soils along streambanks.

Small to large areas of this soil are on nearly all of the wider bottom lands throughout the county. The largest area is at the foot of Owasco Lake along Owasco Inlet north of Moravia. Other large areas are along the Seneca River.

Unless drained, this soil is better suited to water-tolerant pasture or trees than to other crops. If drained and diked, however, it has a high potential for other crops.

Flooding and prolonged wetness are the main limitations to most nonfarm uses. Some areas are suitable for ponds and wildlife marshes. (Capability unit IIIw-4; woodland group 19)

Sodus Series

The Sodus series consists of deep, medium-textured, well-drained soils that have a fragipan. These soils formed in neutral to weakly calcareous, medium-textured till. Red sandstone is prominent and is the main rock constituent of the till, but there are conspicuous amounts of quartzite, gneiss, and granite in the form of gravel, cobbles, and boulders. Sodus soils are in the northern part of the county from Lake Ontario south to Ira Hill and Westbury. About a mile north of their southern boundary, these soils contain slightly more clay and shale.

A typical profile in a cultivated area has a dark grayish-brown gravelly loam plow layer about 7 inches thick. The upper subsoil extends to a depth of about 16 inches and is very friable, yellowish-brown gravelly very fine sandy loam. It is separated from the lower subsoil by a 4-inch, leached layer of firm, pale-brown gravelly very fine sandy loam. The lower subsoil is a very firm, dense fragipan. It grades from medium acid, brown gravelly loam in the upper part to slightly acid gravelly very fine sandy loam at a depth of about 30 inches. Equally dense till is at a depth of about 53 inches. It consists of dark-brown gravelly very fine sandy loam that grades from neutral in the upper part to calcareous below a depth of 73 inches.

Typical profile of Sodus gravelly loam, 2 to 8 percent slopes, in a cultivated field:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) gravelly loam; weak, medium, granular structure; friable; many fine roots; 20 percent coarse fragments; medium acid; abrupt, wavy boundary. 6 to 10 inches thick.

B2—7 to 16 inches, yellowish-brown (10YR 5/4-5/6) gravelly very fine sandy loam; very weak, fine, subangular blocky structure; very friable; common fine roots; many fine and medium pores; 30 percent coarse fragments; strongly acid; clear, wavy boundary. 4 to 12 inches thick.

A'2—16 to 20 inches, pale-brown (10YR 6/3) gravelly very fine sandy loam; moderate, medium, platy structure; firm; few fine roots; many fine pores; 20 percent coarse fragments; centers of plates brown (7.5YR 4/4); strongly acid; clear, wavy boundary. 2 to 6 inches thick.

B'x1—20 to 30 inches, dark-brown (7.5YR 4/4) gravelly loam; strong, very coarse (12 to 24 inches) prisms breaking to weak, medium and thick, plates; very firm; roots confined to spaces between prisms; many, fine, clay-lined pores and clayey spots with frayed edges in prism interiors; no clay skin on ped faces; prisms separated by wedge-shaped interfingering of A'2 material tapering from ¾ inch at top to film at bottom, light brownish gray (10YR 6/2) in color, fine sandy loam in texture; irregular-shaped bodies of similar material inside upper 6 inches of prisms; 25 percent coarse fragments; medium acid; diffuse boundary. 6 to 20 inches thick.

B'x2—30 to 53 inches, dark-brown (7.5YR 4/3) gravelly very fine sandy loam; a few vertical cleavage planes, 2 to 4 feet apart, divide the horizon into extremely large prisms; weak, medium, platy structure to massive within prisms; very firm; no roots; many, fine, clay-lined pores; a film of light brownish-gray (10YR 6/2) fine sand on prism faces; slightly acid; 30 percent coarse fragments; diffuse boundary. 10 to 30 inches thick.

C1—53 to 73 inches, dark-brown (7.5YR 4/3) gravelly very fine sandy loam; moderate, medium and thick, lens-like platy structure; very firm; no roots; few pores; 35 percent coarse fragments; slightly acid grading to neutral with depth; clear, wavy boundary. 0 to 24 inches thick.

C2—73 to 85 inches, dark-brown (7.5YR 4/3) gravelly very fine sandy loam similar to C1 horizon but calcareous.

The thickness of the solum ranges from 40 to 65 inches. The depth to carbonates ranges from 4 to 8 feet, the depth to bedrock from 40 inches to many feet, and the depth to the fragipan from 15 to 24 inches. Gravel and stones make up 10 to 35 percent of the surface layer and subsoil and 30 to 50 percent of the substratum. The clay content, between a depth of 10 and 40 inches, is 8 to 18 percent.

The texture of the Ap horizon ranges from fine sandy loam to silt loam, and the color ranges from very dark grayish brown to reddish brown. The reaction is strongly acid to neutral, depending upon the amount of lime that has been added. The B2 horizon ranges from fine sandy loam to silt loam, from yellowish brown to reddish brown, and from strongly acid to medium acid. The A'2 horizon ranges from sandy loam to loam, from light yellowish brown to reddish brown, and from strongly acid to medium acid. The B'x horizon, or fragipan, ranges from sandy loam to loam and from weak red to dark brown. It grades from medium acid to neutral with depth.

Sodus soils are in a drainage sequence with moderately well drained Ira, somewhat poorly drained Scriba, poorly drained Lyons, and very poorly drained Alden soils. Sodus soils lack the clayey B horizon common to Ontario soils and have a moderately well expressed to well expressed fragipan. They are sandier than Langford soils. They lack the distinct mottling in the B2 horizon above the fragipan that in common in Ira soils.

Sodus gravelly loam, 2 to 8 percent slopes (SoB).—This soil has the profile described as typical of the series. The range of slope is generally 5 to 8 percent, and the slopes are distinctly convex. Consequently, surface water runs off readily. Little or no runoff is received from adjacent areas. Many areas are the gently sloping tops of drumlins. The stone fences and piles of stones indicate that many areas were once stony or very stony.

Though this is the most extensive Sodus soil in the county, only a few areas exceed 30 acres in size. Included in mapping were Ira soils in slight depressions and along narrow drainageways. They occupy no more than 15 percent of any area but delay planting in spring. Spots of poorly drained Scriba soils, also included, are indicated by wet spot symbols on the soil map.

This Sodus soil is suited to crops, pasture, and forest. The areas bordering Lake Ontario are well suited to orchards. Because runoff is moderate, the hazard of erosion is moderate if row crops are grown continuously. The moderate to high gravel content hinders tillage and harvesting and limits the choice of crops. Consequently, hay crops are grown much of the time, and this has helped to keep erosion to a minimum. Lime and complete fertilizer are needed for even a moderate response from crops. Potassium is especially deficient, and phosphorus and nitrogen are in moderate supply.

Slope, gravel, and moderately slow and slow permeability are the main limitations to most nonfarm uses that require good drainage. (Capability unit IIe–2; woodland group 5a)

Sodus gravelly loam, 8 to 14 percent slopes (SoC).—This soil occupies the tops or upper sides of drumlins. Its slopes are uniform and convex. Consequently, runoff is moderately rapid. The stone fences and piles of stones indicate that many areas were once stony or very stony.

Only a few areas of this inextensive soil exceed 20 acres in size. Included in mapping were a few small areas of moderately well drained Ira soils in slight depressions or along narrow drainageways.

This Sodus soil is suited to all crops grown in the county and to pasture and forest. The areas bordering Lake Ontario are especially well suited to orchards.

Because runoff is moderately rapid, the hazard of erosion is moderate to severe if row crops are grown continuously. The moderate to high gravel content hinders tillage and harvesting and limits the choice of crops. Consequently, hay crops are grown much of the time, and cropped areas are only moderately eroded. Wooded areas and some pastures have little or no erosion. Lime and complete fertilizer are needed for even a moderate response from crops. Potassium, especially, is deficient, and phosphorus and nitrogen are moderate to low in supply.

Slope, gravel, and moderately slow and slow permeability are the main limitations to nonfarm uses that require good drainage. (Capability unit IIIe–3; woodland group 5a)

Sodus gravelly loam, 8 to 14 percent slopes, eroded (SoC3).—This soil has lost 4 to 8 inches of the original surface layer. Consequently, it has a lighter or redder colored plow layer and less depth to the moderately well expressed to well expressed fragipan than is typical of the series. Most areas are on the sides and tops of drumlins. The stone fences and piles of stones indicate that many areas were once stony or very stony. The degree of erosion ranges from none to severe. From 50 to 80 percent of the individual areas have lost much of the original surface layer. The more severely eroded areas are redder and have more gravel on the surface. In addition to eroded areas, there are spots where some of the eroded soil has been deposited, commonly on the upper sides of cross-slope fence rows.

Only a few areas of this inextensive soil exceed 20 acres in size. Included in mapping were moderately well drained Ira soils in slight depressions and along narrow drainageways.

This soil is suited to all crops grown in the county and to pasture and forest. The areas bordering Lake Ontario are especially well suited to orchards. Because runoff is rapid, the hazard of continuing erosion is severe. If row crops are grown, intensive management is needed to control erosion and to maintain a good supply of organic matter. Both nitrogen and potassium are deficient in supply, and phosphorus is only moderate. Lime and complete fertilizer are needed for even a moderate response from crops. The moderate to high content of gravel hinders tillage and harvesting and limits the choice of crops.

Slope, gravel, and moderately slow and slow permeability are the main limitations to most nonfarm uses that require good drainage. (Capability unit IVe–3; woodland group 5a)

Sodus gravelly loam, rolling (8 to 14 percent slopes) (SoCK).—This soil has short, irregular, convex slopes. It is inextensive, and only a few areas exceed 50 acres in size. In cropped areas the erosion ranges from none on small, level hilltops to severe on hillsides. In the depressions there are deposits of eroded soil. Included in mapping were moderately well drained Ira soils in depressions and along narrow drainageways and Scriba soils in the lowest parts of depressions. Though these included soils occupy no more than 15 percent of any area, they delay work in spring.

This soil is suited to crops, pasture, and forest. Because of its rolling topography, however, it is better suited to hay and forage than to row crops. Areas bordering Lake Ontario are suited to orchards if sod is maintained, but the small spots of Ira soils hinder spraying in spring.

The limitations are severe for row crops. Because runoff is moderately rapid, the hazard of erosion is moderate to severe, and erosion control measures, other than keeping the soil in sod, are impractical or difficult to apply. Lime and complete fertilizer are needed for sod crops. Potassium, especially, is in low supply.

Slope, gravel, and moderately slow and slow permeability are the main limitations to nonfarm uses that require good drainage. (Capability unit IVe–3; woodland group 5a)

Sodus gravelly loam, 14 to 20 percent slopes (SoD).—This soil has a moderately well expressed to well expressed fragipan that is 4 to 8 inches closer to the surface than is typical of the series. It is inextensive, and only a few areas exceed 20 acres in size. It occupies the sides of drumlins and generally is smoothly sloping, but there are a few strongly rolling or hilly areas. Most of the cropped areas are severly eroded and have a redder color and more gravel on the surface than uneroded areas. Included in mapping were a few spots of moderately well drained Ira soils in slight depressions and seeps.

This soil is used for crops, pasture, and forest, but it is better suited to hay and forage crops than to row crops. Areas bordering Lake Ontario are suitable for orchards if sod is maintained. The slopes are mostly too steep to be contoured safely with farm machinery.

Slope, gravel, and moderately slow and slow permeability are the main limitations to most nonfarm uses. (Capability unit IVe–3; woodland group 5a)

Sodus gravelly loam, 20 to 40 percent slopes (SoE).—This soil has a more variable depth to the fragipan than is typical of the series. It is inextensive, and only a few areas exceed 20 acres in size. Most areas are on the sides of drumlins. Included in mapping were some steep areas of Sodus very stony loam.

The degree of erosion ranges from none to severe. Some areas that were once cropped are severely eroded, but most cleared areas that have been used for pasture are only slightly or moderately eroded, and most of the stony areas are uneroded.

Most of this soil is in pasture or forest. A few small areas are in orchards or hay crops. Many areas are idle and are reverting to brush. Most of the pasture is unimproved and brushy, as management is difficult.

Slope is the main limitation to most nonfarm uses. (Capability unit VIe–1; woodland group 5c)

Stafford Series

The Stafford series consists of deep, somewhat poorly drained soils that formed on sandy deltas and beaches on the lake plain. They occupy scattered low, level areas or depressions, from the Seneca River north to Lake Ontario.

A typical profile in a cultivated area has a very dark grayish-brown fine sandy loam plow layer about 9 inches thick. Just below the plow layer is a leached layer of grayish-brown to light grayish-brown loamy fine sand that is distinctly mottled and about 5 inches thick. The subsoil extends to a depth of more than 48 inches. It is brown to reddish-brown loamy fine sand, distinctly mottled with yellow, red, and gray. It is slightly firm to loose and has a few, firm, yellowish-red and dark reddish-brown iron concretions. The subsoil grades from medium acid in the upper part to slightly acid below a depth of 17 inches.

Typical profile of Stafford fine sandy loam in a cultivated field:

Ap—0 to 9 inches, very dark grayish-brown (10YR 3/2) fine sandy loam; weak, fine and medium, granular structure and weak, very fine, subangular blocky structure; very friable; numerous fine roots; slightly acid; abrupt, smooth boundary. 7 to 10 inches thick.

A2g—9 to 14 inches, grayish-brown (10YR 5/2) to light grayish-brown (10YR 6/2) loamy fine sand; common, medium, distinct, yellowish-brown (10YR 5/6), strong-brown (7.5YR 5/6), and yellowish-red (5YR 4/6) mottles; single grain to very weak, medium, subangular blocky structure; loose to very friable; common fine roots; medium acid; gradual, wavy boundary with narrow tongues extending 2 to 3 inches into underlying horizon. 3 to 7 inches thick.

B1—14 to 17 inches, brown (10YR 5/3) loamy fine sand; many, coarse, distinct, strong-brown (7.5YR 5/6), yellowish-red (5YR 4/8), and light-gray (10YR 6/1) mottles; few, slightly firm, yellowish-red (5YR 4/8) iron concretions; single grain to weak, coarse, subangular blocky structure; loose to very friable; few fine roots; medium acid; clear, wavy boundary. 2 to 5 inches thick.

B2—17 to 28 inches, reddish-brown (5YR 4/3) to brown (7.5YR 4/2) loamy fine sand, aggregated in the form of an irregular-shaped mass 5 to 8 inches in diameter; common, distinct, strong-brown (7.5YR 5/6) and yellowish-brown (10YR 5/6) mottles and few, fine, distinct, light-gray (10YR 6/1) mottles; few, firm, yellowish-brown (10YR 5/6) iron concretions with dark reddish-brown (2.5YR 3/4) centers; structureless to very weak, coarse, blocky structure; this mass is surrounded by ½ inch to 1½ inches of grayish-brown (10YR 5/2 to 2.5Y 5/2) to brown (10YR 5/3), very friable loamy fine sand; common, medium, distinct, yellowish-brown (10YR 5/6) and strong-brown (7.5YR 5/6) mottles; single grain to very weak, fine, subangular blocky structure; irregular-shaped mass is slightly firm in place, very friable if crushed; slightly acid; clear, wavy boundary. 9 to 15 inches thick.

B3—28 to 48 inches, brown (7.5YR 4/4) to reddish-brown (5YR 4/4) loamy fine sand grading to pinkish gray (7.5YR 6/2) at a depth of 48 inches; common, medium, distinct, yellowish-brown (10YR 5/6), strong-brown (7.5YR 5/6), and light-gray (10YR 6/1) mottles that decrease in number and size with depth; very weak, thick, platy structure; slightly firm in place, very friable if crushed; slightly acid.

The predominant texture of the Ap horizon is fine sandy loam that is low in silt and clay content, but the texture ranges to loamy fine sand, and in some places nearly to loamy very fine sand.

The B horizon ranges from loamy fine sand to fine sandy loam in texture and from friable to firm in consistence.

The depth to clay, gravel, or glacial till ranges from 36 inches to many feet. The reaction is acid, but the pH may approach 6.0 at a depth of 36 inches. Iron concretions are common in the subsoil in areas where the reaction is more acid.

Stafford soils are in a drainage sequence with well-drained and excessively drained Colonie soils. They are coarser and more acid than Minoa soils.

Stafford fine sandy loam (0 to 2 percent slopes) (St).—This soil occurs mostly as low, level areas or as depressions that have a slope of less than 2 percent. The largest area of this inextensive soil is near the site of the sugar beet factory in Montezuma. Most other areas are fairly small. Included in mapping were poorly and very poorly drained Lamson soils in slight depressions or along narrow drainageways. These wetter soils occupy no more than 15 percent of any area, but they affect management because they require deeper outlets for drainage. Small areas of Galen soils on the occasional slight rises also were included, but they have little effect on management.

This Stafford soil is suited to crops, pasture, and forest. Undrained, it is better suited to moisture-tolerant hay and forage crops than to other crops. If adequately drained, it is suited to most annual row crops and is especially well suited to vegetables.

Drainage and adequate fertilization are needed for crops. Systematic drainage is needed in most areas. The fine sand flows readily when saturated, however, so special measures are required to prevent plugging of both open and closed drains. A moderate amount of lime is needed, as well as fertilizer, for this soil is especially deficient in nitrogen and potassium. The response to fertilization is high when drainage is adequate. Many crops benefit from irrigation. Water erosion is generally not a hazard, but wind erosion is a hazard in the sandier areas.

Seasonal wetness is the main limitation to most nonfarm uses. (Capability unit IIIw–2; woodland group 12)

Tuller Series

The Tuller series consists of somewhat poorly drained soils that formed in thin, acid, gray to dark-gray glacial till of silt loam texture or in frost-fractured rock material. Bedrock is at a depth of 10 to 20 inches. These soils contain many rock fragments from the underlying dark-gray to grayish-brown, fine-grained sandstone and siltstone and coarse-textured shale. They are inextensive and are in the southeastern part of the county, at an elevation above 1,400 feet.

A typical profile in a pastured area has a very dark grayish-brown channery silt loam surface layer about 5 inches thick. Just below this layer is a thin, leached layer of grayish-brown, firm channery silt loam that is prominently mottled. The subsoil is at a depth of 8 inches. It consists of firm to slightly firm channery silt loam that is grayish brown and prominently mottled in the top 6 inches and olive gray with prominent mottles just over the underlying bedrock. Dark grayish-brown sandstone bedrock is at a depth of about 19 inches. The reaction throughout the profile is strongly acid and very strongly acid.

Typical profile of Tuller channery silt loam, 1 to 8 percent slopes, in an area formerly pastured:

A1—0 to 5 inches, very dark grayish-brown (10YR 3/2) channery silt loam; common, medium, distinct root stains of dark reddish brown (5YR 3/2); moderate, fine and medium, granular structure; friable when moist, nonsticky when wet; very numerous fine roots; very strongly acid; clear, wavy boundary. 4 to 6 inches thick.

A2g—5 to 8 inches, grayish-brown (2.5Y 5/2) channery silt loam; many, medium, distinct mottles of yellowish brown (10YR 5/4, 5/6), dark yellowish brown (10YR 4/4), strong brown (7.5YR 5/6), and brown (7.5YR 4/4); weak, medium and coarse, subangular blocky structure; friable when moist, nonsticky when wet; scattered fine roots; very strongly acid; discontinuous, wavy boundary. 0 to 4 inches thick.

B2g—8 to 14 inches, grayish-brown (2.5Y 5/2) channery silt loam, slightly heavier than the A2g horizon; many, medium and large, prominent mottles of yellowish brown (10YR 5/6, 5/8) and strong brown (7.5YR 5/8) and few, fine, faint mottles of light gray (5Y 6/1); moderate, coarse, angular and subangular blocky structure within very weak, coarse prisms; firm in place, friable if crushed, nonsticky when wet; discontinuous clay film in larger pores; very thin, olive-gray (5Y 5/2) silt coat on vertical ped faces, grading to grayish brown (2.5Y 5/2) on horizontal ped faces; few fine roots along ped faces; strongly acid; gradual, wavy boundary. 5 to 10 inches thick.

B3—14 to 19 inches, olive-gray (5Y 5/2) channery silt loam; common, large, prominent mottles of yellowish brown (10YR 5/6, 5/8), strong brown (7.5YR 5/6, 5/8), and light gray (5Y 7/2); weak, coarse, subangular and angular blocky structure within weak, thick plates; slightly firm in place, friable if crushed; few fine roots; strongly acid; abrupt, discontinuous boundary. 0 to 6 inches thick.

R—19 to 40 inches +, dark grayish-brown (2.5Y 4/2 to 3/2), fractured, fine-grained sandstone bedrock; olive-gray (5Y 5/2), mottled coat of silt loam on rock surfaces and in joints in upper 6 to 12 inches.

The color of the surface layer ranges from nearly black to gray, depending on the degree of wetness and the content of organic matter. The subsoil is gray to grayish brown to olive gray and has medium and large mottles of yellowish brown, strong brown, and light gray. The A and B horizons are silt loam to loam in texture and contain 15 to 35 percent coarse fragments. The reaction ranges from very strongly acid to strongly acid with depth. The depth to bedrock ranges from 10 to 20 inches.

Tuller soils are in a drainage sequence with well drained and moderately well drained Arnot soils, and are commonly associated with Lordstown, Langford, and Erie soils. They are grayer and more strongly gleyed than Arnot soils, and they lack the strongly expressed fragipan of the deeper Erie and Ellery soils.

Tuller channery silt loam, 1 to 8 percent slopes (TuB).—This soil is generally 15 to 20 inches in depth to bedrock, but in some areas it is only 10 inches. It is commonly associated with steeper, better drained Arnot soils and with deeper Erie and Ellery soils, from which it receives considerable runoff. Included in mapping were moderately shallow Erie soils, which are mostly 20 to 30 inches in depth to rock. Also included were Arnot soils on small rises and knolls.

Most of this inextensive soil is idle or in forest. Some of it is in pasture. It is suited to water-tolerant grasses and trees that can also withstand drought during midsummer. It is poorly suited to row crops and small grains.

Liberal amounts of lime, phosphate, and potash are needed for even a moderate response from hay and forage crops. Drainage also is needed, but drains are very difficult to install because of the shallowness to bedrock.

Bedrock and seasonal wetness are the main limitations to most nonfarm uses. (Capability unit IVw-3; woodland group 15)

Varick Series

The Varick series consists of moderately deep, poorly drained soils that formed mostly in residuum of alkaline and calcareous, gray to black silty and clayey shale. The depth to the shale is 20 to 40 inches.

A typical profile in a cultivated area has a very dark gray to very dark brown heavy silt loam plow layer about 9 inches thick. Just below the plow layer is a thin layer of gray to grayish-brown, mottled, friable silt loam. The subsoil, at a depth of 11 inches, is light brownish-gray and grayish-brown, mottled, firm silty clay loam. Below a depth of 23 inches it is firm, gray, mottled silt loam. Underlying the subsoil at a depth of about 29 inches is dark-gray, calcareous shale bedrock. The reaction is neutral in the upper part of the profile and calcareous just over the bedrock.

Typical profile of Varick silt loam in a pasture formerly cultivated:

Ap—0 to 9 inches, very dark gray (10YR 3/1) to very dark brown (10YR 2/2) heavy silt loam; moderate to strong, medium and coarse, granular structure; friable when moist, slightly sticky when wet; neutral; gradual, wavy boundary 4 to 10 inches thick.

A2g—9 to 11 inches, gray (10YR 5/1) to grayish-brown (2.5Y 5/2) heavy silt loam; common, medium, distinct mottles of yellowish brown and light gray (10YR 5/4, 5/6, and 7/2); moderate to strong, medium and coarse, blocky structure; gray (10YR 5/1) to grayish-brown (2.5Y 5/2) ped faces; friable when moist, slightly sticky when wet; neutral; clear, wavy boundary. 0 to 3 inches thick.

B21tg—11 to 16 inches, light brownish-gray (10YR 6/2 to 2.5Y 6/2) silty clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/6), brownish yellow (10YR 6/6), and light gray (10YR 7/2); moderate to strong, medium and coarse, angular blocky structure; light brownish-gray (10YR 6/2 to 2.5Y 6/2) clay film on ped faces; firm when moist, sticky and slightly plastic when wet; neutral; gradual, wavy boundary. 4 to 8 inches thick.

B22tg—16 to 23 inches, grayish-brown (2.5Y 5/2) silty clay loam; common, medium, distinct mottles of light olive brown (2.5Y 5/6), olive yellow (2.5Y 6/6), pale yellow (2.5Y 7/4), yellowish brown (10YR 5/6), and brownish yellow (10YR 6/6); moderate to strong, medium and coarse, angular blocky structure; grayish-brown (2.5Y 5/2) clay film and flow on ped faces; firm when moist, sticky and slightly plastic when wet; neutral; clear, wavy boundary. 5 to 9 inches thick.

Cg—23 to 29 inches, gray (10YR 5/1) heavy silt loam; common, medium, distinct mottles of yellowish brown (10YR 5/6), brownish yellow (10YR 6/6), and light gray (10YR 7/2); weak, thick and very thick, platy structure breaking to weak, medium and coarse, blocky structure; friable to firm when moist; slightly sticky when wet; firm in place; calcareous; abrupt, wavy boundary. 4 to 10 inches thick.

R—29 to 40 inches +, calcareous, dark-gray shale bedrock; upper 12 inches commonly weathered and somewhat broken.

The texture of the Ap horizon is predominantly heavy silt loam or coarse silty clay loam but ranges from silt loam to silty clay loam. The color ranges from black to dark gray to very dark brown. The reaction of the Ap horizon ranges from a pH of 5.5 to 7.5, and the depth to carbonates is 20 to 48 inches. The color of the A2 horizon ranges from light gray to grayish brown to olive gray.

The B2 horizon is predominantly silty clay loam but ranges from heavy silt loam to coarse clay. The clay content of this horizon is predominantly 28 to 35 percent but ranges from 18 to 35 percent. The color ranges from brownish gray to olive gray.

Varick soils are in a drainage sequence with moderately well drained and well drained Aurora and somewhat poorly drained Angola soils. Varick soils differ from Ellery soils in being moderately deep, in containing more clay and lime, and in lacking a fragipan. They differ from Lyons and Romulus soils also in being moderately deep. They are grayer and contain more shale than Romulus soils and generally contain more clay than Lyons soils.

Varick silt loam (0 to 3 percent slopes) (Va).—This soil occurs in nearly level areas or depressions, only a few of which have slopes greater than 2 percent. The broad, level areas receive considerable runoff from higher, better drained Angola soils. The small areas are mostly along small drainageways or in depressions surrounded by better drained Angola or Aurora soils. Included in mapping were Angola soils on slight rises and Lyons and Romulus soils, which are more than 40 inches in depth to shale bedrock.

Undrained areas are used mainly for pasture and forest. Small areas within cultivated fields have been drained to some extent, and most large areas have not been drained adequately for intensive use. Because of the dense, slowly permeable subsoil, drains must be closely spaced. Drained areas need a little lime, a moderate amount of phosphate, and a small amount of potash. Nitrogen is noticeably deficient in spring but may be sufficient by midsummer.

Prolonged wetness and shallowness to bedrock are the main limitations to most nonfarm uses. (Capability unit IVw-4; woodland group 18)

Wampsville Series

The Wampsville series consists of deep, well-drained soils that formed in gravelly glacial outwash containing much reddish and greenish, clayey Vernon shale of the Salina group. These soils are in a narrow belt along, but mainly south of, the Seneca River.

A typical profile in a cultivated area has a dark reddish-gray gravelly silt loam plow layer about 8 inches thick. Just below this layer is a leached layer of very friable, reddish-brown gravelly very fine sandy loam. The subsoil is at a depth of about 12 inches and consists of gravelly sandy clay loam. It is reddish brown and only slightly firm to a depth of about 25 inches. Below this depth it is firm and dark reddish gray to dark reddish brown. In this lower part there are many reddish and greenish-gray shale fragments. The substratum is at a depth of 29 inches. It consists of stratified sand and gravel, and it also contains many fragments of reddish and greenish-gray shale. The reaction grades from neutral in the upper part to calcareous in the substratum.

Typical profile of Wampsville gravelly silt loam, 3 to 8 percent slopes, in a cultivated field:

Ap—0 to 8 inches, dark reddish-gray (5YR 4/2) gravelly silt loam; moderate, medium and coarse, granular structure; friable; many fine and medium roots; neutral; abrupt, wavy boundary. 7 to 9 inches thick.

A2—8 to 12 inches, reddish-brown (5YR 4/4) gravelly very fine sandy loam; moderate, fine and medium, subangular blocky structure; very friable; common fine and medium roots; neutral; clear, wavy boundary with ⅛-inch to ¼-inch fingers, 1 to 3 inches apart, extending 1 to 4 inches along main block faces of the underlying B21t horizon. 2 to 6 inches thick.

B21t—12 to 25 inches, reddish-brown (5YR 4/4) gravelly sandy clay loam; moderate, coarse, subangular and angular blocky structure; hard when dry, firm when moist, slightly sticky when wet; common fine roots; distinct clay film in pores, thin film on ped faces; neutral; clear, wavy boundary. 8 to 18 inches thick.

B22t—25 to 29 inches, dark reddish-gray (5YR 4/2) to dark reddish-brown (5YR 3/3) gravelly sandy clay loam; numerous reddish and greenish-gray fragments of clayey shale; strong, fine and medium, subangular blocky structure; hard when dry, firm when moist, slightly sticky when wet; common fine roots; distinct clay film in pores and on block faces; neutral; clear, wavy boundary. 3 to 15 inches thick.

IIC—29 to 72 inches, stratified sand and gravel; numerous reddish and greenish-gray shale fragments; sand particles are white (N 8/0) and dark gray (N 4/0); shale fragments gradually decrease with depth; few fine and medium roots; calcareous.

The thickness of the solum ranges from 20 to 48 inches and corresponds to the depth to stratified deposits.

The texture of the surface layer ranges from fine sandy loam to light silty clay loam, but silt loam is predominant. The gravel content ranges from 10 to 25 percent. The reaction is medium acid to neutral.

The texture of the B horizon ranges from sandy clay loam to coarse clay loam or silty clay loam, and the clay content is 28 to 35 percent. The color ranges from red to greenish gray, depending on the color of the shale. The reaction is mildly acid to mildly alkaline. The content of coarse fragments is 15 to 35 percent. The solum is gravelly and in places contains cobbles and coarse gravel. The upper stratification of the C horizon is indistinct in some places where there is a high percentage of shale. The depth to calcareous material ranges from 20 to 48 inches.

Wampsville soils are the water-sorted analogs of Cazenovia soils in deep till and of Riga or Lairdsville soils in moderately deep till derived from Vernon shale. In places they resemble Cazenovia soils in the upper part of the solum, but they contain more rounded gravel in the surface layer and are distinctly stratified in the C horizon. They differ from Palmyra soils in having a reddish or a greenish-gray color and a finer textured B horizon.

Wampsville gravelly silt loam, 0 to 3 percent slopes (WaA).—This soil is on nearly level or gently undulating terraces or outwash plains. The largest areas are east and west of Weedsport. Included in mapping were moderately well drained Phelps soils in depressions and drainageways. These wetter soils occupy no more than 5 percent of any area, but they delay tillage slightly in some fields.

This Wampsville soil is well suited to crops, pasture, and forest. Because it contains more clay in the subsoil than Palmyra soils, it dries out slightly later in spring, but it also is slightly higher in fertility and in water-holding capacity. The gravel may hinder the use of machinery for some crops.

Maintenance of fertility and soil structure are the main problems. Intensive cropping has reduced the supply of available phosphorus and potassium in many fields, but most crops show a high response to complete fertilization. The lime requirement ranges from none to slight. Careful management is needed to maintain good soil structure, as intensively cropped areas tend to become severely crusted. Erosion is generally not a problem, and drainage of wet spots is only a minor problem.

Gravel is the main limitation to most nonfarm uses that require good drainage. The high content of clay shale lowers the quality of sand and gravel for many uses. (Capability unit I-1; woodland group 1a)

Wampsville gravelly silt loam, 3 to 8 percent slopes (WaB).—This soil has the profile described as typical of the series. It is on gently sloping or gently undulating terraces or outwash plains. Most of the slopes are short. Included in mapping were moderately well drained Phelps soils in depressions. These wetter soils occupy no more than 10 percent of any area, but they may slightly delay tillage in spring.

This Wampsville soil is well suited to crops, pasture, and forest. The high gravel content limits the use of machinery for some crops.

Maintenance of fertility and soil structure and control of erosion are the main problems. Intensive cropping has reduced the supply of available phosphorus and potassium in many fields, but most crops show a high response to liberal fertilization. The lime requirement ranges from none to slight. As a result of intensive row cropping, many areas are moderately eroded and have poor soil structure. Erosion occurs mostly early in spring when the surface thaws and the subsurface is still frozen. Random drainage of the wet spots benefits many fields.

Slope and gravel are the main limitations to most nonfarm uses that require good drainage. The high content of clay shale lowers the quality of the sand and gravel for many uses. (Capability unit IIe-3; woodland group 1a)

Warners Series

The Warners series consists of very poorly drained to moderately well drained soils on bottom lands. These soils are made up of black to gray, mineral soil material or thin, mucky alluvial deposits over white to gray, highly calcareous marl. Shell or marl fragments are generally scattered throughout the profile. The larger areas of these soils are on the flood plain of the Seneca River and on flooded bottom lands around Cross Lake. Small areas are on the bottom lands of streams fed by springs issuing from the Onondaga limestone and Camillus shale.

A typical profile in a cultivated area has a black loam plow layer about 8 inches thick. This layer is underlain by very dark gray and dark-gray, friable silt loam that is distinctly mottled with yellowish brown. At a depth of about 24 inches, the silt loam is underlain by light-gray, soft marl. The surface layer is mildly alkaline, and the underlying layers are calcareous.

Typical profile of Warners loam in a cultivated field:

Ap—0 to 8 inches, black (10YR 2/1) loam; strong, fine to medium, granular structure; very friable; many roots; mildly alkaline; abrupt, smooth boundary. 6 to 12 inches thick.

C1—8 to 24 inches, very dark gray (10YR 3/1) silt loam, grading to dark gray (10YR 4/1) at a depth of 12 inches; common, fine, distinct, dark yellowish-brown (10YR 4/4) to yellowish-brown (10YR 5/4) mottles; moderate, medium, granular structure; friable; common fine roots in upper 8 inches; many white remnants of shells; moderately calcareous; abrupt, wavy boundary. 10 to 20 inches thick.

IIC2—24 to 40 inches, light-gray (10YR 7/1) soft marl.

The thickness of the mineral material over the marl or other calcareous material ranges from 12 to 40 inches, and the thickness of the calcareous layer ranges from 12 inches to several feet. The texture of the overlying mineral material is typically loam, but in places it is silt loam, light silty clay loam, or very fine sandy loam. In some undisturbed areas a surface layer of muck less than 6 inches thick is present, or the surface layer of mineral soil is high in content of organic matter. The color of the surface layer is black to dark gray to dark brown. The subsurface layers above the marl are gray to brown. The IIC2 horizon is commonly marl, but it is mineral material of mixed mineralogy in some profiles that have been impregnated by carbonate-charged water. The carbonates in this horizon exceed 40 percent. The marl is white to pale brown.

Warners loam (0 to 3 percent slopes) (We).—This soil has the profile described as typical of the series. It is moderately extensive in Cayuga County. The largest areas are along the Seneca River and around Cross Lake. Drainage is poor or very poor, and most areas are flooded every spring. Included in mapping were shallow Edwards muck in slight depressions and Warners loam, fan, on slight rises or along streams. A few widely scattered salt springs occur in this soil.

Most areas are in pasture and forest, and they support only water-tolerant grasses and trees. Some areas that can be drained are used for annual row crops.

Prolonged wetness, flooding, and texture are the main limitations to most nonfarm uses. (Capability unit IIIw-4; woodland group 19)

Warners loam, fan (0 to 3 percent slopes) (Wf).—This soil is somewhat poorly drained or moderately well drained. It has a profile like the one described for the series, except that the layers over the marl are pale brown or light gray rather than black or very dark gray. This soil is inextensive and occurs mostly as narrow bands bordering the Seneca River, where flooding has built up natural levees, or along the smaller streams, which have sufficient gradient to result in a lower or more fluctuating water table than is typical. Most areas are nearly level, but some small areas with a slope of as much as 6 percent were included in mapping.

This soil is suited to crops, pasture, and forest. It is commonly used for row crops that can stand high concentrations of lime. Some areas are used nearly continuously for corn, beans, and other row crops. These crops respond to fertilizer that is high in potash. Erosion is generally no problem, though some of the more strongly sloping areas need structures to control scouring or streambank cutting.

Seasonal wetness, flooding, and texture are the main limitations to most nonfarm uses. (Capability unit IIw-5; woodland group 1a)

Williamson Series

The Williamson series consists of deep, moderately well drained soils that have a fragipan. These are medium-textured soils that formed in silt and very fine sand deposited by lake water. They have a narrow range of particle size that is commonly near the boundary between very fine sand and silt. They contain little clay or fine sand. These soils are in the northern part of the county, mostly north of the Seneca River. They are located on the lake plain where lime influence has been weak or lacking. Most of the acreage is north of where the Lockport dolomite outcrops.

A typical profile in a cultivated area has a dark grayish-brown silt loam plow layer about 9 inches thick. Just below this layer is the upper subsoil, which is friable brown silt loam. It extends to a depth of about 14 inches and is separated from the lower subsoil by a leached layer of friable, mottled, brown silt loam. The lower subsoil is a firm, brittle fragipan. It is at a depth of about 19 inches and consists of brown to dark yellowish-brown silt loam that has a few distinct mottles. The substratum is at a depth of about 36 inches. It consists of brown layers of very fine sandy loam and thinner layers of loamy fine sand and silt. In the upper part of it there are some thin, pinkish-gray streaks. The reaction is strongly acid throughout.

Typical profile of Williamson silt loam, 2 to 6 percent slopes, in a cultivated field:

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; dark brown (10YR 4/3) if rubbed; weak, fine and medium, granular structure; friable when moist, nonsticky when wet; very numerous fine and medium roots; strongly acid; abrupt, smooth boundary. 6 to 10 inches thick.

B2—9 to 14 inches, brown (7.5YR 4/4–5/4) silt loam; weak, fine and medium, subangular blocky structure; friable when moist, nonsticky when wet; numerous fine roots; strongly acid; clear, wavy boundary. 4 to 15 inches thick.

A'2—14 to 19 inches, brown (10YR 4/3–5/3) silt loam; few, medium, distinct mottles of light grayish brown (10YR 6/2) and dark brown (7.5YR 4/4); weak, fine and medium, angular blocky structure within very weak, medium and thick, platy structure; friable when moist, nonsticky when wet; numerous fine roots; strongly acid; clear, wavy boundary. 2 to 8 inches thick.

B'x—19 to 36 inches, brown (7.5YR 4/4) to dark yellowish-brown (10YR 4/4) silt loam, slightly heavier than A'2 horizon; few, fine, distinct mottles of dark reddish gray (5YR 4/2), strong brown (7.5YR 5/6), yellowish brown (10YR 5/6), and pinkish gray (7.5YR 6/2); common, fine, dark reddish-brown (5YR 3/3) to black (N 2/0) manganese concretions; very weak, coarse, angular blocky structure within weak, thick and very thick, platy structure; few clay linings in pores; very few scattered fine roots; firm in place, brittle if crushed; strongly acid; clear, wavy boundary. 15 to 30 inches thick.

C—36 to 48 inches, brown (7.5YR 4/4) very fine sandy loam stratified with thin layers of loamy fine sand and silt, gradually becoming grayer with depth; common, fine, pinkish-gray (7.5YR 7/2) streaklike mottles in upper part; single grain in sand layers to weak, platy structure in silt layers; loose to friable in sand layers; strongly acid, grading to medium acid at a depth of 48 inches; no roots.

The thickness of the solum ranges from 30 to 60 inches. The depth to lime is more than 6 feet.

The surface layer ranges from silt loam to very fine sandy loam in texture and contains very little clay and medium or coarse sand. It ranges from dark grayish brown to brown, depending on organic-matter content and on degree of erosion. This layer has weak structure, or it is structureless. The reaction is very strongly acid to medium acid.

The B horizon ranges from silt loam to fine sandy loam in texture and is low in content of clay and medium sand. It ranges from strong brown to brown, the brightest colors occurring in the upper part of the drainage range.

The depth to mottling ranges from 12 to 24 inches and depends on the depth to the A' horizon, which overlies the fragipan. The A' horizon has a texture of silt to fine sand. It is brown to brownish gray and has a few to common mottles of strong brown to yellowish brown.

The B'x horizon, or fragipan, ranges from 6 to 20 inches or more in thickness and from silt loam to fine sandy loam in texture. It is low in content of clay and medium or coarse sand. The fragipan is strongest in the silt loam and weakest in the fine sandy loam.

The reaction ranges from very strongly acid to medium acid.

The depth to the C horizon ranges from 30 to 60 inches or more. This horizon ranges from fine sandy loam to silt, and in a few places contains thin bands of coarser sand and clay.

Williamson soils are associated with Niagara and Canandaigua soils. They differ from Collamer soils mainly in having a fragipan but also in lacking clay accumulation in the B horizon.

Williamson silt loam, 0 to 2 percent slopes (WmA).—This soil generally has a darker surface layer than is typical of the series and has mottling at a slightly shallower depth. It is in the northern part of the county on the lake plain, where it receives little or no runoff from adjacent areas. It is associated mainly with more strongly sloping Williamson soils. Included with it in mapping were somewhat poorly drained Niagara soils in slight depressions or along narrow drainageways. These wetter soils occupy as much as 20 percent of some areas and delay field operations in spring.

This soil is suited to most crops grown in the county and to pasture and forest. It is used intensively for potatoes, snap beans, and similar crops, and the areas bordering Lake Ontario are used for orchards.

Maintenance of good soil structure is the main problem. If this soil is used intensively for row crops, it quickly develops a floury, single-grain structure and flows when wet, even on gentle slopes. Also, the shallowness to the fragipan limits the depth of rooting and the water-holding capacity. Lime and liberal amounts of fertilizer high in potash are needed. Random drainage of the wet spots benefits most fields.

Moderately slow and slow permeability and seasonal wetness are the main limitations to nonfarm uses that require good drainage. (Capability unit IIw-2; woodland group 5a)

Williamson silt loam, 2 to 6 percent slopes (WmB).—This soil has the profile described as typical of the series. It is on the lake plain where some areas are smoothly sloping and some are undulating.

The smoothly sloping areas are dissected by shallow drainageways at intervals of 200 to 400 feet. These drainageways are far enough apart so that contour tillage can be practiced. The undulating areas are dissected by drainageways less than 200 feet apart and are difficult or impractical to contour. Included in mapping were somewhat poorly drained Niagara soils in slight depressions or along narrow drainageways. These wetter soils occupy no more than 15 percent of any area but delay planting in spring. Also included were a few small areas of gravelly Ira soils on knolls, but these have little effect on management.

This soil is well suited to most crops grown in the county and to pasture and forest. It is used intensively for potatoes, snap beans, and similar crops, and areas bordering Lake Ontario are used for orchards.

Control of erosion and maintenance of fertility and good soil structure are the main management problems. If used for row crops, this soil quickly develops a floury, single-grain structure, and it flows readily when saturated. Consequently, erosion is a hazard, even on the gentlest slopes. In addition, the fragipan limits the depth of rooting and the amount of available water for plants. Lime and liberal applications of fertilizer high in potash and nitrogen are needed for most crops. Random drainage of the wet spots benefits many fields.

Moderately slow and slow permeability, seasonal wetness, and slope are the main limitations to most nonfarm uses. This is one of the better soils for housing sites in the northern part of the county. (Capability unit IIe–7; woodland group 5a)

Williamson silt loam, 6 to 12 percent slopes (WmC).—This soil generally has a stronger or richer brown colored subsoil than is typical of the series, and it is 4 to 12 inches deeper to the fragipan in uneroded areas. It is on the lake plain in areas where the slopes are short and convex and have been cut by so many intermittent drainageways that they are too irregular for contour tillage. Only a few small areas are smoothly sloping.

Most areas of this inextensive soil do not exceed 20 acres in size. They adjoin less strongly sloping Williamson soils, from which they receive considerable runoff. Included in mapping were somewhat poorly drained Niagara soils in small depressions and along narrow drainageways.

This soil is suited to crops, pasture, and forest. Most of it is still in forest and pasture; some of it is idle and reverting to brush or woods. The few areas that are cropped have been well managed and are only moderately eroded.

Because of the complex slopes, long-term hay is more suitable than other crops. Areas that can be contoured can be used for row crops, but the surface layer quickly develops a floury, single-grain structure if used intensively. Consequently, it flows readily when saturated, and erosion is a severe hazard. Lime and liberal amounts of fertilizer high in potash are needed. Random drainage of the wet spots is needed in some fields.

Slope, moderately slow and slow permeability, and seasonal wetness are the main limitations to most nonfarm uses. Some areas are good sites for ponds. (Capability unit IIIe–5; woodland group 5a)

Williamson silt loam, 6 to 12 percent slopes, eroded (WmC3).—This soil has lost 6 to 12 inches of the original surface layer, and the plow layer is browner and lower in content of organic matter than is typical of the series. Also, the fragipan is 4 to 8 inches closer to the surface in the severely eroded spots. This soil occupies short, convex slopes on the lake plain. These areas are dissected by so many intermittent drainageways that the slopes are too irregular for contour tillage. Only a few areas are smoothly sloping. Though most of this soil is severely eroded, the erosion ranges from slight to severe, and there are deposits of the eroded material in slight depressions and along drainageways.

Only a few areas of this inextensive soil exceed 20 acres in size. Most areas adjoin less strongly sloping Williamson soils, from which they receive runoff. Included in mapping were somewhat poorly drained Niagara soils in small depressions and along drainageways.

This soil is used for crops, pasture, and forest. Nearly all of it was once cropped, and most of it is still being farmed. Some of it is idle and slowly reverting to brush and woods.

Because of the complex slopes and the hazard of continuing erosion, this soil is better suited to long-term hay and forage crops than to other crops. Measures are needed to control erosion, improve and maintain soil structure, and increase the organic-matter content. Also needed are lime and liberal amounts of fertilizer high in potash and nitrogen. Random drainage of wet spots is needed in some fields.

Slope, moderately slow and slow permeability, and seasonal wetness are the main limitations to most nonfarm uses. Some areas are good sites for ponds. (Capability unit IVe–5; woodland group 5a)

Formation and Classification of Soils [13]

Soil is the mantle of material that covers the surface of the earth and forms the link between the rock core, or underlying bedrock, and living things on the surface. It may be thick or thin; red, brown, yellow, or gray; and sandy to clayey. It is mainly a mixture of mineral and organic materials with air and water. The proportion is variable, but all the components are present in some degree.

Factors of Soil Formation

A soil at any given point is the result of the interaction of five soil-forming factors, namely parent material, climate, living organisms, relief, and time. All of these factors influence to some degree the genesis or formation of every soil. In places one factor may dominate in the formation of a soil and fix most of its properties, but this has not happened in Cayuga County. Within the county are visible differences that reflect the influence of parent material, relief, or plant and animal life.

Parent material

Practically all of the material in which the soils of the county formed are related directly or indirectly to

[13] JOHN A. NEELEY, soil scientist, Soil Conservation Service, assisted in the preparation of this section.

glacial action. The few exceptions are alluvial materials on the flood plains of streams and organic materials in depressions.

Glacial till is the unsorted materials deposited directly by glacial ice. As the ice moved forward, it dragged with it a heterogeneous mass of stones, gravel, sand, silt, and clay. This material was left behind as the ice melted. It is a mixture of particles of all sizes, from stones to clay. Basal till is the material that was under the ice. It commonly is hard and compact. Soils, such as Lima, Appleton, and Erie, that formed in this dense till commonly have restricted drainage and gray or rusty brown, mottled colors. Ablation till is the heterogeneous material that was held in and on the ice and was deposited as the ice melted. Where it occurs over dense basal till or bedrock in Cayuga County, it commonly is only a few feet thick. Soils, such as Langford and Howard, that formed in ablation till are extremely variable in density and in permeability.

Glacial outwash is the coarse, gravelly materials carried by the rivers that flowed from the melting ice. These materials were laid down as kames, eskers, nearly level terraces, or other features. The outwash generally is stratified as a result of sorting and of deposition by water flowing at different speeds. Soils, such as Palmyra and Howard, that formed in this coarse-textured material are rapidly permeable. Restricted drainage occurs only where there is a high water table.

Lacustrine materials consist of sands, silts, and clays deposited in glacial lakes. The sands were deposited where the streams entered the lakes. These sandy deposits built up, layer upon layer, and in most places are coarse textured throughout. In some places, however, there are thin lenses of silts or clays deposited during periods of change in stream velocity, in the level of the lake, or in the position of the ice front. Where the sands are thick and free of lenses, the soils, such as Arkport and Colonie, commonly are well drained. Silts were deposited where the water movement was relatively slow. Clays settled near the middle of the lake where the water was still. Soils, such as Collamer and Niagara, that formed in silt materials are generally less permeable and more poorly drained than those that formed in coarser sand materials. Although soils, such as Schoharie and Odessa, that formed in clay have better structure than those formed in silt, they generally have a less permeable substratum. Even the better drained clayey soils, such as Schoharie, commonly have some mottling in the subsoil.

Recent alluvium commonly consists of alternating layers of silts and fine sands deposited on land by streams since the glacial period. Genesee and Eel are examples of soils that formed in such material. Commonly, this material is underlain by sand and gravel or clay. It generally is coarser textured adjacent to the stream. Drainage is related to the depth of the water table. In places the alluvium contains deposits of marl, which gave rise to Warners soils, for example. These deposits occur in areas where the stream water is charged with lime. The most extensive marl deposits occur on bottom lands along the Seneca River.

Organic soils formed mainly from plants that grew in shallow, ponded areas. They consist mainly of partially oxidized muck and unoxidized, or raw, peat.

Climate

Cayuga County has a humid, cool-temperate, continental type of climate. Although Lake Ontario and Cayuga, Owasco, and Skaneateles Lakes have a warming influence on bordering areas, this difference in climate has had relatively little or no effect on soil formation. Climatic data for the county are given in the section "General Nature of the County."

Precipitation and temperature influence the rate and kind of weathering and leaching that help to produce soils. Climate also affects the soils indirectly through its influence on the growth of living organisms on or in the soil and on the decay of plants and animal bodies.

Living organisms

The influence of plants and animals living in and on the soil is apparent mainly in the surface soil but goes much deeper. Sudden mass movement of mineral and organic soil material resulting from the windthrow of trees and the burrowing of animals brings weathered fragments of stone and subsoil to the surface where they are subjected to more rapid and intense chemical and physical weathering. Less obvious, but nevertheless persistent, is the cycling of mineral and organic material through the soil by earthworms. The native forests of the county have furnished a large amount of organic matter, which bacteria and fungi break down into simpler compounds that eventually affect the chemical and physical composition of the soil. In addition, some trees draw bases in appreciable amounts from the lower part of the soil and return them to the surface in fallen leaves and stems. This process has probably delayed to some extent the leaching of bases from the soils, Honeoye and Lima soils, for example.

Relief

The shape of the land surface, the slope, and the position in relation to the water table have had great influence on the formation of soils in the county. Sloping soils, such as Ontario and Lordstown, on which runoff is moderate to rapid, are generally well drained, have a bright-colored unmottled subsoil, and in most places are leached to a greater depth than wetter soils, such as Appleton and Tuller, in the same general areas. The more gently sloping soils, such as Hilton and Lima, on which runoff is slower, generally exhibit some evidence of wetness, such as mottling in the subsoil. Level soils or soils in slight depressions, Lyons and Canandaigua, for example, show marked influence of wetness, such as a dark-colored surface soil high in organic-matter content and a very strongly mottled or grayish subsoil. Some soils, such as Lamson and Fredon, are wet because of a high water table or because of their position. Permeability of the soil material, as well as the length, steepness, and configuration of the slope, influences the kind of soil that is formed from place to place. Local differences in the soils are largely the result of differences in parent material and relief.

Time

Compared with soils in unglaciated areas, the soils in Cayuga County are relatively young. The oldest, such as Langford and Erie, which are on highlands in the southeastern part, are probably 15 to 25 thousand years old. Most of the others are probably less than 15 thousand years old, and some are very young. Most of the soil materials were left after the glaciers melted and the lakes dried up. Alluvial materials and plant remains in bogs and swamps are of recent origin and are being deposited at the present time. Muck and Eel, Genesee, and other soils that formed in the recently deposited materials usually have less strongly expressed horizons than soils that formed in the older materials.

Classification of Soils

Soils are classified so that we may more easily remember their significant characteristics, assemble knowledge about them, see their relationships, and understand their behavior and their response to the whole environment. First, through classification, and then through the use of soil maps, we can apply our knowledge to specific fields and other tracts of land.

The classification of soils into series and lower categories is discussed in the section "How This Survey Was Made." Two systems of classifying soils above the series level have been used in the United States in recent years. The older system was adopted in 1938 (*3*) and revised later (*16*). The system currently used by the National Cooperative Soil Survey was adopted in 1965 and is under continual study. Readers interested in the development of this system should refer to the latest literature available (*14*, *17*).

The current system of classification has six categories. Beginning with the most inclusive, these categories are order, suborder, great group, subgroup, family, and series. The criteria for classification are soil properties that are measurable or observable, but the properties are selected so that soils of similar genesis are grouped together. Placement of some soil series in the current system of classification, particularly in families, may change as more precise information becomes available.

Table 9 shows the classification of the soil series in Cayuga County according to both systems. Ten orders are recognized in the current system. Of these, the Entisols, Inceptisols, Mollisols, Alfisols, and Histosols are represented in Cayuga County.

Entisols

Entisols are mineral soils that either have no natural genetic horizons or only the beginning of horizons (fig. 11). The horizons present are so weakly expressed that they fail to meet the requirements of any of the diagnostic horizons, except the albic horizon and those produced through cultivation by man.

At one extreme in age, Entisols consist of very recent alluvium, in place for only a few days or months. Such soils may have an Ap horizon, and they may be mottled with gray or brown. Some mottles may develop in alluvium before the floodwaters recede.

At the other extreme, Entisols include quartz sands that have been in place for many thousands of years. Unless conditions are favorable for the formation of certain kinds of soils, no diagnostic horizons are likely to develop.

The central concept includes soils that formed in deep regolith or earth in which no horizons have formed,

TABLE 9.—*Soil series classified according to the current system of classification and the 1938 system with later revisions*

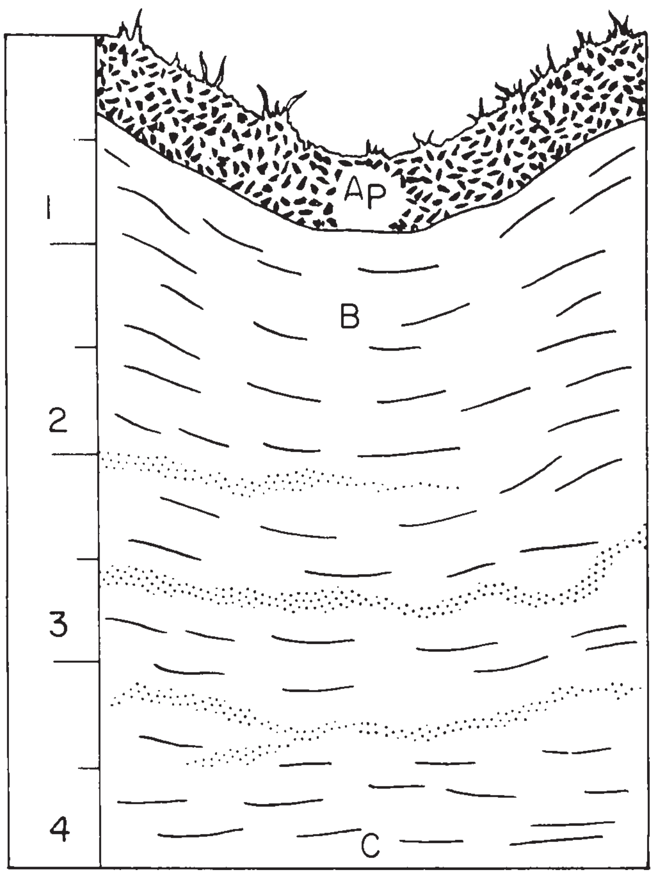
Series	Current classification			1938 system with later revisions	
	Family	Subgroup	Order	Great soil group	Order
Alden	Fine-silty, mixed, nonacid, mesic.	Mollic Haplaquepts	Inceptisols	Humic Gley soils	Intrazonal.
Alton	Loamy-skeletal, mixed, mesic.	Typic Dystrochrepts	Inceptisols	Sols Bruns Acides	Zonal.
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.
Benson	Loamy, mixed, mesic	Lithic Eutrochrepts	Inceptisols	Brown Forest soils	Intrazonal.
Brockport	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils	Zonal.
Camillus	Fine-loamy, mixed, mesic	Typic Eutrochrepts	Inceptisols	Brown Podzolic soils over Brown Forest soils.	Intrazonal.
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.
Collamer	Fine-silty, mixed, mesic	Glossoboric Hapludalfs	Alfisols	Gray-Brown Podzolic soils	Zonal.
Colonie	Mixed, mesic	Alfic Udipsamments	Entisols	Sols Bruns Acides	Zonal.
Conesus	Fine-loamy, mixed, mesic	Glossoboric Hapludalfs	Alfisols	Gray-Brown Podzolic soils	Zonal.
Dunkirk	Fine-silty, mixed, mesic	Glossoboric Hapludalfs	Alfisols	Gray-Brown Podzolic soils	Zonal.
Edwards	[1]	[1]	Histosols [1]	Bog soils	Intrazonal.

See footnote at end of table.

TABLE 9.—*Soil series classified according to the current system of classification and the 1938 system with later revisions*—Con.

Series	Current classification			1938 system with later revisions	
	Family	Subgroup	Order	Great soil group	Order
Eel	Fine-loamy, mixed, mesic	Aquic Fluventic Eutrochrepts.	Inceptisols	Alluvial soils	Azonal.
Ellery	Fine-loamy, mixed, mesic	Typic Fragiaquepts	Inceptisols	Low-Humic Gley soils	Intrazonal.
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.
Fredon	Coarse-loamy, over sandy or sandy-skeletal, mixed, nonacid, mesic.	Aeric Haplaquepts	Inceptisols	Brown Forest intergrading to Gray-Brown Podzolic soils.	Intrazonal.
Galen	Coarse-loamy, mixed, mesic.	Psammentic Hapludalfs	Alfisols	Gray-Brown Podzolic soils	Zonal.
Genesee	Fine-loamy, mixed, mesic	Fluventic Eutrochrepts	Inceptisols	Alluvial soils	Azonal.
Hilton	Fine-loamy, mixed, mesic	Glossoboric Hapludalfs	Alfisols	Gray-Brown Podzolic soils	Zonal.
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	Zonal.
Ira	Coarse-loamy, mixed, mesic.	Typic Fragiochrepts	Inceptisols	Sols Bruns Acides	Zonal.
Kendaia	Fine-loamy, mixed, non-acid mesic.	Aeric Haplaquepts	Inceptisols	Brown Forest intergrading to Gray-Brown Podzolic soils.	Intrazonal.
Lairdsville	Fine, illitic, mesic	Glossoboric Hapludalfs	Alfisols	Gray-Brown Podzolic soils	Zonal.
Lakemont	Fine, illitic, mesic	Udollic Ochraqualfs	Alfisols	Low-Humic Gley soils	Intrazonal.
Lamson	Coarse-loamy, mixed, non-acid, mesic.	Aeric Haplaquepts	Inceptisols	Low-Humic Gley soils intergrading to 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.
Lockport	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils	Zonal.
Lordstown	Coarse-loamy, mixed, mesic.	Typic Dystrochrepts	Inceptisols	Sols Bruns Acides	Zonal.
Lyons	Fine-loamy, mixed, non-acid, mesic.	Mollic Haplaquepts	Inceptisols	Low-Humic Gley soils	Intrazonal.
Madalin	Fine, illitic, mesic	Mollic Ochraqualfs	Alfisols	Low-Humic Gley soils	Intrazonal.
Madalin, sandy subsoil variant.	Fine, illitic over coarse-loamy, mixed, mesic.	Mollic Ochraqualfs	Alfisols	Low-Humic Gley soils	Intrazonal.
Minoa	Coarse-loamy, mixed, mesic.	Aquic Eutrochrepts	Inceptisols	Gray-Brown Podzolic soils	Zonal.
Muck	(1)	(1)	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.
Peat	(1)	(1)	Histosols	Bog soils	Intrazonal.
Phelps	Fine-loamy, over sandy or sandy-skeletal, mixed, mesic.	Glossaquic Hapludalfs	Alfisols	Gray-Brown Podzolic soils	Zonal.
Riga	Fine, illitic, mesic	Glossaquic 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.
Scriba	Coarse-loamy, mixed, mesic.	Aeric Fragiaquepts	Inceptisols	Sols Bruns Acides	Zonal.
Sloan	Fine-loamy, mixed, non-calcareous, mesic.	Fluventic Haplaquolls	Mollisols	Alluvial soils	Azonal.
Sodus	Coarse-loamy, mixed, mesic	Typic Fragiochrepts	Inceptisols	Sols Bruns Acides	Zonal.
Stafford	Mixed, mesic	Typic Psammaquents	Entisols	Sols Bruns Acides	Zonal.
Tuller	Loamy, mixed, acid, mesic	Lithic Haplaquepts	Inceptisols	Low-Humic Gley soils	Intrazonal.
Varick	Fine-loamy, mixed, mesic	Mollic Ochraqualfs	Alfisols	Low-Humic Gley soils	Intrazonal.
Wampsville	Fine-loamy, mixed, mesic	Glossoboric Hapludalfs	Alfisols	Gray-Brown Podzolic soils	Zonal.
Warners	Fine-silty, mixed, cal-careous, mesic.	Typic Haplaquolls	Mollisols	Alluvial soils	Azonal.
Williamson	Coarse-silty, mixed, mesic	Typic Fragiochrepts	Inceptisols	Sols Bruns Acides	Zonal.

[1] Histosols are not classified at the subgroup and family levels, because classification at these levels was provisional at the time the survey went to the printer.



Ap - Dark-brown loamy fine sand; moderate in organic-matter content.

B - Reddish-yellow loamy fine sand; fades with depth to light yellowish brown; structureless. Generally, a few, thin, strong-brown to yellowish-red bands of loamy fine sand below a depth of 18 inches, but bands may persist to a depth of as much as 10 feet. Some bands have distinctly more clay than others but aggregate less than 6 inches within 40 inches of the surface.

C - Light yellowish-brown loamy fine sand or fine sand that becomes paler with depth.

***Figure 11.*—Sequence and relative thickness of horizons of Colonie loamy fine sand. The Colonie series is a member of the mixed, mesic family; the Alfic Udipsamments subgroup; and the Entisols order.**

except perhaps a plow layer. The soil may be any color common to soil because color has no significance.

Some Entisols, particularly sandy ones, may have a strongly colored B horizon. Strongly colored, sandy B horizons, however, are not diagnostic in the current classification system.

A thin layer of peat or muck may be present in marshes and swamps. Entisols are of limited extent in Cayuga County.

Inceptisols

Inceptisols (fig. 12) have one or more of the diagnostic horizons that are thought to form rather quickly and that do not represent significant illuviation or eluviation or extreme weathering. They occur mostly on young but not recent land surfaces.

These soils have either a dark-colored or light-colored surface horizon. So far as is known, all Inceptisols have an umbric or mollic epipedon, or a cambic horizon. There must be an appreciable accumulation of organic matter, or there must be some evidence that the parent material has been altered by weathering. The weathering cannot be so intensive that all weatherable minerals are removed from the sand or silt fraction.

Since argillic and spodic horizons are absent, there cannot be evidence of significant illuviation. Textural differences may be present between horizons, if parent materials are stratified or if clay has been differentially formed in place. Typically, the texture is uniform or nearly so. Inceptisols are extensive in the county (fig. 13).

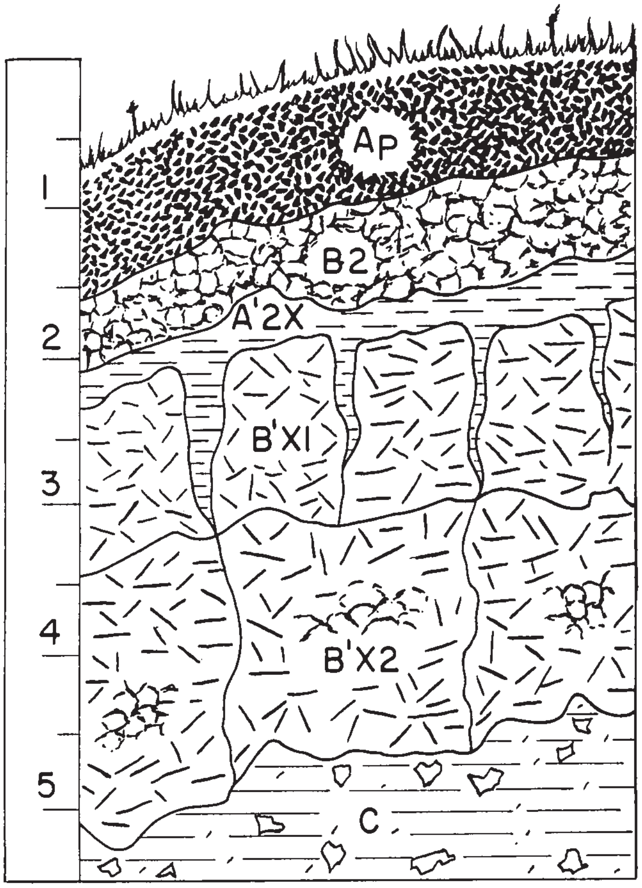
Mollisols

Mollisols have a mollic epipedon (fig. 14), but not all soils in which this epipedon occurs are Mollisols. They have a base saturation of more than 50 percent or a base saturation that increases with depth from the argillic horizon to the C horizon. A vast majority of Mollisols formed under grass vegetation, either tall or short, but spaced closely enough to form a sod. Some formed mostly under sedges and water-loving plants, and a few under deciduous hardwood forest. Those under hardwood forest have basic and calcareous parent materials that have a large earthworm population. The worms pull the leaves underground, and the leaves decay and produce conditions similar to those produced by the decay of grass roots.

In Cayuga County, where the dominant vegetation has been deciduous hardwood forest, the only locations favorable for development of a mollic epipedon are the wet flood plains where the vegetation consists of sedges and there is a supply of base-rich water. Sloan soils occur in these areas.

Alfisols

Alfisols have well-developed horizons. They generally are moist, and they have an argillic horizon that has



Ap - Dark-brown channery silt loam; moderately rich in organic matter; friable.

B2 - Yellowish-brown channery silt loam; very weak, fine, subangular blocky structure; very friable; no increase in clay content.

A'2x - Grayish-brown channery loam; apparently leached; tongues separate prisms in underlying B'x1 horizon; firm in place, fragile to brittle when removed.

B'x1 - Dark grayish-brown channery loam; arranged in prisms, 10 to 18 inches wide; blocky structure when prisms are broken; very firm in place, brittle when removed; slight clay increase over A'2x horizon.

B'x2 - Dark grayish-brown channery loam; arranged in prisms, 18 to 30 inches wide; blocky structure; very firm in place, brittle when removed.

C - Dark grayish-brown channery silt loam glacial till; weak, medium and thick, platy structure; firm to very firm in place, slightly firm and sticky when removed.

Figure 12.—**Sequence and relative thickness of horizons of Langford channery silt loam. Most roots are confined to the Ap and B2 horizons because of the dense fragipan (Bx1 and Bx2 horizons); a few roots extend into the A'2x horizon and around prism faces in the upper part of the B'x1 horizon. The Langford series is a member of the fine-loamy, mixed, mesic family; the Typic Fragiochrepts subgroup; and the Inceptisols order.**

base saturation of more than 35 percent, as measured by the sum of cations. The base saturation, if very high, remains constant with depth below the argillic horizon. If not high in the argillic horizon, the base saturation increases with depth below the argillic horizon. Alfisols also include soils with argillic horizons that have base saturation of less than 35 percent if tongues of an albic horizon extend into the argillic horizon, and if base saturation increases with depth, in or below the argillic horizon but within the soil.

The relatively high base saturation of the argillic horizon limits the occurrence of the Alfisols to places where there has been little movement of water through the soil or to places where the parent materials are young, unweathered, and basic. In humid climates, the parent materials generally are calcareous and the land surfaces are not very old. In cool, humid regions, the Alfisols are almost entirely restricted to young, calcareous parent materials. Here, the argillic horizon seems unstable and is commonly at the base of the solum, adjacent to the calcareous parent material. Alfisols are extensive in the county (fig. 15).

Histosols

Histosols are peat and muck soils developed in organic materials under water. Some have been drained and cultivated. Histosols are not classified at the subgroup and family levels, because classification at these levels was provisional at the time the survey went to the printer.

Laboratory Data

The physical and chemical properties of selected soils of five series in Cayuga County are shown in table 10. The soils sampled were those of the Cazenovia, Langford, Lima, Ontario, and Sodus series. They were sampled between 1948 and 1963.

Samples of Cazenovia loam and Ontario loam were analyzed by the Cornell University Agronomy Service Laboratory, Ithaca, N. Y. Samples of Langford channery silt loam were analyzed by the Soil Survey Laboratory, Soil Conservation Service, Beltsville, Md. Both laboratories analyzed samples of the Lima and Sodus soils.

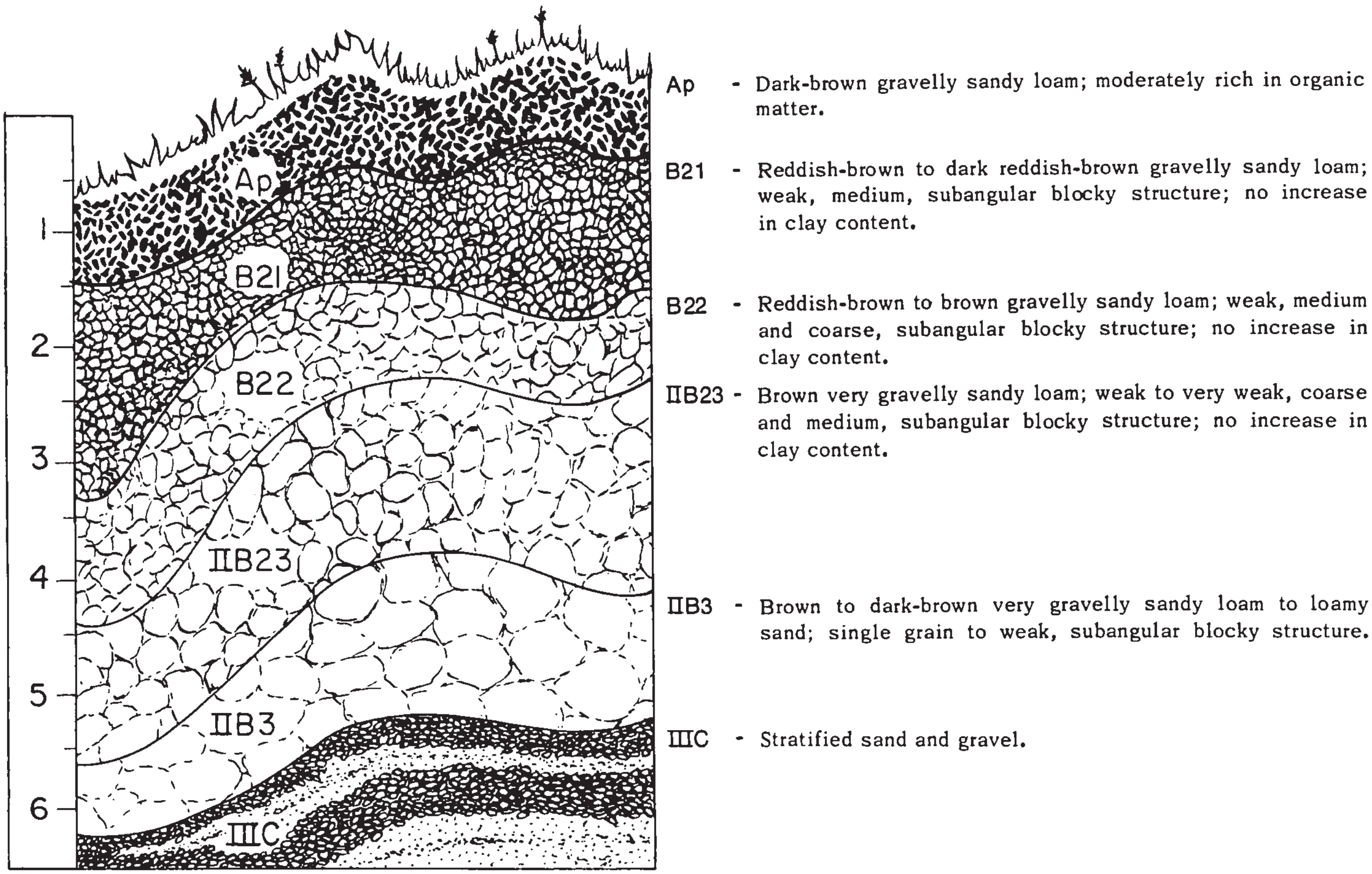


***Figure 13.*—Sequence and relative thickness of horizons of Alton gravelly sandy loam. Roman numerals indicate that this soil is forming in stratified deposits of dissimilar material. The Alton series is a member of the loamy-skeletal, mixed, mesic family; the Typic Dystrochrepts subgroup; and the Inceptisols order.**

Methods of Sampling and Analysis

Samples of approximately 1 gallon were collected from carefully selected pits. The samples were air dried, rolled, and quartered, and a suitable subsample was passed through a 2-millimeter, round-hole sieve. The material larger than 2 millimeters was weighed air-dry for calculation of the percentage larger than 2 millimeters. A subsample of the material smaller than 2 millimeters was ground to approximately 80 mesh with a grinder equipped with ceramic plates for determination of organic-matter content, total nitrogen content, and other properties. The results are reported on an oven-dry basis.

The textural class and pH values as computed by laboratory analysis may differ somewhat from that in the profile descriptions.

Mechanical analysis was made by the method of Kilmer and Alexander (*9*) or by minor modifications of this method. Reaction was measured with a glass electrode in a 1:1 soil-water or solution ratio, using 0.1 Normal KCl suspension for one sample and a 0.01 Molar $CaCl_2$ solution (*13*, *7*) for the others. Bulk density was measured either by paraffined clods in duplicate or by soil core of known volume for all samples. Organic carbon was determined by wet combustion on the Langford, Lima, and Sodus soils, and by dry combustion for the other samples. Total nitrogen was determined by the AOAC modified Kjeldahl procedure (*4*). Free iron oxide was determined by extraction with sodium hydrosulfite and titration with standard potassium dichromate.

Exchangeable cations were determined by sum of cations (*11*).

Moisture held at tensions of 1/10 atmosphere, ⅓ atmosphere, and 15 atmospheres was determined by the method described by Richards (*12*).

Profiles Sampled

Profiles of the Cazenovia, Lima, and Ontario soils are described in the following paragraphs. The Langford and Sodus soils are the soils described as typical of their respective series, and profile descriptions of these

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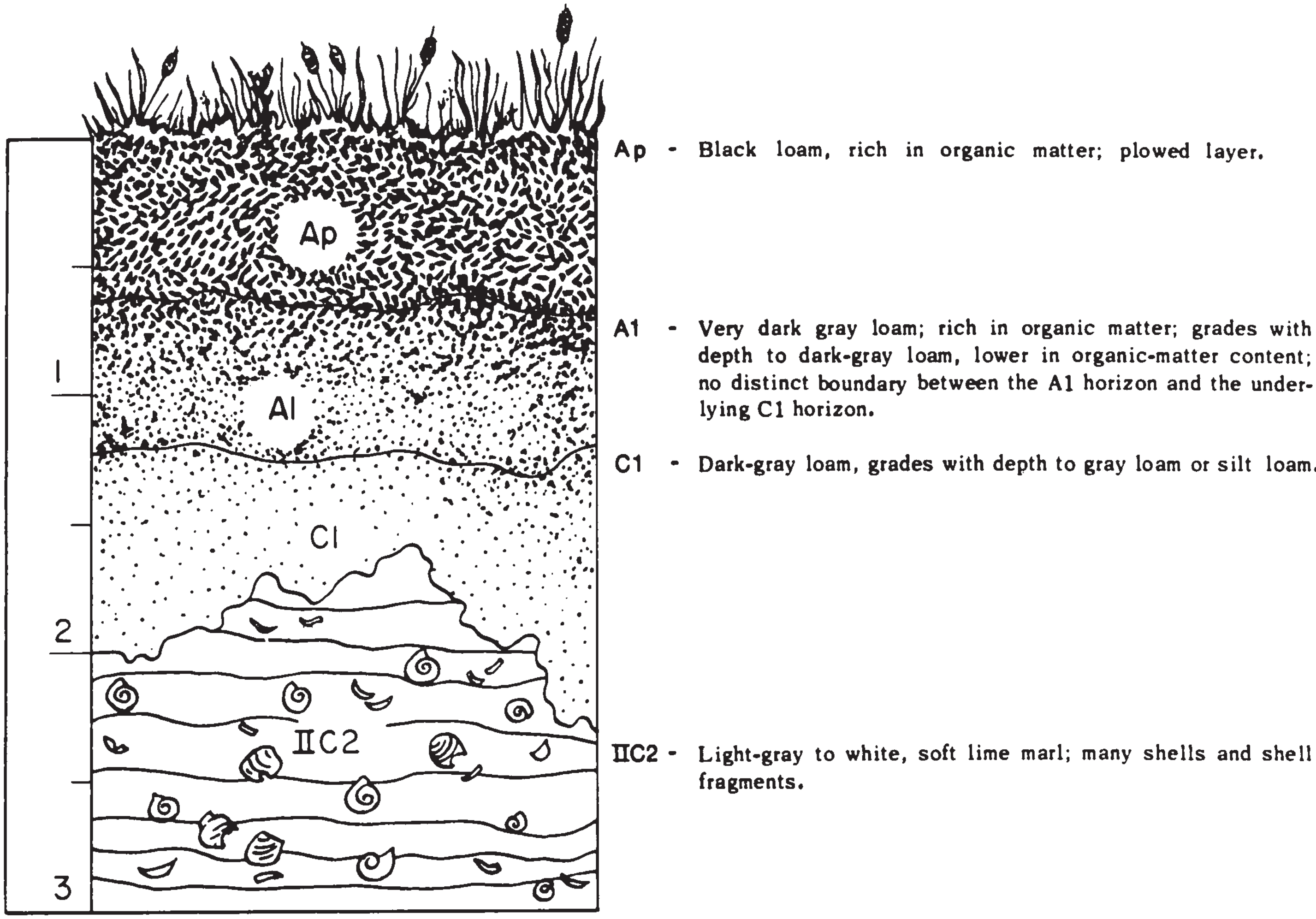

***Figure 14.*—Sequence and relative thickness of horizons of Warners loam. The Roman numeral II prefixed to the C horizon indicates that this soil is forming in deposits of loamy material over dissimilar marl material. The Warners series is a member of the fine-silty, mixed, calcareous, mesic family; the Typic Haplaquolls subgroup; and the Mollisols order.**

soils are included in the section "Descriptions of the Soils."

Cazenovia Soil

The Cazenovia soil is a member of the fine-loamy, mixed, mesic family of Glossoboric Hapludalfs. The classification is firm. The Cazenovia loam sampled is well within the central concept or modal range for the series. It differs from the soil described as typical for the series in Cayuga County in that the surface layer is loam instead of silt loam. A loam surface is typical for the Cazenovia soil that is associated with the Ontario soil in the north-central part of the county. As this soil is of limited extent in the county and does not differ from Cazenovia silt loam in use and management, it was combined, during correlation, with the silt loam type as a textural inclusion. The profile described is that of a soil in an uneroded woodlot. This soil has thicker A2 horizons than those in slightly to moderately eroded cultivated fields. Also, the depth to free carbonates is near the extreme depth for the range of the Cazenovia series.

Profile description of Cazenovia loam:

A1—0 to 4 inches, very dark brown (10YR 2/2) loam; weak, medium, granular structure; friable; many fine and medium roots; leaf litter completely destroyed except for midribs pulled into soil by earthworms; slightly acid; clear, wavy boundary. 3 to 6 inches thick.

A21—4 to 10 inches, yellowish-brown (10YR 5/4) loam; weak, coarse, granular structure; friable; 10 to 20 percent very dark brown (10YR 2/2) material filling earthworm channels; many fine and medium roots; slightly acid; gradual, wavy boundary. 4 to 8 inches thick.

A22—10 to 14 inches, pale-brown (10YR 6/4) loam; weak, coarse, granular structure to fine, subangular blocky; friable; common fine and medium roots; 5 to 10 percent dark-brown (10YR 3/3) material filling earthworm channels; slightly acid; clear, irregular boundary. 2 to 6 inches thick.

B&A—14 to 20 inches, brown (7.5YR 4/4) fine loam; moderate, medium, subangular blocky structure; firm when moist, slightly sticky when wet; peds coated with pale-brown (10YR 6/4) friable loam; ¼ inch thick at top of horizon to film at bottom of horizon; few medium pores; clay lining in center of blocks; common fine roots, and few medium roots;

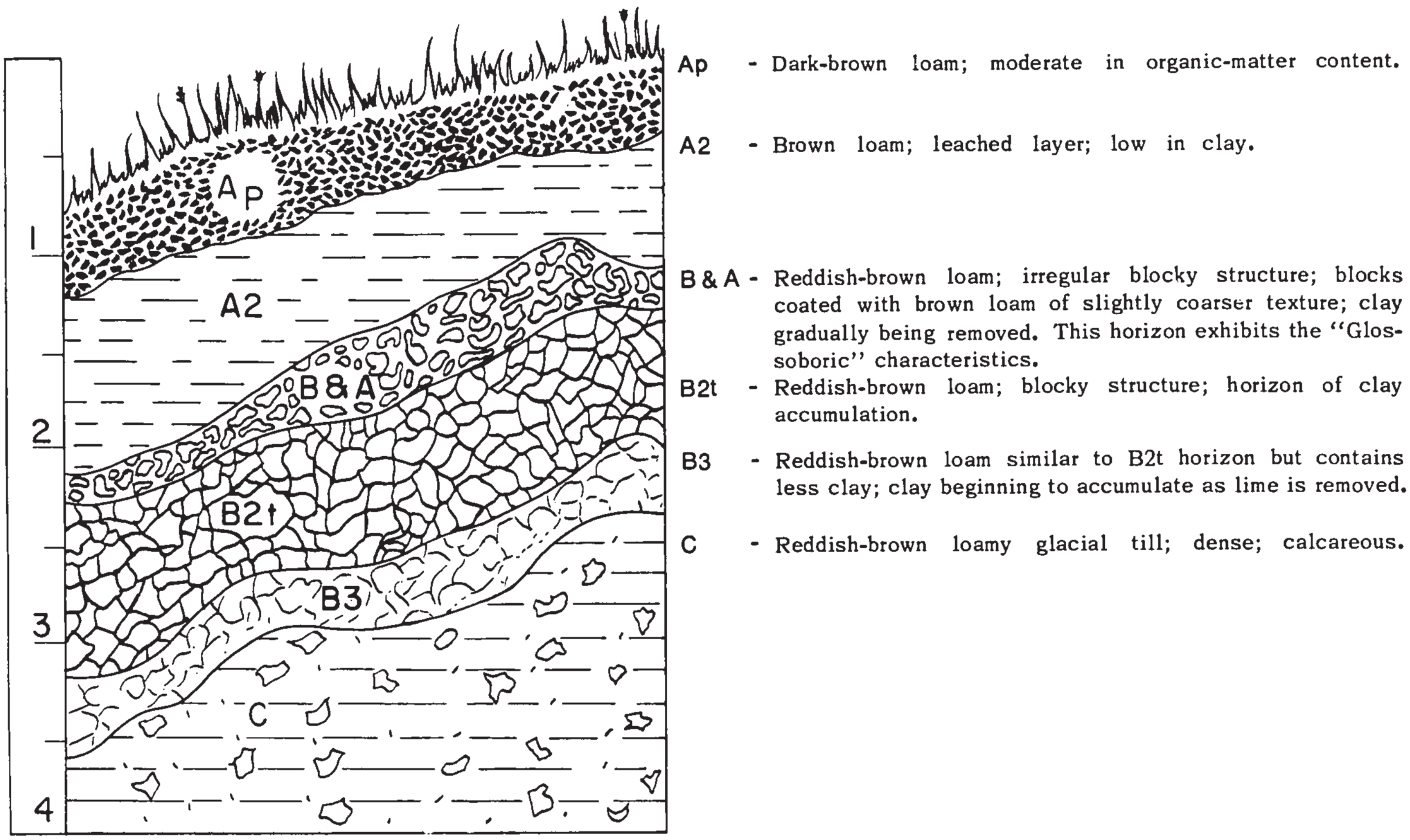

***Figure 15.*—Sequence and relative thickness of Ontario loam. The Ontario series is a member of the fine-loamy, mixed, mesic family; the Glossoboric Hapludalfs subgroup; and the Alfisols order.**

slightly acid; clear, wavy boundary. 4 to 8 inches thick.

B21t—20 to 28 inches, brown (7.5YR 5/4), coarse clay loam; moderate, medium, subangular blocky structure; firm when moist, sticky when wet; thin clay coats on block faces; common medium pores; common fine roots along block faces, few inside blocks; slightly acid; gradual, smooth boundary. 6 to 10 inches thick.

B22t—28 to 36 inches, brown (7.5YR 4/3) clay loam; strong, medium and coarse, subangular blocky structure; firm when moist, sticky when wet; distinct clay coats on block faces; distinct clay lining in common medium pores; few fine roots along block faces, none inside blocks; neutral; gradual, wavy boundary. 5 to 12 inches thick.

IIB23t—36 to 43 inches, brown (7.5YR 4/2), coarse clay loam; moderate, coarse, subangular blocky structure; firm when moist, slightly sticky when wet; thin, continuous clay coats on block faces; few medium pores with distinct clay linings; few fine roots along block faces; 10 to 15 percent gravel and stones; mildly alkaline; locally, spots are calcareous; clear, diffuse boundary.

IIC—43 to 48 inches +, brown (5YR 5/3) gravelly loam; moderate, thick, platy structure breaking to moderate, medium and fine, angular elongated blocky; firm; very few fine roots; slightly calcareous.

Langford Soil

The Langford soil is a member of the fine-loamy, mixed, mesic family of Typic Fragiochrepts. The classification is firm. A profile of Langford channery silt loam, sample number S63NY–6–3 (1–6), is described in the section "Descriptions of the Soils."

This soil differs from the soil described in the official series in that the B2 horizon is coarse-loamy near the fine-loamy border. In the modal soil, the B2 horizon is fine-loamy near the coarse-loamy border. This soil also differs from the modal soil in that it has an A′x horizon, whereas in the modal soil the A′2 horizon is not a fragipan.

In addition to the results shown in table 10, the following data were obtained for the Langford soil.

Using a 0.1 Normal KCl suspension for one sample, the pH value determined was 5.0 at a depth of 0 to 8 inches; 4.1 at 8 to 18 inches; 3.9 at 18 to 21 inches; 3.8 at 21 to 34 inches; 5.0 at 34 to 54 inches; and 6.5 at 54 to 62 inches.

At 1/3 atmosphere, bulk density, in grams per cubic centimeter, was 1.23 at a depth of 0 to 8 inches; 1.34 at 8 to 18 inches; 1.86 at 18 to 21 inches; 1.79 at 21 to 34 inches; 1.78 at 34 to 54 inches; and 1.86 at 54 to 62 inches.

Extractable aluminum was determined by leaching a 10-gram soil sample with 0.1 Normal KCl, and aluminum was determined by a sodium fluoride titration. The milliequivalents per 100 grams of soil were 1.1 at a depth of 8 to 18 inches; 1.6 at 18 to 21 inches; and 1.3 at 21 to 34 inches.

TABLE 10.—*Physical and chemical*

[Lack of data indicates that determinations

Soil type and sample number	Horizon	Depth	Particle-size distribution								Coarse fragments (more than 2 mm.)	Textural class
			Sand (2–0.05 mm.)	Silt (0.05–0.002 mm.)	Clay (less than 0.002 mm.)	Sand						
						Very coarse (2–1 mm.)	Coarse (1–0.5 mm.)	Medium (0.5–0.25 mm.)	Fine (0.25–0.1 mm.)	Very fine (0.1–0.05 mm.)		
		In.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	
Cazenovia loam.	A1	0–4½	45.6	40.3	14.1	1.2	3.1	4.5	17.9	18.9		Loam
	A21	4½–10	45.6	40.5	13.9	1.8	3.4	4.5	17.6	18.3		Loam
	A22	10–14	47.9	41.0	11.1	2.0	3.7	4.7	18.2	19.3		Loam
	B&A	14–20	48.5	37.5	14.0	1.3	3.4	4.8	19.6	19.4		Loam
	B21t	20–28	35.7	35.5	29.0	.8	2.1	3.4	4.4	15.0		Clay loam
	B22t	28–36	32.5	33.8	33.7	1.4	2.2	3.1	13.2	12.6		Clay loam
	IIB23t	36–43	34.0	38.4	27.6	2.1	2.7	3.1	12.6	13.5		Clay loam
	IIC	43–48	30.4	46.1	23.5	3.6	3.2	3.0	10.0	10.6		Loam
Langford channery silt loam. S63NY-6-3 (1–6).	Ap	0–8	26.3	52.6	21.1	4.5	4.4	3.2	6.3	7.9	28	Silt loam
	B2	8–18	31.7	52.4	15.9	5.4	6.0	3.8	7.0	9.5	29	Silt loam
	IIA′x	18–21	37.7	44.9	17.4	6.8	6.5	4.7	8.8	10.9	31	Loam
	IIB′x1	21–34	37.2	45.5	17.3	7.0	7.3	4.6	7.7	10.6	50	Loam
	IIB′x2	34–54	30.0	48.0	22.0	8.5	4.7	3.2	5.4	8.2	42	Loam
	IIC	54–62	23.9	54.0	22.1	5.8	3.0	2.1	4.0	9.0	43	Silt loam
Lima loam. F. No. 5216 (93–97).	Ap	0–10	41.4	41.2	17.4	1.5	3.1	4.7	15.3	16.8	9.2	Loam
	B&A	10–12	41.8	38.7	19.5	1.5	3.3	4.6	15.1	17.3	13.6	Loam
	B2t	12–18	42.1	34.0	23.9	1.3	3.2	4.8	15.7	17.1	12.2	Loam
	IIC1	18–34	38.8	47.6	13.6	4.9	5.7	4.6	10.8	12.8	34.8	Loam
	IIC2	34–44	38.6	48.0	13.4	3.7	5.9	4.7	10.9	13.3	49.2	Loam
Ontario loam.	A1	0–4	40.1	43.9	16.0	.8	2.4	3.1	16.6	17.2		Loam
	A21	4–10	41.0	43.6	15.4	1.3	2.6	3.3	16.4	17.4		Loam
	A22	10–16	41.3	44.1	14.6	1.5	3.3	3.5	16.6	16.4		Loam
	B&A	16–24	41.0	39.6	19.4	1.2	3.1	3.4	16.3	17.0		Loam
	B21t	24–32	39.3	36.9	23.8	2.1	3.2	3.0	14.7	16.3		Loam
	B22t	32–40	37.6	35.3	27.1	1.5	2.9	3.0	14.8	15.4		Clay loam
	C	40–47	39.8	37.4	22.8	1.7	3.4	3.3	15.6	15.8		Loam
Sodus gravelly loam. F. No. 5216 (85–92).	Ap	0–7	52.6	38.0	9.4	2.0	4.4	5.0	16.3	24.9	28	Loam to very fine sandy loam.
	B2	7–16	54.3	38.9	6.8	3.1	5.7	5.6	16.8	23.1	39	Very fine sandy loam.
	A′2	16–20	57.6	37.0	5.4	2.3	4.0	4.4	17.8	29.1	20	Very fine sandy loam.
	B′x1	20–41	51.9	36.6	11.5	1.8	3.4	4.0	16.7	26.0	23	Loam
	B′x2	41–53	54.2	36.3	9.5	2.0	3.8	4.2	17.3	26.9	16	Very fine sandy loam.
	C1	53–73	53.3	36.7	10.0	2.4	4.1	4.2	16.5	26.1	23	Very fine sandy loam.
	C2	73–85	54.1	37.5	8.4	2.8	4.5	4.4	16.3	26.1	33	Very fine sandy loam.

[1] Trace.

properties of selected soils

were not made or material was not present]

pH at 1:1		Organic carbon	Nitrogen	C/N ratio	Free Fe_2O_3	Bulk density	Moisture held at tension of —			Exchangeable cations (sum)	Extractable cations (milliequivalents per 100 grams of soil)					Base saturation
H_2O	$CaCl_2$					(oven-dry)	1/10 atmosphere	1/3 atmosphere	15 atmospheres		Ca	Mg	Na	K	H	
			Pct.		Pct.	Gm./cc.										Pct.
6.2	------	4.64	0.26	18	------	1.1	------	------	------	16.8	15.2	1.4	------	0.13	0.1	99
6.2	------	.99	.08	12	------	1.3	------	------	------	6.6	4.7	.6	------	.07	1.3	81
6.2	------	.35	.04	9	------	1.5	------	------	------	4.2	2.9	.3	------	.06	.9	79
6.4	------	.12	------	------	------	1.5	------	------	------	4.4	3.1	.5	------	.06	.7	83
6.3	------	.29	.04	8	------	1.6	------	------	------	7.6	5.5	1.2	------	.11	.8	19
7.2	------	.23	.04	6	------	1.6	------	------	------	8.0	6.0	1.9	------	.10	0	100
8.0	------	.17	------	------	------	1.7	------	------	------	5.0	------	------	------	.08	0	100
8.0	------	------	------	------	------	1.8	------	------	------	------	------	------	------	------	------	------
4.7	------	2.70	.241	11	1.5	1.28	------	26.6	9.8	21.3	8.3	.6	.1	.1	12.2	43
5.4	------	.87	.046	19	1.2	1.40	------	20.7	6.2	13.9	2.5	.1	.1	.1	11.1	20
5.2	------	.28	------	------	1.0	1.89	------	13.4	5.2	7.9	1.3	.2	.1	.1	6.2	22
5.3	------	.12	------	------	1.1	1.84	------	15.1	6.2	9.0	2.4	.2	(1)	.1	6.3	30
6.4	------	.16	------	------	1.2	1.84	------	15.0	7.9	9.5	6.4	.8	(1)	.1	2.2	77
7.1	------	.14	------	------	1.0	1.94	------	14.7	7.2	------	------	------	------	------	------	------
7.0	6.3	2.49	.184	14	1.6	1.3	35.4	27.0	8.9	20.7	13.4	2.3	.1	.1	4.8	77
7.3	6.5	.87	.089	10	1.9	------	29.0	20.5	8.8	16.1	10.2	2.0	.1	.1	3.7	77
7.6	6.8	.87	.104	9	2.4	1.5	28.0	20.3	10.7	20.9	14.6	2.6	.1	.1	3.5	83
8.3	7.2	.17	------	------	.9	------	19.5	15.3	5.5	------	------	------	------	------	------	------
8.0	7.3	.12	------	------	.8	2.1	18.9	15.0	5.4	------	------	------	------	------	------	------
4.7	------	3.77	.26	14	------	1.1	------	------	------	18.3	4.5	.9	------	.11	12.8	30
4.7	------	1.39	.14	14	------	1.4	------	------	------	12.4	2.3	.4	------	.07	9.7	23
4.7	------	2.74	.07	11	------	1.6	------	------	------	8.5	1.2	.02	------	.05	7.2	15
4.8	------	.23	.04	6	------	1.6	------	------	------	7.7	1.6	.3	------	.07	5.7	25
5.1	------	.23	.04	6	------	1.6	------	------	------	7.9	3.3	.7	------	.09	3.8	52
5.4	------	.23	.04	6	------	1.7	------	------	------	9.8	7.7	1.2	------	.12	.8	92
8.2	------	.12	.03	4	------	1.8	------	------	------	------	------	------	------	------	------	100
5.7	4.8	2.78	.166	17	1.7	------	36.7	21.2	6.6	18.7	5.1	.5	.1	.2	12.4	34
5.4	4.6	.81	.061	13	1.6	------	30.0	15.7	4.8	10.7	1.6	.1	0	.1	8.9	17
5.2	4.4	.23	------	------	.8	------	20.4	10.0	2.4	4.5	1.0	0	0	.1	3.4	24
5.8	4.8	.12	------	------	1..8	2.0	19.6	12.6	5.2	5.9	2.7	.7	0	.1	2.5	59
6.3	5.2	.06	------	------	1.2	------	19.4	12.0	5.2	5.1	2.3	1.1	0	.1	1.7	67
6.3	5.4	.06	------	------	1.8	------	19.3	12.6	5.4	5.3	2.4	1.1	0	.1	1.7	18
8.1	7.2	.06	------	------	1.0	2.0	17.1	11.3	7.2	3.6	------	------	------	------	------	------

352-968—72——14

Lima Soil

The Lima soil is a member of a fine-loamy, mixed, mesic family of Glossoboric Hapludalfs. The classification is tentative. The Lima samples were taken from an area near the location of the soil described in the official series. This soil differs from the modal soil in that it has a loam surface layer, is slightly wetter, and is shallower to calcareous glacial till. It is just within the thinnest range of solum thickness. Lima loam is of limited extent in this county and does not differ from Lima silt loam in use and management.

Profile description of Lima loam, sample F. No. 5216 (93–97):

Ap—0 to 10 inches, very dark grayish-brown (10YR 3/2) loam; moderate, medium, granular structure to fine, subangular blocky; friable; many fine roots; neutral; clear, smooth boundary. 9 to 10 inches thick.

B&A—10 to 12 inches, brown (10YR 5/3 to 4/3) loam; common, fine, faint, yellowish-brown (10YR 5/4) mottles; moderate, medium, subangular blocky structure; slightly firm when moist, slightly sticky when wet; 15 percent dark grayish-brown (10YR 4/2) material filling earthworm channels; many fine roots; many fine pores; ped exteriors have ¹⁄₁₀- to ⅛-inch coats of brown (10YR 5/3) loam; ped interiors are dark-brown (10YR 4/3) fine loam; clay linings in pores; 10 to 15 percent gravel; mildly alkaline; clear, smooth boundary. 0 to 3 inches thick.

B2t—12 to 18 inches, dark-brown (10YR 4/3) fine loam; common, medium, distinct, yellowish-brown (10YR 5/4) mottles; moderate, medium, subangular blocky structure; slightly firm when moist, slightly sticky when wet; common, fine roots; few yellowish-brown fragments of weathered rock; 5 to 10 percent dark grayish-brown (10YR 3/2) material filling worm channels; discontinuous, thin clay coats on block faces; common medium pores with distinct clay linings; 10 to 15 percent gravel and stones; mildly alkaline; clear, wavy boundary. 5 to 7 inches thick.

IIC1—18 to 34 inches, grayish-brown (10YR 5/2) gravelly loam; common, fine and medium, faint, brown (10YR 5/3) mottles, and common, medium, distinct, yellowish-brown (10YR 5/4) mottles that decrease in size and number with depth; weak, medium and thick, platy structure; firm; light grayish-brown (10YR 6/2), silty, segregated lime coats on plate faces; strongly calcareous; diffuse boundary. 14 to 18 inches thick.

IIC2—34 to 41 inches +, grayish-brown (10YR 5/2) gravelly loam; few, fine, distinct, yellowish-brown (10YR 5/4) mottles that decrease in size and number with depth; moderate, thick, platy structure; very firm; common, very firm and hard, cemented masses, ¼ to ¾ inch thick and 1 to 2 inches long; more gravel and stones than IIC1 horizon; strongly calcareous.

Ontario Soil

The Ontario soil is a member of the fine-loamy, mixed, mesic family of Glossoboric Hapludalfs. The classification is firm. The soil sampled is within the range or modal concept for the series. It is, however, near the extreme acid end of the range and near the extreme thickness range. This soil occurs in a wooded area and is undisturbed and uneroded. It has thicker A2 and B2 horizons than most of the Ontario soils in Cayuga County.

Profile description of Ontario loam:

A1—0 to 4 inches, very dark brown (10YR 2/2) loam; moderate, medium, granular structure; friable to very friable; numerous roots; numerous worm casts; leaf litter completely destroyed except for midribs pulled into soil by earthworms; very strongly acid; clear, wavy boundary. 2 to 8 inches thick.

A21—4 to 10 inches, yellowish-brown (10YR 5/4) loam; weak, very fine, granular structure; very friable; 10 to 20 percent very dark brown (10YR 2/2) material filling earthworm channels; many roots; very strongly acid; gradual, wavy boundary. 4 to 8 inches thick.

A22—10 to 16 inches, light yellowish-brown (10YR 6/4) loam; very weak, fine, granular structure; very friable; 5 percent very dark brown (10YR 2/2) material filling earthworm channels; many roots; very strongly acid; gradual, irregular boundary.

B&A—16 to 24 inches, brown (10YR 5/3), fine loam; moderate, medium, subangular blocky structure; slightly firm when moist, slightly sticky when wet; blocks surrounded by pale-brown (10YR 6/3), very friable loam, ⅛- to ¼-inch thick, thicker at top of horizon and thinner at bottom; many fine roots; common medium pores with distinct clay linings; very strongly acid; gradual, wavy boundary. 4 to 10 inches thick.

B21t—24 to 32 inches, brown (10YR 5/3) fine loam; moderate, medium, subangular blocky structure; firm when moist, slightly sticky when wet; discontinuous, thin clay films on block faces; common fine pores with distinct clay linings; common fine roots; strongly acid; clear, wavy boundary. 6 to 10 inches thick.

B22t—32 to 40 inches, brown (10YR 5/3) coarse clay loam; moderate, medium and coarse, subangular blocky structure; firm when moist, slightly sticky when wet; distinct clay films on block faces; common fine pores with distinct clay linings; few fine roots; strongly acid in upper part, mildly alkaline in lower part; gradual, wavy boundary. 4 to 12 inches thick.

C—40 to 47 inches +, pale-brown (10YR 6/3) loam; strong, thick, platy structure; firm; 5 to 15 percent coarse fragments, dominated by red and gray sandstone; calcareous.

Sodus Soil

The Sodus soil is a member of the coarse-loamy, mixed, mesic family of Typic Fragiochrepts. The placement is firm. Sodus gravelly loam, sample F. No. 5216 (85–92), is the soil described for the official series descriptions and is considered to be near the central concept for the series. A profile of this soil is described in the section "Descriptions of the Soils."

General Nature of the County [14]

This section discusses the geology, physiography, and drainage of the county; describes the climate; provides some general information about the county; and gives some important farming statistics. The statistics are from reports published by the U.S. Bureau of the Census.

Geology

The mineral soils of Cayuga County formed in material derived from weathered and disintegrated bedrock. The rock did not weather and disintegrate in place but consists of debris that resulted from glacial action. As the rock material was usually deposited within a few miles from its source, there commonly is some relationship between this material and the underlying bedrock. In the valleys, the thick ice lobes and the large volumes

[14] CARL S. PEARSON, soil scientist, Soil Conservation Service, assisted in preparing all parts of this section except "Climate."

of melt water were able to transport materials long distances. Consequently, the soil materials in these areas show less correlation with the underlying rock than the till deposited by the ice on uplands.

The movement of the glaciers in this area was generally southerly. Thus, the glacial till is south of its original source. This is strikingly apparent in the high-lime soils, which extend beyond the southern and western boundaries of the county. These soils formed in till derived mainly from the limestone bedrock in the vicinity of Auburn.

Cayuga County is underlain by rock formations of two systems, namely the Silurian and the Devonian. Following are brief descriptions of these formations, from north to south throughout the county.

Silurian System

The undifferentiated Medina and Queenston formations underlie the soils in the extreme northern part of the county. The Queenston, usually considered as Ordovician, consists of dark-red shale and some Medina sandstone. The basal Silurian formation consists of hard, somewhat massive sandstone, alternating with layers of red and gray shale. This red rock, particularly the hard, resistant Medina sandstone, is mainly responsible for the red and pink colors apparent in the soils far to the south. The glacial till underlying the Ontario soils contains a large amount of rock material from the Medina formation, and much of the sandy and gravelly material in the northern part of the county is from this resistant rock. Large amounts of this red rock occur in outwash deposits all the way to the southern boundary of the county. In Cayuga County these formations are buried deeply under soils of the Sodus, Williamson, and Alton series. Outcrops are rare except along the lake shore.

The Clinton formation consists of the lower to the upper beds of Oneida conglomerate, Sodus shale, middle Clinton shale and sandstone, Williamson shale, and Rochester shale and sandstone. These beds, which have a maximum thickness of 350 feet, consist of thin layers of limestone and iron ore. The red to purplish colors of some formations have contributed to the color of the overlying glacial drift and to the soils that formed in it. The formations for the most part are deeply buried. Some outcrops occur in creek bottoms.

The Lockport formation is composed mainly of layers of dolomitic limestone, which in places are separated by thin layers of shale (*6*). The dolomitic limestone ranges from brownish gray to almost black. Upon weathering, it becomes dark yellowish brown. This formation has been highly significant in the development of the soils to the south. It is the source of nearly all of the lime and limestone in the soils from Ira and Westbury south to Auburn. The Ontario soil, which is extensive in this part of the county, formed in high-lime material derived from this formation. The limestone gravel in the Palmyra soils north of Auburn is also from the Lockport formation. Other soils that have been influenced are the Appleton, Hilton, Kendaia, Phelps, and Wampsville.

The Vernon shale formation consists mainly of red and green, soft mud shale and some gray gypsiferous shale and thin, flaggy dolomite. Most of this somewhat massive shale formation is deeply buried, although some exposures can be seen in the deeper road cuts, mainly south of the Seneca River, near Port Byron and Weedsport. The red shale has contributed to the red color and heavy texture of the moderately deep Lairdsville and Lockport soils and the deeper Cazenovia soils. The green shale has contributed to the grayish-green or olive colors and heavy texture of the moderately deep Riga and Brockport soils.

The Camillus formation overlies the red and green Vernon shale. The lower part is composed of thin layers of dark dolomite and gray marly shale. The upper part consists of gypsiferous shale beds in which there are thin layers of dolomitic limestone. All of the gypsum mined in western New York is from this formation. This soft gray shale has contributed to the gray color and silty and clayey texture of the Camillus soils and of associated soils. It is also a major constituent of the glacial till of the drumlins and uplands south of the Seneca River to the vicinity of Auburn.

The Bertie formation consists of Bertie waterlime and Cobleskill limestone. The Bertie waterlime is a series of drab, gray, argillaceous, more or less siliceous dolomites. The Cobleskill limestone occurs immediately above the Bertie and consists of 8 to 10 feet of harder, darker colored limestone. Because of the abundance of coral in this material, it is known as a corralline limestone. These rocks contributed to the high-lime material in which Honeoye, Lima, and Kendaia soils formed. Benson and Ontario, moderately shallow variant, soils formed in areas where the limestone is close to the surface.

Devonian System

The Helderberg group includes Rondout waterlime and Manlius limestone. These formations are placed in the Devonian System on the latest State map but are considered Silurian by many geologists. The Rondout, a drab or dark-colored waterlime, is 25 to 30 feet thick at Union Springs. The Manlius limestone is composed of distinct layers of hard, dark-blue limestone, separated by thin layers of black bituminous matter. It is from 2 to 5 feet thick in Cayuga County but pinches out at Seneca Falls to the west. These formations have contributed to the soils in the central and southern parts of the county. Benson and Ontario, moderately shallow variant, soils formed in areas where the formations are close to the surface. Outcrops of these rocks are numerous in the vicinity of Auburn, Union Springs, and Cayuga.

The Onondaga limestone formation consists of heavy beds of bluish-gray limestone embedded with nodules and nodular layers of chert. Thin layers of shale or bituminous mud commonly separate the limestone into even, compact layers or tiers, 6 to 36 inches thick. This thick limestone, which occurred at almost right angles to the movement of the glacial ice, contributed an enormous amount of lime to the soils that extend for a considerable distance to the south. The shallow Benson and Ontario, moderately shallow variant, soils are in areas where this formation occurs.

The Marcellus-Skaneateles formations extend across the central part of the county. The Marcellus shale, immediately above the Onondaga limestone, is 45 to 50 feet thick on the Auburn quadrangle. It is a black, bituminous, pyritiferous fissile shale, characterized by numerous scattered concretions of calcium carbonate that vary from a few inches to several feet in size. The Skaneateles formation, which overlies the Marcellus, includes the Stafford limestone, Cardiff shale, and Skaneateles shale. The Stafford limestone is about 3 feet thick in Cayuga County. The Cardiff shale is a black, calcareous, slaty shale interbedded with thin layers of fossiliferous limestone. Skaneateles shale is hard, dark blue or black, and calcareous in the lower part but becomes somewhat lighter colored and softer in the upper part. These upper beds of soft alkaline to calcareous shale are partly responsible for the gray colors and heavy texture of the Angola, Varick, and Aurora soils.

The Ludlowville-Moscow formations extend across the county, near the southern part. The Ludlowville formation is about 125 feet thick and occurs above the Skaneateles beds. The lower 25 feet consists of somewhat calcareous, sandy shale that is lighter colored and harder than the Skaneateles formation below. The upper 100 feet consists of soft, dark-colored shale that gradually becomes more sandy and lighter colored as depth decreases. It contains thin, calcareous lenses and many small concretions. It is terminated at the top by a thin layer of Tichenor limestone. Moscow shale, which is well defined by Tichenor limestone on the bottom and Tully limestone on the top, is 130 feet thick. It consists of soft, light bluish-gray shale that generally is calcareous and in some places consists of continuous concretionary layers crowded with fossils. The soft, nonresistant shales of the Ludlowville and Moscow formations have contributed to the silty texture, the gray color, and the lime content of the soils of the southwestern part of the county. The formations in the south-central and southwestern parts of the county, except for those on the steep slopes adjacent to Cayuga and Owasco Lakes, are deeply buried by the high-lime materials of the Honeoye and associated soils. Aurora and Angola soils are moderately deep over these shales.

The Tully limestone formation is 14 to 21 feet thick and is composed of 4 to 6 compact layers of fine-grained, blue-black limestone that weathers to a light-gray color. The fresh rock is hard, but after long exposure it breaks easily into small angular fragments. It is deeply buried and is exposed only on the sides of steep slopes and gullies. It is too thin to have much influence on soil formation but does contribute some lime.

The Genesee shale, the Cashaqua shale, and the Hatch shale and flags formations underlie the soils in much of the southern part of the county. Genesee shale occurs immediately above the Tully formation and consists of black, bituminous shale about 65 feet thick. Thin bands of gray shale occur near the top of this formation. Separating the black Genesee shale from the overlying Cashaqua shale is a thin band of calcareous shale and limestone of the Genundewa formation. The overlying Cashaqua shale is about 265 feet thick. Strata of sandstone, some 1 to 3 feet thick, occur throughout this formation, particularly in the upper part. This material has been quarried for use as flagstones. Also in this formation are strata of light-colored, soft, calcareous shale. The Hatch shale and flags formation in the vicinity of Genoa is about 350 feet thick. It consists of alternating strata of sandstone and blue and olive shale. These formations have contributed the silty texture and the numerous flaggy and channery fragments to the soils in this part of the county, particularly to those in the southwestern part. Erie, Langford, Lordstown, and Tuller soils formed mainly in material derived from these formations.

Physiography

All of Cayuga County, except the southeastern part, is in the physiographic province known as the Erie-Ontario Plain. The southeastern part is in the northern extension of the Allegheny Plateau. The Erie-Ontario Plain is made of three distinctly different physiographic areas that extend across the county in a general east-west direction. The northern part is characterized by numerous drumlins. This drumlin area is divided into two sections by the broad, low valley of the Seneca River. A relatively level lake plain begins at the southern edge of the drumlin area and extends southward to a smooth, moraine area. The moraine area merges gradually with the high hill section that forms the northern extension of the Allegheny Plateau.

The drumlins, which occur both singly and in groups, consist of elongated, symmetrical hills oriented in a general north-south or northwest-southeast direction. They are separated by gently rolling, undulating, or flat areas and by depressions that, in many places, contain poorly drained lacustrine material or peat deposits. The drumlins rise from 70 to 125 feet above the general level of the plain, and at their crest are from 450 to 500 feet above sea level. Their northern end is commonly steep; the southern end tapers gradually to the plain.

The Seneca River, which flows through this drumlin area, is bordered on both sides by smooth to flat land consisting mostly of lake-laid material, glacial outwash, and recent alluvium. Extending northward from the Seneca River, near the Wayne County line, is a low-lying strip of outwash material interspersed with many low areas of organic soil.

In the vicinity of Auburn and Cayuga is a belt of comparatively smooth land that crosses the county in a diagonal direction. In this area, the soil material is predominantly lake-laid sediments. This land merges with a till plain of true ground moraine. This till plain is generally smooth with undulating to moderately rolling topography. It is at an elevation ranging from 880 feet above sea level at Auburn to 1,000 feet at Genoa, near the Tompkins County line. The steeper areas border the finger lakes and Salmon and Little Salmon Creek.

The hilly plateau in the southeastern part of the county is a maturely dissected region. The only level land is the smooth, broad hilltops at the summit. The slopes bordering the narrow, deep valleys of the Owasco Inlet and the other major streams are cut by numerous narrow, steep-walled gorges and gullies. The elevation ranges from 700 to 800 feet in the valleys to more than 1,800 feet on the plateau summit.

Drainage

All of the drainage of Cayuga County eventually flows into Lake Ontario. The southwestern part drains into Cayuga Lake, which outlets into the Seneca River. The south-central part drains into Owasco Lake, which flows into the Seneca River through the Owasco Outlet. The uplands in the southeastern part drain into Skaneateles Lake. The central part of the county is drained by the Seneca River, and the extreme northern part drains directly into Lake Ontario.

Much of the land along Seneca River is wet, and there are many small swamps and wet areas throughout the northern part of the county. The drainageways in the southern part occupy valleys that were scoured and deepened largely by ice during the last glacial advance. In places the drainage channels are 300 to 500 feet below the general level of the uplands. In the north-central part of the county, streams are sluggish, and their channels are only a few feet below the level of the adjacent terraces and bottom lands.

Water Supply

Cayuga County is well supplied with water. The annual precipitation of about 36 inches normally is sufficient to recharge ground water supplies. In addition, Owasco Lake is entirely within the county, and two other large finger lakes border the county. Owasco Lake supplies most of the water for the city of Auburn and the villages of Port Byron and Sennett. Most other villages obtain water from springs and wells.

Deposits of sand and gravel above bedrock are considered excellent aquifers because of the amount of pore space for water to accumulate. Such deposits occur along the Seneca River; north of the river along the Wayne County line, principally in the towns of Victory and Conquest; and in the valleys of the Owasco Inlet and Dresserville Creek. Wells dug or drilled into these deposits usually have a high yield in gallons of water per minute.

There is little space for the storage of water in the dense glacial till that underlies the drumlin areas, the plain south of Auburn, and the hills of the southeastern plateau.

Bedrock formations that have many open joint planes or numerous solution cavities are fair aquifers because water is stored in the voids. From north to south, the better bedrock aquifers in Cayuga County are the Lockport formation, which occurs as a belt 5 to 6 miles wide north of Victory; the Camillus and Bertie formations, which occur as a belt 4 to 6 miles wide across the county north of Auburn; and a series of limestone formations south of the Bertie formation, among which are the Cobleskill, Rondout, Manlius, and Onondaga. South of the Onondaga limestone, most formations consist of shale interbedded with fine-grained sandstone. Although this material is highly jointed and fractured, the joints are too tight to leave room for water storage. Tully limestone, which also occurs in this area, is too thin to provide water.

Climate [15]

Cayuga County has a humid, continental type of climate. The atmospheric flow is predominantly from continental sources. Thus, the weather usually is cold and dry when the flow is from the north or northwest and warm and occasionally humid when the flow is from the south or southwest. From time to time, air from maritime sources reaches the county from well-developed storm systems off the mid- or north-Atlantic coast. Such easterly air flow brings cool, cloudy, and often damp weather.

Although the climate is predominantly continental, the range in temperature extremes is less than that in the more centrally located areas of the United States because of the proximity of the Great Lakes and the Atlantic Ocean. Summers are pleasantly warm, winters are long and cold, and there are frequent periods of stormy, unsettled weather. Monthly precipitation tends to be lightest in winter and heaviest from May through July, but the variation in seasonal precipitation is relatively small.

The county is in the path of most major weather systems that cross the continent from west to east. Consequently, it is subject to a variety of weather conditions. Temperature and other atmospheric conditions tend to vary from day to day and from week to week. Seasonal weather frequently varies from year to year.

The climate of Cayuga County is strongly influenced by Lake Ontario, although the influence is greater in areas nearer the lake. In summer, the cooling effect of the lake tends to decrease the number of thunderstorms and thereby to lessen the danger of damage by hail and wind. At night, cooling is reduced. This has the effect of providing a longer growing season in areas nearer the lake. The effect of the finger lakes in and adjacent to the county appears to be limited to areas along their immediate shoreline. In the southern third of the county, the topography and the increase in elevation have some influence on the climate.

Table 11 gives temperatures and precipitation data compiled from records of the United States Weather Bureau at Auburn. The weather data recorded at Auburn are reasonably representative of the greater part of the county. Within a few miles of Lake Ontario, however, the temperature tends to be a little higher than that recorded at Auburn, and on the uplands in the extreme southeastern part of the county, the temperature tends to be a little lower and the precipitation a little heavier.

Temperature

The temperature reaches 90° F. or higher on an average of about 10 days each year. The number of such days varies, however, from as few as 3 or 4 in a cool summer to as many as 15 or more in an unusually warm summer. Temperatures in the 90's occur almost entirely in June, July, and August, although in about 1 year in 2, such temperatures are recorded in September. The temperature seldom reaches 100° or higher. Within a few miles of Lake Ontario, the number of days when the temperature reaches 90° is about half of that in the central and southern parts of the county.

A temperature of 0° or lower can be expected on 6 to 10 days in most winters. In an especially mild winter, the number of such days may not exceed 3, but in a more severe winter, there may be as many as 14 days or more when the temperature will be 0° or colder. A temperature of 0° or lower can be expected from early in December to early in March. Temperatures of 15° below zero or

[15] By A. Boyd Pack, State climatologist, U.S. Environmental Science Services Administration, Weather Bureau.

TABLE 11.—*Temperature and precipitation at Auburn, N.Y.*

[Elevation 715 feet]

Month	Temperature					Precipitation						
	Average daily maximum [1]	Average daily minimum [1]	7 years in 10 will have—		Average heating degree days [1] [2]	Average total [1]	Record minimum [1]	3 years in 10 will have—		Average number of days with 0.10 inch or more [3]	Snow	
			Maximum equal to or higher than [1]—	Minimum equal to or lower than [1]—				More than [1]—	Less than [1]—		Average total [1]	7 years in 10 will have more than [1]—
	°F.	°F.	°F.	°F.		In.	In.	In.	In.		In.	In.
January	32	18	43	0	1,210	2.2	0.9	2.4	1.8	7	21	14
February	33	17	46	1	1,115	2.4	1.0	2.7	1.7	6	21	14
March	40	24	56	11	1,020	2.7	.7	3.3	2.0	7	16	10
April	53	35	70	26	620	2.7	1.2	3.3	2.2	7	3	1
May	66	46	79	33	300	2.8	1.0	3.4	2.1	6	(4)	(5)
June	75	56	88	45	60	2.8	.5	3.8	1.6	6	0	----------
July	81	62	89	54	15	3.0	.6	4.0	2.4	7	0	----------
August	79	61	88	50	20	2.4	.6	2.9	1.9	7	0	----------
September	72	54	85	39	115	2.3	.6	2.8	1.8	6	0	----------
October	62	44	77	31	380	2.8	.2	3.4	1.7	6	1	(6)
November	47	34	64	21	680	2.8	.6	3.4	2.1	7	9	5
December	36	23	50	7	1,060	2.4	.8	2.9	1.6	6	18	11
Year	56	39	90	−5	6,595	31.3	21.5	34.0	29.0	78	89	74

[1] Based on 30-year record.
[2] Based on 65° F. daily mean temperature.
[3] Based on 10-year record.
[4] Less than 0.5 but more than 0.
[5] 1 year in 10 will have more than 1 inch.
[6] 1 year in 10 will have more than 2 inches.

colder occur about 1 year in 3, and temperatures of 20° below zero or colder occur about 1 year in 10. In most winters the lowest temperature is between 2° and 17° below zero. From late in November to the end of March, there are about 50 days when the temperature will not rise above 32°, although it is uncommon for more than 3 or 4 such days to occur consecutively.

Table 12 gives the probability of the last freezing temperature in spring and the first in fall. Ordinarily, the last freeze in spring is likely to occur between April 29 and May 3 over the greater part of the county, and the first freeze in fall is between October 15 and 20. Within a few miles of Lake Ontario, however, the average dates are about a week earlier in spring and about a week later in fall. At the highest elevations in the southeastern part of the county, the average dates are a week later in spring and a week earlier in fall.

The average length of the freeze-free growing season

TABLE 12.—*Probability of last freezing temperature in spring and first in fall at Auburn, N.Y.*[1]

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 31	April 8	April 21	May 2	May 17	May 30
3 years in 10 later than	March 24	April 1	April 13	April 26	May 10	May 21
5 years in 10 later than	March 16	March 24	April 5	April 18	May 2	May 13
7 years in 10 later than	March 9	March 17	March 27	April 11	April 25	May 6
9 years in 10 later than	March 2	March 10	March 19	April 3	April 19	April 28
Fall:						
1 year in 10 earlier than	November 19	November 13	November 2	October 24	October 4	September 18
3 years in 10 earlier than	November 25	November 20	November 9	November 1	October 12	September 25
5 years in 10 earlier than	December 2	November 28	November 17	November 8	October 20	October 2
7 years in 10 earlier than	December 9	December 5	November 25	November 16	October 18	October 10
9 years in 10 earlier than	December 15	December 12	December 2	November 23	November 4	October 17

[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 17; in 5 years out of 10 (50 percent probability), a temperature of 32° or lower can be expected to occur later than May 2. The fall dates are interpreted similarly for a given temperature, but the occurrence is earlier than the date given.

is about 180 days near the shore of Lake Ontario and about 150 days in the southeastern part of the county. In most of the central part, the freeze-free season ranges from 170 to 175 days.

Additional information on freezing temperatures in Cayuga County and other sections of New York State can be found in literature citations (*5*) and (*8*).

Precipitation

The annual precipitation throughout the county varies. In the southeastern part and in the area that extends from the north-central part southeastward to Skaneateles Lake, the annual precipitation ranges from 35 to 36.5 inches. In the rest of the county, which includes the southwestern quarter, most of the central part in the vicinity of Auburn, and the area within a few miles of Lake Ontario, it ranges from 31.5 to 33.5.

Precipitation data, based largely on observations made at the weather bureau station at Auburn, indicate that in most years, the annual precipitation ranges from 26.5 to 35 inches. Extremes recorded at Auburn show that, in a 30-year period, the minimum annual precipitation received was 21.4 inches in 1962 and the maximum was 42.2 in 1945.

From May through September, the total rainfall throughout most of the county is about 14 to 15 inches, or about 40 to 50 percent of the total annual precipitation. Although the total rainfall in this 5-month period has ranged from extremes of less than 9 inches to more than 17 inches, about 10 to 16 inches can be expected in 7 years out of 10. In the extreme southeastern part of the county, the total rainfall for this 5-month period is about 2 inches more than that shown for the rest of the county.

Instead of a more or less steady seasonal trend, the monthly precipitation in the county fluctuates. It is at a minimum during the three winter months. There is a sharp increase in precipitation in March and a very gradual increase during July. This is followed by an abrupt decrease during the months of August and September. The precipitation again increases somewhat in October and November and then declines to the minimum in December.

Normally, the amount and the distribution of rainfall during the growing season are favorable for the growth of most crops. Short periods of drought occur nearly every summer but generally are not a serious hazard. In about 2 years out of 10, however, the periods of drought are so prolonged that the growth and yield of crops are seriously affected.

Precipitation in amounts of 1 inch or more in 24 hours occurs on 6 to 10 days each year. The probability is somewhat greater in warm-season months. The frequency of such rainfall tends to be less in areas near Lake Ontario. Rainfall of more than 2 inches per day is rare. Precipitation in winter usually falls as snow but occasionally may fall as rain or drizzle.

The amount of snowfall in the county is influenced both by the cyclonic storms that move across the continent or up the Atlantic Coast and by lake-effect storms that occur when the prevailing wind is from the west or northwest. Airflow across the relatively warm, open water of Lake Ontario during the colder months frequently results in heavy snowfall over an extensive area to the leeward of the lake and in very heavy amounts in the more local areas. The intensity of these storms tends to diminish late in winter when the greater part of the lake surface is frozen.

The average snowfall in the county ranges from 75 inches in the southwestern part to almost 100 inches in the areas near Lake Ontario. In the greater part of the county, the average is between 85 and 95 inches. Winters having a total snowfall of about 100 inches or more occur about 1 year in 10, but winters having a snowfall of less than 70 inches are rare.

Snowfall is frequently heavy, both in terms of individual storms and monthly amounts. At least one storm each winter, resulting from the combination of a major storm system and the subsequent airflow off the Great Lakes, can be expected to yield more than 12 inches of snow. Snowfall in excess of 24 inches per month is fairly common from December through March, and a snowfall of 12 inches or more frequently occurs in November. The highest monthly snowfall recorded at Auburn in a recent 30-year period was 56 inches.

The snowfall season usually begins in the first or middle part of November and continues through the first half of April. The ground is covered by an inch or more of snow continuously, or nearly continuously, from early in December through the middle or latter part of March. For one or more periods during the winter, snow is likely to accumulate to a depth of more than 12 inches. As a rule, a snow cover can also be expected for short periods in November and April. Although periods of thawing are common in midwinter, snowstorms are so frequent that the ground is bare for only a few days.

The climate of the county favors a considerable amount of cloudiness, especially in winter. Ordinarily, there are from 190 to 200 cloudy days each year, although in the southern part of the county this number may decrease to about 180 days. About 20 cloudy days or more can be expected in each of the months from November through March. During the summer season, there are at least 10 cloudy days each month. Each year, from 65 to 75 days are clear, and from 105 to 110 days are partly cloudy. During the period from June through October, there are 8 or 9 bright, clear days each month.

Observations at Syracuse suggest that the percentage of possible sunshine in Cayuga County is less than 30 percent in November and December, and it increases to about 65 percent in June, July, and August.

The prevailing wind is generally westerly throughout the year, but there is a slight northerly tendency in winter and spring and a slight southerly tendency in summer and fall. The wind velocity is about 8 or 9 miles per hour from June through September. It increases to somewhat more than 10 miles per hour from November through February and to 11 or 12 miles per hour in March and April. Occasionally, there is some damage to property and crops during a locally severe thunderstorm or during the passage of a vigorous storm system. Strong winds that accompany lake-effect snowstorms can cause snow to drift and make highway traffic hazardous.

Thunderstorms occur on about 30 days each year. A few are accompanied by locally damaging winds or heavy rain, or both. Flooding and soil erosion may result if rainfall is intense. Hail accompanies some of the more vigorous thunderstorms but is not regarded as a serious hazard to crops or property.

Two tornadoes have been recorded in Cayuga County since its settlement. Storms that bring freezing rain occur nearly every winter, but only occasionally is there a storm that causes widespread damage to utility lines and trees. The county is not within the usual path of hurricanes, although on rare occasions the interior of the State is crossed by a hurricane that brings destructive winds and heavy rain to Cayuga County.

Dense fog occurs on about 10 to 15 days each year. Afternoon humidity in summer averages between 50 and 60 percent. An uncomfortable combination of high temperature and high humidity is infrequent.

Vegetation

The original forests of Cayuga County were thick and continuous. Beech, hard maple, red oak, and white oak grew on the better drained soils, and elm, soft maple, and willow grew on the more poorly drained soils. The southern part of the county supported stands of hard maple, beech, white ash, hickory, basswood, black cherry, yellow-poplar, black walnut, black locust, and hophornbeam. Hemlock and white pine were dominant in the high hill section in the southeastern part.

The early settlers cleared much of the land of timber, generally by burning. After transportation systems were established, a lumber industry of considerable size developed. Remnants of the original forests occur mostly as scattered woodlots and are composed mainly of second and third growth of the original species.

Settlement and Population

Originally, Cayuga County was part of the Onondaga Military Tract, a large area divided into lots of 640 acres and given as a bounty to soldiers of the Revolution. The first permanent settlement was in 1789, near the present village of Aurora. Once started, settlement was rapid. Most settlers came from the New England States, mainly Massachusetts and Connecticut. Others came from Pennsylvania. All of the land had to be cleared of forest before crops could be grown. Indian trails were numerous but could not be used for wagon transportation. The early part of the nineteenth century was marked by progress in opening up the area. The Erie Canal was completed in 1825, and the New York Central Railroad in 1848.

The population of the county rose sharply, and by 1900 it was 67,107. In 1950, the population was 70,136, and it increased to 73,942 by 1960. The census indicates that in 1960 the population was about equally divided between rural and nonrural. Auburn, the only city, had a population of 35,249, and Moravia, the largest village, a population of 1,575. Other incorporated villages are Weedsport, Port Byron, Aurora, Union Springs, Cayuga, Cato, Meridian, and Fair Haven. There are also numerous small, unincorporated villages.

Industry, Transportation, and Markets

Auburn is a manufacturing city of some importance. The chief products are electrical parts, rope, locomotives, heavy diesel motors, shoes, and plastics. A large sugar refinery, which began operations at Montezuma in 1966, processes locally grown sugar beets and refines imported crude sugar cane. Limestone quarries produce material used mainly in the construction and maintenance of roads.

The county is served by the Penn Central and Lehigh Valley Railroads. The New York State Barge Canal crosses the county from east to west, almost parallel to the main line of the Penn Central Railroad. For much of the distance, it utilizes the channel of the Seneca River. The system of improved State and Federal highways is excellent, and surfaced, all-weather roads serve all parts of the county. The New York State Thruway crosses the county in the vicinity of Weedsport.

Some of the agricultural products of the county are marketed locally, but most are disposed of outside the county, principally in the cities of Syracuse, Rochester, and Buffalo. The dairy industry sells its produce as fluid milk. The sale of milk outside the county is handled through cooperatives. Except for sugar beets, little processing of agricultural products is done in local plants.

Land Use

The 1964 Census of Agriculture shows that about 69 percent, or 308,666 acres, of Cayuga County is in farms. Dairying is the principal type of farming, but general crops and cash crops are also important.

There were 1,663 farms in the county in 1964, and they averaged 186 acres in size. Of these, 232 were classed as field-crop farms, 677 as dairy farms, and 13 as vegetable farms. The rest consisted of poultry, fruit, and miscellaneous-type farms.

Hay is the principal crop grown. In 1964, there were 44,854 acres in alfalfa, a considerable amount of which was baled and sold as a cash crop. Of the 35,491 acres in corn, 22,204 acres was harvested for grain, and the rest was used for silage. The acreage in other important crops included 18,376 acres in winter wheat, 12,285 acres in dry field beans, and 3,706 acres in vegetables. A wide range of other crops were also grown in significant amounts.

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Glossary

Acid soil. See Reaction.

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.

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 moisture capacity. The capacity of a soil to hold water in a form available to plants. Amount of moisture held in soil between field capacity, or about one-third atmosphere of tension, and the wilting coefficient, or about 15 atmospheres of tension.

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.

Channery soil. Soil that contains thin, flat fragments of sandstone or siltstone, as much as 6 inches in length along the longer axis.

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.

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; will 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 terraces.

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.

Drainage sequence. A group of soils, within a specific soil zone, formed from similar parent materials but with unlike soil characteristics because of differences in drainage.

Drumlin. An elongated, oval hill or ridge that is composed of glacial drift, normally compact and unstratified, generally with its longer axis conforming to the direction of the movement of the ice responsible for its deposition.

Erosion. The wearing away of the land surface by wind, 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.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Fragipan. A loamy, brittle, subsurface horizon that is very low in organic matter and clay but is rich in silt or very fine sand. The layer is seemingly cemented when dry, has a hard or very hard consistence, 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.

Geologic erosion. The natural process by which land surfaces are worn down by water, ice or frost, and wind.

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). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice; the deposits are stratified and occur in the form of kames, eskers, deltas, and outwash plains.

Graded stripcropping. Growing of crops in strips that are graded toward a protected waterway.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, and covered by grass for protection against erosion; used to conduct surface water away from cropland.

Green manure (agronomy). A crop grown for the purpose of being turned under in an early stage of maturity or soon after maturity for soil improvement.

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 (1) distinctive characteristics caused by accumulation of clay, sesquioxides, humus, or some combination of these; (2) prismatic or blocky structure; (3) redder or stronger colors than the A horizon; or (4) 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.

Humus. The well-decomposed, more or less stable part of the organic matter in mineral soils.

Internal soil 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.*

Kame (geology). An irregular, short ridge or hill of stratified glacial drift.

Leached layer. A layer from which the soluble materials have been dissolved and washed away by percolating water.

Mapping unit. Areas of soil of the same kind outlined on the soil map and identified by a symbol.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Types are these: Terminal, lateral, medial, ground.

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.

Parent material (soil). The horizon of weathered rock or partly weathered soil material from which soil has formed; horizon C in the soil profile.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

Permeability. The quality that enables a soil horizon to transmit air or water. 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		
Slightly acid	6.1 to 6.5	Very strongly alkaline.	9.1 and higher
Neutral	6.6 to 7.3		

Relief. The elevations or inequalities of a land surface, considered collectively.

Runoff (hydrology). The part of the precipitation upon a drainage area that is discharged from the area in stream channels. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments in soils ranging from 0.05 to 2.0 millimeters in diameter. Most sand grains consist of quartz, but sand may be of any mineral composition. As a textural class, soil material that is 85 percent or more sand and not more than 10 percent clay.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a textural class, soil that 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 upon 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.

Stripcropping. Growing crops in a systematic arrangement of strips, or bands, to serve as vegetative barriers to wind and water erosion.

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 aggregate longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular). and *granular. Structureless* soils are (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the profile below plow depth.

Substratum. Any layer beneath the solum, or true soil.

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.

Topsoil. A presumed fertile soil or soil material, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Upland (geologic). Land consisting of material unworked by water in recent geologic time and lying, in general, at a higher elevation than the alluvial plain or stream terrace. Land above the lowlands along rivers.

Variant. A soil having properties sufficiently different from other known soils to justify a new series name but occupying a geographic area so limited that creation of a new series is not believed to be justified.

Varves. Distinctly marked annual deposits of sediment, regardless of their origin.

Watershed. The total runoff from a region which supplies the water of a river or lake; a catchment area, or drainage basin. (Strictly the *watershed* is the drainage divide.)

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

Weathering. All physical and chemical changes produced in rocks at or near the earth's surface by atmospheric agents. These changes result in more or less complete disintegration and decomposition of the rock.

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the series to which the mapping unit belongs. Other information is given in tables as follows:

Estimated yields, table 1, page 32.
Woodland groups, table 2, page 38.
Engineering uses of the soils, tables 4, 5, and 6, pages 52 through 87.
Nonfarm uses of the soils, table 7, page 90.
Acreage and extent, table 8, page 108.

Map symbol	Mapping unit	Described on page	Capability unit		Woodland group
			Symbol	Page	Number
Ac	Alden mucky silt loam	110	IIIw-8	25	20
Ad	Alden mucky silt loam, till substratum	111	IVw-2	29	20
Al	Alluvial land	111	Vw-1	30	19
AmA	Alton cobbly loam, 0 to 3 percent slopes	112	I-1	16	4
AmB	Alton cobbly loam, 3 to 8 percent slopes	112	IIe-3	16	4
AnA	Alton gravelly sandy loam, 0 to 3 percent slopes	112	IIs-2	20	4
AnB	Alton gravelly sandy loam, 3 to 8 percent slopes	112	IIs-3	21	4
AnC	Alton gravelly sandy loam, 8 to 15 percent slopes	112	IVe-12	28	4
AoD	Alton and Howard soils, 15 to 25 percent slopes	113	IVe-12	28	17b
ArB	Angola silt loam, 1 to 6 percent slopes	113	IIIw-6	24	11
ArC	Angola silt loam, 6 to 12 percent slopes	114	IVe-6	27	11
AsB	Appleton and Lyons loams, 0 to 5 percent slopes	114	IIIw-2	24	11
AtB	Arkport fine sandy loam, 1 to 6 percent slopes	115	IIe-4	17	6a
AtC	Arkport fine sandy loam, 6 to 12 percent slopes	115	IVe-11	28	6a
AuC	Arnot channery silt loam, 3 to 15 percent slopes	116	IVe-4	27	14a
AuD	Arnot channery silt loam, 15 to 25 percent slopes	116	VIe-2	30	14b
AvE	Arnot soils, 25 to 45 percent slopes	116	VIIs-1	31	14b
AwB	Aurora silt loam, 2 to 6 percent slopes	117	IIe-10	18	6a
AwC	Aurora silt loam, 6 to 12 percent slopes	117	IIIe-6	23	6a
AwC3	Aurora silt loam, 6 to 12 percent slopes, eroded	117	IVe-10	28	6b
AwD3	Aurora silt loam, 12 to 18 percent slopes, eroded	118	VIe-1	30	6c
AwE	Aurora silt loam, 18 to 30 percent slopes	118	VIe-1	30	6c
AxB	Aurora silt loam, limestone substratum, 2 to 8 percent slopes	118	IIe-10	18	2a
AyD	Aurora and Farmington shaly silt loams, 12 to 18 percent slopes	118	IVe-4	27	9b
AyE	Aurora and Farmington shaly silt loams, 18 to 40 percent slopes	118	VIe-2	30	9c
AzF	Aurora, Farmington and Benson very rocky soils, 20 to 70 percent slopes	119	VIIs-1	31	16
BeB	Benson loam, 1 to 8 percent slopes	119	IIIs-2	26	10a
BeC	Benson loam, 8 to 14 percent slopes	120	IVe-4	27	10a
BkD	Benson very rocky loam, 2 to 20 percent slopes	120	VIs-3	31	10b
BlB	Brockport and Lockport silty clay loams, 2 to 6 percent slopes	120	IIIw-7	25	11
CaB	Camillus silt loam, 2 to 6 percent slopes	121	IIe-1	16	1a
CaC3	Camillus silt loam, 6 to 12 percent slopes, eroded	121	IVe-2	26	1a
CeB	Cazenovia silt loam, 2 to 8 percent slopes	123	IIe-10	18	2a
CeC	Cazenovia silt loam, 8 to 14 percent slopes	123	IIIe-6	23	2a
CeC3	Cazenovia silt loam, 5 to 14 percent slopes, eroded	123	IVe-10	28	2a
CeCK	Cazenovia silt loam, rolling	124	IVe-9	28	2a
CeD	Cazenovia silt loam, 12 to 20 percent slopes	124	IVe-9	28	2a
ChE	Cazenovia and Schoharie soils, 20 to 40 percent slopes	124	VIe-1	30	2b
ClA	Collamer silt loam, 0 to 2 percent slopes	125	IIw-2	19	6a
ClB	Collamer silt loam, 2 to 6 percent slopes	125	IIe-7	18	6a
CmB	Colonie loamy fine sand, 1 to 6 percent slopes	126	IIIs-1	26	17a
CmC	Colonie loamy fine sand, 6 to 12 percent slopes	126	IVs-1	29	17a
CnB	Colonie fine sandy loam, 1 to 6 percent slopes	126	IIs-3	21	17a
CpD	Colonie and Arkport soils, 12 to 22 percent slopes	126	VIs-2	30	17b
CsA	Conesus gravelly silt loam, 0 to 3 percent slopes	127	IIw-6	20	6a
CsB	Conesus gravelly silt loam, 3 to 8 percent slopes	127	IIe-6	17	6a
DuB	Dunkirk silt loam, 1 to 6 percent slopes	128	IIe-9	18	6a
DuC3	Dunkirk silt loam, 6 to 12 percent slopes, eroded	128	IVe-8	27	6a
DuD3	Dunkirk silt loam, 12 to 18 percent slopes, eroded	128	VIe-1	30	6b
DvE	Dunkirk soils, 18 to 35 percent slopes	129	VIe-1	30	6c
Ed	Edwards muck	129	IVw-5	29	20

Map symbol	Mapping unit	Described on page	Capability unit Symbol	Capability unit Page	Woodland group Number
Ee	Eel silt loam	130	IIw-5	19	1a
Eh	Eel silt loam, high bottom	130	IIw-3	19	1a
ElB	Ellery and Alden silt loams, 3 to 8 percent slopes	131	IVw-2	29	20
ErA	Erie channery silt loam, 0 to 3 percent slopes	132	IIIw-3	24	15
ErB	Erie channery silt loam, 3 to 8 percent slopes	132	IIIw-9	25	15
EsA	Erie channery silt loam, moderately shallow variant, 0 to 3 percent slopes	133	IIIw-3	24	15
EsB	Erie channery silt loam, moderately shallow variant, 3 to 8 percent slopes	133	IIIw-9	25	15
FaC	Farmington shaly silt loam, 1 to 12 percent slopes	134	IIIe-1	21	9a
Fo	Fonda mucky silt loam	135	IVw-1	28	20
Fr	Fredon loam	135	IIIw-2	24	11
Fw	Fresh water marsh	135	VIIIw-1	31	20
GaA	Galen fine sandy loam, 0 to 2 percent slopes	136	IIw-2	19	6a
GaB	Galen fine sandy loam, 2 to 6 percent slopes	136	IIw-7	20	6a
Gn	Genesee silt loam	137	IIw-4	19	1a
Go	Genesee silt loam, high bottom	137	I-2	16	1a
Gv	Genesee gravelly loam, fan	137	IIe-5	17	1a
HlA	Hilton loam, 0 to 3 percent slopes	138	IIw-6	20	1a
HlB	Hilton loam, 3 to 8 percent slopes	139	IIe-6	17	1a
HnB	Honeoye silt loam, 2 to 8 percent slopes	140	IIe-1	16	1a
HnC	Honeoye silt loam, 8 to 14 percent slopes	140	IIIe-2	21	1a
HnC3	Honeoye silt loam, 8 to 14 percent slopes, eroded	140	IVe-2	26	1a
HoCK	Honeoye soils, rolling	140	IVe-1	26	1a
HsD	Honeoye and Lansing gravelly silt loams, 14 to 20 percent slopes	140	IVe-1	26	1b
HwA	Howard gravelly loam, 0 to 3 percent slopes	142	I-1	16	4
HwB	Howard gravelly loam, 3 to 8 percent slopes	142	IIe-3	16	4
HwC	Howard gravelly loam, 8 to 15 percent slopes	142	IVe-12	28	4
IrA	Ira gravelly loam, 0 to 3 percent slopes	143	IIw-1	19	5a
IrB	Ira gravelly loam, 3 to 8 percent slopes	143	IIe-11	19	5a
IsD	Ira and Sodus very stony loams, 2 to 20 percent slopes	143	VIs-1	30	5b
KeB	Kendaia silt loam, 3 to 8 percent slopes	144	IIIw-10	25	11
KlA	Kendaia and Lyons silt loams, 0 to 3 percent slopes	144	IIIw-2	24	11
Lb	Lake beaches	146	VIIIs-1	31	20
Lc	Lakemont silty clay loam	146	IVw-1	28	18
Le	Lamson fine sandy loam	147	IIIw-8	25	12
Lf	Lamson mucky fine sandy loam	147	IIIw-8	25	20
LgB	Langford channery silt loam, 2 to 8 percent slopes	148	IIe-11	19	8a
LgC	Langford channery silt loam, 8 to 15 percent slopes	149	IIIe-4	21	8a
LgCK	Langford channery silt loam, rolling	149	IVe-3	26	8a
LgD	Langford channery silt loam, 15 to 25 percent slopes	149	IVe-3	26	8b
LhB	Langford-Howard gravelly loams, 2 to 8 percent slopes	149	IIe-11	19	7a
LhC	Langford-Howard gravelly loams, 8 to 15 percent slopes	149	IVe-3	26	7a
LhD	Langford-Howard gravelly loams, 15 to 25 percent slopes	150	IVe-3	26	7b
LhE	Langford-Howard gravelly loams, 25 to 45 percent slopes	150	VIe-1	30	7b
LnB	Langford channery silt loam, moderately shallow variant, 2 to 8 percent slopes	151	IIe-11	19	8a
LsB	Lansing gravelly silt loam, 2 to 8 percent slopes	152	IIe-1	16	6a
LsC	Lansing gravelly silt loam, 8 to 14 percent slopes	152	IIIe-2	21	6a
LsC3	Lansing gravelly silt loam, 8 to 14 percent slopes, eroded	152	IVe-2	26	6a
LsCK	Lansing gravelly silt loam, rolling	152	IVe-1	26	6a
LtA	Lima silt loam, 0 to 3 percent slopes	153	IIw-6	20	1a
LtB	Lima silt loam, 3 to 8 percent slopes	154	IIe-6	17	1a
LwB	Lordstown channery silt loam, 2 to 8 percent slopes	155	IIe-2	16	8a
LwC	Lordstown channery silt loam, 8 to 15 percent slopes	155	IIIe-3	21	8a
Ma	Madalin silt loam	157	IVw-1	28	18
Mb	Madalin silt loam, sandy subsoil variant	158	IVw-1	28	18
Mc	Made land, sanitary land fill	158	------	--	20
Md	Made land, tillable	158	------	--	20
Mf	Minoa fine sandy loam	159	IIIw-2	24	12
Mr	Muck, deep	160	IIIw-1	23	20

Map symbol	Mapping unit	Described on page	Capability unit Symbol	Capability unit Page	Woodland group Number
Ms	Muck, shallow	160	IVw-5	29	20
Na	Niagara fine sandy loam	161	IIIw-2	24	12
Nc	Niagara and Canandaigua silt loams	161	IIIw-2	24	12
OdA	Odessa silt loam, 0 to 2 percent slopes	162	IIIw-5	24	11
OdB	Odessa silt loam, 2 to 6 percent slopes	162	IIIw-6	24	11
OfB	Ontario fine sandy loam, 2 to 8 percent slopes	163	IIe-1	16	1a
OfC	Ontario fine sandy loam, 8 to 14 percent slopes	164	IIIe-2	21	1a
OfCK	Ontario fine sandy loam, rolling	164	IVe-1	26	1a
OnB	Ontario loam, 2 to 8 percent slopes	164	IIe-1	16	1a
OnC	Ontario loam, 8 to 14 percent slopes	164	IIIe-2	21	1a
OnC3	Ontario loam, 8 to 14 percent slopes, eroded	165	IVe-2	26	1a
OnCK	Ontario loam, rolling	165	IVe-1	26	1a
OnD	Ontario loam, 14 to 20 percent slopes	165	IVe-1	26	1b
OnD3	Ontario loam, 14 to 20 percent slopes, eroded	165	VIe-1	30	1b
OrA	Ontario silt loam, moderately shallow variant, 0 to 3 percent slopes	166	IIs-1	20	1a
OrB	Ontario silt loam, moderately shallow variant, 3 to 8 percent slopes	167	IIe-1	16	1a
OrC	Ontario silt loam, moderately shallow variant, 8 to 14 percent slopes	167	IIIe-2	21	1a
OtE	Ontario, Honeoye and Lansing soils, 20 to 35 percent slopes	167	VIe-1	30	1b
OtF	Ontario, Honeoye and Lansing soils, 35 to 50 percent slopes	167	VIIe-1	31	1c
OvA	Ovid silt loam, 0 to 2 percent slopes	168	IIIw-5	24	11
OvB	Ovid silt loam, 2 to 6 percent slopes	168	IIIw-6	24	11
PaB	Palmyra gravelly sandy loam, 3 to 8 percent slopes	169	IIs-3	21	3a
PaC	Palmyra gravelly sandy loam, 8 to 15 percent slopes	169	IVe-12	28	3a
PgA	Palmyra gravelly loam, 0 to 3 percent slopes	170	I-1	16	3a
PgB	Palmyra gravelly loam, 3 to 8 percent slopes	170	IIe-3	16	3a
PgC	Palmyra gravelly loam, 8 to 15 percent slopes	170	IVe-12	28	3a
PmD	Palmyra soils, 15 to 25 percent slopes	170	IVe-12	28	3b
PnE	Palmyra, Howard and Alton soils, 25 to 40 percent slopes	171	VIe-1	30	17b
Pu	Peat and Muck	171	VIIw-1	31	20
Pv	Phelps gravelly silt loam	172	IIw-6	20	3a
RgB	Riga and Lairdsville silt loams, 2 to 6 percent slopes	173	IIe-8	18	2a
RlC3	Riga and Lairdsville silty clay loams, 6 to 12 percent slopes, eroded	173	IVe-7	27	2a
Ro	Romulus silty clay loam	174	IVw-1	28	18
SeB	Schoharie silt loam, 2 to 6 percent slopes	175	IIe-8	18	2a
ShC	Schoharie silty clay loam, 6 to 12 percent slopes	175	IVe-7	27	2a
ShD	Schoharie silty clay loam, 12 to 20 percent slopes	175	VIe-1	30	2a
Sk	Scriba gravelly loam	176	IIIw-3	24	13
Sm	Scriba very stony loam	177	Vs-1	30	13
Sn	Sloan silt loam	177	IIIw-4	24	19
SoB	Sodus gravelly loam, 2 to 8 percent slopes	178	IIe-2	16	5a
SoC	Sodus gravelly loam, 8 to 14 percent slopes	179	IIIe-3	21	5a
SoC3	Sodus gravelly loam, 8 to 14 percent slopes, eroded	179	IVe-3	26	5a
SoCK	Sodus gravelly loam, rolling	179	IVe-3	26	5a
SoD	Sodus gravelly loam, 14 to 20 percent slopes	179	IVe-3	26	5a
SoE	Sodus gravelly loam, 20 to 40 percent slopes	179	VIe-1	30	5c
St	Stafford fine sandy loam	180	IIIw-2	24	12
TuB	Tuller channery silt loam, 1 to 8 percent slopes	181	IVw-3	29	15
Va	Varick silt loam	182	IVw-4	29	18
WaA	Wampsville gravelly silt loam, 0 to 3 percent slopes	182	I-1	16	1a
WaB	Wampsville gravelly silt loam, 3 to 8 percent slopes	183	IIe-3	16	1a
We	Warners loam	183	IIIw-4	24	19
Wf	Warners loam, fan	183	IIw-5	19	1a
WmA	Williamson silt loam, 0 to 2 percent slopes	184	IIw-2	19	5a
WmB	Williamson silt loam, 2 to 6 percent slopes	184	IIe-7	18	5a
WmC	Williamson silt loam, 6 to 12 percent slopes	185	IIIe-5	22	5a
WmC3	Williamson silt loam, 6 to 12 percent slopes, eroded	185	IVe-5	27	5a

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